VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELAGAVI

B.E. /B. Tech. In Mining Engineering

Scheme of Teaching and Examinations

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

(Effective from the academic year 2018 – 19)

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

B.E. in MINING ENGINEERING

Scheme of Teaching and Examination 2018 – 19

Choice Based Credit System (CBCS) and Outcome Based Education(OBE)

(Effective from the academic year 2018 – 19)

III SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BSC	18MAT31	Transform Calculus, Fourier Series and Numerical Techniques (Common to all Branches)	Mathematics	2	2	--	03	40	60	100	3
2	PCC	18MN32	Elements of Mining Engineering	MN	3	2	--	03	40	60	100	4
3	PCC	18MN33	Mine Surveying – I	MN	3	0	--	03	40	60	100	3
4	PCC	18MN34	Mechanics of Materials	ME/MN	3	0	--	03	40	60	100	3
5	PCC	18MN35	Drilling and Blasting	MN	3	0	--	03	40	60	100	3
6	PCC	18MN36	Mineralogy, Petrology and Stratigraphy	MN	3	0	--	03	40	60	100	3
7	PCC	18MNL37	Mine Surveying – I Laboratory	MN	--	2	2	03	40	60	100	2
8	PCC	18MNL38	Mineralogy and Petrology Laboratory	MN	--	2	2	03	40	60	100	2
9	HSMC	18KVK39/49	Vyavaharika Kannada (Kannada for communication)/	HSMC	--	2	--	--	100	--	100	1
		18KAK39/49	Aadalitha Kannada (Kannada for Administration)									
		OR										
		18CPC39	Constitution of India, Professional Ethics and Cyber Law		1	--	--	02	40	60		
					Examination is by objective type questions							
				TOTAL	**17**	**08**	**04**	**24**	**420**	**480**	**900**	**24**
					OR	**OR**		**OR**	**OR**	**OR**		
					18	**10**		**26**	**360**	**540**		

Note: BSC: Basic Science, PCC: Professional Core, HSMC: Humanity and Social Science, NCMC: Non-credit mandatory course.

18KVK39Vyavaharika Kannada (Kannada for communication) is for non-Kannada speaking, reading and writing students and 18KAK39 Aadalitha Kannada (Kannada for Administration) is for students who speak, read and write Kannada.

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

10	NCMC	18MATDIP31	Additional Mathematics - I	Mathematics	02	01	--	03	40	60	100	0

(a)The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE/B. Tech programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the students have to fulfill the requirements during subsequent semester/s to appear for SEE.

(b)These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

Courses prescribed to lateral entry B. Sc degree holders admitted to III semester of Engineering programs

Lateral entrant students from B.Sc. Stream, shall clear the non-credit courses Engineering Graphics and Elements of Civil Engineering and Mechanics of the First Year Engineering Programme. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

AICTE Activity Points to be earned by students admitted to BE/B. Tech/B. Plan day college programme (For more details refer to Chapter 6,AICTE Activity Point Programme, Model Internship Guidelines):

Over and above the academic grades, every Day College regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other Universities to fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eighth semester Grade Card.

The activities can be can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, minimum hours' requirement should be fulfilled. Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.

In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

B.E. in MINING ENGINEERING

Scheme of Teaching and Examination 2018 – 19

Choice Based Credit System (CBCS) and Outcome Based Education(OBE)

(Effective from the academic year 2018 – 19)

IVSEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BSC	18MAT41	Mathematics (Title as per the decision of BoS in Sciences)	Mathematics	2	2	--	03	40	60	100	3
2	PCC	18MN42	Underground Metal Mining	MN	3	2	--	03	40	60	100	4
3	PCC	18MN43	Mine Surveying-II	MN	3	0	--	03	40	60	100	3
4	PCC	18MN44	Mining Machinery	MN	3	0	--	03	40	60	100	3
5	PCC	18MN45	Geology for Mining Engineers	MN	3	0	--	03	40	60	100	3
6	PCC	18MN46	Thermodynamics & Fluid Mechanics	ME/MN	3	0	--	03	40	60	100	3
7	PCC	18MNL47	Mine Surveying – II Laboratory	MN	--	2	2	03	40	60	100	2
8	PCC	18MNL48	Geology for Mining Engineers Laboratory	MN	--	2	2	03	40	60	100	2
9	HSMC	18KVK39/49	Vyavaharika Kannada (Kannada for communication)/	HSMC	--	2	--	--	100	--	100	1
		18KAK39/49	Aadalitha Kannada (Kannada for Administration)									
		OR										
		18CPC49	Constitution of India, Professional Ethics and Cyber Law		1	--	--	02	40	60		
					Examination is by objective type questions							
				TOTAL	**17**	**08**	**04**	**24**	**420**	**480**	**900**	**24**
					OR	**OR**		**OR**	**OR**	**OR**		
					18	**10**		**26**	**360**	**540**		

Note: BSC: Basic Science, PCC: Professional Core, HSMC: Humanity and Social Science, NCMC: Non-credit mandatory course.

18KVK39/49Vyavaharika Kannada (Kannada for communication) is for non-Kannada speaking, reading and writing students and 18KAK39/49 Aadalitha Kannada (Kannada for Administration) is for students who speak, read and write Kannada.

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

10	NCMC	18MATDIP41	Additional Mathematics - II	Mathematics	02	01	--	03	40	60	100	0

((a)The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE/B. Tech programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the student have to fulfill the requirements during subsequent semester/s to appear for SEE.

(b)These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

Courses prescribed to lateral entry B. Sc degree holders admitted to III semester of Engineering programs

Lateral entrant students from B.Sc. Stream, shall clear the non-credit courses Engineering Graphics and Elements of Civil Engineering and Mechanics of the First Year Engineering Programme. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

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V SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PCC	18MN51	Mine Management	MN	2	2	--	03	40	60	100	3
2	PCC	18MN52	Underground Coal Mining	MN	3	2	--	03	40	60	100	4
3	PCC	18MN53	Surface Mining	MN	3	2	--	03	40	60	100	4
4	PCC	18MN54	Mine Ventilation	MN	3	--	--	03	40	60	100	3
5	PCC	18MN55	Rock Mechanics	MN	3	--	--	03	40	60	100	3
6	PCC	18MN56	Mine Electrical Engineering	EEE	3	--	--	03	40	60	100	3
7	PCC	18MNL57	Rock Mechanics Laboratory	MN	--	2	2	03	40	60	100	2
8	PCC	18MNL58	Mine Electrical Engineering Laboratory	EEE	--	2	2	03	40	60	100	2
9	HSMC	18CIV59	Environmental Studies	Civil/ Environmental [Paper setting: Civil Engineering Board]	1	--	--	02	40	60	100	1
				TOTAL	**18**	**10**	**04**	**26**	**360**	**540**	**900**	**25**

Note: PCC: Professional Core, HSMC: Humanity and Social Science.

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

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Scheme of Teaching and Examination 2018 – 19

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(Effective from the academic year 2018 – 19)

VI SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PCC	18MN61	Ground Control	MN	3	2	--	03	40	60	100	4
2	PCC	18MN62	Mine Environmental Engineering	MN	3	2	--	03	40	60	100	4
3	PCC	18MN63	Mineral Processing and Fuel Technology	MN	3	2	--	03	40	60	100	4
4	PEC	18MN64X	Professional Elective -1	MN	3	--	--	03	40	60	100	3
5	OEC	18MN65X	Open Elective –A	MN	3	--	--	03	40	60	100	3
6	PCC	18MNL66	Mine Ventilation and Environmental Engineering Laboratory	MN	--	2	2	03	40	60	100	2
7	PCC	18MNL67	Mineral Processing Laboratory	MN	--	2	2	03	40	60	100	2
8	MP	18MNMP68	Mini-project	MN	--	--	2	03	40	60	100	2
9	Internship	--	Internship	To be carried out during the vacation/s of VI and VII semesters and /or VII and VIII semesters.								
				TOTAL	**15**	**10**	**06**	**24**	**320**	**480**	**800**	**24**

Note: PCC: Professional core, PEC: Professional Elective, OE: Open Elective, MP: Mini-project.

Professional Elective -1

Course code under18MN64X	Course Title
18MN641	Underground Mine Planning and Design
18MN642	Surface Mine Planning and Design
18MN643	Environmental Management in Surface Mines

Open Elective -A

Students can select any one of the open electives offered by other Departments expect those that are offered by the parent Department (Please refer to the list of open electives under 18XX65X).

Selection of an open elective shall not be allowed if,

- The candidate has studied the same course during the previous semesters of the programme.
- The syllabus content of open elective is similar to that of the Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the programme.

Registration to electives shall be documented under the guidance of Programme Coordinator/ Advisor/Mentor.

Mini-project work:

Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini-project can be assigned to an individual student or to a group having not more than 4 students.

CIE procedure for Mini-project:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the Mini-project work, shall be based on the evaluation of project report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all the guides of the college.

The CIE marks awarded for the Mini-project, shall be based on the evaluation of project report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

SEE for Mini-project:

(i) Single discipline: Contribution to the Mini-project and the performance of each group member shall be assessed individually in the semester end examination (SEE) conducted at the department.

(ii) Interdisciplinary: Contribution to the Mini-project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted separately at the departments to which the student/s belong to.

Internship: All the students admitted to III year of BE/B. Tech shall have to undergo mandatory internship of 4 weeks during the vacation of VI and VII semesters and /or VII and VIII semesters. A University examination shall be conducted during VIII semester and the prescribed credit shall be included in VIII semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements.

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

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VII SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PCC	18MN71	Mine System Engineering	MN	3	--	--	03	40	60	100	3
2	PCC	18MN72	Computer Application in Mining	MN	3	--	--	03	40	60	100	3
3	PEC	18MN73X	Professional Elective - 2	MN	3	--	--	03	40	60	100	3
4	PEC	18MN74X	Professional Elective - 3	MN	3	--	--	03	40	60	100	3
5	OEC	18MN75X	Open Elective -B	MN	3	--	--	03	40	60	100	3
6	PCC	18MNL76	Computer Application in Mining Laboratory	MN	--	2	2	03	40	60	100	2
7	PCC	18MNL77	Mine Optimization Laboratory	MN	--	2	2	03	40	60	100	2
8	Project	18MNP78	Project Work Phase - 1	MN	--	--	2	--	100	--	100	1
9	Internship	--	Internship	(If not completed during the vacation of VI and VII semesters, it shall be carried out during the vacation of VII and VIII semesters)								
				TOTAL	**15**	**04**	**06**	**18**	**340**	**360**	**700**	**20**

Note: PCC: Professional core, PEC: Professional Elective.

Professional Elective - 2

Course code under 18MN73X	Course Title
18MN731	Open Pit Slope Analysis and Design
18MN732	Numerical Modelling and Instrumentation in Rock Mechanics

Professional Electives - 3

Course code under 18MN74X	Course Title
18MN741	Mineral Economics
18MN742	Occupational Health and General Safety

Open Elective -B

Students can select any one of the open electives offered by other Departments expect those that are offered by the parent Department (Please refer to the list of open electives under 18XX75X).

Selection of an open elective shall not be allowed if,

- The candidate has studied the same course during the previous semesters of the programme.
- The syllabus content of open elective is similar to that of the Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the programme.

Registration to electives shall be documented under the guidance of Programme Coordinator/ Advisor/Mentor.

Project work:

Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinaryproject can be assigned to an individual student or to a group having not more than 4 students. In extraordinary cases, like the funded projects requiring students from different disciplines, the project student strength can be 5 or 6.

CIE procedure for Project Work Phase - 1:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work phase -1, shall be based on the evaluation of the project work phase -1 Report (covering Literature Survey, Problem identification, Objectives and Methodology), project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the Project report shall be the same for all the batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable.

The CIE marks awarded for the project work phase -1, shall be based on the evaluation of project work phase -1 Report(covering Literature Survey, Problem identification, Objectives and Methodology), project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

Internship: All the students admitted to III year of BE/B. Tech shall have to undergo mandatory internship of 4 weeks during the vacation of VI and VII semesters and /or VII and VIII semesters. A University examination shall be conducted during VIII semester and the prescribed credit shall be included in VIII semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements.

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

B.E. in MINING ENGINEERING

Scheme of Teaching and Examination 2018 – 19

Choice Based Credit System (CBCS) and Outcome Based Education(OBE)

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VIII SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PCC	18MN81	Mine Legislation	MN	3	--	--	03	40	60	100	3
2	PEC	18MN82X	Professional Elective - 4	MN	3	--	--	03	40	60	100	3
3	Project	18MNP83	Project Work Phase - 2	MN	--	--	2	03	40	60	100	8
4	Seminar	18MNS84	Technical Seminar	MN	--	--	2	03	100	--	100	1
5	Internship	18MNI85	Internship	Completed during the vacation/s of VI and VII semesters and /or VII and VIII semesters.)				03	40	60	100	3
				TOTAL	**06**	**--**	**04**	**15**	**260**	**240**	**500**	**18**

Note: PCC: Professional Core, PEC: Professional Elective.

Professional Electives - 4

Course code under 18MN82X	Course Title
18MN821	Mine Geo-statistics
18MN822	Dimensional Stone Mining
18MN823	Coal Bed Methane

Project Work

CIE procedure for Project Work Phase - 2:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work phase -2, shall be based on the evaluation of project work phase -2 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable.

The CIE marks awarded for the project work phase -2, shall be based on the evaluation of project work phase -2 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

SEE for Project Work Phase - 2:

(i) Single discipline: Contribution to the project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted at the department.

(ii) Interdisciplinary: Contribution to the project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted separately at the departments to which the student/s belong to.

Internship: Those, who have not pursued /completed the internship shall be declared as fail and have to complete during subsequent University examination after satisfying the internship requirements.

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

Activity points of the students who have earned the prescribed AICTE activity Points shall be sent the University along with the CIE marks of 8th semester. In case of students who have not satisfied the AICTE activity Points at the end of eighth semester, the column under activity Points shall be marked NSAP (Not Satisfied Activity Points).

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SEMESTER - VI **OPEN ELECTIVE - A**

Course Code	18MN65X	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Students can select any one of the open electives offered by other Departments expect those that are offered by the parent Department (For syllabus, please refer to the concerned Programme syllabus book or VTU website vtu.ac.in may be visited.).

Selection of an open elective shall not be allowed if,

- The candidate has studied the same course during the previous semesters of the programme.
- The syllabus content of open elective is similar to that of the Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the programme.

Registration to electives shall be documented under the guidance of Programme Coordinator/ Advisor/Mentor.

SlNO	**Board and the Department offering the Electives**		**Course**		**Course Title**
			Sl No	**code under 18MN65X**	
1		Mechanical Board – MINING ENGINEERING Department	1	18MN651	Tunneling Engineering
			2	18MN652	Underground Space Technology

B. E. MINING ENGINEERING

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER - VII

OPEN ELECTIVE - B

Course Code	18MN75X	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Students can select any one of the open electives offered by other Departments expect those that are offered by the parent Department (For syllabus, please refer to the concerned Programme syllabus book or VTU website vtu.ac.in may be visited.).

Selection of an open elective shall not be allowed if,

- The candidate has studied the same course during the previous semesters of the programme.
- The syllabus content of open elective is similar to that of the Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the programme.

Registration to electives shall be documented under the guidance of Programme Coordinator/ Advisor/Mentor.

Sl NO	**Board and the Department offering the Electives**		**Course**		**Course Title**
			Sl No	**code under 18MN75X**	
1		Mechanical Board – MINING ENGINEERING Department	1	18MN751	Industrial Safety Engineering
			2	18MN752	Project Management

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Scheme of Teaching and Examination and Syllabus

B. E. MINING ENGINEERING

III –VIII SEMESTER

(Effective from Academic year 2018-19**)**

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES
(Common to all Programmes)

Course Code	**18MAT31**	CIE Marks	40
Teaching Hours/Week (L: T:P)	(2:2:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:

- To have an insight into Fourier series, Fourier transforms, Laplace transforms, Difference equations and Z-transforms.
- To develop the proficiency in variational calculus and solving ODE's arising in engineering applications, using numerical methods.

Module-1

Laplace Transform: Definition and Laplace transforms of elementary functions (statements only). Laplace transforms of Periodic functions (statement only) and unit-step function – problems.
Inverse Laplace Transform: Definition and problems, Convolution theorem to find the inverse Laplace transforms (without Proof) and problems. Solution of linear differential equations using Laplace transforms.

