

CURRICULUM - 2023

C -23

DIPLOMA IN MINING ENGINEERING



STATE BOARD OF TECHNICAL EDUCATION & TRAINING
ANDHRA PRADESH

**DIPLOMA IN MINING ENGINEERING
CURRICULUM- 2023 (C-23)**

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PREAMBLE

Technical Education is a key driver of economic development and plays a crucial role in providing individuals with the skills and knowledge necessary to thrive in the workplace. As technological advancements continue to reshape industries and create new opportunities, it is critical that technical education curricula remain relevant and up-to-date.

The curriculum has been designed with this in mind, with a focus on practical skills, critical thinking, and problem-solving. We believe that these skills are essential for success in both academic and professional spheres. The revamping of the technical education curriculum is made with collaborative effort from educators, industry experts, policymakers, and students.

At the heart of the curriculum, is the belief that the technical education should be **student-centered**, empowering learners to take ownership of their learning and pursue their passions. We aim to create a learning environment that is safe, supportive, and nurturing, where every student has the opportunity to reach their fullest potential. We acknowledge that learning is a lifelong journey, and our curriculum is designed to provide a solid foundation for continued growth and development. We hope that our students will not only leave with a diploma but with employability and passion for learning.

The State Board of Technical Education and Training, (SBTET) AP, has been offering Diploma programmes to meet the above said aspirations of the stake holders: industries, students, academia, parents and the society at large. **The Curriculum should be flexible, adaptable, and responsive to the changing needs of the industry and society.** As such, it has been the practice of SBTET, A.P., to keep the curriculum abreast with the advances in technology through systematic and scientific analysis of current curriculum and bring out an updated revised version at regular intervals.

The design of Curriculum C-23 was started in the month of January - 2023. Feedback was collected from all stake holders: Students, Lecturers, Senior Lecturers, Head of Sections and Principals for all programmes for this purpose. Accordingly, a workshop was convened on 15th February 2023 by Smt. C. Naga Rani, I.A.S, Director of Technical Education & Chairperson, SBTET, AP to discuss on revamping of C-20 curriculum to meet the needs of industries and for improvement of placements.

The meeting was attended by Sri. Saurab Gaur, I.A.S, Principal Secretary, Skill Development & Training, Smt. Lavanya Veni, I.A.S, Director, Employment & Training. Thirteen Representatives from Industries and Fourteen Academicians from Higher Level Institutions and officials of ITI, Skill Development, CTE & SBTET attended the workshop.

Smt. C Naga Rani, I.A.S., Commissioner of Technical Education while addressing in the workshop, emphasized the necessity of industrial training and on-hand experience, that the students need to undergo to support the industries and the Gaps in the Curriculum need to be fixed to make the students passionate to work in the industry in order to support economy of the country.

The committees of each branch consisting of experts from Industries, Higher Level Institutions and Faculty of Polytechnics are informed to study the possibility of incorporating the following aspects while preparation of the curriculum so as to improve employability.

- **To bring out industry oriented Diploma Engineers.**
- **Internet of Things (IoT) for all branches**
- **Theoretical & Practical subjects 50: 50 Ratio**
- **Industry 4.0 concepts.**
- **5G Technology.**
- **Critical Thinking (Quantitative Aptitude, Data Interpretation, Quantitative reasoning etc) to face the written tests conducted by the industries during placements.**
- **Dynamic, Student centric to suit the needs of the industry.**

In continuation, series of workshops with subject experts followed in the subsequent weeks for thorough perusal for preparation of draft curriculum. Also, the suggestions received from representatives from various industries, academic experts from higher level institutions, subject experts from Polytechnics, have been recorded, validated for incorporation into the **Curriculum C-23**. Finally, the draft curriculum was sent to academicians of higher-level institutions, industrial experts for Vetting.

The design of new Curricula C-23 for different diploma programmes has thus been finalised with the active participation of the members of the faculty teaching in the Polytechnics of Andhra Pradesh, and duly reviewed by Expert Committee constituted of academicians and representatives from industries. Thus, the primary objective of the curriculum change is to produce employable diploma holders in the country by correlating the growing needs of the industries with relevant academic input.

The outcome-based approach as given by NBA guidelines has been followed throughout the design of this curriculum and designed to meet the requirements of NBA Accreditation, too.

The Revised Curriculum i.e., Curriculum-2023 (C-23) is approved by 45th Academic Committee of SBTET, A.P for its implementation with effect from Academic Year 2023-24. Also, the SBTET, A.P under the aegis of the Department of Technical Education, Andhra Pradesh in it's 62nd Board Meeting held on 13-07-2023 (vide item no: 17) Approved to update the Polytechnic Curriculum C-23 with effect from the academic year 2023-2024 onwards after revamping the present C-20 curriculum, to meet the latest industrial technological developments including Industry 4.0 concepts.

2. HIGHLIGHTS OF CURRICULUM C-23

The following Courses/ Topics are incorporated in this curriculum C-23 as per the suggestions received from Industrial Experts, Faculty of Higher Level Institutions and Polytechnics to improve the Employability Skills of the Polytechnic Students.

1. Duration of course for regular Diploma and for sandwich Diploma is 3 years and 3½ years respectively.

2. The Curriculum is prepared in Semester Pattern. However, First Year is maintained as Year-wise pattern.
3. 6 Months Industrial training has been introduced for 3 years Diploma Courses and 6 months Industrial Training is introduced for 3 ½ years Sandwich Diploma courses.
4. Updated subjects relevant to the industry are introduced in all the Diploma courses.
5. The policy decisions taken at the State and Central level with regard to environmental science are implemented by including relevant topics in Chemistry. This is also in accordance with the Supreme Court guidelines issued in Sri Mehta's case.
6. Keeping in view the increased need of communication skills which is playing a major role in the success of Diploma Level students in the industries, emphasis is given for learning and acquiring listening, speaking, reading and writing skills in English. Further as emphasized in the meetings, Communication Skills lab and Life Skills lab are continuing for all the branches.
7. CAD specific to the branch has been given emphasis in the curriculum. Preparing drawings using CAD software has been given more importance.
8. Upon reviewing the existing C-20 curriculum, it is found that the theory content is found to have more weightage than the Practical content. In C-23 curriculum, more emphasis is given to the practical content in Laboratories and Workshops, thus strengthening the practical skills. The ratio of Theory & Practicals is 50:50.
9. With increased emphasis for the student to acquire Practical skills, the course content in all the subjects is thoroughly reviewed and structured as outcome based than the conventional procedure based.
10. Curriculum of Laboratory and Workshops have been thoroughly revised based on the suggestions received from the industry and faculty, for better utilization of the equipment available in the Polytechnics. The experiments /exercises that are chosen for the practical sessions are identified to confirm to the field requirements of industry.
11. The theory and practical subjects are restructured to find room for new theory and practical subjects to meet the present the industrial/hospital needs.
12. As Biological control systems is the key subject to feedback signal of medical electronics, it is important to learn about control theory in human biology. Hence, to meet the need of present technology a new subject titled " biological control SYSTEMS" is introduced in IV semester.
13. A new laboratory titled "PHYSIOLOGICAL SYSTEMS ENGINEERING LABORATORY" is introduced in III semester in which hospital visits are made compulsory to bridge the gap

between classroom learning and real-world circumstances and to aware the latest trends in industries/hospitals which facilitates the students for better understanding of hospital equipment concepts.

- 14 To make the students effective and efficient in all aspects, three periods per week are allotted in every year/semester for STUDENT CENTRIC ACTIVITY in which student will be trained for placements or make use of library or participate in sports & games/clean & green etc.

3. ACKNOWLEDGEMENTS

The Members of the working group are grateful to Smt C. Naga Rani I.A.S., Commissioner of Technical Education & Chairman of SBTET, for continuous guidance and valuable inputs during process of revising, modifying and updating the Curriculum C-20 to Curriculum C-23.

We are grateful to Sri. S. Suresh Kumar, I.A.S, Principal Secretary, Skills Development & Training for his valuable suggestions to bring the revamped curriculum C-23 in to a final form to meet latest Industry 4.0 concepts.

We are grateful to Sri. Saurab Gaur, I.A.S, former Principal Secretary, Skills Development & Training who actively participated in the Industry-Academia workshop conducted on 15th February, 2023 and offered valuable suggestions and insights into the learning needs and preferences so that the curriculum is engaging, inclusive, and effective.

It is pertinent to acknowledge the support of the following in the making of Curriculum C-23. A series of workshops in different phases were conducted by SBTET, AP, Guntur involving faculty from Polytechnics, Premier Engineering Colleges & representatives from various Industries and Dr. C. R. Nagendra Rao, Professor & Head, NITTTR-ECV to analyse the Previous C-20 Curriculum and in designing of C-23 Curriculum, is highly appreciated and gratefully acknowledged.

We also extend our sincere thanks to Sri. V. Padma Rao, Joint Director of Technical Education, Sri K.V. Ramana Babu, Secretary, SBTE&T, Andhra Pradesh, Sri K. Vijaya Bhaskar, Deputy Director (Academic) , Andhra Pradesh, officials of Directorate of Technical Education and the State Board of Technical Education, Andhra Pradesh and all teaching fraternity from the Polytechnics who are directly or indirectly involved in preparation of the curricula.

4. RULES AND REGULATIONS OF C-23 CURRICULUM

4.1 Duration and pattern of the courses

All the Diploma programs run at various institutions are of AICTE approved 3 years or 3½ years duration of academic instruction. All the Diploma courses are run on year wise pattern in the first year, and the remaining two or two & half years are run in the semester pattern. In respect of few courses like Diploma in Bio-Medical course, the training will be in

the seventh semester. **Run-through system is adopted for all the Diploma Courses, subject to eligibility conditions.**

4.2 Procedure for Admission into the Diploma Courses:

Selection of candidates is governed by the Rules and Regulations laid down in this regard from time to time.

- a) Candidates who wish to seek admission in any of the Diploma courses will have to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET) conducted by the State Board of Technical Education and Training, Andhra Pradesh, Vijayawada. Only the candidates satisfying the following requirements will be eligible to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET).
 - a. The candidates seeking admission should have appeared for S.S.C examination, conducted by the Board of Secondary Education, Andhra Pradesh or equivalent examination thereto, at the time of applying for the Common Entrance Test for admissions into Polytechnics (POLYCET). In case of candidates whose results of their Qualifying Examinations is pending, their selection shall be subject to production of proof of their passing the qualifying examination in one attempt or compartmentally at the time of admission.
 - b. Admissions are made based on the merit obtained in the Common Entrance Test (POLYCET) and the reservation rules stipulated by the Government of Andhra Pradesh from time to time.
 - c. For admission into the following Diploma Courses for which entry qualification is 10+2, candidates need not appear for POLYCET. A separate notification will be issued for admission into these courses.
 - i). D.HMCT ii).D. Pharmacy

4.3 Medium of Instruction

The medium of instruction and examination shall be English.

4.4 Permanent Identification Number (PIN)

A cumulative / academic record is to be maintained of the Marks secured in sessional work and end examination of each year for determining the eligibility for promotion etc., A Permanent Identification Number (PIN) will be allotted to each admitted candidate to maintain academic records.

4.5 Number of Working Days Per Semester / Year:

- a) The Academic year for all the Courses shall be in accordance with the Academic Calendar.
- b) The Working days in a week shall be from Monday to Saturday
- c) There shall be 7 periods of 50 minutes duration each on all working days.
- d) The minimum number of working days for each semester / year shall be 90 / 180 days excluding examination days. If this prescribed minimum is not achieved due to any reason, special arrangements shall be made to conduct classes to complete the syllabus.

4.6 Eligibility (Attendance to Appear for the End Examination)

- a) A candidate shall be permitted to appear for the end examination in all subjects, if he or she has attended a minimum of 75% of working days during the year/Semester.
- b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or 1st year may be granted on medical grounds.
- c) A stipulated fee shall be payable towards condonation for shortage of attendance.
- d) Candidates having less than 65% attendance shall be detained.
- e) Students whose shortage of attendance is not condoned in any semester / 1st year and not paid the condonation fee in time are not eligible to take their end examination of that class and their admissions shall stand cancelled. They may seek re-admission for that semester / 1st year when offered in the next subsequent academic semester/year.

For INDUSTRIAL TRAINING:

- i) During Industrial Training the candidate shall put in a minimum of 90% attendance.
- ii) If the student fails to secure 90% attendance during industrial training, the student shall reappear for 6 months industrial training at his own expenses.

4.7 Readmission

Readmission shall be granted to eligible candidates by the respective Principal/ Regional Joint Director.

- a) (i) Within 15 days after commencement of class work in any semester (Except Industrial Training).
- (ii) For Industrial Training: before commencement of the Industrial training.
- b) Within 30 days after commencement of class work in any year (including D. Pharmacy course or first year course in Engineering and Non-Engineering Diploma streams). Otherwise, such cases shall not be considered for readmission for that semester / year and are advised to seek readmission in the next subsequent eligible academic year.
- c) The percentage of attendance of the readmitted candidates shall be calculated from the first day of beginning of the regular class work for that year / Semester, as officially announced by CTE/SBTET but not from the day on which he/she has actually reported to the class work.

4.8 Scheme of Evaluation

a) First Year

Theory Courses: Each Course carries Maximum marks of 80 with an end examination of 3 hours duration, along with internal assessment for Maximum of 20 marks. (Sessional marks). However, there are no minimum marks prescribed for sessionals.

Laboratory Courses: There shall be 40/20 Marks for internal assessment i.e. sessional marks for each practical Course with an end examination of 3 hours

duration carrying 60/30 marks. However, there are no minimum marks prescribed for sessional.

b) III, IV, V, VI and VII Semesters:

Theory Courses: End semester evaluation shall be of 3 hours duration and for a maximum of 80 marks.

Laboratory Courses: Each Course carry 60/30 marks of 3 hours duration 40/20 sessional marks.

4.9 Internal Assessment Scheme

a) Theory Courses: Internal assessment shall be conducted for awarding Sessional marks on the dates specified. **Three-unit tests shall be conducted for I year students and two Unit Tests for semesters. The details are presented below.**

| S. No. | Type of Assessment | Weightage Assigned |
|--------|---|--------------------|
| (i) | Testing of knowledge through mid-examination for year/sem as (Mid-1+Mid-2+Mid3) or (Mid-1 + Mid-2) | 40 |
| (ii) | Assignments | 5 |
| (iii) | <i>Dynamic Learning activities : Project Work/ Seminar/Tech-fest/Group Discussion, Quizzes etc./Extra-curricular activities/NSS/NCC/ IPSGM/Cleaning & Greening of Campus etc.</i> | 5 |
| | TOTAL | 50 |

Internal Assessment shall be of 90 minutes duration and for a maximum of 40 marks for each test.

At least one assignment should be completed for each unit which carries 10 marks. The total assignment marks should be reduced to 5.

The dynamic learning activity is to be conducted which carries 10 marks. The total marks should be reduced to 5.

The total 50 marks assigned to internal assignment is to be scaled down to 20 marks.

b) Practical Courses:

(i) Drawing Courses:

The award of Sessional marks for internal Assessment shall be as given in the following table:

| Distribution of Marks for the Internal Assessment Marks | | | |
|---|---|-------------------------------------|---|
| First Year (Total:40 Marks) | | Semesters (Total:40 Marks) | |
| Max:20 Marks | Max:20 Marks | Max:20 Marks | Max:20 Marks |
| From the Average of THREE Unit Tests. | From the Average of Assessment of Regular Class work Exercises. | From the Average of TWO Unit Tests. | From the Average of Assessment of Regular Class work Exercises. |

- For first year engineering drawing each unit test will be conducted for a duration of 2 hours with maximum marks of 40.
- (Part - A: 4 questions x 5 marks = 20 Marks; Part -B: 2 questions x 10 marks = 20 marks).
- For the semester drawing examinations, Two Unit tests shall be conducted as per the Board End Examination Question Paper Pattern.
- All Drawing exercises are to be filed in serial order and secured for further scrutiny by a competent authority

(ii) Laboratory Courses:

- (a) Student's performance in Laboratories / Workshop shall be assessed during the year/ semester of study for 40 marks in each practical Course.
- (b) Evaluation for Laboratory Courses, other than Drawing courses:
 - i. Instruction (teaching) in laboratory courses (except for the course on Drawing) here after shall be task/competency based as delineated in the Laboratory sheets, prepared by SBTET, AP & NITTTR- ECV and posted in SBTET website.
 - ii. Internal assessment for Laboratory shall be done on the basis of task/s performed by the student as delineated in the laboratory sheets, prepared by SBTET, AP & NITTTR- ECV and posted in AP, SBTET website.
 - iii. Question paper for End semester Evaluation shall also be task/s based and shall be prepared and distributed by SBTET as done in case of theory courses be prepared as per SBTET rules in vogue.
- c) Internal assessment in Labs / workshops / Survey field work etc., during the course of study shall be done and sessional marks shall be awarded by the concerned Teacher.
- d) For practical examinations, except in drawing, there shall be two examiners. External examiner shall be appointed by the Principal in consultation with respective Head of Section preferably choosing a qualified person from in the order of preference.
 - i) Nearby Industry
 - ii) Govt / Semi Govt organization like R & B, PWD, PR, Railways, BSNL, APSRTC, APSEB etc.
 - iii) Govt / University Engg College.
 - iv) HoD/Senior Lecture (Selection Grade-II) from the Govt. Polytechnic
 Internal examiner shall be the person concerned with internal assessment as in (c) above. The end examination shall be held along with all theory papers in respect of drawing.
- e) Question Paper for Practicals: Question paper should cover (the experiments / exercise prescribed to test various) skills like handling, manipulating, testing, trouble shooting, repair, assembling and dismantling etc., from more than one experiment / exercise
- f) Records pertaining to internal assessment marks of both theory and practical Courses are to be maintained for official inspection.

- g) In case of Diploma programs having Industrial Training, Internal Assessment and Summative Evaluation, shall be done as illustrated in the following table:

| Assessment no | Upon completion of | By | Based on | Max Marks |
|-------------------------------|--------------------|---|---|-----------|
| 1 | 12 weeks | 1.The faculty concerned (Guide) and 2. Training in charge (Mentor) of the industry | Learning outcomes as given in the scheme of assessment ,for Industrial Training | 120 |
| 2 | 22 weeks | | | 120 |
| 3. Final summative Evaluation | 24 week | 1.The faculty member concerned, 2.HoD concerned and 3.An external examiner | 1.Demonstration of any one of the skills listed in learning outcomes | 30 |
| | | | 2.Training Report | 20 |
| | | | 3.Viva Voce | 10 |
| TOTAL | | | | 300 |

- h) Each staff member including Head of Section shall be assigned a batch of students 10 to 15 for making assessment during industrial training.

4.10 Minimum Pass Marks

a) Theory Examination:

For passing a theory Course, a candidate has to secure a minimum of 35% in end examination and a combined minimum of 35% of both Sessional and end examination marks put together.

b) Practical Examination:

For passing a practical Course, a candidate has to secure a minimum of 50% in end examination and a combined minimum of 50% of both sessional and practical end examination marks put together. In case of D.C.C.P., the pass mark for typewriting and short hand is 45% in the end examination. There are no sessional marks for typewriting and Shorthand Courses of D.C.C.P course.

C) Industrial Training:

- Monitoring: Similar to project work each teacher may be assigned a batch of 10-15 students irrespective of the placement of the students to facilitate effective monitoring of students learning during industrial training.
- Assessment: The Industrial training shall carry 300 marks and pass marks is 50% in assessments at industry (first and second assessment) and final summative assessment at institution level put together i.e. 150 marks out of

marks. And also student has to secure 50% marks in final summative assessment at institution level.

III. In-Plant Industrial Training for 3-Year Diploma (C-23) Courses is scheduled as per the Academic Calendar of the SBTET every year.

4.11. Provision for Improvement

Improvement is allowed only after he / she has completed all the Courses from First Year to Final semester of the Diploma.

- a) Improvement is allowed in any 4 (Four) Courses of the Diploma.
- b) The student can avail of this improvement chance **ONLY ONCE**, that too within the succeeding two examinations after the completion of Diploma. However, the duration including Improvement examination shall not exceed **FIVE** years from the year of first admission.
- c) No improvement is allowed in Practical / Lab Courses or Project work or Industrial Training assessment. However, improvement in drawing Course(s) is allowed.
- d) If improvement is not achieved, the marks obtained in previous Examinations hold good.
- e) Improvement is not allowed in respect of the candidates who are punished under Mal-practice in any Examination.
- f) Examination fee for improvement shall be paid as per the notification issued by State Board of Technical Education and Training from time to time.
- g) All the candidates who wish to appear for improvement of performance shall deposit the original Marks Memos of all the years / Semesters and also original Diploma Certificate to the Board. If there is improvement in performance of the current examination, the revised Memorandum of marks and Original Diploma Certificate will be issued, else the submitted originals will be returned.

4.12. Rules of Promotion From 1ST YEAR TO 3rd, 4th, 5th, 6th and 7th Semesters:

A) For Diploma Courses of 3 Years duration

- i). A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds up to 10%) and pay the examination fee.
- ii) A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training, AP from time to time before commencement of 3rd semester.

A candidate is eligible to appear for the 3rd semester examination if he/she puts the required percentage of attendance in the 3rd semester and pays the examination fee.

- iii) A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training AP from time to time before commencement of 4th semester. A candidate is

eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester and pays the examination fee.

- iv) A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester examination if he/she puts the required percentage of attendance in the 5th semester and pays the examination fee.

- v) A candidate shall be sent to Industrial training / VI semester provided he/she puts in the required percentage of attendance in the 5th semester and pay the examination fee/ promotion fee as prescribed by SBTET.
A candidate is eligible to appear for Industrial Training assessment (Seminar/Viva-voce) puts the required percentage of attendance, i.e., 90% in 6th semester Industrial Training.

For IVC & ITI Lateral Entry students:

- i.) A candidate shall be permitted to appear for Third Semester examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds up to 10%) and pay the examination fee for Third semester.
- ii) A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training AP from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester and pays the examination fee.

- ii) A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester examination if he/she puts the required percentage of attendance in the 5th semester and pays the examination fee.

- iii) A candidate shall be sent to Industrial training / VI semester provided he/she puts in the required percentage of attendance in the 5th semester and pay the examination fee/ promotion fee as prescribed by SBTET.

A candidate is eligible to appear for Industrial Training assessment (Seminar/Viva-voce) puts the required percentage of attendance, i.e., 90% in 6th semester Industrial Training and pays the examination fee.