Module-2

Fourier Series: Periodic functions, Dirichlet's condition. Fourier series of periodic functions period 2π and arbitrary period. Half range Fourier series. Practical harmonic analysis.

Module-3

Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. Problems.
Difference Equations and Z-Transforms: Difference equations, basic definition, z-transform-definition, Standard z-transforms, Damping and shifting rules, initial value and final value theorems (without proof) and problems, Inverse z-transform and applications to solve difference equations.

Module-4

Numerical Solutions of Ordinary Differential Equations(ODE's):
Numerical solution of ODE's of first order and first degree- Taylor's series method, Modified Euler's method. Runge -Kutta method of fourth order, Milne's and Adam-Bash forth predictor and corrector method (No derivations of formulae)-Problems.

Module-5

Numerical Solution of Second Order ODE's: Runge-Kutta method and Milne's predictor and corrector method. (No derivations of formulae).
Calculus of Variations: Variation of function and functional, variational problems, Euler's equation, Geodesics, hanging chain, problems.

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

- CO1: Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.
- CO2: Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
- CO3: Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.
- CO4: Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.
- CO5:Determine the externals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.

- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Edition, 2016
2	Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers	44th Edition, 2017
3	Engineering Mathematics	Srimanta Pal et al	Oxford University Press	3rd Edition, 2016
Reference Books				
1	Advanced Engineering Mathematics	C. Ray Wylie, Louis C. Barrett	McGraw-Hill Book Co	6th Edition, 1995
2	Introductory Methods of Numerical Analysis	S.S.Sastry	Prentice Hall of India	4th Edition 2010
3	Higher Engineering Mathematics	B.V. Ramana	McGraw-Hill	11th Edition,2010
4	A Textbook of Engineering Mathematics	N.P.Bali and Manish Goyal	Laxmi Publications	6th Edition, 2014
5	Advanced Engineering Mathematics	Chandrika Prasad and Reena Garg	Khanna Publishing,	2018

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU EDUSAT PROGRAMME - 20

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

ELEMENTS OF MINING ENGINEERING

Course Code	**18MN32**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

Course objectives:

- To understand the basic concept of mining industry in relation to national economy and infrastructure building.
- 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
- To be familiar with the various types of Mine supports.

Module-1

Introduction to Mining Engineering: Significance to mining industry in national economy and infrastructure building, basic mining terminologies, stages in mine life cycle, geo-technical investigations, classification of mining methods and their selection criteria.
Opening up of Deposits: Types, size and location of entries into underground coal and other minerals.

Module-2

Shaft Sinking Operation: Preliminary geo-technical investigations for a shaft sinking, surface arrangements for sinking shafts and equipment. Unit-operations of drilling, blasting, mucking; temporary and permanent lining. Construction of insets and shaft stations.
Special and Mechanized Methods of Shaft Sinking: Methods of sinking shaft in water-logged, pressurized strata in loose and running soils. Mechanized shaft sinking, shaft borers and drop raise method. Need for widening and deepening of operating shafts. Different methods for widening and deepening shafts- cycles of operation, equipment and manpower needed. Numerical related to shaft sinking.

Module-3

Development of Workings: Drivage of cross cuts, drifts, inclines and raises by conventional and mechanized methods. Calculation of OMS. Arrangements for ventilations, supports, lightings, transportations and drainages. Drilling patterns for underground coal mines and hard rock mines.

Module-4

Mine Support Systems: Types of support: timber, prop, chock/cog, cross bar, concrete, steel and hydraulic supports. Yielding and rigid supports. Fore poling, roof stitching, roof bolting, applicability, advantages and limitations of various supports. Systematic support rules.

Module-5

Tunneling Methods : Conventional Method: drilling and blasting method, types of drill patterns, blasting and transportation of muck. Mechanized Method: construction and working principle of tunnel boring machine, applicability, advantages and limitations of tunnel boring machine.
Shield Tunneling Method: construction and working principle, applicability, advantages and limitations.

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, cross-cut 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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Elements of Mining Technology, vol. I	D. J. Deshmukh	Vidyasewa Prakashan, Nagpur	7th Ed, 1996.
2	Introductory Mining Engineering	Hartman H.L	John Wiley Sons	1st Ed. 2004
Reference Books				
3	Underground mining methods handbook	W.A.Hustrulid	S.M.E. of the American institute of mining metallurgical and petroleum Engineers inc, New York,	1982
4	Drilling & Blasting	Carlos Lopez Jimeno		

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

MINE SURVEYING – I

Course Code	**18MN33**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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.

Module-1

Surveying: Definition, objective, classification and principles of surveying.
Linear Measurement: Instruments for measuring distances; Ranging and taping survey lines; Chain surveying – principle, field work, off-sets, booking and plotting, obstacles in taping.

Module-2

Angular Measurement: Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments; Theodolite traversing; Computation of co-ordinates; Adjustment of traverse.

Module-3

Levelling: Definition & terminology; Levelling instruments types - tilting, auto set and digital levels; Levelling staves; Different types of levelling - differential, profile, cross-sectional and reciprocal levelling; Booking and reduction methods; Underground levelling; Temporary and permanent adjustments of levels.

Module-4

Contours: Contour, contour interval and characteristics, methods – direct and indirect, interpretation – arithmetic and graphical method, uses of contours.
Plane Table Surveying: Methods

Module-5

Computation of Areas: General methods for regular & irregular boundaries, area computed from map measurements, construction & uses of planimeter. Problems
Computation of Volumes: General methods of calculation of volumes for Embankments and cuttings, spot levels, volume from contour plans & capacity of reservoirs & volume of borrow pits. Problems

Course outcomes: 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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Surveying Vol. I & II	B.C.Punmia	Laxmi publications	1999
2	Surveying & Levelling	Rangwala	Charotar pub. House pvt. Ltd	2014
Reference Books				
3	Surveying Vol. I	S.K.Duggal	Tata McGraw Hill Publications, New Delhi,	2000
4	Surveying & Levelling Vols I & II	Kanetkar and Kulkarni		

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

MECHANICS OF MATERIALS

Course Code	**18MN34**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- To understand the basic concepts of mechanics of materials, which is the base of rock mechanics.
- To know the relation between stress, strain and between different elastic constants.
- To analyze stresses and strains at any point in a material with various stress conditions.
- To draw the bending moment and shear force diagram and to find out bending and shear stresses at any point in a cross section of the beam.
- To understand the concept behind torsion.

Module-1

Stress and Strain: Definition of Stress, Strain and Stress-strain relations, Mechanical behaviour of materials, Linear elasticity, Young's modulus of elasticity and Poisson's ratio, Stress-Strain curves in tension for Mild steel, Cast iron and non-ferrous metals. Bars of uniform cross section, varying cross section and discontinuous/stepped cross section, Extension / Shortening under point (axial) load, body force (self-weight), temperature change, Compound bars, Composite Sections, Numerical examples.

Module-2

Compound Stress: Uniaxial, Biaxial, General 2D stress state, Definition of Plane stress and Plane strain states, Stresses on inclined sections, Principal stresses, Principal planes, Principal axes, Maximum shear stress, Mohr's circle, Numerical examples. Expression for Volumetric strain, Elastic constants, Numerical examples Cylinders: Determination of deformations, strains and stresses in thin cylinders subjected to internal pressure, Numerical examples.

Module-3

Bending Moment and Shear Force diagrams: Types of beams, loads and reactions, Definition of shear force and bending moment, sign conventions, Relationship between shear force, bending moment and rate of loading, Shear force and bending moment diagrams for different beams, Numerical examples involving beams subjected to concentrated loads, uniformly distributed load (UDL), uniformly varying load (UVL) and couple.

Module-4

Stresses in Beams: Euler-Bernoulli beam theory, Relationship between bending moment, bending stress, and radius of curvature. Transverse Shear stresses, shear stress across rectangular, circular, symmetrical I and T-sections only, Numerical examples. Deflection of Beams : Governing differential equation and its solution, Double integration method for cantilever and simply supported beams for point load, UDL, UVL and Couple, Macaulay's method, Numerical examples.

Module-5

Torsion of shafts with circular cross section: Derivation of governing equation, Torsional rigidity, Torsional strength, Power transmitted by solid and hollow shafts, Numerical examples Elastic stability of Columns: Euler's theory for axially loaded elastic long columns, Derivation of Euler's load for various end conditions, limitations of Euler's theory, Rankine's formula, Numerical examples.

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

- The basic concepts of Mechanics of materials are clear to students.
- By knowing the stresses and strains developed in a structure, the student is able to find out at which point structure is strong and at which point it requires strengthening.
- The bending moments and shear force at any cross section of the beam can be easily found out with the help of BMD and SFD, which enables the student now to study and design the beam.
- The student is now ready to learn designing of different structures. The base of study of rock mechanics and ground control, which are the subjects of higher semesters.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Mechanics of Materials	R.C.Hibbeler	Pearson Edu.	2005
2	Mechanics of materials	James.M.Gere	Thomson	Fifth edition, 2004
Reference Books				
3	Strength of Materials	S.S.Bhavikatti,	Vikas publications House – Pvt. Ltd	2nd Ed., 2006.
4	Mechanics of materials	K.V. Rao, G.C. Raju		First Edition,2007
5	Mechanics of materials S.I. Units,	Ferdinand Beer &RussellJohnst	TATA Mac GrawHill	2003

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

DRILLING AND BLASTING

Course Code	**18MN35**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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.

Module-1

Exploration Drilling: Boring for exploration; Various types of exploratory drills and their applicability – Auger, Cable-tool, Odex, Core Drills; Core recovery: single and double tube core barrels, wire line core barrel; Storage of cores; Interpretation of borehole data.

Module-2

Rock drilling methods: Introduction; Types of drilling operations used in rock breakage; Applicability and limitations of different drilling methods vis-à-vis rock types and hole diameter.
Percussive & Rotary percussive drilling: Introduction; Fundamentals of percussive & rotary percussive drilling; Top hammer drilling; Down the hole hammer drilling; Advance systems; Drilling parameters and their estimation.
Rotary drilling: Introduction; Fundamentals of rotary drilling; Drilling parameters and their estimation. Special drilling methods: Introduction; Jet piercing; Water-jet drilling.

Module-3

Explosives and Initiating Systems
Types of explosives, their composition and properties, classification; Selection of explosives; Manufacture, transport, storage and handling of explosives; Testing of explosives; Types of initiating systems – Electrical Detonators, Detonating Fuse, Detonating Relays, NONEL, Electronic Detonators, Blasting accessories, exploders.

Module-4

Drilling & Blasting in Surface Mines
Drilling: Blasthole drills – types, classification, applicability and limitations; Mechanics of drilling, performance parameters, drilling cost, compressed air requirement for hole cleaning; Selection of drilling systems, drilling errors, organization of drilling. Blasting: Mechanics of rock fragmentation; Livingstone theory of crater formation; Factors affecting blasting, Blast design - estimation of burden and spacing, estimation of charge requirement; Initiation patterns; Secondary blasting – pop and plaster shooting; Problems associated with blasting, Ground vibration and air over pressure, Blast instrumentation.

Module-5

Drilling & Blasting in Underground Mines
Coal mines: Drilling systems and their applicability, blasting-off-solid, different blasting cuts, ring hole blasting, calculation of specific charge, specific drilling and detonator factor, initiation patterns. Metal mines: Drilling systems and their applicability, blast design for horizontal drivages, different blasting cuts, long hole blasting, vertical crater retreat blasting.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Explosives and Blasting Practices in Mines	S.K. Das	Lovely Prakashan, Dhanbad	1993
2	Explosives and Blasting Techniques	G.K. Pradhan,	Minetech Publication	1996
Reference Books				
3	Drilling and Blasting of Rocks	Carlo Lopez Jimeno	A.A. Balkema, Rotterdam, Brookfields	1995
4	Advances in Drilling and Blasting	V.R. Sastry	Allied Publishers Ltd.	1993

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

MINERALOGY, PETROLOGY AND STRATIGRAPHY

Course Code	**18MN36**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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.

Module-1

Physical Geology: Geology and its role in Mining, Earth as a planet- internal structure and composition of the earth, Geological work of wind, rivers, lakes, glaciers, seas, oceans and ground water, influences of these process on Mining Engineering sectors, earthquakes and seismic hazards and their relation with volcanoes, Engineering protection against earthquakes.

Module-2

Mineralogy: Physical and chemical properties; Crystal, crystal classes and systems; Classification of minerals and properties of common silicate minerals (Quartz, Feldspar, Pyroxene, Amphibole, Garnet, Olivine, Mica), sulphides (Pyrite, Chalcopyrite, Galena, Sphalerite) and oxides (Haematite, Magnetite, Chromite, Pyrolusite, Bailamalone)

Module-3

Petrology- 1: Igneous rocks: Magma and lava, extrusive and intrusive forms, textures; Classification and description of some common igneous rocks (Granite, Dolerite, gabbro, Basalt, Rhyolite, Pegmatite).

Module-4

Petrology- 2: Sedimentary rocks: Sedimentation processes; Classification and description of some common sedimentary rocks (Conglomerate, Sandstone, Shale, Limestone).
Metamorphic rocks: Processes of metamorphism, textures and structures of metamorphic rocks; Classification and description of some common metamorphic rocks (Slate, Phyllite, Schist, Gneiss, Quartzite, Marble).

Module-5

Paleontology and Stratigraphy: Concepts of palaeontology; Fossils, their mode of preservation and significance as indices of age and climate; Concept of index fossils. Principles of stratigraphy; Broad stratigraphic subdivisions and associated rock types of important ore provinces, coal belts and oil fields of India.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.Each full question consisting of 16 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Mining Geology	Mckinistry, ,	Asia Publication.	2nd Ed. 2005
2	Engineering and General Geology	Parbin Singh	Katson publisher, Ludhiana,	1st Ed. 2002.
Reference Books				
3	Economic Mineral Deposits	Bateman A.M	John Wiley and sons	2nd Ed. 1999.
4	Structural Geology	Marland& Billings,	Prentice Hall of India Pvt. Ltd., New Delhi.	2000.
5	Principles of Petrology	G.W.Tyrill, B.I.	Publications Pvt. Ltd., New Delhi.	1999

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

MINE SURVEYING – I LABORATORY

Course Code	**18MNL37**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(0:2:2)	SEE Marks	60
Credits	02	Exam Hours	03

Course objectives:

- 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.

Sl. No.	Experiments
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

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.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.■

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

MINERALOGY AND PETROLOGY LABORATORY

Course Code	**18MNL38**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(0:2:2)	SEE Marks	60
Credits	02	Exam Hours	03

Course objectives:

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

Sl. No.	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.

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.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.■

B. E. (Common to all Programmes)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER –II / III / IV

Aadalitha Kannada

Course Code	**18KAK28/39/49**	CIE Marks	100
Teaching Hours/Week (L:T:P)	(0:2:0)		
Credits	01		

DqÀ½vÀ PÀ£ÀßqÀ PÀ°PÉAiÀÄ GzÉÝÃ±ÀUÀ¼ÀÄ:

- ¥ÀzÀ« «zÁåyðUÀ¼ÁVgÀÄªÀÅzÀjAzÀ DqÀ½vÀ PÀ£ÀßqÀzÀ ¥ÀjZÀAiÀÄ ªÀiÁrPÉÆqÀÄªÀÅzÀÄ.
- «zÁåyðUÀ¼À°è PÀ£ÀßqÀ ¨sÁµÉAiÀÄ ªÁåPÀgÀtzÀ §UÉÎ CjªÀÅ ªÀÄÆr¸ÀÄªÀÅzÀÄ.
- PÀ£ÀßqÀ ¨sÁµÁ gÀZÀ£ÉAiÀÄ°è£À ¤AiÀÄªÀÄUÀ¼À£ÀÄß ¥ÀjZÀ¬Ä¸ÀÄªÀÅzÀÄ.
- PÀ£ÀßqÀ ¨sÁµÁ §gÀºÀzÀ°è PÀAqÀÄ§gÀÄªÀ zÉÆÃµÀUÀ¼ÀÄ ºÁUÀÆ CªÀÅUÀ¼À ¤ªÁgÀuÉ. ªÀÄvÀÄÛ ¯ÉÃR£À aºÉßUÀ¼À£ÀÄß ¥ÀjZÀ¬Ä¸ÀÄªÀÅzÀÄ.
- ¸ÁªÀiÁ£Àå CfðUÀ¼ÀÄ, ¸ÀPÁðj ªÀÄvÀÄÛ CgÉ ¸ÀPÁðj ¥ÀvÀæªÀåªÀºÁgÀzÀ §UÉÎ CjªÀÅ ªÀÄÆr¸ÀÄªÀÅzÀÄ.
- ¨sÁµÁAvÀgÀ ªÀÄvÀÄÛ ¥Àæ§AzsÀ gÀZÀ£É §UÉÎ C¸ÀQÛ ªÀÄÆr¸ÀÄªÀÅzÀÄ.
- PÀ£ÀßqÀ ¨sÁµÁ¨sÁå¸À ªÀÄvÀÄÛ ¸ÁªÀiÁ£Àå PÀ£ÀßqÀ ºÁUÀÆ DqÀ½vÀ PÀ£ÀßqÀzÀ ¥ÀzÀUÀ¼À ¥ÀjZÀAiÀÄ ªÀiÁrPÉÆqÀÄªÀÅzÀÄ.

¥Àj«r (¥ÀoÀå¥ÀÄ¸ÀÛPÀzÀ°ègÀÄªÀ «µÀAiÀÄUÀ¼À ¥ÀnÖ)

CzsÁåAiÀÄ – 1 PÀ£ÀßqÀ¨sÁµÉ – ¸ÀAQë¥ÀÛ «ªÀgÀuÉ.
CzsÁåAiÀÄ – 2 ¨sÁµÁ ¥ÀæAiÉÆÃUÀzÀ¯ÁèUÀÄªÀ ¯ÉÆÃ¥ÀzÉÆÃµÀUÀ¼ÀÄ ªÀÄvÀÄÛ CªÀÅUÀ¼À ¤ªÁgÀuÉ.
CzsÁåAiÀÄ – 3 ¯ÉÃR£À aºÉßUÀ¼ÀÄ ªÀÄvÀÄÛ CªÀÅUÀ¼À G¥ÀAiÉÆÃUÀ.
CzsÁåAiÀÄ – 4 ¥ÀvÀæ ªÀåªÀºÁgÀ.
CzsÁåAiÀÄ – 5 DqÀ½vÀ ¥ÀvÀæUÀ¼ÀÄ.
CzsÁåAiÀÄ – 6 ¸ÀPÁðgÀzÀ DzÉÃ±À ¥ÀvÀæUÀ¼ÀÄ.
CzsÁåAiÀÄ – 7 ¸ÀAQë¥ÀÛ ¥Àæ§AzsÀ gÀZÀ£É (¦æ¸ÉÊ¸ï gÉÊnAUï), ¥Àæ§AzsÀ ªÀÄvÀÄÛ ¨sÁµÁAvÀgÀ.
CzsÁåAiÀÄ – 8 PÀ£ÀßqÀ ±À§Ý¸ÀAUÀæºÀ.
CzsÁåAiÀÄ – 9 PÀA¥ÀÆålgï ºÁUÀÆ ªÀiÁ»w vÀAvÀæeÁÕ£À.
CzsÁåAiÀÄ – 10 ¥Áj¨sÁ¶PÀ DqÀ½vÀ PÀ£ÀßqÀ ¥ÀzÀUÀ¼ÀÄ ªÀÄvÀÄÛ vÁAwæPÀ/ PÀA¥ÀÆålgï ¥Áj¨sÁ¶PÀ ¥ÀzÀUÀ¼ÀÄ.

DqÀ½vÀ PÀ£ÀßqÀ PÀ°PÉAiÀÄ ¥sÀ°vÁA±ÀÀUÀ¼ÀÄ:

- DqÀ½vÀ ¨sÁµÉ PÀ£ÀßqÀzÀ ¥ÀjZÀAiÀÄªÁUÀÄvÀÛzÉ.
- «zÁåyðUÀ¼À°è PÀ£ÀßqÀ ¨sÁµÉAiÀÄ ªÁåPÀgÀtzÀ §UÉÎ CjªÀÅ ªÀÄÆqÀÄvÀÛzÉ.
- PÀ£ÀßqÀ ¨sÁµÁ gÀZÀ£ÉAiÀÄ°è£À ¤AiÀÄªÀÄUÀ¼ÀÄ ªÀÄvÀÄÛ ¯ÉÃR£À aºÉßUÀ¼ÀÄ ¥ÀjZÀ¬Ä¸À®àqÀÄvÀÛªÉ.
- ¸ÁªÀiÁ£Àå CfðUÀ¼ÀÄ, ¸ÀPÁðj ªÀÄvÀÄÛ CgÉ ¸ÀPÁðj ¥ÀvÀæªÀåªÀºÁgÀzÀ §UÉÎ CjªÀÅ ªÀÄÆqÀÄvÀÛzÉ.
- ¨sÁµÁAvÀgÀ ªÀÄvÀÄÛ ¥Àæ§AzsÀ gÀZÀ£É §UÉÎ C¸ÀQÛ ªÀÄÆqÀÄvÀÛzÉ.
- PÀ£ÀßqÀ ¨sÁµÁ¨sÁå¸À ªÀÄvÀÄÛ ¸ÁªÀiÁ£Àå PÀ£ÀßqÀ ºÁUÀÆ DqÀ½vÀ PÀ£ÀßqÀzÀ ¥ÀzÀUÀ¼ÀÄ ¥ÀjZÀ¬Ä¸À®àqÀÄvÀÛªÉ.

¥ÀjÃPÉëAiÀÄ «zsÁ£À : ¤gÀAvÀgÀ DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À - CIE **(Continuous Internal Evaluation):**

PÁ¯ÉÃdÄ ªÀÄlÖzÀ°èAiÉÄ DAvÀjPÀ ¥ÀjÃPÉëAiÀÄ£ÀÄß 100 CAPÀUÀ½UÉ «±Àé«zÁå®AiÀÄzÀ

¤AiÀÄªÀÄUÀ¼ÀÄ ªÀÄvÀÄÛ ¤zÉðÃ±À£ÀzÀAvÉ £ÀqÉ¸ÀvÀPÀÌzÀÄÝ.

¥ÀoÀå¥ÀÄ¸ÀÛPÀ : DqÀ½vÀ PÀ£ÀßqÀ ¥ÀoÀå ¥ÀÄ¸ÀÛPÀ (Kannada for Administration)

¸ÀÀA¥ÁzÀPÀgÀÄ - qÁ. J¯ï. wªÉÄäÃ±À

¥ÉÆæ. «. PÉÃ±ÀªÀªÀÄÆwð

¥ÀæPÀluÉ : ¥Àæ¸ÁgÁAUÀ, «±ÉéÃ±ÀégÀAiÀÄå vÁAwæPÀ «±Àé«zÁå®AiÀÄ, ¨É¼ÀUÁ«.

B. E. (Common to all Programmes)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER –II & III/IV

Vyavaharika Kannada

Course Code	**18KVK28/39/49**	CIE Marks	100
Teaching Hours/Week (L:T:P)	(0:2:0)		
Credits	01		

Course Learning Objectives:

The course will enable the students to understand Kannada and communicate in Kannada language.

Table of Contents:

Course Outcomes: At the end of the course, the student will be able to understand Kannada and communicate in Kannada language.

¥ÀjÃPÉëAiÀÄ «zsÁ£À : ¤gÀAvÀgÀ DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À - CIE **(Continuous Internal Evaluation):**

PÁ¯ÉÃdÄ ªÀÄlÖzÀ°èAiÉÄ DAvÀjPÀ ¥ÀjÃPÉëAiÀÄ£ÀÄß 100 CAPÀUÀ½UÉ «±Àé«zÁå®AiÀÄzÀ ¤AiÀÄªÀÄUÀ¼ÀÄ ªÀÄvÀÄÛ ¤zÉðÃ±À£ÀzÀAvÉ £ÀqÉ¸ÀvÀPÀÌzÀÄÝ.

Textbook (¥ÀoÀå¥ÀÄ¸ÀÛPÀ): ªÁåªÀºÁjPÀ PÀ£ÀßqÀ ¥ÀoÀå ¥ÀÄ¸ÀÛPÀ (Vyavaharika Kannada Text Book)

¸ÀÀA¥ÁzÀPÀgÀÄ
qÁ. J¯ï. wªÉÄäÃ±À
¥ÉÆæ. «. PÉÃ±ÀªÀªÀÄÆwð
¥ÀæPÀluÉ : ¥Àæ¸ÁgÁAUÀ, «±ÉéÃ±ÀégÀAiÀÄå vÁAwæPÀ «±Àé«zÁå®AiÀÄ, ¨É¼ÀUÁ«.

B. E. (Common to all Programmes)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW (CPC)

Course Code	**18 CPC39/49**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(1:0:0)	SEE Marks	60
Credits	01	Exam Hours	02

Course Learning Objectives: To

- know the fundamental political codes, structure, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and the duties of citizens
- Understand engineering ethics and their responsibilities; identify their individual roles and ethical responsibilities towards society.
- Know about the cybercrimes and cyber laws for cyber safety measures.

Module-1

Introduction to Indian Constitution:
The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.

Module-2

Union Executive and State Executive:
Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Articles 370.371,371J) for some States.

Module-3

Elections, Amendments and Emergency Provisions:
Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44, 61, 73,74, ,75, 86, and 91,94,95,100,101,118 and some important Case Studies. Emergency Provisions, types of Emergencies and its consequences.

Constitutional special provisions:
Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.

Module-4

Professional / Engineering Ethics:
Scope & Aims of Engineering & Professional Ethics - Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India): Profession, Professionalism, and Professional Responsibility. Clash of Ethics, Conflicts of Interest. Responsibilities in Engineering Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility. Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering

Module-5

Internet Laws, Cyber Crimes and Cyber Laws:
Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types of Cyber Crimes, India and cyber law, Cyber Crimes and the information Technology Act 2000, Internet Censorship. Cybercrimes and enforcement agencies.

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

CO 1: Have constitutional knowledge and legal literacy.
CO 2: Understand Engineering and Professional ethics and responsibilities of Engineers.
CO 3: Understand the the cybercrimes and cyber laws for cyber safety measures.

Question paper pattern for SEE and CIE:

- The SEE question paper will be set for 100 marks and the marks scored by the students will proportionately be reduced to 60. The pattern of the question paper will be objective type (MCQ).
- For the award of 40 CIE marks, refer the University regulations 2018.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Constitution of India, Professional Ethics and Human Rights	Shubham Singles, Charles E. Haries, and et al	Cengage Learning India	2018
2	Cyber Security and Cyber Laws	Alfred Basta and et al	Cengage Learning India	2018
Reference Books				
3	Introduction to the Constitution of India	Durga Das Basu	Prentice –Hall,	2008.
4	Engineering Ethics	M. Govindarajan, S. Natarajan, V. S. Senthilkumar	Prentice –Hall,	2004

B.E.(Common to all Programmes)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

ADDITIONAL MATHEMATICS – I
(Mandatory Learning Course: Common to All Programmes)
(A Bridge course for Lateral Entry students under Diploma quota to BE/B. Tech. programmes)

Course Code	**18MATDIP31**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	60
Credits	**0**	Exam Hours	03

Course Learning Objectives:

- To provide basic concepts of complex trigonometry, vector algebra, differential and integral calculus.
- To provide an insight into vector differentiation and first order ODE's.

Module-1

Complex Trigonometry: Complex Numbers: Definitions and properties. Modulus and amplitude of a complex number, Argand's diagram, De-Moivre's theorem (without proof).
Vector Algebra: Scalar and vectors. Addition and subtraction and multiplication of vectors- Dot and Cross products, problems.

Module-2

Differential Calculus: Review of successive differentiation-illustrative examples. Maclaurin's series expansions-Illustrative examples. Partial Differentiation: Euler's theorem-problems on first order derivatives only. Total derivatives-differentiation of composite functions. Jacobians of order two-Problems.

Module-3

Vector Differentiation: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl-simple problems. Solenoidal and irrotational vector fields-Problems.

Module-4

Integral Calculus: Review of elementary integral calculus. Reduction formulae for $\sin^n x$, $\cos^n x$ (with proof) and $\sin^m x \cos^n x$ (without proof) and evaluation of these with standard limits-Examples. Double and triple integrals-Simple examples.

Module-5

Ordinary differential equations (ODE's. Introduction-solutions of first order and first-degree differential equations: exact, linear differential equations. Equations reducible to exact and Bernoulli's equation.

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

- CO1: Apply concepts of complex numbers and vector algebra to analyze the problems arising in related area.
- CO2: Use derivatives and partial derivatives to calculate rate of change of multivariate functions.
- CO3: Analyze position, velocity and acceleration in two and three dimensions of vector valued functions.
- CO4: Learn techniques of integration including the evaluation of double and triple integrals.
- CO5: Identify and solve first order ordinary differential equations.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook				
1	Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers	43rd Edition, 2015
Reference Books				
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Edition, 2015
2	Engineering Mathematics	N. P .Bali and Manish Goyal	Laxmi Publishers	7th Edition, 2007
3	Engineering Mathematics Vol. I	Rohit Khurana	Cengage Learning	1st Edition, 2015

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - IV

COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS
(Common to all programmes)
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**18MAT41**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:

- To provide an insight into applications of complex variables, conformal mapping and special functions arising in potential theory, quantum mechanics, heat conduction and field theory.
- To develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, design engineering and microwave engineering.

Module-1

Calculus of complex functions: Review of function of a complex variable, limits, continuity, and differentiability. Analytic functions: Cauchy-Riemann equations in Cartesian and polar forms and consequences.
Construction of analytic functions: Milne-Thomson method-Problems.

Module-2

Conformal transformations: Introduction. Discussion of transformations:$w = Z^2, w = e^z, w = z + \frac{1}{z}, (z \neq 0)$.Bilinear transformations- Problems.
Complex integration: Line integral of a complex function-Cauchy's theorem and Cauchy's integral formula and problems.

Module-3

Probability Distributions: Review of basic probability theory. Random variables (discrete and continuous), probability mass/density functions. Binomial, Poisson, exponential and normal distributions- problems (No derivation for mean and standard deviation)-Illustrative examples.

Module-4

Statistical Methods: Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation -problems. Regression analysis- lines of regression –problems.
Curve Fitting: Curve fitting by the method of least squares- fitting the curves of the form-
$y = ax + b, y = ax^b and y = ax^2 + bx + c.$

Module-5

Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation and covariance.
Sampling Theory: Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness of fit.

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

- Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
- Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
- Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
- Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
- Construct joint probability distributions and demonstrate the validity of testing the hypothesis.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.

- There will be two full questions (with a maximum of four sub- questions) from each module.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Edition,2016
2	Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers	44th Edition, 2017
3	Engineering Mathematics	Srimanta Pal et al	Oxford University Press	3rd Edition,2016
Reference Books				
1	Advanced Engineering Mathematics	C. Ray Wylie, Louis C.Barrett	McGraw-Hill	6th Edition 1995
2	Introductory Methods of Numerical Analysis	S.S.Sastry	Prentice Hall of India	4th Edition 2010
3	Higher Engineering Mathematics	B. V. Ramana	McGraw-Hill	11th Edition,2010
4	A Text Book of Engineering Mathematics	N. P. Bali and Manish Goyal	Laxmi Publications	2014
5	Advanced Engineering Mathematics	Chandrika Prasad and Reena Garg	Khanna Publishing,	2018

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU EDUSAT PROGRAMME - 20

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - IV

UNDERGROUND METAL MINING

Course Code	**18MN42**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

Course objectives:

- 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.

Module-1

Introduction: Present status of Indian metal mining industry; Scope and limitations of underground mining.
Development: Choice of level interval and back/block length; Shape, size, position, excavation and equipping of shaft station/plat, grizzly, ore/waste bin, main ore pass system, underground crushing and loading stations, underground chambers, sump and other subsidiary excavations; Arrangements for dumping into main ore pass; Underground crushing, loading and hoisting; Cross-cuts and drifts :- their shape, size and position.

Module-2

Review of excavation process - ground breaking, mucking, ventilation and support; Modern methods of raising - Alimak and Jora-lift raising, longhole method including vertical crater retreat method of raising; Raise boring - systems and their details; Modern methods of winzing.
Stoping methods : Classification of stoping methods, factors affecting the choice of stoping methods like depth, dip, width, grade of ore, physio mechanical characteristics of ore and wall rock. Factors affecting the stope design.