B) For Diploma Courses of 3 ½ Years duration (MET/ CH/ CHPP/ CHPC/ CHOT/ TT):

- i. A candidate shall be permitted to appear for 1st year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.
- ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the 1st year and pays the examination fee. A candidate who could not pay the 1st year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.
- iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.
A candidate is eligible to appear for the 4th semester exam if he/she puts the required percentage of attendance in the 4th semester

For IVC & ITI Lateral Entry students:

- a) Puts the required percentage of attendance in the 4th semester
- iv. A candidate shall be promoted to 5th semester industrial training provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.
- v. Promotion from 5th to 6th semester is automatic (i.e., from 1st spell of Industrial Training to 2nd spell) provided he/she puts the required percentage of attendance, which in this case ie.,90 % of attendance and attends for the VIVA-VOCE examination at the end of training.
- vi. A candidate shall be promoted to 7th semester provided he / she puts the required percentage of attendance in the 6th semester and pays the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 7th semester.
- vii. A candidate shall be promoted to 7th semester of the course provided he/she has successfully completed both the spells of Industrial Training.
A candidate is eligible to appear for 7th semester examination if he/she
 - a) Puts in the required percentage of attendance in the 7th semester

For IVC & ITI Lateral Entry students:

- a) Puts in the required percentage of attendance in the 7 th semester .

C) For Diploma Courses of 3 ½ Years duration (BM):

The same rules which are applicable for conventional courses also apply for this course. The industrial training in respect of this course is restricted to one semester (6 months) after the 6th semester (3 years) of the course.

- i. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.
- ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.
- iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate who could not pay the 3rd semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.
A candidate is eligible to appear for the 4th semester examination if he/she
 - a) Puts in the required percentage of attendance in the 4th semester

For IVC & ITI Lateral Entry Students:

- A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester
- iv. A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.
A candidate is eligible to appear for the 5th semester exam if he/she
 - a) Puts in the required percentage of attendance in the 5th semester.

For IVC & ITI Lateral Entry students:

- a) Puts in the required percentage of attendance in the 5th semester.
- v. A candidate shall be promoted to 6th semester provided he/she puts in the required percentage of attendance in the 5th semester and pays the examination fee.
A candidate who could not pay the 5th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 6th semester.
A candidate is eligible to appear for 6th semester examination
 - a) Puts in the required percentage of attendance in 6th semester

IVC & ITI Lateral Entry students:

- a) Puts in the required percentage of attendance in 6th semester.

- vi. A candidate shall be promoted to 7th semester provided he/she puts in the required percentage of attendance in 6th semester and pay the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee prescribed by SBTET from time to time before commencement of the 7th semester (Industrial Training).

A candidate is eligible to appear for 7th semester Industrial Training assessment (Seminar/Viva-voce) if he/she

- a) Puts in the required percentage of attendance, i.e., 90% in 7th semester Industrial Training.

For IVC & ITI Lateral Entry students:

- a) Puts in the required percentage of attendance, i.e., 90% in 7th semester Industrial Training.

4.13. Students Performance Evaluation

Successful candidates shall be awarded the Diploma under the following divisions of pass.

- a) First Class with Distinction shall be awarded to the candidates who secure an overall aggregate of 75% marks and above.
- b) First Class shall be awarded to candidates who secure overall aggregate of 60% marks and above and below 75% marks.
- c) Second Class shall be awarded to candidates who secure a pass with an overall aggregate of below 60%.
- i. The Weightage of marks for various year/Semesters which are taken for computing overall aggregate shall be 25% of I year marks + 100% of 3rd and subsequent Semesters.
- ii. In respect IVC & ITI Lateral Entry candidates who are admitted directly into diploma course at the 3rd semester (i.e., second year) level the aggregate of (100%) marks secured at the 3rd and subsequent semesters of study shall be taken into consideration for determining the overall percentage of marks secured by the candidates for award of class/division.
- d) Second Class shall be awarded to all students, who fail to complete the Diploma in the regular 3 years/ 3 ½ years and four subsequent examinations from the year of first admission.

4.14. EXAMINATION FEE SCHEDULE:

The examination fee should be as per the notification issued by State Board of Technical Education and Training, AP from time to time.

4.15. Structure of Examination Question Paper:

I. Formative assessment (Internal examination)

a) For theory Courses:

Three-unit tests for first year and two-unit tests for semesters shall be conducted with a duration of 90 minutes for each test for maximum marks of 40. It consists of part A and Part B.

Part A contains five questions and carries 16 marks. Among these five questions first question consists of four objective items like one word or phrase answer/filling-in the blanks/true or false etc with one mark for each question. The other four questions are short answer questions and carry three marks each.

Part B carries 24 marks and consists of three questions with internal choice ie., Either/Or type , and each question carries 8 marks.

The sum of marks of 3 tests for I year and 2 tests for semesters including assignments and Dynamic learning activities (50 marks) shall be reduced to 20 marks in each Course for arriving at final sessional marks.

b) For drawing Courses:

For I year:

Three-unit tests with duration of 90 minutes and for maximum marks of 40 marks shall be conducted for first year. It consists of part A and Part B.

Part A consists four questions for maximum marks of 16 and each question carries four marks (4×4 marks=16 marks).

Part B carries maximum marks of 24 and consists of five questions while the student shall answer any three questions out of these five questions. Each question in this part carries a maximum mark of 8, (3×8 marks=24 marks).

The sum of marks obtained in 3-unit test marks shall be reduced to 20 marks for arriving at final sessional marks. Remaining 20 marks are awarded by the Course teacher based on the student's performance during regular class exercise.

For semester: Two-unit tests with duration of 90 minutes and for maximum marks of 40 marks shall be conducted. The sum of marks obtained in 2-unit test marks shall be reduced to 20 marks for arriving at final sessional marks. Remaining 20 marks are awarded by the Course teacher based on the student's performance during regular class exercise.

c) For Laboratory /workshop: 50% of total marks for the Course shall be awarded based on continuous assessment of the student in laboratory/workshop classes and the remaining 50% shall be based on the sum of the marks obtained by the students in two tests.

II. Summative assessment (End examination)

The question paper for theory examination is patterned in such a manner that the Weightage of periods/marks allotted for each of the topics for a particular Course be considered. End Examination paper is of 3 hours duration.

a) Each theory paper consists of Section 'A' and 'B'

Section 'A' with Max marks of 30, contains 10 short answer questions. All questions are to be answered and each carry 3 marks, i.e., $10 \times 3 = 30$.

Section 'B' with Max marks of 50 contains 8 essay type questions. Only 5 questions are to be answered and each carry 10 marks, i.e., Max. Marks: $5 \times 10 = 50$.

Thus, the total marks for theory examination shall be: 80.

b) For Engineering Drawing Course (107) consist of section 'A' and section 'B'.

Section 'A' with max marks of 20, contains four (4) questions. All questions in section 'A' are to be answered to the scale and each carries 5 marks, ie. $4 \times 5 = 20$.

Section 'B' with max marks of 40, contains six (6) questions. The student shall answer any four (4) questions out of the above six questions and each question carries 10 Marks, i.e., $4 \times 10 = 40$.

c) Practical Examinations

For Workshop practice and Laboratory Examinations, Each student has to pick up a question paper distributed by Lottery System.

Max. Marks for an experiment / exercise : 50

Max. Marks for VIVA-VOCE : 10

Total Max. Marks : 60

In case of practical examinations with 50 marks, the marks shall be distributed as

Max. Marks for an experiment / exercise : 25

Max. Marks for VIVA-VOCE : 05

Total Max. Marks : 30

In case of any change in the pattern of question paper, the same shall be informed sufficiently in advance to the candidates.

d) Note: Evaluation for Laboratory Courses, other than Drawing courses:

- I. Instruction (teaching) in laboratory courses (except for the course on Drawing) hereafter shall be task/competency based as delineated in the Laboratory sheets, prepared by SBTET, AP and posted in its website.
- II. Internal assessment for Laboratory shall be done on basis of task/s performed by the student as delineated in the laboratory sheets, prepared by SBTET, AP and posted in its website.
- III. Question paper for End semester Evaluation shall be prepared as per SBTET rules in vogue.

4.16. ISSUE OF MEMORANDUM OF MARKS

All candidates who appear for the end examination will be issued memorandum of marks without any payment of fee. However candidates who lose the original memorandum of marks have to pay the prescribed fee to the Secretary, State Board of Technical Education and Training, A.P. for each duplicate memo from time to time.

4.17. MAXIMUM PERIOD FOR COMPLETION OF DIPLOMA PROGRAMMES:

Maximum period for completion of the diploma courses is twice the duration of the course from the date of First admission (includes the period of detention and discontinuation of studies by student etc) failing which they will have to forfeit the claim for qualifying for the award of Diploma (They will not be permitted to appear for examinations after that date). This rule applies for all Diploma courses of 3 years and 3 ½ years of engineering and non-engineering courses.

4.18. ELIGIBILITY FOR AWARD OF DIPLOMA

A candidate is eligible for award of Diploma Certificate if he / she fulfil the following academic regulations.

- i. He / She pursued a course of study for not less than 3 / 3 ½ academic years & not more than 6 / 7 academic years.
- ii. He / she have completed all the Courses.

Students who fail to fulfil all the academic requirements for the award of the Diploma within 6 / 7 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

For IVC & ITI Lateral Entry students:

- i. He / She pursued a course of study for not less than 2 / 2 ½ academic years & not more than 4 / 5 academic years.
- ii. He / she has completed all the Courses.

Students who fail to fulfil all the academic requirements for the award of the Diploma within 4 / 5 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

4.19. ISSUE OF PHOTO COPY OF VALUED ANSWER SCRIPT, RECOUNTING& REVERIFICATION:

A) FOR ISSUE OF PHOTO COPIES OF VALUED ANSWER SCRIPTS

- I. A candidate desirous of applying for Photo copy of valued answer script/s should apply within prescribed date from the date of the declaration of the result.
- II. Photo copies of valued answer scripts will be issued to all theory Courses and Drawing Course (s).
- III. The Photo copy of valued answer script will be dispatched to the concerned candidate's address as mentioned in the application form by post.
- IV. No application can be entertained from third parties.

B) FOR RE-COUNTING (RC) and RE-VERIFICATION(RV) OF THE VALUED ANSWER SCRIPT

- i. A candidate desirous of applying for Re-verification of valued answer script should apply within prescribed date from the date of the declaration of the result.
- ii. Re-verification of valued answer script shall be done for all theory Courses' and Drawing Course(s).
- iii. The Re-verification committee constituted by the Secretary, SBTETAP with Course experts shall re-verify the answer scripts.

I. RE-COUNTING

The Officer of SBTET will verify the marks posted and recount them in the already valued answer script. The variations if any will be recorded separately, without making any changes on the already valued answer script. The marks awarded in the original answer script are maintained (hidden).

II. RE-VERIFICATION

- (i) The Committee has to verify the intactness and genuineness of the answer script(s) placed for Re-verification.
- (ii) Initially single member shall carry out the re-verification.
- (iii) On re-verification by single member, if the variation is less than 12% of maximum marks, and if there is no change in the STATUS in the result of the candidate, such cases will not be referred to the next level i.e., for 2-Tier evaluation.
- (iv) On re-verification by a single member, if the variation is more than 12% of maximum marks, it will be referred to 2-Tier evaluation.
- (v) If the 2-Tier evaluation confirms variation in marks as more than 12% of maximum marks, the variation is considered as follows:
 - a) If the candidate has already passed and obtains more than 12% of the maximum marks on Re-verification, then the variation is considered.
 - b) If the candidate is failed and obtains more than 12% of the maximum marks on Re-verification and secured pass marks on re-verification, then the status of the candidate changes to PASS.
 - c) If a candidate is failed and obtains more than 12% of the maximum marks on Re-verification and if the marks secured on re-verification are still less than the minimum pass marks, the status of the candidate remain FAIL only.
- (vii) After Re-verification of valued answer script the same or change if any therein on Re-verification, will be communicated to the candidate.
- (viii) On Re-verification of Valued Answer Script if the candidate's marks are revised, the fee paid by the candidate will be refunded or else the candidate has to forfeit the fee amount.

Note: No request for Photo copies/ Recounting /Re-verification of valued answer script would be entertained from a candidate who is reported to have resorted to Malpractice in that examination.

4.20. Mal Practice Cases:

If any candidate resorts to Mal Practice during examinations, he / she shall be booked and the Punishment shall be awarded as per SBTETAP rules and regulations in vogue.

4.21. Discrepancies/ Pleas:

Any Discrepancy /Pleas regarding results etc., shall be represented to the SBTETAP within one month from the date of issue of results. Thereafter, no such cases shall be entertained in any manner.

4.22. Issue of Duplicate Diploma

If a candidate loses his/her original Diploma Certificate and desires a duplicate to be issued he/she should produce written evidence to this effect. He / she may obtain a

duplicate from the Secretary, State Board of Technical Education and Training, A.P., on payment of prescribed fee and on production of an affidavit signed before a First Class Magistrate (Judicial) and non-traceable certificate from the Department of Police. In case of damage of original Diploma Certificate, he / she may obtain a duplicate certificate by surrendering the original damaged certificate on payment of prescribed fee to the State Board of Technical Education and Training, A.P.

In case the candidate cannot collect the original Diploma within 1 year from the date of issue of the certificate, the candidate has to pay the penalty prescribed by the SBTET AP from time to time.

4.23. Issue of Migration Certificate and Transcripts:

The Board on payment of prescribed fee will issue these certificates for the candidates who intend to prosecute Higher Studies in India or Abroad.

4.24. General

- i. The Board may change or amend the academic rules and regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students, for whom it is intended, with effect from the dates notified by the competent authority.
- ii. All legal matters pertaining to the State Board of Technical Education and Training, AP are within the jurisdiction of Mangalagiri.
- iii. In case of any ambiguity in the interpretation of the above rules, the decision of the Secretary, SBTET, A.P is final.

C-23 Curriculum for DMNGE
With Industrial training in Semester VI

VISION

Develop Mining Engineering professionals competent to face the global challenges in a progressive environment conducive to learn technical knowledge, skills blended with ethics and values, to serve the society and to better it for a happy and comfortable living.

MISSION

| | |
|----|---|
| M1 | To provide a competitive learning environment, through a need based curriculum designed in collaboration with industry, conducive for high quality education emphasising on transfer of knowledge and skill development essential for the profession and the society as well. |
| M2 | To nurture higher order leadership qualities and ethics and values in students to enable them to be leaders in their chosen professions while maintaining the highest level of ethics. |
| M3 | Conduct of laboratories, guest lectures, industrial visits and industrial training for better understanding of critical concepts of Mining Engineering |
| M4 | To foster effective interactions and networking with all the stake holders so as to work towards the growth and sustainability of the society and environment. |

PROGRAMME OUTCOMES (POs)

1. **Basic and discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis:** Identify and analyse well-defined engineering problems using codified standard methods.
3. **Design/Development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs .
4. **Engineering tools, Experimentation and Testing:** Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
5. **Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.
6. **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well defined engineering activities.
7. **Life-long learning:** Ability to analyse individual needs and engaging updating in the context of technological changes.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

1. An ability to apply disciplines - specific knowledge to solve core and/or applied Mining Engineering problems.
2. An ability to plan and perform experiments and practices and to use the results to solve Mining Engineering problems.

Apply appropriate technologies and tools with an understanding of the limitations

DIPLOMA IN MINING ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
I YEAR

| Subject Code | Name of the Subject | Instruction period / week | | Total Period / Sem | Scheme of Examination | | | |
|---|---|---------------------------|---------------------|--------------------|-----------------------|-----------------|----------------|-------------|
| | | Theory | Practical/ Tutorial | | Duration (hours) | Sessional Marks | End Exam Marks | Total Marks |
| THEORY | | | | | | | | |
| MNG- 101 | English | 3 | - | 90 | 3 | 20 | 80 | 100 |
| MNG-102 | Engineering Mathematics – I | 5 | - | 150 | 3 | 20 | 80 | 100 |
| MNG-103 | Engineering Physics | 4 | - | 120 | 3 | 20 | 80 | 100 |
| MNG-104 | Engineering Chemistry & Environmental Studies | 4 | - | 120 | 3 | 20 | 80 | 100 |
| MNG-105 | Elements of Mining | 4 | - | 120 | 3 | 20 | 80 | 100 |
| MNG-106 | Fundamentals of Geology | 4 | - | 120 | 3 | 20 | 80 | 100 |
| PRACTICAL | | | | | | | | |
| MNG-107 | Engineering Drawing | - | 6 | 180 | 3 | 40 | 60 | 100 |
| MNG-108 | Workshop Practice | - | 3 | 90 | 3 | 40 | 60 | 100 |
| MNG-109 | Physics Lab | - | 3 | 45 | 3 | 20 | 30 | 50 |
| MNG-110 | Chemistry Lab | | 3 | 45 | 3 | 20 | 30 | 50 |
| MNG-111 | Computer Fundamentals Practice | - | 3 | 90 | 3 | 40 | 60 | 100 |
| | Activities | - | 3 | 90 | - | - | - | - |
| | TOTAL | 24 | 18 | 1260 | | 280 | 720 | 1000 |
| Note: MNG-101, 102,103,104,109,110,111 Common with all branches | | | | | | | | |
| MNG-107 Common with DME | | | | | | | | |

DIPLOMA IN MINING ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
III SEMESTER (SECOND YEAR)

| Subject Code | Name of the Subject | Instruction period / week | | Total Period / Sem | Scheme of Examination | | | |
|---|--|---------------------------|---------------------|--------------------|-----------------------|-----------------|----------------|-------------|
| | | Theory | Practical/ Tutorial | | Duration (hours) | Sessional Marks | End Exam Marks | Total Marks |
| THEORY | | | | | | | | |
| MNG-301 | Engineering Mathematics - II | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-302 | Basic Electrical Engineering | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-303 | Basic Mechanical Engineering | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-304 | Underground Coal Mining Methods | 5 | - | 75 | 3 | 20 | 80 | 100 |
| MNG-305 | Mine Surveying-I | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-306 | Mining Geology | 5 | - | 75 | 3 | 20 | 80 | 100 |
| PRACTICAL | | | | | | | | |
| MNG-307 | Basic Electrical Engineering Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-308 | Basic Mechanical Engineering Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-309 | Mine Surveying Practice –I | - | 4 | 60 | 3 | 40 | 60 | 100 |
| MNG-310 | Mining Geology Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| | Activities | - | 3 | 45 | - | - | - | - |
| | TOTAL | 26 | 16 | 630 | | 280 | 720 | 1000 |
| Note: MNG-301 is common to Group-I branches A/AA/CER/M/MET/MNG/TT | | | | | | | | |

DIPLOMA IN MINING ENGINEERING

SCHEME OF INSTRUCTIONS AND EXAMINATIONS IV SEMESTER (SECOND YEAR)

| Subject Code | Name of the Subject | Instruction period / week | | Total Period / Sem | Scheme of Examination | | | |
|---|--|---------------------------|---------------------|--------------------|-----------------------|-----------------|----------------|-------------|
| | | Theory | Practical/ Tutorial | | Duration (hours) | Sessional Marks | End Exam Marks | Total Marks |
| THEORY | | | | | | | | |
| MNG- 401 | Mine Legislation -1 | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-402 | Underground Metal Mining Methods | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-403 | Mine Environmental Engineering | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-404 | Mining Machinery-I | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-405 | Mine Surveying – II | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-406 | Surface Mining -I | 4 | | 60 | 3 | 20 | 80 | 100 |
| PRACTICAL | | | | | | | | |
| MNG-407 | Mine Environmental Engineering Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-408 | Communication Skills | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-409 | Mine Surveying Practice - II | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-410 | Mine Planning and Design Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-411 | Mining Machinery Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| | Activities | - | 3 | 45 | - | - | - | - |
| | TOTAL | 24 | 18 | 630 | | 320 | 780 | 1100 |
| Note: MNG- 408 Common with all branches | | | | | | | | |

DIPLOMA IN MINING ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
V SEMESTER (THIRD YEAR)

| Subject Code | Name of the Subject | Instruction period / week | | Total Period / Sem | Scheme of Examination | | | |
|---|---------------------------------------|---------------------------|---------------------|--------------------|-----------------------|-----------------|----------------|-------------|
| | | Theory | Practical/ Tutorial | | Duration (hours) | Sessional Marks | End Exam Marks | Total Marks |
| THEORY | | | | | | | | |
| MNG-501 | Mine Management and Entrepreneurship | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-502 | Mine Legislation-II | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-503 | Mine Hazards and Rescue | 5 | - | 75 | 3 | 20 | 80 | 100 |
| MNG-504 | Mining Machinery-II | 5 | - | 75 | 3 | 20 | 80 | 100 |
| MNG-505 | Rock Mechanics and Strata Control | 5 | - | 75 | 3 | 20 | 80 | 100 |
| MNG-506 | Surface Mining -II | 4 | - | 60 | 3 | 20 | 80 | 100 |
| PRACTICAL | | | | | | | | |
| MNG-507 | Rock Mechanics Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-508 | Life Skills | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-509 | Total Station Survey and CAD Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-510 | Project Work | - | 3 | 45 | 3 | 40 | 60 | 100 |
| | Activities | - | 3 | 45 | - | - | - | - |
| | TOTAL | 27 | 15 | 630 | | 300 | 700 | 1000 |
| Note: MNG- 508 Common with all branches | | | | | | | | |

MNG-601 INDUSTRIAL TRAINING

| Assessment no | Upon completion of | By | Based on | Max Marks |
|------------------------------|--------------------|------------------------------------|---|-----------|
| 1 | 12 weeks | 1.The faculty concerned and | Learning outcomes as given in the following scheme of assessment | 120 |
| 2 | 20-22 weeks | 2. Training Mentor of the industry | | 120 |
| 3.Final summative Evaluation | 23 weeks | 1.The faculty member concerned, | 1. Demonstration of any one of the skills listed in learning outcomes, other than S.No. 2 | 30 |
| | | 2.HoD concerned and | 2.Training Report | 20 |
| | | 3. An external examiner | 3.Viva Voce | 10 |
| TOTAL | | | | 300 |

FIRST YEAR

DIPLOMA IN MINING ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
I YEAR

| Subject Code | Name of the Subject | Instruction period / week | | Total Period / Sem | Scheme of Examination | | | |
|---|---|---------------------------|---------------------|--------------------|-----------------------|-----------------|----------------|-------------|
| | | Theory | Practical/ Tutorial | | Duration (hours) | Sessional Marks | End Exam Marks | Total Marks |
| THEORY | | | | | | | | |
| MNG- 101 | English | 3 | - | 90 | 3 | 20 | 80 | 100 |
| MNG-102 | Engineering Mathematics – I | 5 | - | 150 | 3 | 20 | 80 | 100 |
| MNG-103 | Engineering Physics | 4 | - | 120 | 3 | 20 | 80 | 100 |
| MNG-104 | Engineering Chemistry & Environmental Studies | 4 | - | 120 | 3 | 20 | 80 | 100 |
| MNG-105 | Elements of Mining | 4 | - | 120 | 3 | 20 | 80 | 100 |
| MNG-106 | Fundamentals of Geology | 4 | - | 120 | 3 | 20 | 80 | 100 |
| PRACTICAL | | | | | | | | |
| MNG-107 | Engineering Drawing | - | 6 | 180 | 3 | 40 | 60 | 100 |
| MNG-108 | Workshop Practice | - | 3 | 90 | 3 | 40 | 60 | 100 |
| MNG-109 | Physics Lab | - | 3 | 45 | 3 | 20 | 30 | 50 |
| MNG-110 | Chemistry Lab | | 3 | 45 | 3 | 20 | 30 | 50 |
| MNG-111 | Computer Fundamentals Practice | - | 3 | 90 | 3 | 40 | 60 | 100 |
| | Activities | - | 3 | 90 | - | - | - | - |
| | TOTAL | 24 | 18 | 1260 | | 280 | 720 | 1000 |
| Note: MNG-101, 102,103,104,109,110,111 Common with all branches | | | | | | | | |
| MNG-107 Common with DME | | | | | | | | |