Module-3

Open stoping & Unsupported stoping: room and pillar, sublevel, large diameter blast hole/DTH, shrinkage and vertical crater retreat methods - their applicability, stope layouts, stope preparation, ground breaking, mucking, ventilation and supporting, haulage and dumping. Case studies.
Supported stoping: post and pillar, square set, longwall, cut and fill- their applicability, stope layouts, stope preparation, ground breaking, mucking, ventilation and supporting, haulage and dumping. Case studies.

Module-4

Stoping by Caving method: top slicing, sublevel caving, and block caving; their applicability, stope layouts, stope preparation, ground breaking, mucking, ventilation and supporting, haulage and dumping. Case studies.
Innovations in support and reinforcement systems for hard rock mines.

Module-5

Special methods: Solution mining, in-situ leaching, borehole mining, underground retorting, Problems of deep mining and their remedial measures. Case studies; Mining of parallel and superimposed veins, Pillar recovery Dilution, loss and recovery in stoping.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Elements of Mining Technology Vol. II	D.J.Deshmukh	Central Techno Publication, Nagpur	1998.
2	Introductory Mining Engg	H.L.Hartman		
Reference Books				
3	SME Mining Engineering Handbook	Edited - by H.L.Hartman	SME publication	
4	Techniques in Underground Mining Selection	Richard E. Gertsch et al	SME	1998

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - IV

MINE SURVEYING-II

Course Code	**18MN43**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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.

Module-1

Mine Plans and Sections: Statuary requirements of Mine Plans and Sections, accuracies, scale; duties and responsibilities of surveyors.
Curve Ranging: Linear and angular methods of setting out of simple curves on surface and below ground, requirements and functions of a transition curve.

Module-2

Control Surveys: Triangulation – classification; Reconnaissance; Procedures for angles and base-line measurement; Comparison with precise EDM traversing.
Tachometric Survey: Application and limitation, principles and methods, anallactic lens, reduction of stadia notes, errors.

Module-3

Correlation: Methods of correlation – direct traversing in inclined shaft, correlation in vertical shaft – single and two shafts, Gyro-Laser combination; Shaft depth measurement.
Development Surveys: Control of direction and gradient in drifts, tunnels, raises, winzes.

Module-4

Stope Surveying: Purpose; Methods of survey in moderately and steeply inclined ore bodies, flat and vertical ore bodies/seams.
Slope Monitoring in Opencast Mines: Geodetic and Remote Sensing Methods, Slope Stability Radars.
Subsidence Monitoring: Subsidence Monitoring of subsidence due to underground mining activities.

Module-5

GPS: Principle of GPS; Instrument; Errors and working with GPS; Application of GPS in mine surveying; Developments in satellite based Navigation system.
Introduction to Surveying softwares.
Application of GIS and Remote Sensing in Surveying.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Surveying Vol. II & Vol. III	B.C. Punmia,	Lakshmi Publications	12th edition, 1994
2	Mine Surveying Vol. I, II, III,	Ghatak,	Coal Field Publishers,	5th edition, 1996.
Reference Books				
3	Metalliferous Mine Surveying	Fedrickm Wini Berg	Mining Publications, London	2nd edition 1935

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - IV

MINING MACHINERY

Course Code	**18MN44**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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.

Module-1

Ropes: Wire ropes of different types and their construction and selection, rope capping, recapping and rope splicing. estimation of size of rope and safety factor for ropes used in winding. Numerical problems.

Rope Haulages: Types of rope haulages, selection, computations, and safety devices. Mine tubs, mine cars, links, clips and rope capel; Application of rope haulages. Numerical problems.

Module-2

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

Locomotives: Different types; diesel, electric trolley wire, construction and operation, application and maintenance; Locomotive haulage computations; safety devices; Track laying and maintenance.

Module-3

Winding: Drum and friction winding with their variations and limitations; duty cycle, torque time diagrams and computations; Multilevel and deep winding; Drives for winding; Safety devices on winders; emergency braking, over speed control, slow banking, depth indicators, automatic contrivances.

Pumps: Types of mine pumps, application and related computations.

Module-4

Coal cutting machines: shearers, coal ploughs, lump breakers, road headers, TBMs, raise and shaft borers, continuous miners, stage loaders; their main features and applicability

Loading machines: rocker shovel, SDL, LHD, gathering arm loader, shuttle car, LPDTs, scraper; their main features, applicability, selection and production capacities

Module-5

Opencast Machinery: Shovels, draglines, dumpers, wheel loaders; their main features, applicability, selection and production capacities;

Continuous surface mining equipment: bucket wheel excavators, surface miners, spreaders, dredging equipment; their main features, applicability, selection and production capacities

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Elements of mining technology Vol III	D.J.Deshmukh,	Vidyasewaprakashan, Nagpur	7th Ed. 2000
2	Mine pumps haulage & winding",	S. Ghatak,	Coalfield Publishers, Asansol	1st Ed. 1995.
Reference Books				
3	Universal Mining School reports Vol I and Vol II,"	Cardif,	Great Britain	1999.
4	Mine Hoisting	M.A.Ramlu	Oxford & IBH,	1996

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - IV

GEOLOGY FOR MINING ENGINEERS

Course Code	**18MN45**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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.

Module-1

Structural Geology I:
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.

Module-2

Structural Geology II:
Forms of igneous intrusions - dyke, sill and batholith. Effects of folds and fractures on strata/orebodies and their importance in mining operations. Principles of stereographic projections of linear and planar features of

Module-3

Economic Geology:
Introduction and scope of economic geology; Ore and gangue; Processes of ore formation; Major Indian mineral deposits (Iron, Manganese, Copper, Lead, Zinc) - distribution and mode of occurrence.

Module-4

Exploration Geology:
Mineral Exploration – concepts and methods viz. surface and subsurface; Exploration strategy and design; Stages of exploration; Resources and reserves.

Module-5

Coal and Petroleum Geology
Rank, characteristics and important constituents of coal; Classification and origin of coal; Chief characteristics of Indian coals; Geology of the principal coalfields of India.
Concept of organic constituents of petroleum origin, migration, accumulation, concept of traps and important petroliferous basins of India.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Mining Geology	Mckinistry, ,	Asia Publication.	2nd Ed. 2005
2	Engineering and General Geology	Parbin Singh		
Reference Books				
3	Economic Mineral Deposits	Bateman A.M	John Wiley and sons	2nd Ed. 1999.
4	Ore Deposits of India	Gokhale&Rao T.C	Thompson press. India, Faridabad.	1999

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - IV

THERMODYNAMICS AND FLUID MECHANICS

Course Code	**18MN46**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- To understand basic principles and basic concepts of Thermodynamics.
- To understand Principles of Fluid mechanics
- To understand working principles of compressor.
- To understand the working principles of pumps, flow through pipes

Module-1

Basic concepts of Thermodynamics: Thermodynamic system, classification of thermodynamic system. Thermodynamic property- extensive and intensive properties. Thermodynamic state, thermodynamic process. Reversible, irreversible process, Quasi-static process. Thermodynamic equilibrium, zeroth law of thermodynamics.

Energy: classification, stored energy and energy in motion. Work and heat-definition, work done at the moving boundary. Comparison between work and heat.

Module-2

I and II Laws of Thermodynamics: I and II Laws of thermodynamics: Statements, cyclic processes, numerical problems.

Air Compressors: Single stage and multistage reciprocating air compressors on surface and in underground mines. Expression for work done during single stage air compression with and without clearance volume. Volumetric efficiency. Simple numerical problems on single stage compressors only.

Module-3

Fluid Mechanics: Definition and properties of Fluids, ideal and real fluid units, systems of measurement. Fluid properties-density, specific weight, specific volume, specific gravity, viscosity, compressibility, surface tension and capillarity, vapour pressure and cavitation,

Fluid flow measurements: Venturimeter, Orifice meter. Flow through orifices and notches. Loss of head due to friction in pipes. Discharge measurements in pipes.

Module-4

Fluid Statistics: pressure, atmospheric pressure, gauge and absolute pressure, measurement of pressure, piezometer tube, double column u-tube manometer, differential and inverted U-tube measurements, Bourdon's pressure gauge, diaphragm pressure gauge and dead weight pressure gauge. Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined planes, curved surface submerged in liquid.

Buoyancy: definition, center of buoyancy, metacenter and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of metacentric height experimentally and theoretically.

Module-5

Fluid Dynamics: Introduction to equation of motion, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of Bernoulli's equation, assumptions, hydraulic gradient line and total energy line. Numerical Problems.

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

- Able to understand basic concepts of Thermodynamics.
- Enables to solve problem related to work & heat.
- Able to understand principle and operation of reciprocating compressor.
- Able to understand pumps &flow through pipes.

- Able to understand basic principles of Fluid mechanics.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Engineering thermodynamics	Nag P.K.	Tata McGraw Hill publications	2nd Ed. 2002
2	A Text Book of Fluid Mechanics and Hydraulic	R.K.Bansal	Laxmi publications.	2006
Reference Books				
3	Hydraulics and Fluid Mechanics,	Modi P.N. and Seth, S.M.	Standard Publishers, New Delhi	1999.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - IV

MINE SURVEYING – II LABORATORY

Course Code	**18MNL47**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(0:2:2)	SEE Marks	60
Credits	02	Exam Hours	03

Course objectives:

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

Sl. No.	Experiments
1	To determine the constant K and C of the tachometer by field method.
2	To determine the distance and elevation by Stadia Method.
3	To determine the distance and elevation by Tangential Method.
4	To set out a simple curve by Deflection distance Method.
5	To set out a simple curve by Rankin's Method.
6	Correlation survey by Direct Traversing through Incline
7	Correlation survey by Direct Traversing through Incline and Shaft.
8	Correlation survey by Weisback Co-planning Method.
9	Correlation survey by Weisback Triangle Method.
10	To control the directions of underground workings.
11	To transfer levels from surface to underground.
12	Study of GPS and data collection.

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.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.■

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - IV

GEOLOGY FOR MINING ENGINEERS LAB

Course Code	**18MNL48**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(0:2:2)	SEE Marks	60
Credits	02	Exam Hours	03

Course objectives:

- Determinations of Dip & Strike of strata.
- Able to gain the knowledge of Geophysics & Bore hole based Problems.
- Ore reserve estimation of limited and unlimited boundaries.

Sl. No	Experiments
	Geological Maps: Interpretation of topographic, geological and structural maps & tracing of outcrop maps
1	Interpretation & description of topographic maps
2	Interpretation & description of Geological maps
3	Interpretation & description of structural geological maps – Dipping strata
4	Interpretation & description of structural geological maps – Folded & Faulted strata
5	Interpretation & description of structural geological maps – Unconformities
6	Tracing of out crop maps
	Dip and Strike problems
7	To determine true dip when two apparent dips are known.
8	To determine the amount of apparent dip when true dip and direction of apparent dips are given.
9	To determine the direction of apparent dip when true dip and amount of amount of apparent are known.
10	Calculation of attitude, thickness and depth of ore bodies
11	Bore Hole problems (Three point problems): on ground level
12	Ore Reservation Estimation: Bedded deposits, vein deposits and Load deposits.

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

- To possess ability to identify, formulate, and solve engineering problems in Dip & Strike determination, Geophysics & Bore-hole and ore reserve estimation.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.■

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - IV

ADDITIONAL MATHEMATICS – II
(Mandatory Learning Course: Common to All Branches)
(A Bridge course for Lateral Entry students under Diploma quota to BE/B. Tech programmes)

Course Code	**18MATDIP41**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(2:1:0)	SEE Marks	60
Credits	--	Exam Hours	03

Course objectives:

- To provide essential concepts of linear algebra, second & higher order differential equations along with methods to solve them.
- To provide an insight into elementary probability theory and numerical methods.

Module-1

Linear Algebra: Introduction - rank of matrix by elementary row operations - Echelon form. Consistency of system of linear equations - Gauss elimination method. Eigen values and eigen vectors of a square matrix. Problems.

Module-2

Numerical Methods: Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae (Statements only)-problems. Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods (only formulae)- Illustrative examples. Numerical integration: Simpson's one third rule and Weddle's rule (without proof) Problems.

Module-3

Higher order ODE's: Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators.[Particular Integral restricted to $R(x) = e^{ax}, \frac{sinax}{cosax}, x^n \; for \; f(D)y = R(x)$.

Module-4

Partial Differential Equations (PDE's): Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only.

Module-5

Probability: Introduction. Sample space and events. Axioms of probability. Addition & multiplication theorems. Conditional probability, Bayes's theorem, problems.

Course outcomes: At the end of the course the student will be able to:
CO1: Solve systems of linear equations using matrix algebra.
CO2: Apply the knowledge of numerical methods in modelling and solving of engineering problems.
CO3: Apply the knowledge of numerical methods in modelling and solving of engineering problems.
CO4: Classify partial differential equations and solve them by exact methods.
CO5: Apply elementary probability theory and solve related problems.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year

Textbook				
1	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	43rd Edition, 2015
Reference Books				
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Edition, 2015
2	Engineering Mathematics Vol.I	RohitKhurana	Cengage Learning	2015.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - V

MINE MANAGEMENT

Course Code	**18MN51**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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.

Module-1

Brief History of Management: Evolution of Management, traditional management, Scientific management, Contribution of pioneers to scientific management, Functions of management, Principles of Management. Mine management: Duties and responsibilities of mines manager.

Module-2

Organization and Industrial Ownership: Characteristics of Organization, Principles of organization, types of organization, management of conflict, management by exception, management by objective (MBO). Mine organization: Opencast and underground mines.
Industrial ownership: Definition, types of ownership, single ownership, partnership, Joint Stock Companies, co-operatives organization and State and central government owned. Mine ownership: duties and responsibilities

Module-3

Personal Management: Functions of personnel management, recruitment and selection of employees. Education and training: mines vocational training center. Communication: formal and informal communication, barriers in communication and techniques to overcome barriers and improve communication.
Industrial Psychology and Human Relation: Definition, scope of industrial psychology, aims of industrial psychology. Group Dynamics. Motivation: definition, characteristics of motivation, kinds of motivation, factors affecting motivation, motivational techniques, theories of motivation. Maslow's hierarchy of needs, Theory X and Y, Hawthorne experiment.

Module-4

Industrial Relations and Legislation: Introduction, basic requirement of industrial –relation programme. Trade unions: definition, functions of trade unions. Industrial disputes: causes, settlement of industrial disputes, handling of workers' grievances. Workers participation in management, work of ILO. Necessity of labour legislation, principles of labour legislation. Important provisions of factories act, payment of wages act, Workmen's Compensation act, Employee state insurance Act.

Module-5

Work Study: Definition, productivity and work study, postion of work study department in the organization, work study man, work study and the workers, work study and the management. Motion Study: Definition, aims of motion study, procedure for motion study, micro motion study, motion economy. Time Study: Definition, uses of time study, procedure, performance rating number of cycles to be timed, allowances, uses of time study data for wage incentives. Standard Data: Advantages, Methods for determining Standard Data, Work factor system, Method Time Measurement (MTM), Basic Motion Time Study.
Management Information System (MIS): Introduction, Need for Information System, Characteristics of Good MIS, Sources of Information, application of MIS, design of MIS, development, Implementation of MIS.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Mine Management, Legislation and General Safety	S. Ghatak	Coal Field Publishers, Asansol	1999
2	Management	Harold Koontz and Heinz	Mc Graw Hill Company	1990.
Reference Books				
3	Industrial Organization and Engineering Economics,	Banga and Sharma,	Khanna Publication, New Delhi,	1999.
4	Modern Production Management	Buffa	John Wiley and Sons,	1998.
5	Industrial Management,	O.P.Khanna,	Dhanpat Rai and Sons	1999.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - V

UNDERGROUND COAL MINING

Course Code	**18MN52**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

Course objectives:

- 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

Module-1

Introduction: status of coal reserves, grade and rank of coals available in India, status of coal mining in India, mining conditions in Indian coalfields.

Opening of Coal Seams: Access by adits, by surface drifts on incline, vertical shafts; Division of mine into blocks.

Choice of Coal Mining Methods: Basic Mining Methods, Factors influencing choice of mining methods.

Module-2

Development: Bord and Pillar, and Room and Pillar Mining; design of bord & pillar workings, the panel system, panels and inter-panel barriers, size of pillars and galleries; methods of driving galleries; layouts for different combinations of loading and transport systems including continuous systems**.**

Depillaring: preparatory arrangements for depillaring; sequence and manner of extraction of pillars; mechanized pillar extraction, setting and withdrawal of supports; air-blasts; partial extraction.