C23-MNG-101: English

| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for FA | Marks for SA |
|-------------|--------------|-------------------------|----------------------|--------------|--------------|
| C23-MNG-101 | English | 3 | 90 | 20 | 80 |

| Time Schedule : C23-MNG- 101 : ENGLISH | | | | | | |
|--|-----------------------------|------------------|-------------------------|-------------------------------|------------------------------|-------------------------|
| S.no. | Title of the Unit | Periods allotted | Weightage of Marks | No. of Short answer questions | No. of Long Answer questions | Mapping of COs |
| 1 | English for Employability | 8 | 16 | 2 | 1 | CO1, CO2, CO3, CO4, CO5 |
| 2 | Living in Harmony | 8 | | | 26 | 2 |
| 3 | Connect with Care | 8 | CO1, CO2, CO3, CO4, CO5 | | | |
| 4 | Humour for Happiness | 8 | | CO1, CO2, CO3, CO4, CO5 | | |
| 5 | Never Ever Give Up! | 8 | 10 | 1 | 1 | CO1, CO2, CO3, CO4, CO5 |
| 6 | Preserve or Perish | 9 | 23 | | 2 | 2 |
| 7 | The Rainbow of Diversity | 8 | | 19 | | |
| 8 | New Challenges -Newer Ideas | 8 | CO1, CO2, CO3, CO4, CO5 | | | |
| 9 | The End Point First | 8 | | | CO1, CO2, CO3, CO4, CO5 | |
| 10 | The Equal Halves | 8 | | 1 | | CO1, CO2, CO3, CO4, |

| | | | | | | |
|----|--------------------------|-----------|------------|-----------|-----------|-------------------------------|
| | | | 16 | | 1 | C05 |
| 11 | Dealing with Disaster | 9 | | 1 | | C01, C02, C03, C04, C05 |
| | Total | 90 | 110 | 30 | 80 | |
| | | | | | | |

| | |
|--------------------------|--|
| Course Objectives | - To improve grammatical knowledge and enrich vocabulary. |
| | - To develop effective reading, writing and speaking skills. |
| | - To comprehend themes related to Personality, Society, Environment to exhibit Universal Human Values. |

| CO No. | Course Outcomes |
|---------------|--|
| CO1 | Learn and apply various grammatical concepts to communicate in academic, professional and everyday situations |
| CO2 | Use appropriate vocabulary in various contexts |
| CO3 | Read and comprehend different forms of academic, professional and general reading material |
| CO4 | Communicate effectively in speaking and writing in academic, professional and everyday situations. |
| CO5 | Display human values by applying the knowledge of themes related to Self, Society, Environment, Science and Technology for holistic development and harmonious living through communication. |

CO-PO Matrix

| Course Code Common-101 | Course Title: English Number of Course Outcomes: 5 | | | | No. of Periods: 90 |
|---------------------------|---|---|------------|--------------------------------|---|
| POs | Mapped CO No. | CO Periods Addressing PO in Column 1 | | Level of Mapping (1,2,3) | Remarks |
| | | Number | Percentage | | |
| PO1 | | Not directly Applicable for English course, however, the language activities make use of the content from Science and Technology relevant to the programme to enhance English communication skills. | | | |
| PO2 | | | | | |
| PO3 | | | | | |
| PO4 | | | | | |
| PO5 | CO5 | 16 | 18% | Level 1 | Up to 20%: Level 1 21%-50%: Level 2 >50%: Level 3 |
| PO6 | CO1, CO2, CO3, CO4, | 52 | 58% | Level 3 | |
| PO7 | CO1, CO2, CO3, CO4.CO5 | 22 | 24% | Level 2 | |

Learning Outcomes

1. English for Employability

- 1.1. Perceive the need for improving communication in English for employability
- 1.2. Use adjectives and articles effectively while speaking and in writing
- 1.3. Write simple sentences

2. Living in Harmony

- 2.1. Develop positive self-esteem for harmonious relationships
- 2.2. Use affixation to form new words
- 2.3. Use prepositions and use a few phrasal verbs contextually

3. Connect with Care

- 3.1. Use social media with discretion
- 3.2. Speak about abilities and possibilities
- 3.3. Make requests and express obligations
- 3.4. Use modal verbs and main verbs in appropriate form
- 3.5. Write short dialogues about everyday situations

4. Humour for Happiness

- 4.1. Realize the importance of humour for a healthy living
- 4.2. Improve vocabulary related to the theme
- 4.3. Inculcate reading and speaking skills
- 4.4. Frame sentences with proper Subject – Verb agreement
- 4.5. Understand the features of a good paragraph and learn how to gather ideas as a preliminary step for writing a good paragraph.

5. Never Ever Give Up!

- 5.1. Learn to deal with failures in life
- 5.2. Use the present tense form for various every day communicative functions such as speaking and writing about routines, professions, scientific descriptions and sports commentary
- 5.3. Write paragraphs with coherence and other necessary skills

6. Preserve or Perish

- 6.1. Understand the ecological challenges that we face today and act to save the environment.
- 6.2. Narrate / Report past events and talk about future actions
- 6.3. Develop vocabulary related to environment
- 6.4. Write e-mails

7. The Rainbow of Diversity

- 7.1. Appraise and value other cultures for a happy living in multi-cultural workspace
- 7.2. Understand the usage of different types of sentences
- 7.3. Ask for or give directions, information, instructions

7.4. Use language to express emotions in various situations

7.5. Write letters in various real life situations

8. New Challenges – Newer Ideas

8.1. Understand the functional difference between Active Voice and Passive Voice

8.2. Use Passive Voice to speak and write in various contexts

8.3. Understand the major parts and salient features of an essay

8.4. Learn about latest innovations and get motivated

9. The End Point First!

9.1. Understand the importance of setting goals in life

9.2. Report about what others have said both in speaking and writing

9.3. Write an essay following the structure in a cohesive and comprehensive manner

9.4. Apply the words related to Goal Setting in conversations and in life

10. The Equal Halves

10.1. Value the other genders and develop a gender-balanced view towards life

10.2. Identify the use of different conjunctions in synthesising sentences

10.3. Write various types of sentences to compare and contrast the ideas

10.4. Apply the knowledge of sentence synthesis in revising and rewriting short essays

10.5. Develop discourses in speech and writing

11. Dealing with Disasters

11.1. be aware of different kinds of disasters and the concept of disaster management

11.2. Generate vocabulary relevant to disaster management and use it in sentences

11.3. Analyze an error in a sentence and correct it

11.4. Learn and write different kinds of reports

Textbook: ‘**INTERACT**’ (A Text book of English for I Year Engineering Diploma Courses) - by SBTET, AP

Reference Books:

Martin Hewings: *Advanced Grammar in Use*, Cambridge University Press

Murphy, Raymond : *English Grammar in Use*, Cambridge University Press

Sidney Greenbaum : *Oxford English Grammar*, Oxford University Press

Wren and Martin (Revised by N.D.V. Prasad Rao) : *English Grammar and Composition*, Blackie ELT Books, S. Chand and Co.

Sarah Freeman: *Strengthen Your Writing*, Macmillan

| | End Exam (80 Marks) | 1,2,3 Unit Tests (20 Marks each) |
|--------------------|---|--|
| Part A | 10 Question @ 3 Marks | 5 Questions @ (1Q X4M) + (4Q X3M =12) |
| | Total = 30 Marks | Total = 16 Marks |
| Part B | 5 Questions (+ 3 Choice) @10 Marks | 3 Questions (with internal choice) @ 8 Marks |
| | Total = 50 Marks | Total = 24 marks |
| Grand Total | 80 Marks | 40 Marks |

C-23 MNG-102
ENGINEERING MATHEMATICS-I
(Common to all Branches)

| Course Code | Course Title | No. of Periods/week | Total No. of periods | Marks for FA | Marks for SA |
|-------------|---------------------------|---------------------|----------------------|--------------|--------------|
| MNG-102 | Engineering Mathematics-I | 5 | 150 | 20 | 80 |

| S.No. | Unit Title | No. of periods | COs mapped |
|----------------------|-----------------------------|----------------|------------|
| 1 | Algebra | 31 | CO1 |
| 2 | Trigonometry | 44 | CO2 |
| 3 | Co-ordinate Geometry | 23 | CO3 |
| 4 | Differential Calculus | 34 | CO4 |
| 5 | Applications of Derivatives | 18 | CO5 |
| Total Periods | | 150 | |

| | |
|--------------------------|---|
| Course Objectives | (i) To apply the principles of Algebra, Trigonometry and Co-ordinate Geometry to real-time problems in engineering. (ii) To comprehend and apply the concept of Differential Calculus in engineering applications. |
|--------------------------|---|

| | | |
|------------------------|-----|---|
| Course Outcomes | CO1 | Identify functions as special relations, resolve partial fractions and solve problems on matrices and determinants. |
| | CO2 | Solve problems using the concept of trigonometric functions, their inverses and complex numbers. |
| | CO3 | Find the equations and properties of straight lines, circles and conic sections in coordinate system. |
| | CO4 | Evaluate the limits and derivatives of various functions. |
| | CO5 | Find solutions for engineering problems using differentiation. |

Learning Outcomes:

UNIT - I

C.O. 1 Identify functions, resolve partial fractions and solve problems on matrices and determinants.

- L.O.**
- 1.1 Define Set, Ordered pair and Cartesian product of two sets - examples.
 - 1.2 Explain Relations and Functions – examples
 - 1.3 Find Domain & Range of functions – simple examples.
 - 1.4 Define one-one and onto functions.
 - 1.5 Find the inverse of a function – simple examples.
 - 1.6 Define rational, proper and improper fractions of polynomials.
 - 1.7 Explain the procedure of resolving proper fractions of the types mentioned below into partial fractions

$$i) \frac{f(x)}{(ax+b)(cx+d)} \quad ii) \frac{f(x)}{(ax+b)^2(cx+d)}$$

- 1.8 Define a matrix and order of a matrix.
- 1.9 State various types of matrices with examples (emphasis on 3rd order square matrices).
- 1.10 Compute sum, difference, scalar multiplication and product of matrices. Illustrate the properties of these operations such as commutative, associative and distributive properties with examples and counter examples.
- 1.11 Define the transpose of a matrix and state its properties – examples.
- 1.12 Define symmetric and skew-symmetric matrices with examples. Resolve a square matrix into a sum of symmetric and skew-symmetric matrices and provide examples.
- 1.13 Define determinant of a square matrix; minor, co-factor of an element of a 3x3 square matrix with examples. Expand the determinant of a 3 x 3 matrix using Laplace expansion formula. State and apply the properties of determinants to solve problems.
- 1.14 Distinguish singular and non-singular matrices. Define multiplicative inverse of a matrix and list properties of adjoint and inverse. Compute adjoint and multiplicative inverse of a square matrix.
- 1.15 Solve a system of 3 linear equations in 3 unknowns using Cramer's rule and matrix inversion method.

UNIT - II

C.O. 2 Solve problems using the concept of trigonometric functions, their inverses and complex numbers.

- L.O.**
- 2.1 Define trigonometric ratios of any angle - List the values of trigonometric ratios at specified values.
 - 2.2 Draw graphs of trigonometric functions - Explain periodicity of trigonometric functions.
 - 2.3 Define compound angles and state the formulae of $\sin(A \pm B)$, $\cos(A \pm B)$, $\tan(A \pm B)$ and $\cot(A \pm B)$.
 - 2.4 Give simple examples on compound angles to derive the values of $\sin 15^\circ$, $\cos 15^\circ$, $\sin 75^\circ$, $\cos 75^\circ$, $\tan 15^\circ$, $\tan 75^\circ$ etc.
 - 2.5 Derive identities like $\sin(A+B) \sin(A-B) = \sin^2 A - \sin^2 B$ etc.
 - 2.6 Solve simple problems on compound angles.
 - 2.7 Derive the formulae of multiple angles $2A$, $3A$ etc and sub multiple angle $A/2$ in terms of angle A of trigonometric functions.
 - 2.8 Derive useful allied formulae like $\sin^2 A = (1 - \cos 2A)/2$ etc.
 - 2.9 Solve simple problems using the multiple and submultiple formulae.
- Syllabus for Unit test-I completed
- 2.10 Derive the formulae on transforming sum or difference of two trigonometric ratios into a product and vice versa - examples on these formulae.
 - 2.11 Solve problems by applying these formulae to sum or difference or product of two terms.
 - 2.12 Explain the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.
 - 2.13 Define inverses of six trigonometric functions along with their domains and ranges.
 - 2.14 Derive relations between inverse trigonometric functions so that the given inverse trigonometric function can be expressed in terms of other inverse trigonometric functions with examples.

2.15 State various properties of inverse trigonometric functions and identities like

$$\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}, \text{ etc.}$$

2.16 Apply formulae like $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$, where $x \geq 0, y \geq 0, xy < 1$ etc.,

to solve Simple problems.

2.17 Explain what is meant by solution of trigonometric equations and find the general solutions of $\sin x = k$, $\cos x = k$ and $\tan x = k$ with appropriate examples.

2.18 Solve models of the type $a \sin^2 x + b \sin x + c = 0$ and $a \sin x + b \cos x = c$.

2.19 State sine rule, cosine rule, tangent rule and projection rule and solve a triangle using these formulae.

2.20 List various formulae for the area of a triangle with examples.

2.21 Define a complex number, its modulus, conjugate, amplitude and list their properties.

2.22 Define arithmetic operations on complex numbers with examples.

2.23 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form with examples.

UNIT - III

Coordinate Geometry

C.O. 3 Find the equations and properties of straight lines, circles and conic sections in coordinate system.

L.O. 3.1 Write different forms of a straight line – general form, point-slope form, slope-intercept form, two-point form, intercept form and normal form (or perpendicular form).

3.2 Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.

3.3 Define locus of a point and circle.

3.4 Write the general equation of a circle and find its centre and radius.

3.5 Find the equation of a circle, given (i) centre and radius, (ii) two ends of the diameter (iii) three non collinear points of type (0,0) (a,0), (0, b).

3.6 Define a conic section - Explain the terms focus, directrix, eccentricity, axes and latus-rectum of a conic with illustrations.

3.7 Find the equation of a conic when focus, directrix and eccentricity are given.

3.8 Describe the properties of Parabola, Ellipse and Hyperbola in standard forms whose axes are along the co-ordinate axes and solve simple examples on these conics.

| |
|-------------------------------------|
| Syllabus for Unit test-II completed |
|-------------------------------------|

C.O.4 Evaluate the limits and derivatives of various functions.

L.O. 4.1 Explain the concept of limit and meaning of $\lim_{x \rightarrow a} f(x) = l$ and state the properties of limits.

4.2 Evaluate the limits of the type $\lim_{x \rightarrow a} \frac{f(x)}{g(x)}$ and $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)}$

4.3 State the Standard limits $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$, $\lim_{x \rightarrow 0} \frac{\sin x}{x}$, $\lim_{x \rightarrow 0} \frac{\tan x}{x}$, $\lim_{x \rightarrow 0} \frac{a^x - 1}{x}$,

$\lim_{x \rightarrow 0} \frac{e^x - 1}{x}$, $\lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}}$, $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$ (without proof) and solve simple problems

using these standard limits.

4.4 Explain the concept of continuity of a function at a point and on an interval

4.5 State the concept of derivative of a function $y = f(x)$ – definition, first principle as $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ and also provide standard notations to denote the derivative of a function.

4.6 Explain the significance of derivative in scientific and engineering applications.

4.7 Find the derivative of standard algebraic, logarithmic, exponential and trigonometric functions using the first principle.

4.8 Find the derivatives of inverse trigonometric, hyperbolic and inverse hyperbolic functions.

4.9 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with simple illustrative examples.

4.10 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples.

4.11 Explain the method of differentiation of parametric functions with examples.

4.12 Explain the procedure for finding the derivatives of implicit functions with examples.

4.13 Explain the need of taking logarithms for differentiating some functions of $[f(x)]^{g(x)}$ type – examples on logarithmic differentiation.

4.14 Explain the concept of finding the second order derivatives with examples.

4.15 Explain the concept of functions of several variables, finding partial derivatives and difference between the ordinary and partial derivatives with simple examples.

4.16 Explain the concept of finding second order partial derivatives with simple problems.

C.O. 5 Evaluate solutions for engineering problems using differentiation

L.O. 5.1 State the geometrical meaning of the derivative - Explain the concept of derivative to find the slopes of tangent and normal to a given curve at any point on it with examples.

5.2 Find the equations of tangent and normal to a given curve at any point on it – simple problems.

5.3 Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.

5.4 Explain the derivative as a rate measurer in the problems where the quantities like areas, volumes vary with respect to time- illustrative examples.

- 5.5 Define the concept of increasing and decreasing functions - Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.
- 5.6 Explain the procedure to find the extreme values (maxima or minima) of a function of single variable- simple problems for quadratic and cubic polynomials.
- 5.7 Apply the concept of derivatives to find the errors and approximations - simple problems.

Syllabus for Unit test-III completed

CO/PO – Mapping

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 2 | 3 | | | | 3 | 2 | 2 |
| CO2 | 3 | 3 | 2 | 2 | | | | 3 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 2 | | | | 3 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | | | | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | | | | 3 | 3 | 3 |
| Avg. | 3 | 2.8 | 2.4 | 2.6 | | | | 3 | 2.4 | 2.4 |

3 = Strongly mapped (High), **2** =moderately mapped (Medium), **1** =slightly mapped (Low)

Note: The gaps in CO/PO mapping can be met with appropriate activities as follows:

For PO5: Appropriate quiz programmes may be conducted at intervals and duration as decided by concerned faculty.

For PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

For PO7: Plan activities in such a way that students can visit the Library to refer standard books on Mathematics and access the latest updates in reputed national and international journals. Additionally, encourage them to attend seminars and learn mathematical software tools.

PO- CO – Mapping strength

| PO No | Mapped with CO no | CO periods addressing PO in column I | | Level (1,2 or 3) | Remarks |
|-------|-------------------------|--------------------------------------|-------|------------------|---|
| | | No | % | | |
| 1 | CO1, CO2, CO3, CO4, CO5 | 150 (31+44+23+34+18) | 100% | 3 | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5% to 25% Level 1 Low addressed <5% Not |
| 2 | CO1, CO2, CO3, CO4, CO5 | 80 (8+23+12+22+15) | 53.3% | 3 | |
| 3 | CO1, CO2, CO3, CO4, CO5 | 61 (9+14+9+14+15) | 40.6% | 3 | |
| 4 | CO1, CO2, CO3, CO4, CO5 | 61 (14+9+9+14+15) | 40.6% | 3 | |
| PSO 1 | CO1, CO2, CO3, CO4, CO5 | 150 (31+44+23+34+18) | 100% | 3 | |
| PSO 2 | CO1, CO2, CO3, CO4, CO5 | 62 | 41.3% | 3 | |

| | | | | | |
|-------|-------------------------|-----------------------|-------|---|-----------|
| | | (10+14+9+14+15) | | | addressed |
| PSO 3 | CO1, CO2, CO3, CO4, CO5 | 62 (10+14+9+14+15) | 41.3% | 3 | |

COURSE CONTENT

Unit-I

Algebra

1. Functions:

Definitions of Set, Ordered pair, Cartesian product of two sets, Relations, Functions, Domain & Range of functions – One-one and onto functions, inverse of a function.

2. Partial Fractions:

Definitions of rational, proper and improper fractions of polynomials. Resolve rational fractions (proper fractions) into partial fractions covering the types mentioned below.

$$i) \frac{f(x)}{(ax+b)(cx+d)} \quad ii) \frac{f(x)}{(ax+b)^2(cx+d)}$$

3. Matrices:

Definition of a matrix, types of matrices - Algebra of matrices, equality of two matrices, sum, difference, scalar multiplication and product of matrices. Transpose of a matrix, Symmetric, skew-symmetric matrices-Determinant of a square matrix, minor and cofactor of an element, Laplace's expansion, properties of determinants - Singular and non-singular matrices, Adjoint and multiplicative inverse of a square matrix-System of linear equations in 3 variables-Solutions by Cramer's rule and Matrix inversion method.

Unit-II

Trigonometry

4. Trigonometric ratios:

Definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.

5. Compound angles:

Formulas of $\sin(A \pm B)$, $\cos(A \pm B)$, $\tan(A \pm B)$, $\cot(A \pm B)$, and related identities.

6. Multiple and sub multiple angles:

Formulae for trigonometric ratios of multiple angles $2A$, $3A$ and sub multiple angle $A/2$.

7. Transformations:

Transformations of products into sums or differences and vice versa.

8. Inverse trigonometric functions:

Definition, domains and ranges-basic properties.

9. Trigonometric equations:

Concept of a solution, principal value and general solution of trigonometric equations:

$\sin x = k$, $\cos x = k$, $\tan x = k$, where k is a constant. Solutions of simple quadratic equations and equations of type $a \sin x + b \cos x = c$.

10. Properties of triangles:

Relations between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule- area of a triangle.

11. Complex Numbers:

Definition of a complex number, modulus, conjugate and amplitude of a complex number- Arithmetic operations on complex numbers - Modulus-Amplitude (polar) form, Exponential form (Euler form) of a complex number.

UNIT-III

Coordinate geometry

- 12. Straight lines:** Various forms of a straight line - Angle between two lines, perpendicular distance from a point, intersection of non-parallel lines and distance between parallel lines.
- 13. Circle:** Locus of a point, Circle definition-Circle equation given (i) centre and radius, (ii) two ends of a diameter (iii) three non-collinear points of type $(0,0)$, $(a,0)$, $(0, b)$ - General equation of a circle –its centre and radius.
- 14.** Definition of a conic section - Equation of a conic when focus, directrix and eccentricity are given - Properties of parabola, ellipse and hyperbola in standard forms.

UNIT-IV

Differential Calculus

- 15. Concept of Limit-** Definition and Properties of Limits and Standard Limits -Continuity of a function at a point.
- 16. Concept of derivative-** Definition (first principle)- different notations- Derivatives of standard algebraic, logarithmic, exponential, trigonometric, inverse trigonometric, hyperbolic and inverse hyperbolic functions - Derivatives of sum, difference, scalar multiplication, product, quotient of functions - Chain rule, derivatives of parametric functions, derivatives of implicit functions, logarithmic differentiation - Second order derivatives - Functions of several variables, first and second order partial derivatives.

UNIT-V

Applications of Derivatives

- 17.** Geometrical meaning of the derivative, equations of tangent and normal to a curve at any point.
- 18.** Physical applications of derivatives – Velocity, acceleration, derivative as a rate measurer.
- 19.** Applications of the derivative to find the extreme values – Increasing and decreasing functions, maxima and minima for quadratic and cubic polynomials.
- 20.** Absolute, relative and percentage errors - Approximate values due to errors in measurements.

Textbook:

Engineering Mathematics-I, a textbook for first year diploma courses, prepared & prescribed by SBTET, AP.

Reference Books:

1. Shanti Narayan, A Textbook of matrices, S.Chand&Co.
2. Robert E. Moyer & Frank Ayers Jr., Schaum's Outline of Trigonometry, 4th Edition, Schaum's Series.
3. G.B.Thomas, R.L.Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
4. Frank Ayers & Elliott Mendelson, Schaum's Outline of Calculus, Schaum's Series.
5. M.Vygodsky, Mathematical Handbook, Mir Publishers, Moscow.

TIME SCHEDULE

| S.No. | Chapter | No. of Periods | Marks Allotted | Short type | Essay type | COs mapped |
|--|---------------------------------|----------------|----------------|------------|------------|------------|
| Unit - I: Algebra | | | | | | |
| 1 | Functions | 6 | 3 | 1 | 0 | CO1 |
| 2 | Partial Fractions | 5 | 3 | 1 | 0 | CO1 |
| 3 | Matrices and Determinants | 20 | 16 | 2 | 1 | CO1 |
| Unit - II: Trigonometry | | | | | | |
| 4 | Trigonometric Ratios | 2 | 0 | 0 | 0 | CO2 |
| 5 | Compound Angles | 5 | 3 | 1 | 0 | CO2 |
| 6 | Multiple and Submultiple angles | 8 | 3 | 1 | 0 | CO2 |
| 7 | Transformations | 6 | 5 | 0 | 1/2 | CO2 |
| 8 | Inverse Trigonometric Functions | 6 | 5 | 0 | 1/2 | CO2 |
| 9 | Trigonometric Equations | 6 | 5 | 0 | 1/2 | CO2 |
| 10 | Properties of triangles | 5 | 5 | 0 | 1/2 | CO2 |
| 11 | Complex Numbers | 6 | 3 | 1 | 0 | CO2 |
| Unit III: Co-ordinate Geometry | | | | | | |
| 12 | Straight Lines | 5 | 3 | 1 | 0 | CO3 |
| 13 | Circles | 6 | 5 | 0 | 1/2 | CO3 |
| 14 | Conic Sections | 12 | 5 | 0 | 1/2 | CO3 |
| Unit – IV: Differential Calculus | | | | | | |
| 15 | Limits and Continuity | 6 | 3 | 1 | 0 | CO4 |
| 16 | Differentiation | 28 | 23 | 1 | 2 | CO4 |
| Unit – V: Applications of Derivatives | | | | | | |
| 17 | Geometrical Applications | 4 | 5 | 0 | 1/2 | CO5 |
| 18 | Physical Applications | 6 | 5 | 0 | 1/2 | CO5 |
| 19 | Maxima and Minima | 4 | 5 | 0 | 1/2 | CO5 |
| 20 | Errors and Approximations | 4 | 5 | 0 | 1/2 | CO5 |
| Total | | 150 | 110 | 10 | 8 | |
| Marks | | | | 30 | 80 | |

Unit Test Syllabus

| Unit Test | Syllabus |
|---------------|----------------------------|
| Unit Test-I | From L.O. 1.1 to L.O. 2.9 |
| Unit Test-II | From L.O. 2.10 to L.O. 3.8 |
| Unit Test-III | From L.O.4.1 to L.O. 5.7 |

ENGINEERING PHYSICS

| Course code | Course title | No.of periods per week | Total no. of periods | Marks for FA | Marks for SA |
|-------------|---------------------|------------------------|----------------------|--------------|--------------|
| MNG -103 | Engineering Physics | 03 | 90 | 20 | 80 |

TIME SCHEDULE

| S.No | Major topics | No. of Periods | Weightage of Marks | Short Answer type (3 marks) | Essay type (10 marks) | COs mapped |
|------|-------------------------|----------------|--------------------|-----------------------------|-----------------------|------------|
| 1. | Units and measurements | 09 | 03 | 1 | | CO1 |
| 2. | Statics | 11 | 13 | 1 | 1 | |
| 3. | Gravitation | 12 | 20 | 1 | 2 | CO2 |
| 4. | Concepts of energy | 10 | 13 | 1 | 1 | |
| 5. | Thermal physics | 10 | 13 | 1 | 1 | CO3 |
| 6. | Sound | 12 | 16 | 2 | 1 | |
| 7. | Electricity & Magnetism | 13 | 16 | 2 | 1 | CO4 |
| 8. | Modern physics | 13 | 16 | 2 | 1 | |
| | Total: | 90 | 110 | 10 | 8 | |

| Course title : Engineering Physics | |
|------------------------------------|--|
| Course objectives | <p>(1) To understand the basic concepts of physics for various Engineering applications as required for industries.</p> <p>(2) To equip the students with the scientific advances in technology and make the student suitable for any industrial or scientific organization.</p> |

| | | |
|--------------------|-----|---|
| COURSE OUTCOMES | CO1 | Familiarize with various physical quantities, their SI units and errors in measurements; understand the concepts of vectors and various forces in statics. |
| | CO2 | Understand the concepts of gravitation with reference to applications in satellites, provide the knowledge of various forms of energy and their working principles. |
| | CO3 | Familiarize with the knowledge of transmission of heat and gas laws; provide the knowledge on musical sound and noise as pollution and also the concepts of echo and reverberation. |
| | CO4 | Provide basic knowledge of electricity and concepts of magnetism and magnetic materials; familiarize with the advances in Physics such as photoelectric effect, optical fibers, semiconductors, superconductors and nanotechnology. |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 2 | 1 | | | 2 | 2 | | 2 |
| CO2 | 3 | 2 | 2 | 2 | 2 | | 2 | 1 | | 2 |
| CO3 | 2 | | 1 | | 2 | | 1 | | 1 | 1 |
| CO4 | 3 | 2 | 3 | 2 | 2 | | 3 | 2 | | 2 |

MATRIX SHOWING MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES

| CO-PO Mapping Strength | | | | | |
|-------------------------|--|---|--------|---------------------|--|
| Course code MNG -103 | Engineering Physics No of Course Objectives : 4 | | | | No of periods 90 |
| POs | Mapped with CO No | CO periods addressing PO in Col 1 NO | | Level 1,2,3 % | remarks |
| PO1 | CO1,CO2,CO3,CO4 | 44 | 48.9 % | 3 | <div>>40% level 3 (highly addressed)</div> <div>25% to 40% level 2 (moderately addressed)</div> <div>5% to 25% level 1 (Low addressed)</div> <div>< 5% (not addressed)</div> |
| PO2 | CO1,CO2, CO4 | 11 | 12.2% | 1 | |
| PO3 | CO1, CO2,CO3, CO4 | 10 | 11.1% | 1 | |
| PO4 | CO1, CO2,CO4 | 8 | 8.9% | 1 | |
| PO5 | CO2,CO3, CO4 | 8 | 8.9% | 1 | |
| PO6 | | | | | |
| PO7 | CO1, CO2, CO3, CO4 | 9 | 10.0% | 1 | |

3 = strongly mapped, 2 = moderately mapped, 1 = slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following.

- | | | | |
|------------------------|------------------------|--------------------------------|---------------------|
| (i) Seminars | (ii) Tutorials | (iii) Guest Lecturers | (iv) Assignments |
| (v) Quiz competitions | (vi) Industrial visits | (vii) Tech fest | (viii) Mini project |
| (ix) Group discussions | (x) Virtual classes | (xi) Library visit for e-books | |

Learning outcomes

Upon completion of the course the student shall be able to

1.0 Understand the concept of units and measurements

- 1.1 Explain the concept of units
- 1.2 Define the terms
 - a) Physical quantity b) Fundamental physical quantities and
 - c) Derived physical quantities
- 1.3 Define unit
- 1.4 Define fundamental units and derived units
- 1.5 State SI units with symbols for fundamental and some derived quantities
- 1.6 State Multiples and Submultiples in SI system
- 1.7 State rules of writing S.I units
- 1.8 State advantages of SI units
- 1.9 What are direct and indirect measurements
- 1.10 Define accuracy and least count
- 1.11 Define error in measurement
- 1.12 Define absolute, relative and percentage errors with their formulae
- 1.13 Solve simple problems on absolute, relative and percentage errors

2.0 Understand the concepts of statics

- 2.1 Explain the concept of Vectors
- 2.2 Define scalar and vector quantities with examples
- 2.3 Represent vectors geometrically
- 2.4 Define the types of vectors (equal, negative, unit, co-initial, co-planar, position vector)
- 2.5 Resolve the vector into rectangular components
- 2.6 State and explain triangle law of addition of vectors
- 2.7 Define concurrent forces, co-planar forces and equilibrant.
- 2.8 State and explain Lami's theorem
- 2.9 State the parallelogram law of addition of forces with diagram.
- 2.10 Write the expressions for magnitude and direction of resultant (no derivation)
- 2.11 Illustrate parallelogram law with examples (i) flying of bird and (ii) working of sling.
- 2.12 Define moment of force and couple.
- 2.13 Write the formulae and S.I units of moment of force and couple.
- 2.14 Solve simple problems on (i) Resolution of force and (ii) Parallelogram law of forces (finding R, α and θ).

3.0 Understand the concepts of Gravitation

- 3.1 State and explain Newton's universal law of gravitation.
- 3.2 Define G and mention its value.
- 3.3 Explain the acceleration due to gravity (g)
- 3.4 Explain the factors affecting the value of g
- 3.5 Derive the relationship between g and G.
- 3.6. State and explain the Kepler's laws of planetary motion
- 3.7 Define a satellite.
- 3.8 What are natural and artificial satellites, Give examples.
- 3.9 Define orbital velocity and write its formula.
- 3.10 Define escape velocity and write its formula.
- 3.11 Write a brief note on Polar satellites.

- 3.12 Write a brief note on Geo-stationary satellites.
- 3.13 Mention the applications of artificial satellites.
- 3.14 Solve simple problems on (i) Newton's law of gravitation and (ii) calculation of orbital and escape velocities.

4.0 Understand the concepts of Energy.

- 4.1 Define work done and energy. Mention their SI units.
- 4.2 List various types of energy.
- 4.3 Define P.E with examples. Write its equation.
- 4.4 Define K.E with examples. Write its equation.
- 4.5 Derive relationship between K.E and momentum.
- 4.6 State the law of conservation of energy. Give various examples.
- 4.7 Write a brief note on solar energy.
- 4.8 Explain the principle of solar thermal conversion.
- 4.9 Explain the principle of photo voltaic effect
- 4.10 Solve simple problems on (i) work done (ii) P.E & K.E and (iii) Relation between K.E & momentum.

5.0 Understand the concepts of thermal physics

- 5.1 Define the concepts of heat and temperature
- 5.2 State different modes of transmission of heat
- 5.3 Explain conduction, convection and radiation with two examples each.
- 5.4 State and explain Boyle's law
- 5.5 Define absolute zero temperature
- 5.6 Explain absolute scale of temperature
- 5.7 State the relationship between degree Celsius, Kelvin and Fahrenheit temperatures
- 5.8 State Charle's law and write its equation
- 5.9 State Gay-Lussac's law and write its equation
- 5.10 Define ideal gas
- 5.11 Derive ideal gas equation
- 5.12 Explain why universal gas constant (R) is same for all gases in nature
- 5.13 Calculate the value of R for 1 gram mole of gas.
- 5.14 Solve simple problems on (i) Inter conversion of temperatures between °C, K and F
(ii) Gas laws and (iii) Ideal gas equation.

6.0 Understand the concepts of Sound

- 6.1 Define the term sound
- 6.2 Define longitudinal and transverse waves with one example each
- 6.3 Explain the factors which affect the velocity of sound in air
- 6.4 Distinguish between musical sound and noise
- 6.5 Explain noise pollution and state SI unit for intensity of sound
- 6.6 Explain sources of noise pollution
- 6.7 Explain effects of noise pollution
- 6.8 Explain methods of minimizing noise pollution
- 6.9 Define Doppler effect.
- 6.10 List the Applications of Doppler effect
- 6.11 Define reverberation and reverberation time
- 6.12 Write Sabine's formula and name the physical quantities in it.
- 6.13 Define echoes and explain the condition to hear an echo.
- 6.14 Mention the methods of reducing an echo
- 6.15 Mention the applications of an echo

- 6.16 What are ultrasonics
- 6.17 Mention the applications of ultra sonics, SONAR
- 6.18 Solve simple problems on echo

7.0 Understand the concepts of Electricity and Magnetism

- 7.1 Explain the concept of P.D and EMF
- 7.2 State Ohm's law and write the formula
- 7.3 Explain Ohm's law
- 7.4 Define resistance and specific resistance. Write their S.I units.
- 7.5 State and explain Kichoff's first law.
- 7.6 State and explain Kirchoff's second law.
- 7.7 Describe Wheatstone bridge with legible sketch.
- 7.8 Derive an expression for balancing condition of Wheatstone bridge.
- 7.9 Describe Meter Bridge experiment with necessary circuit diagram.
- 7.10 Write the formulae to find resistance and specific resistance in meter bridge
- 7.11 Explain the concept of magnetism
- 7.12 What are natural and artificial magnets (mention some types)
- 7.13 Define magnetic field and magnetic lines of force.
- 7.14 Write the properties of magnetic lines of force
- 7.15 State and explain the Coulomb's inverse square law of magnetism
- 7.16 Define magnetic permeability
- 7.17 Define para, dia, ferro magnetic materials with examples
- 7.18 Solve simple problems on (i) Ohm's law (ii) Kirchoff's first law (iii) Wheatstone bridge (iv) meter bridge and (v) Coulomb's inverse square law

8.0 Understand the concepts of Modern physics

- 8.1 State and explain Photo-electric effect.
- 8.2 Write Einstein's Photo electric equation and name the physical quantities in it.
- 8.3 State laws of photo electric effect
- 8.4 Explain the Working of photo electric cell
- 8.5 List the Applications of photoelectric effect
- 8.6 Recapitulate refraction of light and its laws
- 8.7 Define critical angle
- 8.8 Explain the Total Internal Reflection
- 8.9 Explain the principle and working of Optical Fiber
- 8.10 List the applications of Optical Fiber
- 8.11 Explain the energy gap based on band structure
- 8.12 Distinguish between conductors, semiconductors and insulators based on energy gap
- 8.13 Define doping
- 8.14 Explain the concept of hole
- 8.15 Explain the types of semiconductors , Intrinsic and extrinsic
- 8.16 Explain n-type and p-type semiconductors
- 8.17 Mention the applications of semiconductors
- 8.18 Define superconductor and superconductivity
- 8.19 List the applications of superconductors
- 8.20 Nanotechnology definition, nano materials and applications

COURSECONTENT

1. Units and measurements

Introduction – Physical quantity – Fundamental and Derived quantities – Fundamental and derived units - SI units – Multiples and Sub multiples – Rules for writing S.I. units-Advantages of SI units – Direct and indirect measurements – Accuracy and least count – Errors : Absolute, relative and percentage errors –Problems.

2. Statics

Scalars and Vectors– Representation of a vector - Types of vectors - Resolution of vector into rectangular components – Triangle law of vectors – Concurrent forces - Lami's theorem - Parallelogram law of forces : Statement, equations for magnitude and direction of resultant, examples – Moment of force and couple – Problems.

3. Gravitation

Newton's law of gravitation and G – Concept of acceleration due to gravity (g) – Factors affecting the value of g – Relation between g and G - Kepler's laws – Satellites : Natural and artificial – Orbital velocity and escape velocity – Polar and geostationary satellites – Applications of artificial satellites – Problems.

4. Concepts of energy

Work done & Energy-Definition and types of energy - potential energy - kinetic energy-- K.E and momentum relation – Law of Conservation of energy, examples - Solar energy, principles of thermal and photo conversion – Problems.

5. Thermal physics

Modes of transmission of heat – Expansion of Gases - Boyle's law – Absolute scale of temperature - Thermometric scales and their inter conversion - Charle's law - Gay-Lussac's law - Ideal gas equation - Universal gas constant (R) - Problems.

6. Sound

Sound - Nature of sound - Types of wave motion, Longitudinal and transverse – Factors affecting the velocity of sound in air - musical sound and noise - Noise pollution – Causes & effects - Methods of reducing noise pollution - Doppler effect - Echo- Reverberation -Reverberation time-Sabine 's formula – Ultrasonics & applications – SONAR - Problems.

7. Electricity & Magnetism

Concept of P.D and EMF - Ohm's law and explanation-Specific resistance - Kirchoff's laws – Wheat stone's bridge - Meter bridge.

Natural and artificial magnets – magnetic field and magnetic lines of force – Coulomb's inverse square law – Permeability – Magnetic materials – Para, dia, ferro – Examples – Problems.

8. Modern Physics

Photoelectric effect – laws of photoelectric effect – photoelectric cell – Applications of photoelectric cell - Total internal reflection - Fiber optics - Principle and working of an optical fiber - Applications of optical fibers – Semiconductors : Based on Energy gap – Doping – Hole - Intrinsic and extrinsic semiconductors (n-type & p-type) – Applications of semiconductors – Superconductivity – applications – Nanotechnology definition, nano materials, applications.

REFERENCES

- | | |
|--|-----------------------------------|
| 1. Intermediate physics - Volume - I & 2 | Telugu Academy (English version) |
| 2. Unified physics Volume 1, 2, 3 and 4 | Dr. S.L Guptha and Sanjeev Guptha |
| 3. Concepts of Physics, Vol 1 & 2 | H.C. Verma |
| 4. Text book of physics Volume I & 2 | Resnick & Halliday |
| 5. Fundamentals of physics | Brijlal & Subramanyam |
| 6. Text book of applied physics | Dhanpath Roy |

7. NCERT Text Books of physics

Class XI & XII Standard

8. e-books/e-tools/websites/Learning Physics software/eLMS

Table showing the scope of syllabus to be covered for unit tests

| Unit test | Learning outcomes to be covered |
|------------------|--|
| Unit test - 1 | From 1.1 to 3.14 |
| Unit test - 2 | From 4.1 to 6.18 |
| Unit test - 3 | From 7.1 to 8.20 |

Engineering Chemistry and Environmental Studies

| Course code | Course Title | No. of Periods per week | Total No. of Periods | Marks for FA | Marks for SA |
|-------------|---|-------------------------|----------------------|--------------|--------------|
| 104 | Engineering Chemistry and Environmental Studies | 3 | 90 | 20 | 80 |

| S.No | Unit Title/Chapter | No. of Periods | COs Mapped |
|------|----------------------------------|----------------|------------|
| 1 | Fundamentals of Chemistry | 14 | CO1 |
| 2 | Solutions, Acids and Bases | 16 | CO1 |
| 3 | Electrochemistry | 12 | CO2 |
| 4 | Corrosion | 8 | CO2 |
| 5 | Water Treatment | 8 | CO3 |
| 6 | Polymers & Engineering Materials | 12 | CO4 |
| 7 | Fuels | 6 | CO4 |
| 8 | Environmental Studies | 14 | CO5 |
| | Total | 90 | |

Course Objectives

| Course Title: Engineering Chemistry & Environmental Studies | |
|---|--|
| Course Objectives | <ol style="list-style-type: none"> 1. To familiarize with the concepts of chemistry involved in the process of various Engineering Industrial Applications. 2. To know the various natural and man-made environmental issues and concerns with an interdisciplinary approach that include physical, chemical, biological and socio cultural aspects of environment. 3. to reinforce theoretical concepts by conducting relevant experiments/exercises |

Course outcomes

| | | |
|------------------------|-----|---|
| Course Outcomes | CO1 | Explain Bohr's atomic model, chemical bonding, mole concept, acids and bases, P ^H and Buffer solutions. |
| | CO2 | Explain electrolysis, Galvanic cell, batteries and corrosion |
| | CO3 | Explain the chemistry involved in the treatment of hardness in water. |
| | CO4 | Explain the methods of preparation and applications of Polymers and Elastomers, chemical composition and applications of Alloys, Composite Materials, Liquid Crystals, Nano Materials and Fuels. |
| | CO5 | Explain Global impacts due to air pollution, causes, effects and controlling methods of water pollution and understand the environment, forest resources, e-Pollution and Green Chemistry Principles. |

| | | | | | |
|--------|---|---------------------------------------|--------|-------------|---|
| EE-104 | Engineering. Chemistry and Environmental studies No of Course Outcomes:5 | | | | No Of periods 90 |
| POs | Mapped with CO No | CO periods addressing PO in Col NO. 1 | % | Level 1,2,3 | remarks |
| PO1 | CO1,CO2,CO3 | 42 | 46.7 % | 3 | >40% level 3 (highly addressed) 25% to 40% level 2(moderately addressed) 5% to 25% level 1 (Low addressed) < 5%(not addressed) |
| PO2 | CO2,CO3 | 16 | 17.8% | 1 | |
| PO3 | CO4 | 12 | 13.3% | 1 | |
| PO4 | CO4 | 6 | 6.7% | 1 | |
| PO5 | CO5 | 14 | 15.5% | 1 | |
| PO6 | - | - | - | - | |
| PO7 | - | - | - | - | |

COs-POs mapping strength (as per given table)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---------|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | - | - | - | - | - | - | - | - | - |
| CO2 | 3 | 1 | - | - | - | - | - | - | - | - |
| CO3 | 3 | 1 | - | - | - | - | - | - | - | - |
| CO4 | - | - | 1 | 1 | - | - | - | - | - | - |
| CO5 | - | - | - | - | 1 | - | - | - | - | - |
| Average | 3 | 1 | 1 | 1 | 1 | | - | - | - | - |

3=strongly mapped 2= moderately mapped 1= slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

- a) Seminars ii) Tutorials iii) Guest Lectures iv) Assignments v) Quiz competitions vi) Industrial visit vii) Tech Fest viii) Mini project ix) Group discussions x) Virtual classes xi) Library visit for e-books

Model Blue Print with Weightage for Blooms category and questions for each chapter and COs mapped

| S.No | Unit Title/Chapter | No of Periods | Weight age of marks | Question wise distribution | | Mapped with CO |
|-------|-----------------------------------|---------------|---------------------|----------------------------|-------|----------------|
| | | | | Essay | Short | |
| 1 | Fundamentals of Chemistry | 14 | 21 | 1½* | 2 | CO1 |
| 2 | Solutions, Acids and Bases | 16 | 21 | 1½* | 2 | CO1 |
| 3 | Electrochemistry | 12 | 13 | 1 | 1 | CO2 |
| 4 | Corrosion | 8 | 13 | 1 | 1 | CO2 |
| 5 | Water Treatment | 8 | 13 | 1 | 1 | CO3 |
| 6 | Polymers & Engineering materials. | 12 | 13 | 1 | 1 | CO4 |
| 7 | Fuels | 6 | 3 | 0 | 1 | CO4 |
| 8 | Environmental Studies | 14 | 13 | 1 | 1 | CO5 |
| Total | | 90 | 110 | 8 | 10 | |

*One question of 10 marks should be given with 50% weightage from unit title 1 and 2

Upon completion of the course, the student shall be able to learn out

ENGINEERINGCHEMISTRY AND ENVIRONMENTAL STUDIES

1.0 Atomic structure

- 1.1 Explain the charge, mass of fundamental particles of an atom (electron, proton and neutron) and the concept of atomic number and mass number.
- 1.2 State the Postulates of Bohr's atomic theory and its limitations.
- 1.3 Explain the significance of four Quantum numbers and draw the atomic structures of Silicon and Germanium.
- 1.4 Define Orbital of an atom and draw the shapes of s,p and d-orbitals.