Module-3

Longwall Mining: Factors affecting longwall mining, longwall face layouts, advancing and retreating faces, single versus double unit longwall faces, orientation of longwall faces; single versus multiple heading gate roads, factors affecting length and width of longwall panel.

Module-4

Extraction of Longwall panel: working with shearer and plough, support system of longwall face and gate roads, monolithic packing in longwall advancing gate roads; case studies of longwall faces in India.
Strata mechanics around Longwall panel.

Module-5

Thick seam mining: multi-section mining, slicing methods, sublevel caving, integrated sublevel caving, blasting gallery method, thick seam extraction by cable bolting, hydraulic mining.

Contiguous seam working: working under surface structures and water bodies, harmonic mining; shaft pillar extraction; **Horizon mining; Gasification of coal**.

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.
- Ability to design the extraction of thick coal seams by special methods.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Principles and Practices of Modern Coal Mining	R.D. Singh	, New Age International,	1997.
2	Modern Coal Mining Technology	S.K. Das	Lovely Prakashan Publishers	2 nd edition, 1994
Reference Books				
3	Underground Coal Mining Methods	G.Singh	J, BrajKalpa Publishers, Varnasi,	2000.
4	Longwall Mining	S.Peng&H.S. Chang,	John Wiley and Sons Inc.	1983
5	Advanced Coal Mining, Vol. 1 and 2	Vorbojev&Deshmukh	Asia Publishing House, Bombay,	1964.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - V

SURFACE MINING

Course Code	**18MN53**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

Course objectives:

- 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

Module-1

Introduction

Surface mining - basic concepts, applicability, advantages and disadvantages; Role of surface mining in total mineral production; Deposits amenable to surface mining vis-à-vis excavation characteristics; Surface mining unit operations; Surface mining systems vis-à-vis equipment systems – classification, applicability, advantages and disadvantages.

Opening up of deposits

Box cut – objective, types, parameters, methods; Factors affecting selection of site for box; Production benches – formation, parameters and factors affecting their selection.

Preparation for excavation

Ripper: Types, classification, applicability and limitations; Method and cycle of operation; Estimation of output; Concept of rippability.

Estimation of number of drills required for a given mine production.

Module-2

Discontinuous/cyclic methods of excavation and transport

Shovel-dumper operation: Applicability and limitations of electric shovel, hydraulic excavators and dumpers; Cycle time and productivity calculation for shovel and dumper; Estimation for equipment (shovel, dumper and other heavy earth moving machines) required for a given mine production; Method of work for sub-surface bedded and massive deposits and for hilly massive deposits by shovel – dumper combination.

Dragline operation: Applicability and limitations, different modes of operation; Side cast diagram and calculation of reach; Cycle time and productivity calculation; Calculation of required bucket capacity for a given handling requirement; Maximum usefulness factor and its significance in selection of dragline for a given situation; Method of work by simple side casting.

Scrapers: Applicability and limitations, various types; Method and cycle of operation; Pusher dozer and push-pull operation.

Dozers: Applicability and limitations; Types and classification; Types of blade and corresponding merits and demerits; Method and cycle of operation.

Front-end-loaders: Applicability and limitations; Method and cycle of operation; Minimum tipping- load – concept, estimation and significance; Calculation of maximum working load and selection of bucket capacity of a front-end-loader for a given job condition.

Module-3

Continuous methods of excavation and transport

Bucket wheel excavators: Applicability and limitations; Types and principle of operation; Operational methods – lateral block / half block method, full block methods and their corresponding merits and demerits; Calculation of productivity.

Continuous surface miners: Types, classification, applicability and limitations; Principles of operation; Operational methods – classification; Wide / full bench method, block mining method and stepped cut method; Empty travel back method, turn back method and continuous mining method; Conveyor / truck loading method, side casting method and windrowing method, Respective merits & demerits and applicability & limitations of these methods.

Conveyors: Shiftable and high angle conveyors; Mode of operation, applicability and limitations; Merits and

demerits of conveyor as a system of transportation.

Module-4

Semi-continuous methods of excavation and transport

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

Mining of developed coal seams and dimensional stones

Mining of developed coal seams: Problems associated; Methods of working. Dimensional stones: Types, occurrences and uses; Methods vis-à-vis equipment for extraction of primary blocks in granite and marble quarries.

Module-5

Slopes in surface mines

Types of mine slope – highwall and waste dumps; Common modes of slope failure; Factors influencing stability of slopes; Slope stability assessment techniques; Waste dumps - types and formation methods; Slope protection, stabilization and monitoring.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Surface Mining Technology	S.K.Das,	Lovely Prakashan, Dhanbad,	1994.
2	Surface Mining	G.B.Mishra,	Dhanbad Publishers,	1978.
Reference Books				
3	Opencast Mining	R.T. Deshmukh	M. Publications, Nagpur	1996
4	Rock Slope Engineering	Hock and Bray,	The Institution of Mining and Metallurgy,	1981

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - V

MINE VENTILATION

Course Code	**18MN54**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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

Module-1

Composition of mine atmosphere: Mine gases - production, properties and effects; Sampling and analysis of mine air; Methane content; Methane drainage; Flame safety lamp and its uses; Methanometers; Methane layering; Radon gas and its daughter products; Monitoring of gases.

Module-2

Heat and humidity: Sources of heat in mines; Effects of heat and humidity; Psychrometry, Kata thermometer; Air-conditioning.

Module-3

Air flow through mine openings: Laws of flow, resistance of airways, equivalent orifice, losses in airways, distribution of air, economic design of airways; Flow control devices; Permissible air velocities in different types of workings/openings; Standards of ventilation.

Module-4

Natural ventilation: Causes, effect of seasonal variations, calculation of NVP from air densities, thermodynamic principles and other methods. Mechanical ventilation: 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; Booster and auxiliary ventilation; Venturi blowers; Ventilation of deep mines - underground and open pit.

Module-5

Ventilation planning: Planning of ventilation systems and economic considerations; Ventilation layouts for underground coal and metal mines; Calculation of air quantity required for ventilating a mine; Calculation of total mine head; Ventilation network analysis principles and computer applications; Ventilation surveys.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbook/s				

1	Mine Ventilation:	G. B. Mishra	Oxford University Press,	1994
2	Environmental Engineering in Mines	Vutukuri & Lama	–, Cambridge University Press, Cambridge,	1992.
Reference Books				
3	Mine ventilation and air-conditioning in mines:	Howard L. Hartman.	Wiley International,	1976.
4	Mine Ventilation Vol. – II	S. Ghatak	Coalfield Publishers,	1993.

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SEMESTER - V

ROCK MECHANICS

Course Code	**18MN55**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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.

Module-1

Introduction to Rock Mechanics: Definition, Scope and importance, development and application of rock mechanics in mining. Discontinuities; Description of discontinuities, Introduction to mapping and hemispherical projection of discontinuities, Barton's shear strength of joints.

Module-2

Analysis of Stress: Introduction, definition and basic concepts, stress in a plane, (two dimensional stress), Mohr's Circle of stress, equations of equilibrium, plane stress equations. Simple numerical problems.
Analysis of Strain: Introduction, definition and basic concepts, strain in a plane, (two dimensional strain), Mohr's Circle of strain, equations of compatibility, stress-strain relationship, plain strain equations, elasto plastic behaviour of rocks.

Module-3

Physico-mechanical properties of rock: Determination of physical properties, strengths, strength indices and static elastic constants; Parameters influencing strength; Abrasivity of rock and its determination.
Time dependent properties of rock: Creep deformation and strength behaviour; Creep test and rheological models.

Module-4

Strength and Deformability of Rock Mass: In situ shear tests; Evaluation of shear strength; In situ bearing strength test; In situ deformability tests- Plate Loading Test, Plate Jacking Test and Borehole Jack Tests.

Module-5

Dynamic properties of rock and rockmass: Determination of dynamic strength and elastic constants of rock.
Failure criteria for rock and rockmass: Theories of rock failure; Coulomb, Mohr and Griffith criteria; Empirical criteria.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Strata Mechanics in Coal Mining,	Jeremic, K.L. Jeremic	Rotterdam, Balkema	1985
2	Mechanics and Engineering,	Charles Jaeger,	Cambridge University Press,	1979.
Reference Books				
3	Continuum Theory of rock Mechanics	Csaba Asszonyi,	Transtech Publications	1979.
4	Ground Mechanics in Hard rock Mining,	M.L. Jeremic	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi,	1987.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - V

MINE ELECTRICAL ENGINEERING

Course Code	**18MN56**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- To learn the importance of Electrical Engineering and its applications in Mining and allied industries.

Module-1

Introduction: Scope and importance of Electrical Engineers in Mining, qualification, Indian Electricity Rules applicable to Mining.

Introduction to Electrical Drives and its Application in Mining: Electrical Drives, advantages, parts, choice of electrical drives, status of AC and DC drives, types of electric drives for control of winders, shearers and conveyors, electric drives for mine hoists.

Module-2

DC Machines: Types and characteristics of DC motors, voltage &torque equation of DC motor, speed control of shunt motors – armature, flux and voltage control, problems on shunt motors. Electric braking of shunt motors – dynamic, plugging and regenerative.

Module-3

AC Machines: Types and working principle of 3 phase induction motors, speed control of induction motors, plugging of an induction motor, working principle of an alternator.

Module-4

Protective Devices: Fuses - types, air break switches, air circuit breakers, oil circuit breakers, principle of underground signaling in mines,, methods of neutral grounding, types of motor enclosures in mines

Power Distribution in Mines: Single line diagram of power distribution on surface and in underground mines, Cables – various types for surface and underground mines, Flameproof apparatus, Intrinsically safe apparatus, Standard voltage levels for mining as per IER 1956.

Module-5

Mine Illumination: Definition, laws of illumination, types of lighting sources, standards of mine lighting, LED lighting.

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

- Students will be aware of Indian Electricity Rules 1956.
- They will be able to differentiate various Motors and generators.
- They will be able to draw the single line diagram of distribution system in Mines.
- They will understand types of lighting used in mines and its design.
- They will be familiar with Electrical Safety devices and its operating principles.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				

1	Fundamentals of Electrical Drives	G.K. Dubey	Narosa Publishing House,	1995
2	Electrical Technology	B.L. Theraja, A.K. Theraja	S.Chand& Company	1999
3	Electrical Power	J.B. Gupta, S.K	Kataria& Sons,	1992
Reference Books				
4	Universal Mining School Reports	Cardiff,	Mining publishing London	1st Ed., 1997
5	The Indian Electricity Rules 1956			
6	Electric Motors: Applications & Controls	M.V.Deshpande		

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - V

ROCK MECHANICS LAB

Course Code	**18MNL57**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(0:2:2)	SEE Marks	60
Credits	02	Exam Hours	03

Course objectives:

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.

Sl. No.	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

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.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.■

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - V

MINE ELECTRICAL ENGINEERING LABORATORY

Course Code	**18MNL58**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(0:2:2)	SEE Marks	60
Credits	02	Exam Hours	03

Course objectives:

- Learn to calculate Resistance / Inductance / power / Efficiency / Power Factor.
- To study the speed / Torque characteristics of AC and DC machines and to calculate losses and find their Efficiency,
- To calculate losses in a transformer and to plot the efficiency curves

Sl. No	Experiments
1	Measurement of a) Resistance by voltmeter and Ammeter method. b) Inductance and Power factor of choke by ammeter voltmeter, wattmeter method.
2	Open circuit characteristics of a D.C. Generator.
3	Load test on shunt generator.
4	Load test on compound generator
5	Speed control of DC shunt motor
6	Load test on DC shunt motor
7	O.C. and S.C. test on a single-phase transformer and predetermination of efficiency and regulation.
8	Load test on a single phase Induction motor.
9	Load test on 3-phase Induction motor
10	Calibration of energy meter

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

- Find the resistance of a given conductor, calculate inductance of a coil and hence power factor
- Conduct tests on transformer and evaluate their performance.
- Identify and conduct tests on AC and DC machines and draw its performance characteristics
- Connect and use energy meter and find out its error.
- Assess the performance of a compound generator with varying load.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.■

B. E. MINING ENGINEEING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – V

ENVIRONMENTAL STUDIES

Course Code	**18CIV59**	CIE Marks	40
Teaching Hours / Week (L:T:P)	(1:0:0)	SEE Marks	60
Credits	01	Exam Hours	02

Module - 1

Ecosystems (Structure and Function): Forest, Desert, Wetlands, Riverine, Oceanic and Lake. 02 Hrs
Biodiversity: Types, Value; Hot-spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation.

Module - 2

Advances in Energy Systems (Merits, Demerits, Global Status and Applications)**:** Hydrogen, Solar, OTEC, Tidal and Wind. 02 Hrs
Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable Mining, Cloud Seeding, and Carbon Trading.

Module - 3

Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies)**:** Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution.02 Hrs
Waste Management & Public Health Aspects: Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge.

Module - 4

Global Environmental Concerns (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.

Module - 5

Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications): G.I.S. & Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship- NGOs. 03 Hrs
Field work: Visit to an Environmental Engineering Laboratory or Green Building or Water Treatment Plant or Waste water treatment Plant; ought to be Followed by understanding of process and its brief documentation.

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.

Question paper pattern:

- The Question paper will have 100 objective questions.
- Each question will be for 01 marks
- Student will have to answer all the questions in an OMR Sheet.
- The Duration of Exam will be 2 hours.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Environmental Studies	Benny Joseph	Tata Mc Graw – Hill.	2nd Edition, 2012

2.	Environmental Studies	S M Prakash	Pristine Publishing House, Mangalore	3rd Edition, 2018
3	Environmental Studies – From Crisis to Cure	R Rajagopalan	Oxford Publisher	2005
Reference Books				
1	Principals of Environmental Science and Engineering	Raman Sivakumar	Cengage learning, Singapur.	2nd Edition, 2005
2	Environmental Science – working with the Earth	G.Tyler Miller Jr.	Thomson Brooks /Cole,	11th Edition, 2006
3	Text Book of Environmental and Ecology	Pratiba Sing, AnoopSingh& Piyush Malaviya	Acme Learning Pvt. Ltd. New Delhi.	1st Edition

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VI

GROUND CONTROL

Course Code	**18MN61**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

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

Module-1

Design and stability of structures in rock: Definition, types of underground excavation, excavation design and constraints. Methods for design and stability analysis of underground excavations; Energy released by making an underground excavation; Design of single and multiple openings in massive, stratified and jointed rock mass. Numerical problems.

Module-2

Design of mine pillars: 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.

Module-3

Subsidence: Causes and impacts of subsidence; Mechanics of surface subsidence, discontinuous and continuous subsidence; Monitoring, prediction, control and management of subsidence, prediction of subsidence using graphical and analytical method, monitoring and determination. Numerical Problems.

Module-4

Caving of rock mass: Rock caving in mining; Mechanics of rock caving; Assessment of cavability; caving prediction and control.

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

Module-5

Engineering classification of rocks and rock masses: Classification systems in rock engineering; Classification of intact rocks; Classification of rockmasses -Terzaghi's rock load, RQD, Rock Structure Rating, Bieniawski's RMR, Barton's Q-System, Laubscher's-MRMR, Hoek's-GSI, Palmstrom's RMi, CMRI-ISM Rock mass classification and Recent developments; correlations between different classification systems; Applications of Rockmass Classification in rock engineering.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Rock Mechanics and the Design of Structures in Rocks	L.Obert and W.I.Duvall,	John Wiley and Sons,	1966.
2	Coal Mine Ground Control,	S.Peng	John Wiley and Sons, Inc.	1978
Reference Books				
3	Strata Mechanics in Coal Mining	M. Jeremic,	CRC Press,	1985
4	Underground Excavations in rock	E. Hoek and E.T. Brown	IMM,	1980
5	Underground Excavation in Hard Rock	E. Hoeket. al	Oxford and IBH	1995

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VI

MINE ENVIRONMENTAL ENGINEERING

Course Code	**18MN62**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

Course objectives:

- 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.

Module-1

Mine fires: Causes and classification of mine fires; Spontaneous combustion - mechanism, stages of spontaneous combustion, susceptibility indices, factors affecting spontaneous combustion; Detection and prevention of spontaneous heating and accidental fires; Dealing with mine fires - direct and indirect methods, fire stoppings; Re-opening of sealed-off areas; Fires in quarries, Coal stacks and waste dumps.