- 1.5 Explain 1. Aufbau principle, 2. Pauli's exclusion principle, 3. Hund's principle.
- 1.6 Write the electronic configuration of elements up to atomic number 30.
- 1.7 Explain the significance of chemical bonding.
- 1.8 Explain the Postulates of Electronic theory of valency.
- 1.9 Define and explain Ionic and Covalent bonds with examples of NaCl, H_2 , O_2 and N_2 . (* Lewis dot method).
- 1.10 List out the Properties of Ionic compounds and covalent compounds and distinguish between their properties.

2.0 Solutions, Acids and Bases

- 2.1 Define the terms 1. Solution, 2. Solute and 3. Solvent.
- 2.2 Classify solutions based on solubility.
- 2.3 Define the terms 1. Atomic weight, 2. Molecular weight and 3. Equivalent weight.
Calculate Molecular weight and Equivalent weight of the given acids (HCl, H_2SO_4 , H_3PO_4) Bases (NaOH , $\text{Ca}(\text{OH})_2$, $\text{Al}(\text{OH})_3$ and Salts (NaCl , Na_2CO_3 , CaCO_3).
- 2.4 Define mole and solve numerical problems on mole concept.
- 2.5 Define molarity, normality and solve numerical problems on molarity and normality.
 - a) Calculate the Molarity or Normality, if weight of solute and volume of solution are given.
 - b) Calculate the weight of solute, if Molarity or Normality with volume of solution are given.
 - c) Problems on dilution to convert high concentrated solutions to low concentrated solutions.
- 2.6 Explain Arrhenius theory of Acids and Bases and give its limitations.
- 2.7 Define ionic product of water, pH and solve numerical problems on pH (Strong Acids and Bases).
- 2.8 Define buffer solution and classify buffer solutions with examples. Give its applications.

3.0 Electrochemistry

- 3.1 Define the terms 1. Conductor 2. Semiconductor 3. Insulator, 4. Electrolyte 5. Non-electrolyte. Give two examples each.
- 3.2 Distinguish between Metallic conduction and Electrolytic conduction.
- 3.3 Explain electrolysis by taking an example of used NaCl and list out the applications of electrolysis.
- 3.4 Define Galvanic cell. Explain the construction and working of Galvanic cell.
- 3.5 Distinguish between electrolytic cell and galvanic cell.
- 3.6 Define battery and list the types of batteries with examples.
- 3.7 Explain the construction, working and applications of i) Dry cell (Leclanche cell), ii) Lead storage battery, iii) Lithium-Ion battery and iv) Hydrogen-Oxygen fuel cell.

4.0 Corrosion

- 4.1 Define the term corrosion.
- 4.2 state the Factors influencing the rate of corrosion.
- 4.3 Describe the formation of (a) composition cell (b) stress cell (c) concentration cell during corrosion.
- 4.4 Define rusting of iron and explain the mechanism of rusting of iron.
- 4.5 Explain the methods of prevention of corrosion by
 - (a) Protective coatings (anodic and cathodic coatings).
 - (b) Cathodic protection (Sacrificial anode process and Impressed-voltage process).

5.0 Water Treatment

- 5.1 Define soft water and hard water with respect to soap action.
- 5.2 Define and classify the hardness of water.
- 5.3 List out the salts that causing hardness of water (with Formulae).
- 5.4 State the disadvantages of using hard water in industries.
- 5.5 Define Degree of hardness and units of hardness (mg/L and ppm).
- 5.6 Solve numerical problems on hardness.
- 5.7 Explain the methods of softening of hard water by (i) Ion-exchange process and (ii) Reverse Osmosis process.

6.0 Polymers & Engineering materials.

A) Polymers

- 6.1 Explain the concept of polymerization.
- 6.2 Describe the methods of polymerization (a) addition polymerization of ethylene (b) condensation polymerization of Bakelite (Only flowchart).
- 6.3 Define plastic. Explain a method of preparation and uses of the following plastics:
1. PVC 2. Teflon 3. Polystyrene 4. Nylon 6,6.
- 6.4 Define elastomers. Explain a method of preparation and applications of the following:
1. Buna-S 2. Neoprene.

B) Engineering Materials

- 6.5 Define an alloy. Write the composition and applications of the following:
1. Nichrome 2. Duralumin 3. Stainless Steel.
- 6.6 Define Composite Materials and give any two examples. State their Properties and applications.
- 6.7 Define Liquid Crystals and give any two examples. State their Properties and applications.
- 6.8 Define Nano Materials and give any two examples. State their Properties and applications.

7.0 Fuels

- 7.1 Define the term fuel.
- 7.2 Classify the fuels based on occurrence.
- 7.3 Write the composition and uses of the following:
1. LPG 2. CNG 3. Biogas 4. Power alcohol
- 7.4 Write the commercial production of Hydrogen as future fuel. Give its advantages and disadvantages.

8.0 ENVIRONMENTAL STUDIES

- 8.1 Explain the scope and importance of environmental studies.
- 8.2 Define environment. Explain the different segments of environment.
1. Lithosphere 2. Hydrosphere 3. Atmosphere 4. Biosphere
- 8.3 Define the following terms:
1. Pollutant 2. Pollution 3. Contaminant 4. Receptor 5. Sink 6. Particulates 7. Dissolved oxygen (DO) 8. Threshold Limit Value (TLV) 9. BOD 10. COD 11. Eco system 12. Producers 13. Consumers 14. Decomposers with examples.
- 8.4 State the renewable and non-renewable energy sources with examples.
- 8.5 State the uses of forest resources.
- 8.6 Explain the causes and effects of deforestation.
- 8.7 Define air pollution and explain its Global impacts 1. Greenhouse effect, 2. Ozone layer depletion and 3. Acid rain.
- 8.8 Define Water pollution. Explain the causes, effects and controlling methods of Water pollution.
- 8.9 Define e-Pollution, State the sources of e-waste. Explain its health effects and control methods.
- 8.10 Define Green Chemistry. Write the Principles and benefits of Green Chemistry.

COURSE CONTENT

ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

1. Fundamentals of Chemistry

Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers – Atomic structure of Silicon and Germanium - Orbitals, shapes of s, p and d orbitals - Aufbau's principle - Hund's rule - Pauli's exclusion Principle - Electronic configuration of elements.

Chemical Bonding: significance – Electronic theory of valency - Types of chemical bonds – Ionic and covalent bond with examples – Properties of Ionic and Covalent compounds.

2. Solutions, Acids and Bases

Solutions: Types of solutions - Mole concept – Numerical problems on mole concept - Methods of

expressing concentration of a solution – Molarity and Normality – Numerical problems on molarity and normality.

Acids and Bases: Arrhenius theory of acids and bases – Ionic product of water- pH–Numerical problems on pH–Buffer solutions – Classification- applications.

3. Electrochemistry

Conductors, semiconductors, insulators, electrolytes and non-electrolytes – Electrolysis of fused NaCl–Applications of electrolysis - Galvanic cell – Battery-Types- Dry Cell (Leclanche Cell),Lead- Storage battery- Lithium-Ion battery -Hydrogen-Oxygen Fuel cell.

4. Corrosion

Introduction - Factors influencing corrosion - Composition, Stress and Concentration Cells– Rusting of iron and its mechanism – Prevention of corrosion by Protective Coating methods, Cathodic Protection methods.

5. Water treatment

Introduction– Soft and Hard water– Causes of hardness– Types of hardness– Disadvantages of hard water – Degree of hardness (ppm and mg/lit) – Numerical problems on hardness - Softening methods – Ion-Exchange process– Reverse Osmosis process.

6. Polymers & Engineering materials

Polymers:

Concept of polymerization – Types of polymerization – Addition, condensation with examples – Plastics - Preparation and uses of i).PVC ii) Teflon iii) Polystyrene and iv) Nylon 6,6.

Elastomers: Preparation and application of i)Buna-s and ii) Neoprene.

Engineering Materials:

Alloys- Composition and applications of i) Nichrome, ii)Duralumin and iii) Stainless Steel.

Composite Materials- Properties and applications.

Liquid Crystals- Properties and applications.

Nano Materials- Properties and applications.

7. Fuels

Definition and classification of fuels – Composition and uses of i) LPG ii) CNG iii) Biogas and iv) Power alcohol – Hydrogen as a future fuel-production- advantages and disadvantages.

8. ENVIRONMENTAL STUDIES

Scope and importance of environmental studies – Environment - Important terms related to environment–Renewable and non-renewable energy sources–Forest resources – Deforestation –Air pollution–Global impacts on environment –Water pollution – causes – effects – control measures- e- Pollution –Sources of e-waste - Health effects - Control methods - Green Chemistry- Principles -Benefits.

Table specifying the scope of syllabus to be covered for Unit Test- 1, Unit Test- 2 and Unit Test -3

| Unit Test | Learning outcomes to be covered |
|---------------|---------------------------------|
| Unit Test – 1 | From 1.1 to 2.8 |
| Unit Test – 2 | From 3.1 to 5.7 |
| Unit Test – 3 | From 6.1 to 8.10 |

REFERENCE BOOKS

- | | |
|---------------------------|---------------------------------|
| 1. Telugu Academy | Intermediate chemistry Vol. 1&2 |
| 2. Jain & Jain | Engineering Chemistry |
| 3. O.P. Agarwal, Hi-Tech. | Engineering Chemistry |
| 4. D.K.Sharma | Engineering Chemistry |
| 5. A.K. De | Engineering Chemistry |

ELEMENTS OF MINING

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|----------------|---------------------------|----------------------|---------------------|--------------|--------------|
| MNG-105 | Elements of Mining | 5 | 150 | 20 | 80 |

TIME SCHEDULE

| S. No. | Unit Title/Chapter | Periods | Weightage of Marks | No.of short questions | No. of Essay questions | CO's Mapped |
|--------|--------------------------------|------------|--------------------|-----------------------|------------------------|------------------|
| 1 | Introduction& stages of Mining | 17 | 06 | 02 | | CO1 |
| 2 | Concepts of Mining Methods | 17 | 13 | 01 | 01 | CO1, CO2 |
| 3 | Drilling Methods | 33 | 26 | 02 | 02 | CO1, CO2,CO3,CO5 |
| 4 | Explosives | 33 | 26 | 02 | 02 | CO2,CO3.CO4 |
| 5 | Blasting practice in mines | 33 | 26 | 02 | 02 | CO3,CO4,CO5 |
| 6 | Shaft sinking | 17 | 13 | 01 | 01 | CO3.CO4,CO5 |
| | Total | 150 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes

| | | |
|--------------------------|---|--|
| Course Objectives | Upon completion of the course the student shall be able to: <ul style="list-style-type: none"> i) To familiarize the various methods of accessing the deposits and different mining activities ii) To familiarize various Mining methods iii) Explain Different methods of drilling iv) Explain Various types of explosives and their field use v) Describe various methods of shaft sinking and their field applicability | |
| Course outcomes | CO1 | Fundamental concepts of mining, Mining methods, drilling methods, methods of shaft sinking |
| | CO2 | Explain Pre-mining, post mining operations, various types of explosives |
| | CO3 | Explain Different types of drilling methods, blasting practices in mines |
| | CO4 | Determination of efficiency of blasting operations, Mining methods under various conditions, usage of explosives in a given conditions |
| | CO5 | Computation of powder factor, Shaft sinking methods under various mining conditions |

PO-CO Mapping

| Course Code: MNG-105 | | Course Title: Elements of Mining | | | No of Periods: 150 |
|----------------------|-------------------|-----------------------------------|----|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1,CO2,CO3 | 57 | 48 | 3 | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately Addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO 2 | CO3 | 23 | 19 | 1 | |
| PO 3 | | | | | |
| PO 4 | | | | | |
| PO 5 | CO2,CO3 | 40 | 33 | 2 | |
| PO 6 | | | | | |

| | | | | | |
|-------------|--|--|--|--|--|
| PO 7 | | | | | |
|-------------|--|--|--|--|--|

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | | | | | | | 1 |
| CO2 | 3 | | | | 2 | | | | 1 | 1 |
| CO3 | 3 | 1 | | | 2 | | | 1 | 1 | |
| CO4 | | | | | | | | | | |
| CO5 | | | | | | | | | | |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Upon completion of the course, student shall be able to:

1.0 Know the various Fundamental concepts of Mining and stages/phases in Mining

- 1.1 Explain the contribution of Mining activity in the cause of human civilization, national economy.
- 1.2 Status of mineral resources in India and in the world.
- 1.3 State the role of Mining engineer in the industry
- 1.4 List the various Mining industries in the state and in the country
- 1.5 Define the terms mine, mining, mining engineering, ore, ore deposits, waste/gangue, mineral, mineral deposits, Shaft, Incline and Adit, Haul road
- 1.6 List the various stages of mining operations: Pre- mining, Mining and Post-mining.
- 1.7 List the various pre-mining operations-Exploration, land acquisition, prospecting licence, de-vegetation, and initial ground treatment for future (Next stage) of Mining operations – Forming approach Roads.
- 1.8 List the various mining operation (Entry to deposit, development, exploitation, stopping/depillaring.)
- 1.9 List the various ancillary mining operations – (Strata control, transportation, ventilation, drainage, lighting, reclamation, soil or back filling.)
- 1.10 List the various post mining operations (beneficiation of mineral, concentration techniques, assaying and metallurgical operations.)
- 1.11 List different types of mode of entry to mineral deposits, and state applicability, limitations of the above

2.0 Know the concepts of Mining Methods.

- 2.1 Define the following terms with sketches
- 2.2 Out crop, Cover, overburden, back, vein, lode, ore shoot, coal measures, pit top, pit-bank, pit-bottom, shaft station, reserve station, rest station, mineral reserves, tunnel, cross cut, level, drive, staple pit, inset, gallery, heading, blind heading, face, dip, closures, slice, split, stook, barrier, sump, shaft, auxiliary shaft.

- 2.3 Give the classification of coal seams based on the thickness, depth, inclination, gassiness and wateriness.
- 2.4 Give the classification of methods of working coal in respect of underground and open cast mining
- 2.5 Compare underground mining vs opencast mining
- 2.6 Compare Shaft vs Incline

3.0 Know the Drilling methods.

- 3.1 State the purpose of drill holes in Mining.
- 3.2 Give the classification of drilling methods, selection criteria of each method and limitations
- 3.3 State the applicability of percussive and rotary drilling methods.
- 3.4 List the drilling tools and accessories used in percussive and rotary drilling and their purpose
- 3.5 Explain methods of percussive drilling, rotary drilling with sketches.
- 3.6 Describe the feed mechanism – Screw Feed and Hydraulic feed with sketches.
- 3.7 Define the terms mud flushing, sludge and core.
- 3.8 State the purpose of mud flushing and core recovery.
- 3.9 List the different methods of core recovery.
- 3.10 State the reasons for deviation of bore holes.

4.0 Understand the explosives

- 4.1 Define the term explosive, low explosive, high explosive, booster, primer, Permitted explosive and detonator.
- 4.2 State the uses of explosives for mining industry.
- 4.3 List and explain the characteristics of explosives
- 4.4 Classify the explosives based on strength, density
- 4.5 State the composition of low explosives and high explosives.
- 4.6 List the properties of low explosives and high explosives.
- 4.7 State their field of applications of low explosives and high explosives.
- 4.8 Compare the Low explosive vs High explosive.
- 4.9 Classify the Permitted explosives, the tests that a permitted explosive should pass through and state their applicability
- 4.10 Give the composition of permitted explosives with the examples un- sheathed, sheathed, ultra safe, and Blasting off the Solid (BOS) explosives.
- 4.11 List the types of initiation of explosives.
- 4.12 Describe the safety fuse and mention the field application of Safety fuse and Cordtex
- 4.13 Classify the detonators and state the composition of different detonators.
- 4.14 Describe the constructional details of a) Ordinary b) electric c) delay d) Nonel detonators and field application

5.0 Blasting practice in mines

- 5.1 Define solid blasting and state field of application
- 5.2 Define the term blasting
- 5.3 Explain the solid blasting and state rules and provisions related to solid blasting
- 5.4 Define the term induced blasting
- 5.5 Explain different blasting patterns for underground excavations
- 5.6 List the blasting tools used in the fuse and electric blasting and state their functions
- 5.7 Explain direct and inverse initiation with sketches

- 5.8 Define Blown-out shot, Socket, Misfire, Powder factor, Drilling ratio, Yield / Kg
- 5.9 State the causes, remedial measures, procedure for treating misfires
- 5.10 List the dangers associated with underground blasting
- 5.11 List precautions to be taken before and after blasting
- 5.12 Simple numerical problems to calculate a) Power factor b) yield per Kg of explosive.

6.0 Know the Method of shaft sinking.

- 6.1 List the factors to be considered for the selection of a shaft as a mode of entry
- 6.2 State the factors consider for selection of a site for shaft sinking.
- 6.3 List the necessary equipment required for sinking a shaft
- 6.4 List the different stages of shaft sinking.
- 6.5 Explain the different stages of sinking through normal strata.
- 6.6 Explain temporary supporting while sinking shaft.
- 6.7 List different permanent supporting methods of sinking shaft.
- 6.8 Classify the special methods of shaft sinking and their applicability's.
- 6.9 List the modern techniques used in shaft sinking

COURSE CONTENT:

1. Introduction and stages of Mining

Contribution of Mining activities of civilization-Definitions of terms –Mining Industries in the state and in the country. – Pre mining, mining and post-mining – ancillary mining operations, Types of entries to mineral deposits – Shaft, Incline, Adit –applicable conditions- limitations, compare shaft vs incline.

2. Concepts and Definition of terms commonly used in coal and non-coal mining

Classification of the mineral deposits basing on various factors, shallow, deep, very deep, steeply inclined, moderately inclined, inclined vein, massive deposits. Classification of coal seams- Thick, moderately thick, thin seams, I, II, III-degree gassy seams. Classification of methods of working coal-opencast, underground-Bord and Pillar/ longwall-Advancing and retreating.

3. Drilling methods

Use of drill holes – (Classification) methods – applicable conditions – tools used for drilling – percussive and rotary, feed mechanism – Screw feed and hydraulic feed mechanism – mud flushing – sludge and core, core recovery methods of core recovery – reasons for deviation of bore holes.

4. Explosives

Uses of explosives in mining industry, characteristics classification basing on strength, speed and application, low and high explosives, their composition, properties – explosives used in underground in opencast workings including LOX, slurries, boosters, primer – their composition application permitted explosives – tools, applicability, examples with their composition. Selection of explosives – factors, Initiation of explosives – fuses – safety fuse, cortex fuse. Detonators – types, composition, constructional details and applications.

5. Blasting practice in mines

Solid blasting- rules and provisions related-induced blasting-different types of blasting practice- different types of drill bits- tools –Reconditioning-Dangers and precaution measures of blasting, fuse and electric blasting and misfire dealing.

6. Shaft Sinking

Uses, factors for selection of site, different stages of sinking through subsoil, special methods.

Purpose of widening and deepening- special methods- modern trends

REFERENCE BOOKS:

1. Elements of Mining : D.J.DeshmukhVol-I
2. Winning and working coal : R.T.Deshmukh&D.J.DeshmukhVol-I
3. Explosives & Blasting Practice : Samir Kumar Das
4. Elements of Mining : D.J.Deshmukh Vol.-II
5. Explosives and Blasting practice : G.K.Pradhan
- 6 UMS. : VOLUME-I,II, III

Table specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|----------------|------------------------------|
| Unit Test –I | From 1.1 to 3.5 |
| Unit Test –II | From 3.6 to 5.3 |
| Unit Test -III | From 5.4 to 6.9 |

FUNDAMENTALS OF GEOLOGY

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|-------------------------|----------------------|---------------------|--------------|--------------|
| MNG-106 | Fundamentals of Geology | 05 | 150 | 20 | 80 |

TIME SCHEDULE

| S. No. | Major Topics | Periods | Weightage of Marks | No.of short questions | No. of Essay questions | CO's Mapped |
|--------|--------------------|------------|--------------------|-----------------------|------------------------|--------------|
| 1 | Introduction | 16 | 13 | 01 | 01 | CO1 |
| 2 | Physical Geology | 32 | 29 | 03 | 02 | CO1, CO2 |
| 3 | Mineralogy | 32 | 16 | 02 | 01 | CO2, CO3,CO5 |
| 4 | Petrology | 36 | 26 | 02 | 02 | CO3,CO4, CO5 |
| 5 | Structural Geology | 34 | 26 | 02 | 02 | CO4,CO5 |
| | Total | 150 | | | | |

Course Objectives and Course Outcomes

| | |
|--------------------------|--|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <p>Understand the scope and importance of Geology in mining</p> <p>Explain the formation of earth and its internal structure</p> <p>Understand various types of minerals and their composition</p> <p>Understand the formation of minerals and their mode of formation</p> <p>Explain the structural formation of minerals such as faults, folds, joints etc.</p> |
|--------------------------|--|

| | | |
|------------------------|-----|--|
| Course Outcomes | CO1 | Explain the Scope of geology, branches of Geology, applicability in Mining |
| | CO2 | Explain Internal structure of earth, and nature of formation. Different methods of formation of minerals and their composition |
| | CO3 | Describe the Categorization of various minerals, nature of formation, and their composition |
| | CO4 | Explain Formation of minerals under various conditions |
| | CO5 | Describe the Structural formation of minerals such as faults, folds. Dykes, sill discontinuity, |

PO-CO Mapping

| Course Code: MNG 106 | | Course Title: Fundamentals of Geology | | | No of Periods: 150 |
|----------------------|-------------------|---------------------------------------|----|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1,CO2,CO3,CO4 | 60 | 50 | 3 | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately Addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO 2 | CO3,CO5 | 30 | 25 | 2 | |
| PO 3 | | | | | |
| PO 4 | | | | | |
| PO 5 | | | | | |
| PO 6 | | | | | |
| PO 7 | CO3,CO5 | 30 | 25 | 2 | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | | | | | | | 1 |
| CO2 | 3 | | | | | | | | | 1 |
| CO3 | 3 | 2 | | | | | 2 | | 2 | 1 |
| CO4 | 3 | | | | | | | | | 1 |
| CO5 | | 2 | | | | | 2 | | 2 | |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Upon completion of the course, student shall be able to:

1.0 Know the scope, uses and general aspects of Geology

- 1.1 Define the term Geology
- 1.2 Explain the scope of Geology

- 1.3 Mention the different branches of Geology
- 1.4 State the uses of geology in Mining field.
- 1.5 Explain the origin of the Earth
- 1.6 Explain the Nebular hypothesis of Kant and Laplace
- 1.7 Name the important methods to determine the age of the Earth.
- 1.8 Explain the Age of the earth.
- 1.9 List the common radio metric methods – Potassium-Argon, Rubidium-Strontium, Uranium-Lead and Radiocarbon method
- 1.10 Describe the internal structure of the Earth

2.0 Understand the physical Geology

- 2.1 Define the physical Geology
- 2.2 Define the terms Erosion, Deflation, Abrasion, Attrition and Denudation
- 2.3 Define the terms Weathering
- 2.4 Explain types of Weathering (Mechanical and Chemical Weathering)
- 2.5 Explain different factors responsible for Weathering.
- 2.6 Describe the Geological work of wind, River.
- 2.7 Define the Earthquakes and related terms
- 2.8 Explain the formation of an earth quake
- 2.9 State the different types and effects of earth quakes
- 2.10 Define the Volcanoes and related terms
- 2.11 State the classification of Volcanoes.