Module-2

Mine explosions: Firedamp and coal dust explosions - causes and prevention, explosive limits, Problems on explosibility limit; Stone-dust and water barriers; Explosion in quarries over developed pillars; Investigation

Module-3

Inundation: Causes and prevention; Precautions and techniques of approaching old workings; Dewatering of waterlogged working, safety boring apparatus, pattern of holes; Design and construction of water dams.

Module-4

Rescue and recovery: Rescue equipment and their uses, classification of rescue apparatus; Resuscitation; Rescue stations and rescue rooms; Organisation of rescue work; Emergency preparedness and response system.

Module-5

Airborne respirable dust: Generation, dispersion, measurement and control; Physiological effects of dust, dust-related diseases.

Illumination: Cap lamps; Layout and organisation of lamp rooms; Standards of illumination; Photometry and illumination survey; Luminance calculations.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Mine Disasters and Mine Rescue,	M.A. Ramulu,	Oxford & IBH Publishing Co. Ltd.,	1991.
2	Elements of Mine Technology Vol. II	D.J.Deshmukh	Central Techno Publications, Nagpur.	6 th Edition

Reference Books				
3	Mine Ventilation, Vol. I	S. Ghatak,	Coal Field Publishers, Asansol,	1983
4	Environmental Engineering in Mines,	V.S. Vutukuri& R.D. Lama,	Cambridge University Press,	1992

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VI

MINERAL PROCESSING & FUEL TECHNOLOGY

Course Code	**18MN63**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

Course objectives:

- 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.

Module-1

Introduction: Scope, objectives and limitations of mineral processing; Liberation and beneficiation characteristics of minerals and coal. Laboratory sampling.
Comminution: Theory and practice of crushing and grinding; Different types of crushing and grinding equipment - their application and limitations.

Module-2

Size separation: Laboratory size analysis and interpretation; Settling of solids in fluids; Industrial screens; Mechanical classifiers and hydro-cyclones: Numerical problems.

Module-3

Gravity concentration methods: Jigging, heavy media separation, flowing film concentration - theory, application and limitations.

Froth flotation: Physico-chemical principles; Reagents; Machines; Flotation of sulphides, oxides and coal.

Electrical and magnetic methods of concentration: Principles, fields of application and limitations.

Module-4

Float and sink test: procedure for float and sink test, construction of washability curves and their use/application

Dewatering: Principles and techniques: thickening, filtration, and drying techniques.

Simplified processing/ beneficiation flow sheets: coal, copper, lead, zinc, gold, iron, manganese ores and lime stone.

Module-5

Solid fuels: Wood, peat, lignite, coal, anthracite; proximate and ultimate analyses; coal characteristics for different industrial uses; characteristics of Indian coals; caking and coking properties; Liquid fuels: Petroleum - its products and testing methods. Geseous fuels: Natural gas, producer gas and water gas.
Combustion of Coal: Mechanism of coal combustion, combustion systems (combustion stoichiometry), carbonization of coal: Low temperature carbonization, high temperature carbonization.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Mineral Processing Technology,	B.A.Wills,	Pergamon Press.	5th Edition,
2	Ore Processing	S.K.Jain,	Oxford IBH,	2nd Edition, 1990
Reference Books				
1	Fuels and Combustion,	Dr. Samir Sarkar,	Published by Orient Longman Ltd.,	1990.
2	Principles of Mineral Dressing,	A.K. Gaudin,	TMH Edition, Tata Mc. Graw Hill,	1971.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VI

UNDERGROUND MINE PLANNING AND DESIGN

Course Code	**18MN641**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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.

Module-1

Introduction, Social-Legal-Political-Economic impacts, Environmental consequences: air, water and land pollution; causes and preventive measures.

General principles of mine development, Land Acquisition, Plant silting and construction, environmental Protection and Permission.

Module-2

Principles of mine planning, stages of planning of new mines: pre-feasibility report, feasibility report and DPR, selection of mine sites, geological aspects, and division of a coal field into mining areas. Surface layouts, pit bottom layout, transport system. Application of computers in mine planning.

Module-3

Mining Area, Term of life and mine capacity, division of mining property into parts, length, number and position of productive Longwall faces, dimensions of development workings.

Module-4

Stope planning: Cut-off grade, evaluate stope boundaries, selection criteria for stoping methods, application of computers in stope design, economics of each stope.

Production planning: Stope reserve, development, manpower, ore/wastehandling, equipment, essential services, production scheduling, time and work study for improvement of production, Optimization ofmine size (mine production capacity) based on techno-economic considerations.

Module-5

Planning for mine closure: Lease agreements, surface facilities, underground facilities, water management, site rehabilitation, socio economics.

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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Advanced Coal Mining	B.M. Vorobjev&R.T.	Asia Publishing House, Bombay 1966.	
2	S.M.E. Mining Engineering Handbook, Vol. I & II	Hartman,	. Society for Mining metallurgy and Exploration Inc.	1992
Reference Books				
1	Mine Planning for Coal	S.P.Mathur	, MG Consultants Bilaspur,	1993..
2	Modern Coal Mining Technology	S.K.Das,	Lovely Prakashan, Dhanbad,	1996

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VI

SURFACE MINE PLANNING & DESIGN

Course Code	**18MN642**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- to be familiar with basic elements of surface mine planning .
- to understand the concept of open pit planning and also production planning
- to understand the closure aspect of surface mine

Module-1

Introduction: Stages/Phases of mine life; Preliminary evaluation of surface mining prospects; Mine planning and its importance; Mining revenues and costs, and their estimation; Mine planning components, planning steps and planning inputs.

Ore reserve estimation: Ore zone and bench/level compositing; Objectives and principles of ore reserve estimation; Estimation of grade at unknown point; Methods of ore reserve estimation - vertical cross section method, horizontal cross section method and 3-D geological block method.

Module-2

Stripping ratio: Concept of stripping ratio; Types of stripping ratios and their significance; Choice between surface and underground mining.

Geometrical considerations: Basic bench geometry; Pit layouts.

Module-3

Pit Planning: Development of economic block model; Pit Cut-off grade and its estimation; Ultimate pit configuration and its determination – hand method, floating cone technique, Lerchs-Grossmann algorithm, and computer assisted hand method.

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

Module-4

Analysis and design of highwall slopes and waste dumps: Pit slope geometry; Influence of pit slope on mine economics; Highwall slope stability analysis and design methodology; Stability analysis and design methodology for waste dumps.

Module-5

Design of haul roads: Addition of haul road on pit plan; Design of road cross section; Design of road width, curves and gradient; Haul road safety features and their design.

Design of drainage system in surface mines.

Closure of surface mines.

Feasibility Report - Contents and preparation.

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

- Understand basic components of surface mine planning.
- Estimate ore reserve using various methods
- Plan open pit mine given the ore reserve and economic condition.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Surface Mining Technology	S.K.Das,	Lovely Prakashan, Dhanbad,	1994.
2	Surface Mining	G.B.Mishra,	Dhanbad Publishers,	1978.
Reference Books				
1	Opencast Mining	R.T. Deshmukh	M. Publications, Nagpur	1996
2	Rock Slope Engineering	Hock and Bray,	The Institution of Mining and Metallurgy,	1981
3	Principles and Practices of Modern Coal Mining	R.D. Singh	New Age International,	1997.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VI

ENVIRONMENTAL MANAGEMENT IN SURFACE MINES

Course Code	**18MN643**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

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

Module-1

Introduction: Environmental issues in mineral industry — national and global; ambient environment mining complexes; environmental impacts of mineral exploitation - opencast mining and associated activities.
Air Pollution: Sources, characterization, ill effects, measurement, monitoring, standards, mitigating measures.

Module-2

Water Pollution: Sources, ill effects, water quality parameters – physico-chemical, biological and bacteriological. Water quality criteria, standards, monitoring and mitigating measures. Heavy metal pollution and its abatement. Ground water pollution – detection and management. Acid mine drainage.

Module-3

Noise Pollution: Basics of acoustics. Sound power, intensity and pressure levels. Noise indices, effects, standards, instrumentation, monitoring and control.
Blasting : Environmental aspects of blasting.

Module-4

Biological Land Reclamation : Environmental factors affecting revegetation – climatic, physical and chemical factors. Analysis and evaluation of site and soil. Plant species selection. Methods of vegetation establishment. Vegetation survey.
Societal Environment : Societal environment and its management including resettlement and rehabilitation; socio-economic impacts; sustainable development; concept of carrying capacity based planning.

Module-5

Environmental Administration in India: Administration and Management, Environmental Impact Assessment - Methods of EIA and their applicability; Environmental Management Plan - Structure and preparation of EMP; Environmental audit, salient features of Environment Protection Act; Environmental Laws.

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

- To develop expertise in legal requirement in connection with mine environment
- To develop expertise environmental management capabilities

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				

1	Environmental Impact of Mining	C.G. Down. and J. Stock	Applied Science Publishers Ltd. London,	Second Edition, 1980
2	Mining and Environment	B.B.Dhar	Ashish Publishing House, New Delhi,	1986.
Reference Books				
1	Mine Environment	Dhar and Thakur		
2	Environmental Pollution Control Engineering	C.S. Rao,	Wiley Eastern Ltd.	1992

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VI

OPEN ELECTIVE - A

TUNNELING ENGINEERING

Course Code	**18MN651**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- Design tunnels, rock support and grouting and evaluate the most important issues in the procedure
- Evaluate tunnel excavation method from technical and production aspects
- Analyze cost and time for ordinary tunnels based on risks and construction management principles
- Carry out a basic design of tunnel ventilation

Module-1

Introduction: Scope and application, historical developments, art of tunneling, tunnel engineering, future tunneling considerations. Types of Underground Excavations: tunnel, adit, decline, shaft; parameters influencing location, shape and size; geological aspects; planning and site investigations for a tunnel.

Module-2

Tunnelling Methods: Types and purpose of tunnels; factors affecting choice of excavation technique; Methods - soft ground tunneling, hard rock tunneling, shallow tunneling, deep tunneling; Shallow tunnels – cut and cover, cover and cut, pipe jacking, jacked box excavation techniques, methods of muck disposal, supporting, problems encountered in tunneling and remedial measures.

Module-3

Tunneling by Drilling and Blasting: Unit operations in conventional tunneling; Drilling - drilling principles, drilling equipment, drilling tools, drill selection, rock drillability factors; Blasting - explosives, initiators, blasting mechanics, blast hole nomenclature; types of cuts- fan, wedge and others; blast design, tunnel blast performance - powder factor, parameters influencing, models for prediction; mucking and transportation equipment selection.

Module-4

Tunneling by Road headers and Impact Hammers: Cutting principles, method of excavation, selection, performance, limitations and problems.
Tunnelling by Tunnel Boring Machines: Boring principles, method of excavation, selection, performance, limitations and problems; TBM applications.

Module-5

Supports in Tunnels: Different types of supports in tunneling and their applicability, NATM. Ground Treatment in Tunnelling: Adverse ground conditions and its effect on tunneling; introduction to ground control.
Tunnel Services: Ventilation, drainage and pumping
Tunnelling Hazards: Explosion, flooding, chimney formation, squeezing ground.

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

- Design tunnels, rock support and grouting and evaluate the most important issues in the procedure
- Evaluate tunnel excavation method from technical and production aspects
- Analyze cost and time for ordinary tunnels based on risks and construction management principles
- Carry out a basic design of tunnel ventilation

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Driving Horizontal Workings and Tunnel	by Pokorovski	, Mir Publishers,	1980.
2	Harbour, Dock and Tunneling Engineering	by R. Srinivasan	R. C. Pattii, Chal'otar Book Stall, Station Road TulsiSada, Arland (W. Rly), India.	
Reference Books				
3	Rock Mechanics and Design in Mining and Tunneling,	Bieniawski, Z.T.,	Rotterdam A.A. Balkema,	1984.
4	Drilling and Blasting of Rocks	Carlos L Jimeno,	A.A. Balkema/Rotterdam/Brookfield	1995.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VI

OPEN ELECTIVE - A

UNDERGROUND SPACE TECHNOLOGY

Course Code	**18MN652**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- Excavation methods for construction of underground structures
- Requirement of different machinery for excavation purposes
- Facility design in under structures
- Hazards associated with underground construction works

Module-1

Historical: Natural caves, archeological caves and their construction, tunnels for road, rail and hydropower. Need for Underground Space: Congestion driven needs for development of infrastructure for transport, water, power supply, vehicle movement in cities, storage of materials

Module-2

Engineering Utilities: Hydropower tunnels and caverns, underground storage for LPG, LNG, Crude and its products – basic principles.
Nuclear Waste Disposal: Conditions for waste disposal, effect of radioactivity and heat on surrounding rock, conceptual design of a nuclear waste disposal facility.

Module-3

Strategic Utilities: Defense facilities, civil shelters, navy bases, air force hangers, safety and risk assessment systems.

Other Storage: Grain storage, their advantages, disadvantages, underground cold storage and cellar for foods and beverages.

Module-4

Modern Developments: Underground ring roads in mega cities, submerged and floating tunnels, underground libraries, museums, dwelling units, resorts.

Module-5

Traffic surveillance and control system (TSCS) in tunnels: Traffic control signs, signals, lights, cameras. Assignment: Preparation of different underground space application plans.

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

- excavation methods for construction of underground structures
- requirement of different machinery for excavation purposes
- facility design in under structures
- hazards associated with underground construction works

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				

1	Underground Space Design: A Guide to Subsurface Utilization	John Carmody,	Raymond Sterling:	
2	Rock Mechanics and Design in Mining and Tunneling	Bieniawski, Z.T	Rotterdam A.A. Balkema,	1984.
Reference Books				
3	Harbour, Dock and Tunneling Engineering	R. Srinivasan	R. C. Pattii, Chal'otar Book Stall, Station Road TulsiSada, Arland (W. Rly), India.	

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VI

OPEN ELECTIVE - A

Course Code	**18XX653**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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

Module-1

Introduction: Scope and importance of rock excavation engineering in mining and construction industries; physico-mechanical and geotechnical properties of rocks vis-à-vis excavation method; selection of excavation method. Rock breaking processes: Primary, Secondary and Tertiary, Energy consumption computations

Module-2

Drilling: Advances in drilling equipment, pneumatic versus hydraulic, design and operating parameters of surface and underground drilling; evaluation of drill performance; mechanism of bit wear; bit selection;

Module-3

Blasting: Explosives and their selection criteria for rock excavation; blast design for surface excavations and optimisation; advanced blast initiation systems; blast performance evaluation; cast blasting; techno-economic and safety aspects of surface and underground blasting; advances in blast design for underground excavations; contour blasting; computer aided blast designs. Under water drilling and blasting

Module-4

Rock Cutting: Theories of rock tool interaction for surface excavation machinery - rippers, dozers, scrapers, BWE, continuous surface miners, auger drills; theories of rock tool interaction for underground excavation machinery - ploughs, shearers, road headers, continuous miners and tunnel boring machines; selection criteria for cutting tools;

Module-5

Advanced rock cutting techniques - high pressure water jet assisted cutting.
Recent Developments in rock excavation machinery

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SEMESTER - VI

OPEN ELECTIVE - A

18XX653

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

- Students will acquire knowledge about excavation techniques and their selection

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1				
2				
Reference Books				
3				
4				
5				

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VI

MINE VENTILATION AND ENVIRONMENT LABORATORY

Course Code	**18MNL66**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(0:2:2)	SEE Marks	60
Credits	02	Exam Hours	03

Course objectives:

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

Sl. No.	Experiments
1	Assembling and dismantling of flame safety lamp
2	Assess the percentage of methane and oxygen using flame safety lamp
3	Determine the relative humidity of the atmosphere
4	Determine the quantity of air flow in a mine
5	Determine the cooling efficiency of the atmosphere
6	Determination of characteristic curves of a fan with respect mine characteristics
7	Demonstration of fire extinguishers to quench the fire
8	To determine the quantity of particulate matter using dust samplers
9	Study of gas sampling equipment and determination of CO (MSA CO detector and other equipment).
10	Demonstration of self-contained breathing apparatus, self-rescuers, and short distance apparatus.

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.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VI

MINERAL PROCESSING LABORATORY

Course Code	**18MNL67**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(0:2:2)	SEE Marks	60
Credits	02	Exam Hours	03

Course objectives:

- 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

Sl. NO	Experiments
1	Sampling: a) Coning and quartering b) Riffle Sampling
2	Sieve analysis and interpretation of data
3	Determination of actual capacity of a jaw crusher.
4	Determination of actual capacity of a roll crusher.
5	Determination of grindability index of the given ore.
6	Determination of free settling velocities of quartz particle and comparison of the results with theoretical results.
7	Separation of heavier from the given feed using mineral jig and calculation of ratio of concentration.
8	Study of the particle movement on the deck of an operating table.
9	Separation of ferrous minerals using magnetic separator.
10	Study of the flotation characteristics of the sulphide/ oxide ore/coal and, calculate the ratio of concentration.

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.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

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SEMESTER -VI

MINI PROJECT

Course Code	**18MNMP68**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	60
Credits	02	Exam Hours/Batch	03

Course objectives:

- 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. ◢

Mini-Project: 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.

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. ◢

CIE procedure for Mini - Project:

The CIE marks awarded for Mini - Project, shall be based on the evaluation of Mini - Project Report, Project Presentation skill and Question and Answer session in the ratio 50:25:25.The marks awarded for Mini - Project report shall be the same for all the batch mates. ■

Semester End Examination

SEE marks for the mini-project shall be awarded based on the evaluation of Mini-Project Report, Presentation skill and Question and Answer session in the ratio 50:25:25 by the examiners appointed by the University. ■

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VI

INTERNSHIP

All the students admitted to III year of BE/B. Tech shall have to undergo mandatory internship of 4 weeks during the vacation of VI and VII semesters and /or VII and VIII semesters. A University examination shall be conducted during VIII semester and the prescribed credit shall be included in VIII semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared as fail and shall have to complete during subsequent University examinations after satisfying the internship requirements.

Course Code	Refer to VIII semester scheme	CIE Marks	40
Duration of internship	04 weeks	SEE Marks	60
Credit	02	Exam Hours/ Batch	03

Course objectives:

Internship/Professional practice provide students the opportunity of hands-on experience that include personal training, time and stress management, interactive skills, presentations, budgeting, marketing, liability and risk management, paperwork, equipment ordering, maintenance, responding to emergencies etc. The objective are further,

- To put theory into practice.
- To expand thinking and broaden the knowledge and skills acquired through course work in the field.
- To relate to, interact with, and learn from current professionals in the field.
- To gain a greater understanding of the duties and responsibilities of a professional.
- To understand and adhere to professional standards in the field.
- To gain insight to professional communication including meetings, memos, reading, writing, public speaking, research, client interaction, input of ideas, and confidentiality.
- To identify personal strengths and weaknesses.

Internship: Students under the guidance of internal guide/s and external guide shall take part in all the activities regularly to acquire as much knowledge as possible without causing any inconvenience at the place of internship.

Seminar: Each student, is required to

- Present the seminar on the internship orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit the report duly certified by the external guide.

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

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

- Gain practical experience within industry in which the internship is done.
- Acquire knowledge of the industry in which the internship is done.
- Apply knowledge and skills learnt to classroom work.
- Develop a greater understanding about career options while more clearly defining personal career goals.
- Experience the activities and functions of professionals.
- Develop and refine oral and written communication skills.
- Identify areas for future knowledge and skill development.
- Expand intellectual capacity, credibility, judgment, intuition.
- Acquire the knowledge of administration, marketing, finance and economics. ■

Continuous Internal Evaluation
CIE marks for the Internship shall be awarded by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculties from the department with the senior most acting as the Chairman.
The CIE marks awarded shall be based on the evaluation of Internship Report, Presentation skill and Question and Answer session in the ratio 50:25:25.■

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Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VII

MINE SYSTEMS ENGINEERING

Course Code	**18MN71**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- Identify and develop operational research models from the verbal description of the Real Systems.
- Enables to create mathematical models that are useful to solve optimization problems.
- Ability to estimate the optimum cost/distance in transporting the goods.
- Able to apply the different types of strategies of game theory in decision making.
- Able to design and develop the analytical models like PERT and CPM for planning, scheduling and controlling projects.

Module-1

System Engineering: Introduction to systems concept, analysis and systems engineering. Models in systems analysis. Basic concepts of statistical decision theory.
Linear Programming: Definition, mathematical formulation, standard form, solution space, solution-feasible, basic feasible, optimal,infeasible, multiple, optimal, Redundancy, Degeneracy, Graphical and Simplex methods.

Module-2

Variants of Simplex algorithm – Artificial basis techniques. Duality, Economic interpretation of Dual, Solution of LPP using duality concept, Dual simples method.
Simulation: Simulation techniques for equipment selection and production scheduling, Significance of management information systems in controlling and managing the mining activities.
Inventory Model: Definition, deterministic models, probabilistic models and their applications to mining.

Module-3

Transportation Problem: Formulation of transportation model, Basic feasible solution using different methods, Optimality Methods, Unbalanced transportation problem, Degeneracy in transportation problems, Applications of Transportation problems. Assignment Problem**:** Formulation, unbalanced assignment problem, Traveling salesman problem.

Module-4

Project Management Using Network Analysis: Network construction, Network techniques for mining projects, determination of critical path and duration, floats.
PERT –Estimation of project duration, variance.
CPM – Elements of crashing, least cost project scheduling. Flow innetworks: Determination of shortest route, Determination of Maximum flowthrough the networks for mining project.

Module-5

Queuing Theory: Queuing system and their characteristics. The M/M/I Queuing system, Steady state performance analyzing of M/M/I and M/M/C queuing model.
Game Theory: Formulation of games, Two Person - Zero sum game, games with and without saddle point, Graphical solution (2xn, mx2game), and dominance property.

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

1. Mine Systems Engineering presents the theoretical principals and practical applications for strategic mine planning in surface and underground mining operations.
2. It covers planning and valuation methodologies applicable to metal and coal mining projects.
3. The students will explore and apply basic manual procedures, algorithms, computer applications and mathematical models for strategic mine planning.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	.Mining Engineers Handbook, Vol. II SME	Cummins	AIME, New York,	1979
2	Mathematical Models in Operations Research.	Sharma J.K	Tata Mcgraw-Hill, New Delhi,	1989.
Reference Books				
3	Operations Research and Introduction,	Taha H.A	.Mc. Millan.	ISBN -0-02-418940-5
4	Introduction to Operation Research	Hiller and Liberman	Mc. GrawHill	V Edition.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VII

COMPUTER APPLICATION IN MINING

Course Code	**18MN72**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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

Module-1

Computer Aided Design : Fundamentals of CAD, Introduction, The Design Process, The application of Computers for Design, Creating the Manufacturing Data Base, Benefits of Computer – Aided Design.
Hardware in Computer – Aided Design: Introduction, The design Workstation, the Graphics Terminal, Operator Input Devices, Plotters and Other Output Devices, The Central Processing Unit, Secondary Storage.

Module-2

Computer Graphics software and Database : Introduction, The Software Configuration of a Graphics System, Functions of a Graphics Package, Constructing the Geometry, Transformations, Data base Structure and Content, Wire-frame Versus Solid Modeling, Other CAD Features, Application of Computers in Mining Industries

Module-3

Algorithms : Development of algorithms in Ore Reserve Estimation, Equipment Selection, Material Handling System, Pit Configuration, Blast Design, Pillar Design, Subsidence Protection, Ventilation Network Analysis, Ground Vibration Prediction from Blasting.

Module-4

Introduction to the application of robotics in mines, remote controlled and manless mining.
Database systems: Overview of file organization - sequential, direct, indexed, hashed, inverted; introduction to RDBMS; use of DBASE and Microsoft Access. Mine management Information Systems, Inventory management application

Module-5

Expert systems: concept and applications in mining. Artificial Intelligence Programming Computer applications to mine environment, computer aided blast applications.
Mine design computer applications : based on rock mechanics and ground control like slope stability, pillar design, mine opening design etc

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

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Fundamentals of Database Systems,	Elmarsi and Navathe,	Wesley	3rd edition, 2000
2	CAD/CAM : Computer Aided Design and Manufacturing,	Mikell P. Groover, Emory	Jr. PHI Inida,	1989.
Reference Books				
3	DBASE Handbook			
4	Mine Ventilation and Air – Conditioning,	Hartman,	Wiley International,	1961.

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SEMESTER - VII

OPEN PIT SLOPE ANALYSIS AND DESIGN

Course Code	**18MN731**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- To explain slopes, their modes of failure and various factors/parameters that influence stability of slopes in surface mines.
- To identify the geotechnical parameters that are required for stability studies of a slope

Module-1

Introduction : Types and formation of slopes in surface mines, pit slope vis-à-vis mine economics, mechanism of common modes of slope failure, factors influencing stability of slopes, and planning of slope stability investigations.

Module-2

Geotechnical Information : Geotechnical data required for high wall slope stability studies. Collection of Geological Data and their interpretation for stability studies of high wall slopes.

Module-3

Shear Strength: Shear strength of intact rock, discontinuity surfaces, filled discontinuities and rock-mass - estimation and determination; Surface roughness, joint roughness coefficient – estimation and determination.

Module-4

Water Flow : Concepts of water flow through a material and its permeability; water flow through rock-mass, water flow through soil type material and broken spoil material; Estimation and measurement of permeability and water pressure; Graphical solution of seepage problems (flow nets), seepage forces and seepage patterns under different conditions.

Module-5

Analysis and Design of Pit Slopes and Waste Dumps: Slope stability assessment methods and techniques; Analysis and design criteria and methodology for high wall slopes and backfill and waste dumps; Probabilistic approaches of slope analysis and design.

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

- Explain slopes, their modes of failure and various factors/parameters that influence stability of slopes in surface mines.
- Identify the geotechnical parameters that are required for stability studies of a slope

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Surface Mining Technology	S.K.Das,	Lovely Prakashan, Dhanbad,	1994.

2	Surface Mining	G.B.Mishra,	Dhanbad Publishers,	1978.
Reference Books				
3	Opencast Mining	R.T. Deshmukh	M. Publications, Nagpur	1996
4	Rock Slope Engineering	Hock and Bray,	The Institution of Mining and Metallurgy,	1981

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Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VII

NUMERICAL MODELLING AND INSTRUMENTATION IN ROCK MECHANICS

Course Code	**18MN732**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- **Knowledge of numerical modeling**

Module-1

Basic Concepts: Sensitivity, range, reproducibility and accuracy, drift, absolute and relative measurements, error, environmental factors and planning for instrumentation.
Principles: Mechanical, pneumatic, optical, vibrating wire, piezoelectric, electrical and thermal.

Module-2

Field and Laboratory Instruments: Load cells, MPBX, tape extensor meters, convergence recorders; Load, stress, deformation and strain measuring instruments.

Module-3

Instrumentation monitoring: Introduction, purpose, monitoring systems, data collection, interpretation and application in mining engineering.

Module-4

Introduction to numerical modelling: Introduction, need, domain and boundary conditions; discretisation, approach to numerical simulation for excavations in mining. Steps followed in numerical modelling.

Module-5

Methods of Numerical modelling: Methods of numerical modelling: Basic principle, advantages and their limitations of Finite difference method, finite element method, boundary element method and discrete element code.

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

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Rock mechanics, instrumentation, room and pillar workings tests	Parker,	Jack. 02650.	
2	Numerical Methods in Rock Mechanics	G. N. Pande,	John Wiley & Sons Inc	(June 1, 1990)
Reference Books				
3	Fundamentals of Rock Mechanics _	Jager & Cook,	Methuen and co. London,	1969.
4	Strata Mechanics in Coal Mining,	Jeremic, K.L. Jeremic	Rotterdam, Balkema,	1985

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VII

MINERAL ECONOMICS

Course Code	**18MN741**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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.

Module-1

Introduction: Economic importance of mineral industry, special features of mineral industry, demand and supply analysis, National Mineral Policy.
Mineral Price and Pricing: International Monetary system, Factors affecting mineral price, Kinds of price quotation, Mineral Price Index, Mineral Price.

Module-2

Sampling: Definition, purpose, scope, common methods of sampling, types of samples, errors in sampling.
Estimation of reserves: Classification of reserves, tenor, grade. Preparation of assay plans, various methods of ore reserve estimation and problems on ore reserves

Module-3

Mine Valuation –1 : Factors affecting mine valuation, life of mine, redemption of capital, project assessment by D.C.F., net present value methods, Hoskold's two rate formula.
Mine valuation – 2: mining fixed costs, operating costs, feasibility study, project evaluation, depreciation, problems on mine valuation and depreciation.

Module-4

Financial Management: Methods of financing industrial enterprises, structure, formation and capitalization. Sources of finance.

Principles of book keeping as applied to mining industry and accountancy. Balance sheet, profit and loss accounts.

Module-5

Cost Accounting: Introduction, need for cost accounting, elements of cost, overheads, allocation of over heads, breakeven analysis.
Budget and Budgetary control: Definition of budget, Principle of budget and budgetary control, types of budgets.

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 accountin 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.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Mineral and Mine Economics	R.T. Deshmukh,	Myra Publications, Nagpur,	1986.
2	Mineral Economics	N. L. Sharma and Sinha	Oxford and IBH,	1992.
Reference Books				
3	Industrial Management	O.P. Khanna,	Dhanpat Rai and Sons,	1999.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VII

OCCUPATIONAL HEALTH & GENERAL SAFETY

Course Code	**18MN742**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- Understand the mine safety related rules, regulation and bye-laws in mines.
- Explain the mine safety related rules, regulation and bye-laws in mines.

Module-1

Introduction: Safety conference and their impact, Safety Education and training; Pit Safety committee, health and safety program, Feedback on safety.

Module-2

Occupational Health: Safety and occupational health survey, notified and general miners diseases and their preventive measures. Permissible standard of dustiness. The Mines Rescue Rules, 1985.

Module-3

Safety Rules and Regulations: Standing order in event fire, inundation and failure of main mechanical ventilator.
Bye-Laws: ANFO Explosive, A.C. mains firing, Bulk transportation of explosives, Diesel Locomotives.

Module-4

Accidents: Classification of accidents, statistics, causes and preventive measures of various accidents; Accident enquiry report for accidents due to roof fall, blasting, machinery failure etc.

Module-5

Accidental Planning: Collection and presentation of accidental records, zero accidental planning (ZAP) and minimum accidental planning (MAP). Inspection for safety. Accident Compensation, Job safety Analysis.

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

- Understand the mine safety related rules, regulation and bye-laws in mines.
- Explain the mine safety related rules, regulation and bye-laws in mines.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Legislation in Indian Mines – A critical Appraisal	Prasad and Rakesh	Tara Printing Works	5th edition, 1990
2	Encyclopedia of Mining Law	D.D. Seth.	Law Publishers (India) Pvt. Ltd., Allahabad	1999
Reference Books				
3	Mine Management Legislation and General Safety	Ghatak	Coal Field Publishers, Asansol,.	1998

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SEMESTER - VII

OPEN ELECTIVE - B

INDUSTRIAL SAFETY ENGINEERING

Course Code	**18MN751**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- Gain insights of hazards and accidents of different working conditions in industries.
- Have knowledge of occupational health and safety in different industries

Module-1

HOT WORKING AND COLD WORKING OF METALS: 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, Forging operations, Specific safety measures in different forging operations, Preventive maintenance of forging machines, Safe work practices in forging, Operation in hot and cold rolling mills, Preventive maintenance and periodic check for safe operations, 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.

Module-2

SAFETY IN OPERATION: 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.

Module-3

SAFETY IN CONSTUCTION INDUSTRY : Work at Height-High incidence of serious accidents in working at heights, Types of operations, Safety features associated with design, construction and use of stairways, rungs, ramps, gangways, floors, ladders of different types, working on roofs, d).Other safety requirements while working at height, Bootswain's chair-safety harness etc.,

Prevention of fall of persons at floor level, Potential tripping and slipping hazards, Erection, Inspection and Certification and safe use of various types of scaffolds, Safety of high rise building, Bridges and tunnels

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

Module-4

SAFETY IN SPECIFIC INDUSTRIES: Mining industry, Ceramic industry, Textile industry, Leather industry, Sugar industry, Fertilizer industry, Cement industry, Tanneries

Module-5

EMERGING ISSUES ON OSH: Safety in Nano Technology, Safety in Robots, Safety in hospital, Safety in film industry

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

- Be familiar with hazards in different industries.
- Decide precautions of safety and health in different occupation.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Industrial Safety,	Dr. K U Mistry	Siddharth Prakashan; Ahmedhabad-	380014
2	Industrial Safety Management	L M Deshmukh,	, Mcgrawhill Education,	July 2017
Reference Books				
3	Fundamentals of Industrial Safety and Health,	Dr. K U Mistry	, Siddharth Prakashan; Ahmedhabad-	380014.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VII

OPEN ELECTIVE - B

PROJECT MANAGEMENT

Course Code	**18MN752**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- 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.
- To understand the scheduling and uncertainty in projects.
- To students will be able to understand risk management planning using project quality tools.