3.0 Develop the Fundamental concepts of Mineralogy

- 3.1 Define the terms Mineral and Mineralogy
- 3.2 Explain the Physical properties of minerals- Form, Colour, Streak, Cleavage, Luster, Fracture, Specific Gravity and Hardness
- 3.3 List the important Minerals of Quartz, Olivine, Amphiboles, Pyroxenes, Feldspar and Mica family
- 3.4 Explain the megascopic properties of Minerals viz., Form, Colour, Streak, Cleavage, Lustre, Fracture, Specific gravity, Hardness with suitable examples.
- 3.5 List the industrial uses of following Metallic Minerals: Corundum, Chromite, Hematite, Magnetite, Bauxite, Chalcopyrite, Malachite, and Kyanite.
- 3.6 List the industrial uses of following Non-Metallic Minerals.
Mica, Barites, Graphite, Calcite, Gypsum, Apatite, Ball clay, China clay, Fire clay, Quartz
- 3.7 List the industrial uses of following Precious and Atomic Minerals: Diamond, Topaz, Uranium, Zirconium Monazite, Beryllium.
- 3.8 State the occurrence and distribution of important Minerals in India and A. P.
- 3.9 List the various mineral based Industries in India and A.P.

4.0 Develop the fundamental concepts of Petrology

- 4.1 Define the terms Petrology, lava and magma
- 4.2 State the characteristics of Igneous, Sedimentary and Metamorphic rocks.
- 4.3 Explain the origin of Igneous Rocks.
- 4.4 Explain Forms, Textures and structures of Igneous rocks.

- 4.5 State the classification of Igneous rocks
- 4.6 Describe the following rocks 1) Granite 2) Rhyolite 3) Gabbros 4) Basalt 5) Dolerite 6) Pegmatite
- 4.7 State the classification of Sedimentary rocks and explain the structure , formation of Sedimentary rocks.
- 4.8 Describe the following Sedimentary rocks
1) Breccia 2) Conglomerate 3) Sand stone 4) Shale 5) Lime stone 6) Dolomite
- 4.9 Define the terms Metamorphism and Metamorphic rocks.
- 4.10 State the different kinds of Metamorphism and metamorphic agents
- 4.11 Describe important textures and structures of metamorphic rocks.
- 4.12 Describe the following Metamorphic rocks
i) Gneisses ii) Schist iii) Phyllite iv) Slate v) Quartzite vi) Charnockite

5.0 Develop the Fundamental concepts of structural Geology

- 5.1 Define the term Structural Geology.
- 5.2 Describe the primary structures of rock formations.
- 5.3 State the terms Bedding, Dip, True Dip, Apparent Dip, Strike, Overlap, Inlier, Outlier.
- 5.4 Explain the Fold and it's components with sketches.
- 5.5 Describe different kinds of Folds
- 5.6 Describe the Fault and it's components with sketches.
- 5.7 Describe different kinds of Faults with sketches.
- 5.8 Define the term Joints and Unconformities.
- 5.9 Explain various kinds of Unconformities
- 5.10 State the significance of Unconformities.

COURSE CONTENT:

1. **Introduction:** Definition, Scope, Classification & Uses of Geology in Mining field, Origin of Earth, Nebular hypothesis of Kant and Laplace, Age of earth, its determination internal structure of earth.
2. **Physical Geology:** Definition, weathering, erosion denudation, Attrition, Erosion – Geological work of wind, river and their products, Earth quakes, volcanoes.
3. **Mineralogy:** Terms-Minerals-Mineralogy-Important Minerals- Quartzite-Olivine, Amphiboles, Pyroxenes, Feldspar, Mica Group. Megascopic Properties of minerals, Form, Colour, Streak, Clearage, Lustre, Fracture, Specific Gravity, Hardness. Industrial Uses of Metallic Minerals: Corundum, Chromite, Hematite, Magnetite, Bauxite, Barites Chalcopyrite, Malachite, Kyanite. Industrial uses of Non-Metallic Minerals: Mica, Graphite, Calcite, Gypsum, Apatite, Ball clay, China clay, Fire clay, Quartz. Industrial uses of Precious and Atomic Minerals viz.,Diamond, Topaz, Uranium, Zirconium Monazite, and Beryllium. Occurrence and Distributions of Minerals in Andhra Pradesh. Minerals based industries in A.P. Occurrence and Distributions of Minerals India. Minerals based industries in India.
4. **Petrology:** Lava, Magma, Petrology. Classification of Rocks-Igneous, Sedimentary and Metamorphic .Forms, textures and structures of Igneous Rocks-Granite, Rhyolite, Gabbros, Basalt, Dolomite, Pegmatite. Formation of Sedimentary Rocks – Classification – Breccia, Conglomeration, Sandstone,

Shale, Limestone, Dolomite- Metamorphosis – Metamorphic Rocks – Gneiss, Schist, Phyllite, Slate, Quartzite, Charnockite

5. **Structural Geology:** Primary and secondary structure of rock formation, terms-bedding, Dip, True Dip, Apparent Dip, Strike, Overlap, Inlier, and Outlier. Fold and its components. Types of Folds. Different Kinds of faults, joints, Unconformities and their types.

REFERENCE BOOKS:

1. Physical Geology : A.K.Datta.
2. Engg. Geology : Parbingsingh.
3. Introduction to Geology : A.K. Mukharjee.
4. Principles of petrology : G.W. Tyrell

Table specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|----------------|------------------------------|
| Unit Test –I | From 1.1 to 2.11 |
| Unit Test –II | From 3.1 to 4.6 |
| Unit Test –III | From 4.7 to 5.10 |

Engineering Drawing

| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|-------------|---------------------|-------------------------|----------------------|--------------------------------|--------------------------------|
| MNG-107 | ENGINEERING DRAWING | 06 | 180 | 40 | 60 |

| S.No | Major Topics | Periods | COs Mapped |
|------|---|------------|------------|
| 1 | Importance of Engineering Drawing | 01 | CO1 |
| 2 | Engineering Drawing Instruments | 05 | CO1 |
| 3 | Free hand lettering & Numbering | 06 | CO1 |
| 4 | Dimensioning Practice | 09 | CO1 |
| 5 | Geometrical constructions | 21 | CO2 |
| 6 | Projections of points, Lines, Planes & Solids | 21 | CO3 |
| 7 | Auxiliary views | 6 | CO3 |
| 8 | Sections of Solids | 27 | CO3 |
| 9 | Orthographic Projections | 33 | CO3 |
| 10 | Isometric Views | 30 | CO4 |
| 11 | Development of surfaces | 21 | CO5 |
| | Total | 180 | |

COURSE OBJECTIVES:

| | |
|---|---|
| Upon completion of the course the student shall able to | |
| Course Objectives | understand the basic graphic skills and use them in preparation of engineering drawings, their reading and interpretation |

COURSE OUTCOMES:

| | | | |
|------------------------|-----|-----------|---|
| Course Outcomes | CO1 | MNG-107.1 | Practice the use of engineering drawing instruments and Familiarise with the conventions to be followed in engineering drawing as per BIS |
| | CO2 | MNG-107.2 | Construct the i) basic geometrical constructions ii) engineering curves |
| | CO3 | MNG-107.3 | Visualise and draw the orthographic projections of i) Points ii) Lines iii) Regular Planes iv) Regular Solids V) Sections of Regular Solids . |
| | CO4 | MNG-107.4 | Visualise and draw the isometric views of objects . |
| | CO5 | MNG-107.5 | Draw the developments of surfaces of regular solids and thereby the components used in daily applications |

LEARNING OUTCOMES:

| | |
|--------------------------|--|
| Learning Outcomes | <p>1.0 Understand the basic concepts of Engineering Drawing</p> <p>1.1 State the importance of drawing as an engineering communication medium</p> <p>1.2 State the necessity of B.I.S. Code of practice for Engineering Drawing.</p> <p>1.3 Explain the linkages between Engineering drawing and other subjects of Mechanical Engineering</p> <p>2.0 Use of Engineering Drawing Instruments</p> <p>2.1 Select the correct instruments to draw the different lines / curves</p> <p>2.2 Use correct grade of pencil to draw different types of lines and for different purposes</p> <p>2.3 Select and use appropriate scales for a given application.</p> <p>2.4 Identify different drawing sheet sizes as per I.S. and Standard Lay- outs.</p> <p>2.5 Prepare Title block as per B.I.S. Specifications.</p> <p>2.6 Identify the steps to be taken to keep the drawing clean and tidy.</p> <p>Drawing Plate 1: (Having two exercises)</p> <p>3.0 Write Free Hand Lettering and Numbers</p> <p>3.1 Write titles using sloping lettering and numerals of 7mm, 10mm and 14mm height</p> <p>3.2 Write titles using vertical lettering and numerals of 7mm, 10mm and</p> |
|--------------------------|--|

| | |
|--|---|
| | <p>14mm height</p> <p>3.3 Select suitable sizes of lettering for different layouts and applications</p> <p>Drawing plate 2: (Having 5 to 6 exercises)</p> <p>4.0 Understand Dimensioning Practice</p> <p>4.2 Acquaint with the conventions, notations, rules and methods of dimensioning in engineering drawing as per the B.I.S.</p> <p>4.5 Dimension a given drawing using standard notations and desired system of dimensioning.</p> <p>Drawing Plate 3: (Having 08 to 10 exercises)</p> <p>5.0 Apply Principles of Geometric Constructions</p> <p>5.1 Practice the basic geometric constructions like</p> <ul style="list-style-type: none"> i) dividing a line into equal parts ii) exterior and interior tangents to the given two circles iii) tangent arcs to two given lines and arcs <p>5.2 Draw any regular polygon using general method when</p> <ul style="list-style-type: none"> i) side length is given ii) inscribing circle radius is given iii) describing circle radius is given <p>2.2 Draw the conics using general and special methods,</p> <p>2.3 Draw the engineering curves like i) involute</p> <ul style="list-style-type: none"> ii) cycloid iii) helix <p>5.4 Identify the applications of the above constructions in engineering practice.</p> <p>Drawing Plate -4: Having problems up to construction of polygon</p> <p>Drawing Plate -5: Having problems of construction of conics</p> <p>Drawing Plate -6: Having problems of construction of involutes, cycloid and helix</p> <p>6.0 Apply Principles of Projection of points, lines, planes & auxiliary planes</p> <p>6.1 Explain the basic principles of the orthographic projections</p> <p>6.2 Visualise and draw the projection of a point with respect to reference planes (HP & VP)</p> <p>6.3 Visualise and draw the projections of straight lines with respect to two reference planes (up to lines parallel to one plane and inclined to other plane)</p> <p>6.4 Visualise and draw the projections of planes (up to planes perpendicular to one plane and inclined to other plane)</p> <p>6.5 Identify the need of Auxiliary views for a given engineering drawing.</p> <p>6.5 Draw the auxiliary views of a given engineering component</p> <p>Drawing Plate -7: Having problems up to projection of points and Lines (15 exercises)</p> <p>Drawing Plate -8: Having problems of projection of planes (6 exercises)</p> |
|--|---|

| | |
|--|--|
| | <p>Drawing Plate -9: Having problems on auxiliary planes (Having 4 exercises)</p> <p>7.0 Draw the Projections of Solids</p> <p>7.1 Visualise and draw the projections of solids (up to axis of solids parallel to one plane and inclined to other plane)</p> <p>Drawing plate No.10: Having problems of projection of solids (10 exercises)</p> <p>8.0 Appreciate the need of Sectional Views</p> <p>8.1 Identify the need to draw sectional views.</p> <p>8.4 Differentiate between true shape and apparent shape of section</p> <p>8.5 Draw sectional views and true sections of regular solids by applying the principles of hatching.</p> <p>Drawing Plate–11: Having problems of section of solids (6 exercises)</p> <p>9.0 Apply principles of orthographic projection</p> <p>9.1 Draw the orthographic views of an object from its pictorial drawing.</p> <p>9.2 Draw the minimum number of views needed to represent a given object fully.</p> <p>Drawing Plate 12 : (Having 10 to 12 exercises)</p> <p>10.0 Prepare pictorial drawings</p> <p>10.1 identify the need of pictorial drawings.</p> <p>10.2 Differentiate between isometric scale and true scale.</p> <p>10.3 Prepare Isometric views for the given orthographic drawings.</p> <p>Drawing plate 13: (Having 10 to 12 exercises)</p> <p>11.0 Interpret Development of surfaces of different solids</p> <p>11.1 State the need for preparing development drawing.</p> <p>11.2 Draw the development of simple engineering objects (cubes, prisms, cylinders, cones, pyramid) using parallel line and radial line method.</p> <p>11.3 Prepare development of surface of engineering components like i) funnel ii) 90° elbow</p> <p>Drawing plate No. 14: (Having 05 exercises)</p> |
|--|--|

PO-CO Mapping

| Course Code : MNG-107 | Course Title ENGINEERING DRAWING Number of Course Outcomes: 06 | | | | No. of Periods 180 |
|--------------------------|---|--|----|------------------|---|
| POs | Mapped with CO No. | CO Periods addressing PO in Column 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1, CO2, CO3, CO4, CO5 | 12 | 7 | 1 | >40% Level.3 (Highly addressed) 25% - 40% Level.2 (Moderately addressed) |
| PO2 | CO1, CO2, CO3, CO4, CO5 | 12 | 7 | 1 | |
| PO3 | CO1, CO2, CO3, CO4, CO5 | 72 | 40 | 3 | |
| PO4 | CO1, CO2, CO3, CO4, CO5 | 72 | 40 | 3 | |
| PO5 | | | | | 5% - 25% Level.1 (Low addressed) <5% Not addressed |
| PO6 | CO1, CO2, CO3, CO4, CO5 | 12 | 6 | 1 | |
| PO7 | | | | | |

CO-PO Mapping

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---------|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | 2 | 3 | 3 | | 2 | | 1 | 2 | 2 |
| CO2 | 2 | 3 | 3 | 3 | | 2 | | 1 | 2 | 2 |
| CO3 | 3 | 2 | 3 | 3 | | 3 | | 1 | 2 | 2 |
| CO4 | 3 | 2 | 3 | 3 | | 3 | | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | | 3 | | 2 | 2 | 2 |
| Average | 2.6 | 2.2 | 3 | 3 | | 2.6 | | 1.4 | 2 | 2 |

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz
(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

Key competencies to be achieved by the student

| S.No | Major topic | Key Competency |
|------|--|---|
| 1. | Importance of Engineering Drawing | <ul style="list-style-type: none"> Explain the linkages between Engineering drawing and other subjects of study in Diploma course. |
| 2. | Engineering Drawing Instruments | <ul style="list-style-type: none"> Select the correct instruments to draw various entities in different orientation |
| 3. | Free hand lettering & Numbering | <ul style="list-style-type: none"> Write titles using sloping and vertical lettering and numerals as per B.I.S (Bureau of Indian standards) |
| 4. | Dimensioning Practice | <ul style="list-style-type: none"> Dimension a given drawing using standard notations and desired system of dimensioning |
| 5. | Geometrical construction | <ul style="list-style-type: none"> Construct ellipse, parabola, rectangular hyperbola, involute, cycloid and helix from the given data. |
| 6. | Projection of points, Lines, Planes & Solids | <ul style="list-style-type: none"> Draw the projections of points, straight lines, planes & solids with respect to reference planes (HP& VP) |
| 7. | Auxiliary views | <ul style="list-style-type: none"> Draw the auxiliary views of a given Engineering component Differentiate between Auxiliary view and apparent view |
| 8. | Sections of Solids | <ul style="list-style-type: none"> Differentiate between true shape and apparent shape of section Apply principles of hatching. Draw simple sections of regular solids |
| 9. | Orthographic Projection | <ul style="list-style-type: none"> Draw the minimum number of views needed to represent a given object fully. |
| 10. | Pictorial Drawings | <ul style="list-style-type: none"> Differentiate between isometric scale and true scale. Draw the isometric views of given objects,. |
| 11. | Development of surfaces | <ul style="list-style-type: none"> Prepare development of Surface of regular solids and other components like i) funnel ii) 90° elbow |

COURSE CONTENT

NOTES:

1. **B.I.S Specification should invariably be followed in all the topics.**
2. **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

1.0 The importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46 –1988 – Mention B.I.S - Role of drawing in -engineering education – Link between Engineering drawing and other subjects of study.

2.0 Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description -Scales: Recommended scales reduced & enlarged -Lines: Types of lines, selection of line thickness - Selection of Pencils -Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet, Drawing plate: Lay out of sheet – as per SP-46-1988 to a suitable scale - Simple Exercises on the use of Drawing Instruments. Importance of Title Block.

3.0 Free hand lettering & numbering

Importance of lettering – Types of lettering -Guide Lines for Lettering - Practicing of letters & numbers of given sizes (7mm, 10mm and 14mm) -Advantages of single stroke or simple style of lettering - Use of lettering stencils

4.0 Dimensioning practice

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object -Definition of Dimensioning size description -Location of features, surface finish, fully dimensioned Drawing -Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools -Placing dimensions: Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions Chain, parallel, combined progressive, and dimensioning by co-ordinate methods-The rules for dimensioning standard, features “Circles (holes) arcs, angles, tapers, chamfers, and dimension of narrow spaces.

5.0 Geometric Construction

Division of a line: to divide a straight line into given number of equal parts -Construction of tangent lines: to draw interior and exterior tangents to two circles of given radii and centre distance - Construction of tangent arcs: -i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles)-ii)Tangent arc of given radius touching a circle or an arc and a given line-iii)Tangent arcs of radius R, touching two given circles internally and externally - Construction of polygon: construction of any regular polygon by general method for given side length, inscribing circle radius and describing/superscribing circle radius - Conics: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and a loci of a moving point, Eccentricity of above curves – Their Engg. Applicationsviz.,Projectiles, reflectors, P-V Diagram of a Hyperbolic process - Construction of any conic section of given eccentricity by general method -Construction of ellipse by concentric circles method, Oblong Method and Arcs of circles method -Construction of parabola by rectangle method and Tangent method -Construction of rectangular hyperbola - General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point -their engineering application, viz., Gear tooth profile, screw threads, springs etc. –their construction

6.0 Projection of points, lines and planes & solids

Classification of projections, Observer, Object, Projectors, Projection, Reference Planes, Reference Line, Various angles of projections – Differences between first angle and third angle projections - Projections of points in different quadrants - Projections of straight line – (a) Parallel to both the planes (b) Perpendicular to one of the planes (c) Inclined to one plane and parallel to other planes - Projections of regular planes - (a) Plane parallel to one of the reference planes - (b) Plane perpendicular to HP and inclined to VP and vice versa - Projections of regular solids - (a) Axis perpendicular to one of the planes (b) Axis parallel to VP and inclined to HP and vice versa.

7.0 Auxiliary views

Need for drawing auxiliary views - Explanation of the basic principles of drawing an auxiliary view explanation of reference plane and auxiliary plane - Partial auxiliary view.

8.0 Sections of Solids

Need for drawing sectional views – what is a sectional view - Hatching – Section of regular solids inclined to one plane and parallel to other plane

9.0 Orthographic Projections

Meaning of orthographic projection - Using a viewing box and a model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object - Concept of front view, top view, and side view sketching these views for a number of engg objects - Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given - Method of representing hidden lines - Selection of minimum number of views to describe an object fully.

10.0 Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and Perspective and their use - Isometric drawings: Iso axis, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and ordinary scale difference between Isometric view and Isometric projection - Isometric and non-Isometric lines - Isometric drawing of common features like rectangles, circular - shapes, non-isometric lines - Use of box and offset methods.

11.0 Development of Surfaces

Need for preparing development of surface with reference to sheet metal work - Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal and parallel to the other - Development of simple solids like cubes, prisms, cylinders, cones, pyramid and truncation of these solids - Types of development: Parallel line and radial line development - Procedure of drawing development of funnels, 90° elbow pipes.

REFERENCE BOOKS:

- | | |
|---|---|
| 1. P I Varghese | : Engineering Graphics – (McGraw-hill) |
| 2. Basant Agarwal & C.M Agarwal | : Engineering Drawing - (McGraw-hill) |
| 3. N.D.Bhatt | : Engineering Drawing . |
| 4. T.S.M. & S.S.M on “ Technical Drawing” | : T.T.T.I., Madras. |
| 5. SP-46-1998 | : Bureau of Indian Standards. |

WORKSHOP PRACTICE

| Course code | Course title | No. of periods/week | Total no.of periods | Marks for FA | Marks for SA |
|-------------|-------------------|---------------------|---------------------|--------------|--------------|
| MNG-108 | Workshop practice | 3 | 90 | 40 | 60 |

| S.No. | Major Topics | No. of periods |
|--------------|--------------------------|----------------|
| 1. | Carpentry | 24 |
| 2. | Fitting and welding | 36 |
| 3. | Basic machine operations | 22 |
| 4. | Plumbing | 08 |
| TOTAL | | 90 |

| Course title : Workshop Practice | | |
|----------------------------------|--|--|
| Course Objectives | (i) To familiarize with the knowledge different materials tools used in general Engineering processes (ii) To use various basic implements used in general Engineering processes (iii) To know the etiquette of working with the fellow workforce (iv) To reinforce theoretical concepts by conducting relevant experiments/exercises | |
| Course Outcomes | C01 | Demonstrate the skill of planning and organizing experimental set up for a desired purpose |
| | C02 | Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems |
| | C03 | Observe various parameters, their variations and graphically represent the same |
| | C04 | Analyse the experimental results to draw inferences to make recommendations |
| | C05 | Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group |

Learning outcome

- 1.0 Use of different tools in Carpentry, Fitting, Welding and Turning section of workshop.
- 2.0 Prepare various carpentry joints, panel boards and cabinet boxes.
- 3.0 Hacksaw cutting, grinding, thread cutting for metal conduit; G.I. Pipes and rods etc, in fitting section.
- 4.0 Handle welding transformer and make lap and butt joints.
- 5.0 Exercise on lathe like simple turning, step turning, taper turning and knurling.
- 6.0 Exercise on thread cutting for pipes and rods on Lathes.
- 7.0 Hand drilling machines and grinding machine.
- 8.0 Know the basics of plumbing work and applications.
- 8.1 Know the types of pipe joints.
 - Understand the symbols.
 - Know the materials used pipes.
 - Assembling, threading, joining of pipes.
 - Able to understand cross, T, L joints etc.

COURSE CONTENT

Following list of experiments are to be made by every student in the workshop

1. CARPENTRY

1. Exercises on planning, sawing and chiseling
2. Prepare a half lap joint
3. Prepare a Dovetail joint.
4. Prepare a Mortise joint.
5. Prepare a 20 cm X 15 cm Teakwood switch board with hinges and bottom hook.
6. Fix the laminate sheet to the above box and cut suitable holes to mount tone flush type switch, socket.

2. FITTING AND WELDING

1. Exercises to cut a metal conduit, G.I. Pipe and solid rod using hack saw.
2. 3 & 4 Thread cutting of G.I. pipe, metal conduit and solid rod using Die set.
5. & 6. Internal thread cutting using Tap set and cleaning the threads using reamers and make a hexagonal nut from a round rod.

WELDING

1. Prepare a job and to make a lap joint and finish it using grinder.
2. Prepare a job and make a butt joint and finish it with grinder.
3. Prepare the job and make 'T' joint.

3. MACHINE SHOP

Exercise on turning the given rod to get three different diameters using lathe.

Make a bolt and cut threads using lathe.

Cut the threads to G.I. Pipe using lathe.

Prepare a centre punch and knurl its head.

Make a square plate using power hack saw, remove sharp edges using grinder, make triangle and drill three holes of different diameters at the vertices.

4. PLUMBING

Plumbing work and applications

1. Types of pipe joints.
2. Symbols
3. Materials used for pipes
4. Assembling, Threading, Joining of pipes.
5. Different fittings such as cross, L, T etc.,

Scheme of Valuation for end Lab Practical Examination :

| | |
|---|--------------------------|
| A. Writing Aim, Apparatus, Formula, Graph, Precautions carries | 10 (Ten) Marks |
| B. For Drawing the table, taking Readings, Calculation work, Drawing the graph, finding result carries | 15 (Fifteen) Marks |
| C. Viva Voice | 05 (Five) Marks |
| Total | 30 (Thirty) Marks |

ENGINEERING PHYSICS LAB

| SUBJECT | SUBJECT CODE | TOTAL PERIODS | NUMBER OF PERIODS PER WEEK |
|-------------|--------------|---------------|-------------------------------|
| PHYSICS LAB | MNG -109 | 45 | 03 |

| | |
|--------------------------|--|
| Course objectives | (1) To provide strong practical knowledge of Physics to serve as a tool for various device applications in Engineering. (2) To enhance scientific skills of the students by incorporating new experiments so as to enrich the technical expertise of the students as required for industries. |
|--------------------------|--|

| | | |
|----------------------------|-----|--|
| COURSE OUTCOMES | CO1 | Improving accuracy in various measurements; understanding the nature of the forces keeping the body in equilibrium. |
| | CO2 | Estimating the acceleration caused by the gravity of earth; Practical study of the concepts of refraction of light at curved/plane surface |
| | CO3 | Understanding the pressure of the gas as function of its volume; study of the combined magnetic field of the earth and an artificial magnet to estimate its pole strength; Estimating the velocity of sound in air through resonance phenomenon. |
| | CO4 | Applying Kirch off's laws to evaluate the specific resistance of a wire; Study of exchange of heat from system to surrounding by graphical analysis; Conversion of light energy to micro currents as potential engineering application. |

CO-PO MAPPING

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3 | 2 | 2 | 2 | 2 | 1 | 2 |
| CO2 | 3 | | 1 | 1 | 1 | 1 | 1 |
| CO3 | 3 | 2 | | | 1 | | |
| CO4 | 3 | 2 | 2 | | | 1 | 2 |

CO-PO Mapping Strength

| Course code Common - 109 | Engineering Physics No of Course Objectives : 4 | | | | No of periods 45 |
|-----------------------------|--|-----------------------------------|--------|-------------|---|
| POs | Mapped with CO No | CO periods addressing PO in Col 1 | | Level 1,2,3 | remarks |
| | | NO | % | | |
| PO1 | CO1,CO2,CO3,CO4 | 15 | 33.3 % | 2 | >40% level 3 (highly addressed) 25% to 40% level 2 (moderately addressed) 5% to 25% level 1 (Low addressed) < 5% (not addressed) |
| PO2 | CO1,CO3, CO4 | 8 | 17.8% | 1 | |
| PO3 | CO1, CO2, CO4 | 6 | 13.3% | 1 | |
| PO4 | CO1, CO2 | 3 | 6.7% | 1 | |
| PO5 | CO1,CO2, CO3 | 5 | 11.1% | 1 | |
| PO6 | CO1, CO2, CO4 | 3 | 6.7% | 1 | |
| PO7 | CO1, CO2, CO4 | 5 | 11.1% | 1 | |

3 = strongly mapped, 2 = moderately mapped, 1 = slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following.

- | | | |
|--------------------------|-----------------------|-------------------------------|
| (i) Seminars | (ii) Viva-voce | (iii) Assignments |
| (iv) Quiz competitions | (v) Industrial visits | (vi) Tech fest |
| (viii) Group discussions | (ix) Virtual labs | (vii) Mini project |
| | | (x) Library visit for e-books |

ENGINEERING PHYSICS LAB

Subject Title : Engineering Physics Lab
Subject Code : MNG-109
Periods per week : 03
Total periods per year : 45

TIMESCHEDULE

| S.No | List of experiments | No.of Periods |
|------|---|---------------|
| 1. | Vernier calipers | 03 |
| 2. | Micrometer (Screw gauge) | 03 |
| 3. | Verification of Lami's theorem using concurrent forces | 03 |
| 4. | Determination of 'g' using simple pendulum | 03 |
| 5. | Focal length and focal power of convex lens | 03 |
| 6. | Refractive index of solid using travelling microscope | 03 |
| 7. | Verification of Boyle's law using Quill tube | 03 |
| 8 | Determination of pole strength of the bar magnet through magnetic field lines | 03 |
| 9 | Resonance apparatus – Determination of velocity of sound in air | 03 |
| | Experiments for demonstration | |
| 10 | Meter bridge – Determination of resistance and specific resistance of a wire | 03 |
| 11 | Verification of Newton's law of cooling | 03 |
| 12 | Photo electric cell – Study of its characteristics | 03 |
| | Revision | 06 |
| | Test | 03 |
| | Total: | 45 |

Learning Outcomes

Upon completion of the course the student shall be able to

- 1.0 Practice with Vernier calipers to determine the volumes of cylinder and sphere.
- 2.0 Practice with Screw gauge to determine thickness of a glass plate and cross sectional area of a wire.
- 3.0 Verify the Lami's theorem using concurrent forces.

- 4.0 Determine the value of acceleration due to gravity (g) using Simple Pendulum. To verify the result from $I-T^2$ graph.
- 5.0 Calculate the Focal length and focal power of convex lens using distant object method and U-V method. To verify the result from U-V graph and $1/U - 1/V$ graph methods.
- 6.0 Determine the refractive index of a solid using travelling microscope
- 7.0 Verify the Boyle's law using Quill tube. To draw a graph between P and $1/l$.
- 8.0 Determination of magnetic pole strength of a bar magnet by drawing magnetic lines of force and locating null points (either N - N or N - S method)
- 9.0 Determine the velocity of sound in air at room temperature and its value at zero degree Centigrade using resonance apparatus.
- 10.0 Determine the resistance and specific resistance of material of a wire using Meter Bridge
- 11.0 To verify the Newton's law of cooling.
- 12..0 To study the characteristics of photo electric cell.

Course Outcomes

| S.No | List of experiments | No.of Periods | COs |
|------|---|---------------|-----|
| 1. | Vernier calipers | 03 | CO1 |
| 2. | Micrometer (Screw gauge) | 03 | |
| 3. | Verification of Lami's theorem using concurrent forces | 03 | |
| 4. | Determination of g using simple pendulum | 03 | CO2 |
| 5. | Focal length and power of convex lens | 03 | |
| 6. | Refractive index of solid using travelling microscope | 03 | |
| 7. | Verification of Boyle's law using Quill tube | 03 | CO3 |
| 8 | Determination of pole strength of the bar magnet through magnetic field lines | 03 | |
| 9 | Resonance apparatus – Determination of velocity of sound in air | 03 | |
| 10 | Meter bridge – Determination of resistance and specific resistance of a wire | 03 | CO4 |
| 11 | Verification of Newton's law of cooling | 03 | |
| 12 | Photo electric cell – Study of its characteristics | 03 | |

Competencies and Key competencies to be achieved by the student

| Name of the Experiment (Nu | Competencies | Key competencies |
|---|--|---|
| 1 . Practice on Vernier Calipers (03) | <ul style="list-style-type: none"> Find the Least count Fix the specimen in position Read the scales Calculate the physical quantities of given object | <ul style="list-style-type: none"> Read the scales Calculate the requisite physical quantities of given objects Calculating volumes of the cylinder and sphere |
| 2. Practice on Screw gauge(03) | <ul style="list-style-type: none"> Find the Least count Fix the specimen in position Read the scales Calculate thickness of glass plate and cross section of wire from radius | <ul style="list-style-type: none"> Read the scales Noting zero error Calculate thickness of given glass plate Calculate cross section of wire from radius |
| 3. Verification of Lami's theorem forces(03) | <ul style="list-style-type: none"> Making experimental set up Fix suitable weights Note the positions of threads on drawing sheet Find the angles between the concurrent forces Changing weights appropriately Verify Lami's theorem | <ul style="list-style-type: none"> Measuring angles between the forces Marking the directions of forces on a paper Verifying Lami's theorem from the weights and measured angles between the forces. |
| 4. Simple pendulum(03) | <ul style="list-style-type: none"> Fix the simple pendulum to the stand Adjust the length of pendulum Find the time for number of oscillations (say 20) Find the time period Calculate the acceleration due to gravity Draw $I-T^2$ graph | <ul style="list-style-type: none"> Find the time for number of oscillations Find the time period Calculate the acceleration due to gravity Verify form $I-T^2$ graph |
| 5. Focal length and Focal power of convex lens (03) | <ul style="list-style-type: none"> Fix the object distance Find the Image distance Calculate the focal length and power of convex lens Draw u-v and $1/u - 1/v$ graphs | <ul style="list-style-type: none"> Find focal length from distant object method. Calculate the focal length and power of convex lens Verify result from u-v and $1/u - 1/v$ graphs |

| | | |
|--|--|--|
| 6 Refractive index of solid using traveling microscope(03) | <ul style="list-style-type: none"> Find the least count of Vernier on microscope Place the graph paper below microscope Read the scales | <ul style="list-style-type: none"> Reading the scales on Microscope. Finding real and apparent thickness of the slab Calculate the refractive |
| 7 . Boyle's law verification (03) | <ul style="list-style-type: none"> Note the atmospheric pressure Fix the Quill tube to retort stand Find the length of air column Find the pressure of enclosed air Find and compare the calculated values of $P \times l$ | <ul style="list-style-type: none"> Fixing Quill tube in various positions on retort stand. Find the length of air column Find the pressure of enclosed air Find the values of $P \times l$ Verify Boyle's law. |
| 8. Mapping of magnet lines of force (03) | <ul style="list-style-type: none"> Draw magnetic meridian Place the bar magnet in N-N or N-S directions Draw magnetic lines of force Locate the neutral points | <ul style="list-style-type: none"> Draw the pattern of magnetic lines of force Locate the neutral points Calculating pole strength of the bar magnet |
| 9. Velocity of sound in air – Resonance method (03) | <ul style="list-style-type: none"> Arrange the resonance apparatus Adjust the reservoir level for booming sound Find the first and second resonating lengths Calculate velocity of sound . | <ul style="list-style-type: none"> Adjust the reservoir level Find the first and second resonating lengths Calculate velocity of sound at room temperature and at 0°C |
| 10. Meter bridge(03) | <ul style="list-style-type: none"> Make the circuit connections Find the balancing length Calculate unknown resistance Find the radius of wire Calculate the specific resistance | <ul style="list-style-type: none"> Making connections as per circuit diagram. Find the balancing length Calculate unknown resistance Calculate the specific resistance of the given wire |

| | | |
|---|---|--|
| 11. Verification of Newton's law of Cooling (03) | <ul style="list-style-type: none"> • Heating liquid in a beaker using a heating element • Inserting thermometer in liquid in calorimeter • Stirring liquid • Measuring temperatures as a function of time using thermometer • Plotting a cooling curve | <ul style="list-style-type: none"> • Measuring temperature of a liquid as function of time. • Plotting a cooling curve. • Verifying Newton's law of cooling. |
| 12. Photo electric cell – Study of its Characteristics (03) | <ul style="list-style-type: none"> • Experimental set up and making connections • Verifying intensity of light by varying distances between light source and photocell. • Measuring Voltage and current values. | <ul style="list-style-type: none"> • Making connections for experimental set up. • Varying distances appropriately • Measuring Voltage and current values. • Study of V- I Characteristics form graph. |

Scheme of Valuation for End Practical Examination :

| Activity | Marks |
|---|--------------|
| For writing, Apparatus, formulae, least count (if applicable) | 5 |
| Procedure & precautions | 5 |
| Drawing Tables | 3 |
| Readings, calculations, graph (if applicable), reporting the findings | 12 |
| Viva-voce | 5 |
| Total marks | 30 |

CHEMISTRYLABORATORY
(C-23 curriculum common to all Branches)

SubjectTitle : Chemistry Laboratory
SubjectCode : MNG -110
Periodsperweek : 03
Totalperiodspereyear : 45

| | |
|------------|---|
| CO1 | Operate and practice volumetric apparatus and preparation of standard solution. |
| CO2 | Evaluate and judge the neutralization point in acid base titration. |
| CO3 | Evaluate the end point of reduction and oxidation reaction. |
| CO4 | Judge the stable end point of complex formation, stable precipitation. |
| CO5 | Judge operate and demonstrate and perform precise operations with instrument for investigation of water pollution parameters. |

PO- CO mapping

| Course code Common-110 | Chemistry Laboratory No. of CO's:5 | | | | No. of periods : 45 |
|---------------------------|---------------------------------------|---|-------|----------------|--|
| POs | Mapped with CO No. | CO periods addressing PO in Col. No. 1 | % | Level 1,2,3 | Remarks |
| PO1 | CO1,CO2,CO3, CO4,CO5 | 12 | 26.66 | 2 | >40% Level 3 (highly addressed) 25% to 40% Level2 (moderately addressed) 5% to 25% Level1 (Low addressed) < 5%(not addressed) |
| PO2 | CO1,CO2,CO3, CO4,CO5 | 9 | 20 | 1 | |
| PO3 | | | | | |
| PO4 | CO1,CO2,CO3, CO4,CO5 | 12 | 26.66 | 2 | |
| PO5 | CO2,CO3, CO4,CO5 | 12 | 26.66 | 2 | |
| PO6 | - | - | - | - | |
| PO7 | - | - | - | - | |

COs-POs mapping strength (as per given table)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|------------|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | 1 | - | 2 | - | - | - | - | - | - |
| CO2 | 2 | 1 | - | 2 | 2 | - | - | - | - | - |
| CO3 | 2 | 1 | - | 2 | 2 | - | - | - | - | - |
| CO4 | 2 | 1 | - | 2 | 2 | - | - | - | - | - |
| CO5 | 2 | 1 | - | 2 | 2 | - | - | - | - | - |

3=strongly mapped2= moderately mapped1= slightly mapped

Note:The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following: i) Seminars ii) Tutorials iii) Guest Lectures iv) Assignments v) Quiz competitionsvi) Industrial visit vii) Tech Fest viii) Mini project ix) Group discussions x) Virtual classes xi) Library visit for e-books

TIMESCHEDULE

| S.No | Name of the Experiment | o.ofPeriods | Mapped with COs |
|------|--|-------------|-----------------|
| 1. | a) Recognition of chemical substances and solutions used in the laboratory by senses. b) Familiarization of methods for Volumetricanalysis. | 03 | CO1 |
| 2. | Preparation of Std. Na_2CO_3 solution and making solutions of different | 03 | CO1 |
| 3. | Estimation of HCl solution using Std. Na_2CO_3 solution. | 03 | CO2 |
| 4. | Estimation of NaOH using Std. HCl solution. | 03 | CO2 |
| 5. | Determination of acidity of water sample. | 03 | CO2 |
| 6. | Determination of alkalinity of water sample. | 03 | CO2 |
| 7. | Estimation of Mohr's Salt using Std. KMnO_4 Solution. | 03 | CO3 |
| 8. | Estimation of Ferrous ion by using Std. $\text{K}_2\text{Cr}_2\text{O}_7$ solution. | 03 | CO3 |
| 9. | Determination of total hardness of water sample using Std. EDTA solution. | 03 | CO4 |
| 10. | Estimation of Chlorides present in water sample by using Std. AgNO_3 solution. | 03 | CO4 |
| 11. | Estimation of Dissolved Oxygen (D.O) in water sample by using Std. hypo solution. | 03 | CO5 |
| 12. | Determination of pH using pH meter.. | 03 | CO5 |
| 13. | Determination of conductivity of water and adjusting ionic strength required level. | 03 | CO5 |
| 14. | Determination of turbidity of water. | 03 | CO5 |
| 15. | Estimation of total solids present in water sample. | 03 | CO5 |
| | Total: | 45 | |

Objectives:

Upon completion of the course the student shall be able to

- 1.0 To identify the chemical compounds and solutions by senses.
Practice volumetric measurements (using pipettes, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc.
- 2.0 Practice making standard solutions with pre weighed salts and to make solutions of desired dilutions using appropriate techniques.
- 3.0 Conduct titrations adopting standard procedures and using Std. Na_2CO_3 solution for estimation of HCl.
- 4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH.
- 5.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available).
- 6.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (One ground water and one surface / tap water).
- 7.0 Conduct titrations adopting standard procedures and using Std. KMnO_4 solution for estimation of Mohr's Salt.
- 8.0 Conduct titrations adopting standard procedures and using Std. $\text{K}_2\text{Cr}_2\text{O}_7$ solution for estimation of Ferrous ion.
- 9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution.
10. Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water (One ground water and one surface / tap water) using Std. AgNO_3 solution.
11. Conduct the test using titrimetric / electrometric method to determine. Dissolved Oxygen (D.O) in the given water samples (One sample from closed container and one from open container / tap water) by Std. Hypo solution.
12. Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter.
13. Conduct the test on given samples of water / solutions.
 - a) to determine conductivity.
 - b) to adjust the ionic strength of the sample to the desired value.
14. Conduct the test on given samples of solutions (coloured and non-coloured) to determine their turbidity in NTU.
15. Determine the total solids present in given samples of water (One ground water and one surface / tap water).