Module-1

Introduction: Definition of project, characteristics of projects, understand projects, types of projects, scalability of project tools, project roles

Project Selection And Prioritization – Strategic planning process, Strategic analysis, strategic objectives, portfolio alignment – identifying potential projects, methods of selecting projects, financial mode / scoring models to select projects, prioritizing projects, securing and negotiating projects.

Module-2

Planning Projects: Defining the project scope, Project scope checklist, Project priorities, Work Breakdown Structure (WBS), Integrating WBS with organisation, coding the WBS for the information system.

Scheduling Projects: Purpose of a project schedule, historical development, how project schedules are limited and created, develop project schedules, uncertainty in project schedules, Gantt chart.

Module-3

Resourcing Projects: Abilities needed when resourcing projects, estimatere source needs, creating staffing management plant, project team composition issues, Budgeting Projects: Cost planning, cost estimating, cost budgeting, establishing cost control.

Project Risk Planning: Risk Management Planning, risk identification, risk analysis, risk response planning, Project Quality Planning and Project Kickoff: Development of quality concepts, project quality management plan, project quality tools, kickoff project, baseline and communicate project management plan, using Microsoft Project for project baselines.

Module-4

Performing Projects: Project supply chain management: - Plan purchasing and acquisitions, plan contracting, contact types, project partnering and collaborations, project supply chain management.

Project Progress and Results: Project Balanced Scorecard Approach, Internal project, customer, financial issues, Finishing the project: Terminate project early, finish projects on time, secure customer feedback and approval, knowledge management, perform administrative and contract closure.

Module-5

Network Analysis

Introduction, network construction - rules, Fulkerson's rule for numbering the events, AON and AOA diagrams; Critical path method (CPM) to find the expected completion time of a project, floats; PERT for finding expected duration of an activity and project, determining the probability of completing a project, predicting the completion time of project; crashing of simple projects.

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.
- Students will be able to understand risk management planning using project quality tools.

- Understand the activities like purchasing, acquisitions, contracting, partnering and collaborations related to performing projects.
- Determine project progress and results through balanced scorecard approach
- Draw the network diagram to calculate the duration of the project and reduce it using crashing.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Mine Management, Legislation and General Safety	S. Ghatak	Coal Field Publishers, Asansol	1999
2	Management	Harold Koontz and Heinz	Mc Graw Hill Company	1990.
Reference Books				
3	Industrial Organization and Engineering Economics,	Banga and Sharma,	Khanna Publication, New Delhi,	1999.
4	Modern Production Management	Buffa	John Wiley and Sons,	1998.
5	Industrial Management,	O.P.Khanna,	Dhanpat Rai and Sons	1999.

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SEMESTER - VII

COMPUTER APPLICATION IN MINING

Course Code	**18MNL76**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(0:2:2)	SEE Marks	60
Credits	02	Exam Hours	03

Course objectives:

- To understand the draw, modify and dimensioning tools in the CAD package
- To draw the orthographic projections
- To draw mining Machineries using CAD tools.

Sl. No.	Experiments
1	Learning of the following commands using a CAD package.
2	Drawing Commands: Line, arc, circle, polygon, Donut, Solid, Spline Pline, Text, M Line, ellipse, dimensioning, object snaps point, Hatch, layers, Units.
3	Editing Commands: Limits, Erase, Array, Copy, Move, Offset, Stretch, Pedit, change properties, Trim, Extend, Fillet, Chamfer, Break, Mirror, Scale, Rotate, Zoom, Pan.
4	Enquiry Commands: Id, list, Dist, Area, DB list, Status Selection sets i.e. window, crossing, fence, W polygon. Plotting.
5	Simple exercises using any of the above commands
6	05 (Eight) Exercises (Mining Drawing) using any of the above commands.
7	Study of Mine design related software

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

- To use the draw, modify and dimensioning tools in the CAD package.
- Ability to draw orthographic projections using CAD package.
- Ability to draw mining Machineries using CAD tools.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero. ■

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VII

MINE OPTIMIZATION LABORATORY

Course Code	**18MNL77**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(0:2:2)	SEE Marks	60
Credits	02	Exam Hours	03

Course objectives:

- The course equips the students in understanding the various optimization tools and their application in mineral industry

Sl. No.	Experiments
1	Determine cut-off grade of ore in a mine
2	Optimize cost of transportation for supplying coal from mines to various destinations
3	Determine the optimal assignment of 'm' jobs or workers to 'n' machine in a mine using Hungarian Method.
4	Scheduling of production in a mine.
5	Determine equipment replacement policy in a mine
6	Optimize mining project completion time.
7	Optimize shovel-dumper system in open cast mine by Queuing System
8	Optimization of scheduling of drilling, blasting, loading and support operation in development heading.
9	Optimize drilling and blasting cost for surface mine.
10	Determine optimum level of inventory to be maintained in a mine.

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

- The course equips the students in understanding the various optimization tools and their application in mineral industry

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

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Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER -VII

PROJECT WORK PHASE - 1

Course Code	**18MNP78**	CIE Marks	100
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	--
Credits	01	Exam Hours/Batch	--

Course objectives:

- 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. ▰

Project Work Phase - II: 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.

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. ▰

CIE procedure for Project Work Phase - 1:

(i)Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work phase -1, shall be based on the evaluation of project work phase -1 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable.

The CIE marks awarded for the project work phase -1, shall be based on the evaluation of project work phase -1 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.■

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SEMESTER -VIII

MINE LEGISLATION

Course Code	**18MN81**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- The students are made conversant with legal requirements and safety aspects of mining

Module-1

Introduction and the Mines Act, 1952: Brief historical perspective legislation in Indian Mines.

Preliminary, Inspectors and Certifying surgeons, committee, mining operations and management of mines. Provisions to health and safety. Hours and limitations of employment Leave with wages, Regulations and bylaws, penalties and procedures.

Module-2

The Mines Rules,1955: Preliminary, committee, court of enquiry, certifying surgeons, Medical Examination of persons employed. Workmen's inspector and safety committee, health and sanitation provision, first aid and medical appliance. Employment of persons, leave with wages and overtime. Welfare amenities, registers and notices.

Module-3

The Metalliferous mines regulation,1961 and The Coal mines regulations,2017: Preliminary returns, notices and records, inspectors and mine officials, duties and responsibilities of work men, plans and sections, means of access, ladders and ladder ways, transport of men and materials, winding in shafts, transport of men and material haulage, mine workings, precaution against dangers from fire, dust gas and water, ventilation, lighting and safety lamps, Explosives and shot firing, machinery, plants and equipments.

Module-4

Mines and Minerals (Development and Regulation) Act, 1952 and related rules: Mines and Minerals (Development & Regulation) Act, 1957, Mineral Concession Rules, 1960and Mineral conservation and Development Rules. Salient provisions of the mines.

Module-5

Miscellaneous: Salient Features of: The Mines Creche Rules, 1966, Maternity Benefit Act and Rules; Indian electricity Rules, 1956 and Coal Mines Provident Fund Act and Rules.

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

- The students will be conversant with legal requirements and safety aspects of mining

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Mines Act 1952 and Mines Rules 1955		Universal Law Publishing, Pvt. Ltd	1999
2	Metalliferous Mines Regulations 1961		Universal Law Publishing, Pvt. Ltd	

3	Coal Mines Regulation 2017		Universal Law Publishing, Pvt. Ltd	
Reference Books				
3	Legislation in Indian Mines – A critical Appraisal	Prasad and Rakesh	Tara Printing Works	5th edition, 1990
4	Encyclopedia of Mining Law	D.D. Seth.	Law Publishers (India) Pvt. Ltd., Allahabad	1999
5	MM (R & D) Act, 1957			

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SEMESTER -VIII

MINING GEOSTATISTICS

Course Code	**18MN821**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- Students are made conversant with basic statistical and geostatistical methods
- Application of these tools are made with reference to mineral grade calculations

Module-1

Introduction to Geo-statistics: Definition, Schools of geo statistics. Estimation models for mine evaluation – average method, polygonal or triangular method.

Module-2

Deterministic Mathematical Model: Independent random model, trend with random noise, correlated random model and trend with correlated random residuals.

Module-3

Correlated Random Theory-1: Semi Variogram: Definition of semi variogram, mathematical models of semi-variogram.
Practical problems – Isotropy and anisotropy, stationarity, regularization, nugget effect.

Module-4

Correlated Random Theory- 2: Extension Variance and Estimation Variance: Extension and estimation variance, calculation of estimation variance, the nugget effect and estimation variance, examples, auxiliary functions.
Correlated Random Theory – 3: Kriging: Kriging and optimal valuation, kriging equations in general cases.

Module-5

The Integrated Geological – Geostatistical System: Statistical analysis, comparative statistical analysis, geostatistical structural analysis, trend analysis, point kriging cross validation, block kriging, mineral inventory, grade – tonnage relations, examples to assess ore and metal recoveries.
Example to calculate planning cut-off grade. Optimization of drilling programme. Misclassified tonnages – actual Vs estimated. Grade control.

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

- Mining graduates will be well aware with the various geostatistical techniques for the mineral reserve estimation.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Geostatistics – Methods and Applications	Rendu J.M	John Wiley and Sons	1981

2	Mining Geostatistics	Jurnel, A.G. and Huigbregts, Ch. J.	John Wiley and Sons,	1978.
Reference Books				
3	Open Pit Planning – SME			
4	Geostatistical Ore Reserve Estimation	Dravid, Michel,	Mc. Graw Hill,	1977.

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER -VIII

DIMENSIONAL STONE MINING

Course Code	**18MN822**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- to make students conversant aspects of dimensional stone mining
- to develop skill in planning and design dimensional stone mining

Module-1

Introduction: Definition, historical use of natural stones. Geology and occurrences: Classification of dimensional stones, composition, chemical and geo-chemical properties, various standards for normalization of dimensional stones.

Module-2

Mining of dimensional stones: Various techniques of dimensional stone mining – block mining and slab mining; Manual mining; Mechanized mining – line drilling, in-situ sawing by wire saw, chain saw, portable circular saw, flame cutting.

Cutting / Sawing tools: Tool carrier – circular steel blade, steel wire rope, chain jib saw, physical and mechanical properties, elastic properties, tension etc.; Cutting tools – diamond segments, diamond pearls / bits,

Module-3

Handling of blocks and slabs: Equipment used - derrick crane, front loaders, fork-lifts, mobile cranes, trucks and trailers.

Quarrying machines for dimensional stones: Portable circular saw, wire saw, chain saw, line drills – special design features of the machines, their use and maintenance.

Production monitoring: Recovery, waste generation, productivity, inherent defects, measurement and corrective actions, cost evaluation.

Module-4

Environmental issues: Management of solid waste, slurry waste, soil land and water; Protection and rehabilitation.

Health, safety and welfare: Protective care from abrasive dust, personal safety and welfare.

Module-5

Application, processing and architecture in dimensional stone: Application – flooring, roofing, cladding, stairs, paving, facets; Processing and polishing – various techniques for sawing of blocks, shaping of edges, polishing and calibration; Fixing and installation – techniques of fixing of dimensional stones in various applications like flooring, cladding, faceds, stairs, roofing and paving; Care and maintenance of dimensional stones – techniques for post fixing care and maintenance of dimensional stones in various applications.

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

- conversant aspects of dimensional stone mining
- develop skill in planning and design dimensional stone mining

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				

1	Dimensional Stone Technology	Rathore S. S., Bhardwaj G. S., Jain S. C	Himanshu Publication New Delhi	
2	Recent Development in Machinery and Equipment for Dimensional Stone Mining	Rathore S. S., Gupta Y. C., Parmar R. L		
Reference Books				
3	Safety and Technology in Marble Mining and Processing in New Millennium	Rathore S. S., Laxminarayana V	Proc. of National Workshop held march 10-11 200 Udaipur.	

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SEMESTER -VIII

COAL BED METHANE

Course Code	**18MN823**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- To understand the philosophy of coal bed methane production
- To interpret coal specific tests such as sorption tests, sorption isotherms and well tests
- To evaluate coal bed methane exploration and development
- Opportunities
- To compute gas in the reservoirs and estimate ultimate recovery

Module-1

Introduction: Overview of- coal bed methane (CBM) in India — CBM vs conventional reservoirs. Geological influences on coat formation of coals-Coal chemistry-Significance of rank-Cleat system and natural fracture. Sorption: Principles of Adsorption-The Isotherm construction-CH_4 retention by coal seams-CH_4 content determination in coal seams-The isotherm for recovery prediction model of the micro-pores-coal sorption of other molecular species.

Module-2

Reservoir Analysis: Coal as a reservoir-Permeability-Porosity-Gas flow-Reserve analysis-Well spacing and drainage area-Enhanced recovery. Well Construction: Drilling-Cementing. Completions: Open hole completions-Open hole cavitation process, Cased hole completions- Multi zone entry in cased hole.

Module-3

Formation Evaluations, Logging : Borehole environment-Tool measurement response in coal-wire line log evaluation of CBM wells-Gas-In-Place calculations-Recovery factor-Drainage area calculations-Coal permeability/ Cleating-Natural fracturing and stress orientation-Mechanical rock properties in CBM evaluation.

Module-4

Hydraulic fracturing of coal seams: Need for fracturing coals-Unique problems in fracturing coals-Types of fracturing fluids for coal-In situ conditions-Visual observation of fractures.

Module-5

Water production and disposal: Water production rates from methane wells-Chemical content-Environmental regulations-Water disposal techniques-Economics of coal bed methane recovery.

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

- The student would be in a position to have knowledge of interpreting various techniques involved in enhancing the recovery of coal bed methane.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Coal Bed Methane: Principles and Practice	R. E. Roger	Prentice Hall	3rd Edition, , 1991

2	Coal Bed Methane- American	Robert A. Lamarre,	Association of Petroleum Geologists	2008
Reference Books				
3	Fundamentals of Coal Bed Methane reservoir Engineering	John Seidle	Pennwell Corp.	2011
4	A Guide to coal bed methane operations	B. A. Hollub	Society of petroleum	1992

B. E. MINING ENGINEERING
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SEMESTER -VIII

PROJECT WORK PHASE -II

Course Code	**18MNP83**	CIE Marks	40
Contact Hours/Week	0:0:2	SEE Marks	60
Credits	08	Exam Hours/Batch	03

Course objectives:

- To support independent learning and innovative attitude.
- To guide to select and utilize adequate information from varied resources maintaining 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. ◼

Project Work Phase - II: 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.

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. ◼

CIE procedure for Project Work Phase - 2:

(i)Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work phase -2, shall be based on the evaluation of project work phase -2 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable.

The CIE marks awarded for the project work phase -2, shall be based on the evaluation of project work phase -2 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.■

Semester End Examination

SEE marks for the project (60 marks)shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) as per the University norms by the examiners appointed VTU.■

B. E. MINING ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER -VIII

TECHNICAL SEMINAR

Course Code	**18MNS84**	CIE Marks	100
Contact Hours/Week	0:0:2	SEE Marks	--
Credits	01	Exam Hours	--

Course objectives:
The objective of the seminar is to inculcate self-learning, face audience confidently, enhance communication skill, involve in group discussion and present and exchange ideas.
Each student, under the guidance of a Faculty, shall choose, preferably, a recent topic of his/her interest 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-soft equation and drawing tools or any such 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

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

- 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-time issues.
- 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.◼

Evaluation Procedure:
The CIE marks for the seminar shall be awarded (based on the relevance of the topic, presentation skill, participation in the question and answer session and quality of report) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three teachers from the department with the senior most acting as the Chairman.

Marks distribution for CIE of the course:
Seminar Report:50 marks

Presentation skill:25 marks

Question and Answer: 25 marks.■