Competencies and Key competencies to be achieved by the student

| Name of the Experiment (No of Periods) | Competencies | Key competencies |
|--|---|--|
| Recognition of chemical substances and solutions. Familiarization of methods for Volumetric analysis. (03) | - | -- |
| Preparation of Std. Na_2CO_3 solution and making solutions of different dilutions. (03) | <ul style="list-style-type: none"> ▪ Weighing the salt to the accuracy of .01 mg. ▪ Measuring the water with volumetric flask, measuring jar, volumetric | <ul style="list-style-type: none"> ▪ Weighing the salt to the accuracy of 0.01 mg. ▪ Measuring the water with volumetric flask, measuring jar, volumetric |
| Estimation of HCl solution using Std. Na_2CO_3 solution. (03) | <ul style="list-style-type: none"> ▪ Cleaning the glassware and rinsing with appropriate solutions. ▪ Making standard solutions. ▪ Measuring accurately the standard solutions and titrants. ▪ Filling the burette with titrant. ▪ Fixing the burette to the stand. ▪ Effectively Controlling the flow of the titrant. ▪ Identifying the end point. ▪ Making accurate observations. ▪ Calculating the results. | <ul style="list-style-type: none"> ▪ Making standard solutions. ▪ Measuring accurately the standard solutions and titrants. ▪ Effectively Controlling the flow of the titrant. ▪ Identifying the end point. ▪ Making accurate observations. |
| Estimation of NaOH using Std. HCl solution. (03) | | |
| Determination of acidity of water sample. (03) | | |
| Determination of alkalinity of water sample. (03) | | |
| Estimation of Mohr's Salt using Std. KMnO_4 solution. (03) | | |
| Estimation of Ferrous ion by using Std. $\text{K}_2\text{Cr}_2\text{O}_7$ solution (03) | | |
| Determination of total hardness of water using Std. EDTA solution. (03) | | |
| Estimation of Chlorides present in water sample using Std. AgNO_3 solution (03) | | |
| Estimation of Dissolved Oxygen (D.O) in water sample (By titration method) (03) | <ul style="list-style-type: none"> ▪ Familiarize with | <ul style="list-style-type: none"> ▪ Prepare standard |
| Determination of pH using pH meter. (03) | | |

| | | |
|---|---|--|
| Determination of conductivity of water and adjusting ionic strength to required level. (03) | instrument. ▪ Choose appropriate 'Mode' / 'Unit'. | solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions. |
| Determination of turbidity of water. (03) | ▪ Prepare standard solutions / buffers, etc. ▪ Standardize | ▪ Plot the |
| Estimation of total solids present in water sample. (03) | ▪ Measuring the accurate volume and weight of sample. ▪ Filtering and air drying without | ▪ Measuring the accurate volume and weight of sample. ▪ Filtering and air drying without |

SCHEME OF VALUATION

| | |
|---|------------|
| A) Writing Chemicals, apparatus, principle and procedure. | 5M |
| B) Demonstrated competencies. | 20M |
| Making standard solutions. | |
| Measuring accurately the standard solutions and titrants. | |
| Effectively controlling the flow of the titrant. | |
| Identifying the end point. | |
| Making accurate observations. | |
| C) Viva-voce. | 5M |
| Total | 30M |

COMPUTER FUNDAMENTALS PRACTICE

| Course code | Course Title | No. of Periods/Weeks | Total No. of periods | Marks for FA | Marks for SA |
|-------------|---------------------------|----------------------|----------------------|--------------|--------------|
| MNG-111 | Computer Fundamentals Lab | 3 | 90 | 40 | 60 |

Time schedule:

| S.No. | Chapter/Unit Title | No. of sessions each of 3 periods duration | No.of Periods |
|----------------------|--------------------------|--|---------------|
| 1. | Computer hardware Basics | 2 | 6 |
| 2. | Windows Operating System | 2 | 6 |
| 3. | MS Word | 8 | 24 |
| 4. | MS Excel | 7 | 21 |
| 5. | MS PowerPoint | 5 | 15 |
| 6. | Adobe Photoshop | 6 | 18 |
| Total periods | | 30 | 90 |

| S.No. | Chapter/Unit Title | No.of Periods | CO's Mapped |
|----------------------|--------------------------|---------------|-------------|
| 1. | Computer hardware Basics | 6 | CO1 |
| 2. | Windows Operating System | 6 | CO1 |
| 3. | MS Word | 24 | CO2 |
| 4. | MS Excel | 21 | CO3 |
| 5. | MS PowerPoint | 15 | CO4 |
| 6. | Adobe Photoshop | 18 | CO5 |
| Total periods | | 90 | |

| | |
|--------------------------|---|
| Course Objectives | i)To know Hardware Basics ii)To familiarize operating systems iii)To use MS Office effectively to enable to students use these skills in future courses iv) To use Adobe Photoshop in image editing. |
|--------------------------|---|

| | | | |
|------------------------|---|-----------|--|
| Course Outcomes | At the end of the course students will be able to | | |
| | CO1 | MNG-111.1 | Identify hardware and software components |
| | CO2 | MNG-111.2 | Prepare documents with given specifications using word processing software |
| | CO3 | MNG-111.3 | Use Spread sheet software to make calculation and to draw various graphs / charts. |
| | CO4 | MNG-111.4 | Use Power point software to develop effective presentation for a given theme or topic. |
| | CO5 | MNG-111.5 | Edit digital or scanned images using Photoshop |

CO-PO/PSO MATRIX

| CO NO. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---------|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| C-110.1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| C-110.2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| C-110.3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| C-110.4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| C-110.5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| Average | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

Learning Outcomes:**I. Computer Hardware Basics**

1. a).To Familiarize with Computer system and hardware connections
b).To Start and Shut down Computer correctly
c).To check the software details of the computer
2. To check the hardware present in your computer

II. Windows's operating system

3. To Explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. Practice with MS-WORD

6. To familiarize with Ribbon layout of MS Word
Home – Insert- Page layout – References – Review- View.
7. To practice Word Processing Basics
8. To practice Formatting techniques
9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV.Practice with MS-EXCEL

13. To familiarize with MS-EXCEL layout
14. To access and enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To sort and filter data in table.
20. To present data using Excel Graphs and Charts.
21. To develop lab reports of respective discipline.
22. To format a Worksheet in Excel, Page Setup and Print

V. Practice with MS-POWERPOINT

23. To familiarize with Ribbon layout features of PowerPoint 2007.
24. To create a simple PowerPoint Presentation
25. To set up a Master Slide in PowerPoint
26. To insert Text and Objects
27. To insert a Flow Charts
28. To insert a Table
29. To insert a Charts/Graphs
30. To insert video and audio
31. To practice Animating text and objects
32. To Review presentation

VI. Practice with Adobe Photoshop

33. To familiarize with standard toolbox
34. To edit a photograph.
35. To insert Borders around photograph.
36. To change Background of a Photograph.
37. To change colors of Photograph.
38. To prepare a cover page for the book in your subject area.
39. To adjust the brightness and contrast of the picture so that it gives an elegant look.
40. To type a word and apply the shadow emboss effects.

Key competencies:

| Expt No | Name of Experiment | Competencies | Key competencies |
|---------|--|---|--|
| 1 (a). | To familiarize with Computer system and hardware connections | <ol style="list-style-type: none">a. Identify the parts of a Computer system: i). CPU ii). Mother Board iii) Monitor iv) CD/DVD Drive v) Power Switch vi) Start Button vii) Reset Buttonb. Identify and connect various peripheralsc. Identify and connect the cables used with computer systemd. Identify various ports on CPU and connect Keyboard & Mouse | Connect cables to external hardware and operate the computer |
| 1 (b). | To Start and Shut down Computer correctly | <ol style="list-style-type: none">a. Log in using the passwordb. Start and shut down the computerc. Use Mouse and Key Board | <ol style="list-style-type: none">a. Login and logout as per the standard procedureb. Operate mouse & Key Board |
| 1 (c). | To Explore Windows Desktop | <ol style="list-style-type: none">a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts | <ol style="list-style-type: none">a. Access application programs using Start menu |

| | | | |
|----|--|--|---|
| | | <ul style="list-style-type: none"> b. Access application programs using Start menu, Task manager c. Use Help support | <ul style="list-style-type: none"> b. Use taskbar and Task manager |
| 2. | To check the software details of the computer | <ul style="list-style-type: none"> a. Find the details of Operating System being used b. Find the details of Service Pack installed | Access the properties of computer and find the details |
| 3. | To check the hardware present in your computer | <ul style="list-style-type: none"> a. Find the CPU name and clock speed b. Find the details of RAM and Hard disk present c. Access Device manager using Control Panel and check the status of devices like mouse and key board d. Use My Computer to check the details of Hard drives and partitions e. Use the Taskbar | <ul style="list-style-type: none"> a. Access device manager and find the details b. Type /Navigate the correct path and Select icon related to the details required |
| 4. | Working with Files and Folders | <ul style="list-style-type: none"> a. Create folders and organizing files in different folders b. Use copy / paste move commands to organize files and folders | <ul style="list-style-type: none"> a. Create files and folders Rename , arrange and search for the required folder/file |
| | Working with Files and Folders Continued.... | <ul style="list-style-type: none"> c. Arrange icons – name wise, size, type, Modified d. Search a file or folder and find its path e. Create shortcut to files and folders (in other folders) on Desktop f. Familiarize with the use of My Documents g. Familiarize with the use of Recycle Bin | <ul style="list-style-type: none"> b. Restore deleted files from Recycle bin |

| | | | |
|----|---|---|--|
| 5. | To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint | a.Familiarize with the use of Calculator b.Access Calculator using Run command c.Create Text Files using Notepad and WordPad and observe the difference in file size d.Use MS paint and create .jpeg, .bmp files using MS Paint | a. Use windows accessories and select correct text editor based on the situation. b. Use MS pain to create /Edit pictures and save in the required format. |
| 6. | To familiarize with Ribbon layout of MS word. – Home – Insert- page layout- References-Review- View | a.Create/Open a document b.Use Save and Save as features c.Work on two Word documents simultaneously d.Choose correct Paper size and Printing options | a. Create a Document and name appropriately and save b. Set paper size and print options |
| 7. | To practice Word Processing Basics | a.Typing text b.Keyboard usage c. Use mouse (Left click / Right click / Scroll) d.Use Keyboard shortcuts e.Use Find and Replace features in MS- word f. Use Undo and Redo Features g.Use spell check to correct Spellings and Grammar | a. Use key board and mouse to enter/edit text in the document. b. Use shortcuts c. Use spell check/ Grammar features for auto corrections. |
| 8. | To practice Formatting techniques | a.Formatting Text b.Formatting Paragraphs c. Setting Tabs d.Formatting Pages e.The Styles of Word f. Insert bullets and numbers g.Themes and Templates h.Insert page numbers, header and footer | a. Format Text and paragraphs and use various text styles. b. Use bullets and numbers to create lists c. Use Templates /Themes d. Insert page numbers date, headers and footers |
| 9. | To insert a table of required number of rows and columns | a.Edit the table by adding the fields – Deleting rows and columns –inserting sub table – marking borders. Merging and splitting of cells in a Table b.Changing the background colour of the table c. Use table design tools | a. Insert table in the word document and edit b. Use sort option for arranging data. |

| | | | |
|-----|--|--|---|
| | | d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features e. Convert Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/descending order | |
| 10. | To Insert objects, clipart and Hyperlinks | a. Create a 2-page document. & Insert hyperlinks and t Bookmarks. b. Create an organization chart c. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table. | a. Insert hyperlinks & Bookmarks b. Create organization charts/flow charts |
| 11. | To Use Mail merge feature of MS Word | a. Use mail merge to prepare individually addressed letters b. Use mail merge to print envelopes. | Use Mail merge feature |
| 12. | To use Equations and symbols features. | a. Explore various symbols available in MS Word b. Insert a symbol in the text c. Insert mathematical equations in the document | Enter Mathematical symbols and Equations in the word document |
| 13. | To Practice with MS-EXCEL | a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button- b. Use Quick Access Toolbar- Title Bar- Ribbon-Worksheets- Formula Bar-Status Bar | a. Familiarize with excel layout and use b. Use various features available in toolbar |
| 14. | To access and Enter data in the cells | a. Move Around a Worksheets- Quick access -Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel | a. Access and select the required cells by various addressing methods b. Enter data and edit |
| 15. | To edit spread sheet Copy, Cut, Paste, and selecting cells | a. Insert and Delete Columns and Rows-Create Borders-Merge and Center b. Add Background Color-Change the Font, Font Size, and Font | Format the excel sheet |

| | | | |
|-----|--|--|---|
| | | Color c. Format text with Bold, Italicize, and Underline-Work with Long Text-Change a Column's Width | |
| 16. | To use built in functions and Formatting Data | a. Perform Mathematical Calculations verify -AutoSum b. Perform Automatic Calculations-Align Cell Entries | Use built in functions in Excel |
| 17. | To enter a Formula for automatic calculations | a. Enter formula b. Use Cell References in Formulae c. Use Automatic updating function of Excel Formulae d. Use Mathematical Operators in Formulae e. Use Excel Error Message and Help | Enter formula for automatic calculations |
| 18. | To Create Excel Functions, Filling Cells | a. Use Reference Operators b. Work with sum, Sum if , Count and Count If Functions c. Fill Cells Automatically | a. Create Excel sheets involving cross references and equations b. Use the advanced functions for conditional calculations |
| 19. | To sort and filter data in table | a. Sort data in multiple columns b. Sort data in a row c. Sort data using Custom order d. Filter data in work sheet | a. Refine the data in a worksheet and keep it organized b. Narrow a worksheet by selecting specific choice |
| 20. | To Practice Excel Graphs and Charts | a. Produce an Excel Pie Chart b. Produce c. Excel Column Chart | a. Use data in Excel sheet to Create technical charts and graphs Produce Excel Line Graph b. Produce a Pictograph in Excel |
| 21. | To develop lab reports of respective discipline | Create Lab reports using MS Word and Excel | a. Insert Practical subject name in Header and page numbers in Footer |
| 22. | To format a Worksheet in Excel, page setup and print | a. Shade alternate rows of data b. Add currency and percentage symbols c. Change height of a row and width of a column | a. Format Excel sheet b. Insert headers & footers and print |

| | | | |
|-----|--|---|---|
| | | <ul style="list-style-type: none"> d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print | |
| 23. | To familiarize with Ribbon layout & features of PowerPoint 2007. | Use various options in PowerPoint <ul style="list-style-type: none"> a. Home b. Insert c. Design d. Animation e. Slideshow f. View g. Review | Access required options in the tool bar |
| 24. | To create a simple PowerPoint Presentation | <ul style="list-style-type: none"> a. Insert a New Slide into PowerPoint b. Change the Title of a PowerPoint Slide c. PowerPoint Bullets d. Add an Image to a PowerPoint Slide e. Add a Textbox to a PowerPoint slide | <ul style="list-style-type: none"> a. Create simple PowerPoint presentation with photographs/ClipArt and text boxes b. Use bullets option |
| 25. | To Set up a Master Slide in PowerPoint and add notes | <ul style="list-style-type: none"> a. Create a PowerPoint Design Template b. Modify themes c. Switch between Slide master view and Normal view d. Format a Design Template Master Slide e. Add a Title Slide to a Design Template f. The Slide Show Footer in PowerPoint g. Add Notes to a PowerPoint Presentation | <ul style="list-style-type: none"> a. Setup Master slide and format b. Add notes |
| 26. | To Insert Text and Objects | <ul style="list-style-type: none"> a. Insert Text and objects b. Set Indents and line spacing c. Insert pictures/ clipart d. Format pictures e. Insert shapes and word art f. Use 3d features g. Arrange objects | Insert Text and Objects Use 3d features |
| 27. | To insert a Flow Chart / Organizational Charts | <ul style="list-style-type: none"> a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art | Create organizational charts and flow charts using smart art |
| 28. | To insert a Table | <ul style="list-style-type: none"> a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend | Insert tables and format |

| | | | |
|-----|--|--|---|
| 29. | To insert a Charts/Graphs | <ul style="list-style-type: none"> a. Create 3D Bar Graphs in PowerPoint b. Work with the PowerPoint Datasheet c. Format a PowerPoint Chart Axis d. Format the Bars of a Chart e. Create PowerPoint Pie Charts f. Use Pie Chart Segments g. Create 2D Bar Charts in PowerPoint h. Format the 2D Chart e. Format a Chart Background | Create charts and Bar graphs, Pie Charts and format. |
| 30. | To Insert audio & video, Hyperlinks in a slide Add narration to the slide | <ul style="list-style-type: none"> a. Insert sounds in the slide and hide the audio symbol b. Adjust the volume in the settings c. Insert video file in the format supported by PowerPoint in a slide d. Use automatic and on click options e. Add narration to the slide f. Insert Hyperlinks | <ul style="list-style-type: none"> a. Insert Sounds and Video in appropriate format. b. Add narration to the slide c. Use hyperlinks to switch to different slides and files |
| 31. | To Practice Animation effects | <ul style="list-style-type: none"> a. Apply transitions to slides b. To explore and practice special animation effects like Entrance, Emphasis, Motion Paths & Exit | Add animation effects |
| 32. | Reviewing presentation | <ul style="list-style-type: none"> a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation <ul style="list-style-type: none"> (a) Slides (b) Hand-out | <ul style="list-style-type: none"> a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show |
| 33 | To familiarize with standard toolbox | <ul style="list-style-type: none"> a. Open Adobe Photoshop b. Use various tools such as <ul style="list-style-type: none"> i. The Layer Tool ii. The Color & Swatches Tool iii. Custom Fonts & The Text Tool | Open a photograph and save it in Photoshop |

| | | | |
|----|--|---|--|
| | | iv. Brush Tool v. The Select Tool vi. The Move Tool vii. The Zoom Tool viii. The Eraser ix. The Crop Tool x. The Fill Tool | |
| 34 | To edit a photograph | a. Use the Crop tool b. Trim edges c. Change the shape and size of a photo d. Remove the part of photograph including graphics and text | a. Able to edit image by using corresponding tools. |
| 35 | To insert Borders around photograph | a. Start with a single background layer b. Bring the background forward c. Enlarge the canvas d. Create a border color e. Send the border color to the back f. Experiment with different colors | Able to create a border or frame around an image to add visual interest to a photo |
| 36 | To change Background of a Photograph | a. open the foreground and background image b. Use different selection tools to paint over the image c. Copy background image and paste it on the foreground. d. Resize and/or drag the background image to reposition. e. In the Layers panel, drag the background layer below the foreground image layer. | Able to swap background elements using the Select and Mask tool and layers. |
| 37 | To change colors of Photograph | a. Change colors using: i) Color Replacement tool ii) Hue/Saturation adjustment layer tool | Able to control color saturation |
| 38 | To prepare a cover page for the book in subject area | a. open a file with height 500 and width 400 for the cover page. b. apply two different colors to work area by dividing it into two parts using Rectangle tool. c. Copy any picture and place it on work area→ resize it using free transform tool. d. Type text and apply color and style | Able to prepare cover page for the book |

| | | | |
|----|--|--|--------------------------------------|
| | | e. Apply effects using blended options | |
| 39 | To adjust the brightness and contrast of picture to give an elegant look | a. open a file. b. Go to image→ adjustments→ Brightness/Contrast. c. adjust the brightness and contrast. d. Save the image. | Able to control brightness/contrast. |
| 40 | To type a word and apply the shadow emboss effects | a. open a file b. Select the text tool and type text. c. Select the typed text go to layer→ layer style→ blended option→ drop shadow, inner shadow, bevel and emboss→ contour→ satin→ gradient overlay d. Save the image. | Able to apply shadow emboss effects |

Table specifying the scope of syllabus to be covered for unit tests

| Unit Test | Learning outcomes to be covered |
|------------------|--|
| Unit test-1 | From 1 to 8 |
| Unit test-2 | From 9 to 22 |
| Unit test-3 | From 23 to 40 |

III SEMESTER

DIPLOMA IN MINING ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
III SEMESTER (SECOND YEAR)

| Subject Code | Name of the Subject | Instruction period / week | | Total Period / Sem | Scheme of Examination | | | |
|---|--|---------------------------|---------------------|--------------------|-----------------------|-----------------|----------------|-------------|
| | | Theory | Practical/ Tutorial | | Duration (hours) | Sessional Marks | End Exam Marks | Total Marks |
| THEORY | | | | | | | | |
| MNG-301 | Engineering Mathematics - II | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-302 | Basic Electrical Engineering | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-303 | Basic Mechanical Engineering | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-304 | Underground Coal Mining Methods | 5 | - | 75 | 3 | 20 | 80 | 100 |
| MNG-305 | Mine Surveying-I | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-306 | Mining Geology | 5 | - | 75 | 3 | 20 | 80 | 100 |
| PRACTICAL | | | | | | | | |
| MNG-307 | Basic Electrical Engineering Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-308 | Basic Mechanical Engineering Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-309 | Mine Surveying Practice –I | - | 4 | 60 | 3 | 40 | 60 | 100 |
| MNG-310 | Mining Geology Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| | Activities | - | 3 | 45 | - | - | - | - |
| | TOTAL | 26 | 16 | 630 | | 280 | 720 | 1000 |
| Note: MNG-301 is common to Group-I branches A/AA/CER/M/MET/MNG/TT | | | | | | | | |

C-23 M-301
ENGINEERING MATHEMATICS-II
(common to A/AA/CER/C/EE/M/MET/MNG/TT)

| Course Code | Course Title | No. of Periods/week | Total No. of periods | Marks for FA | Marks for SA |
|-------------|----------------------------|---------------------|----------------------|--------------|--------------|
| MNG-301 | Engineering Mathematics-II | 4 | 60 | 20 | 80 |

| S.No. | Unit Title | No. of periods | COs mapped |
|-------|------------------------------------|----------------|------------|
| 1 | Indefinite Integration | 20 | CO1 |
| 2 | Definite Integration | 10 | CO2 |
| 3 | Applications of Definite Integrals | 10 | CO3 |
| 4 | Differential Equations | 20 | CO4 |
| | Total Periods | 60 | |

| | |
|--------------------------|--|
| Course Objectives | <p>(iii) To understand the concepts of indefinite integrals and definite integrals with applications to engineering problems.</p> <p>(iv) To understand the formation of differential equations and learn various methods of solving first order differential equations.</p> <p>(v) To learn the principles of solving homogeneous and non-homogeneous differential equations of second order.</p> |
|--------------------------|--|

| | | |
|------------------------|-----|---|
| Course Outcomes | CO1 | Integrate various functions using different methods. |
| | CO2 | Evaluate definite integrals. |
| | CO3 | Solve engineering problems by applying definite integrals. |
| | CO4 | Obtain differential equations and solve differential equations of first order and first degree, and solve homogeneous and non-homogeneous differential equations of second order. |

C-23M-301
ENGINEERING MATHEMATICS – II
(common to A/AA/CER/C/EE/M/MET/MNG/TT)
Learning Outcomes
Unit-I

C.O. 1 Integrate various functions using different methods.

L.O.1.1. Explain the concept of Indefinite integral as an anti-derivative.

1.2. State the indefinite integral of standard functions and properties of $\int (u + v) dx$ and $\int k u dx$ where u, v are functions of x and k is constant.

1.3. Solve problems involving standard functions using these properties.

1.4. Evaluate integrals involving simple functions of the following type by the method of substitution.

i) $\int f(ax + b) dx$, where $f(x)$ is in standard form.

ii) $\int (f(x))^n f'(x) dx$, $n \neq -1$

iii) $\int \frac{f'(x)}{f(x)} dx$

iv) $\int [f(g(x))] g'(x) dx$

1.5. Find the integrals of $\tan x$, $\cot x$, $\sec x$ and $\operatorname{cosec} x$ w.r.t x

1.6. Evaluate the Standard integrals of the functions of the type

i) $\frac{1}{a^2 + x^2}, \frac{1}{a^2 - x^2}, \frac{1}{x^2 - a^2}$

ii) $\frac{1}{\sqrt{a^2 + x^2}}, \frac{1}{\sqrt{a^2 - x^2}}, \frac{1}{\sqrt{x^2 - a^2}}$

iii) $\sqrt{a^2 + x^2}, \sqrt{a^2 - x^2}, \sqrt{x^2 - a^2}$

1.7. Evaluate integrals using decomposition method.

1.8. Solve problems using integration by parts.

1.9 Use Bernoulli's rule for evaluating the integrals of the form $\int u.v dx$.

1.10. Evaluate the integrals of the form $\int e^x [f(x) + f'(x)] dx$

Unit-II

C.O.2 Evaluate definite integrals.

L.O.2.1. State the fundamental theorem of integral calculus

2.2. Explain the concept of definite integral.

2.3. Solve simple problems on definite integrals.

2.4. State various properties of definite integrals.

2.5. Evaluate simple problems on definite integrals using these properties.

Syllabus for Unit test-I completed

Unit -III

C.O.3 Solve engineering problems by applying definite integrals.

L.O. 3.1. Find the area bounded by a curve and axes.

3.2. Obtain the mean and R.M.S values of the simple functions in given intervals.

3.3. Solve simple problems using Trapezoidal rule and Simpson's 1/3 rule for the approximation of definite integrals.

Unit -IV

C.O. 4 Form differential equations and solve differential equations of first order and first degree and Solve homogeneous and non-homogeneous differential equations of second order

L.O.4.1. Define a Differential equation, its order and degree

4.2 Find order and degree of a given differential equation.

4.3 Form a differential equation by eliminating arbitrary constants.

4.4 Solve the first order and first degree differential equations by variables separable method.

4.5 Solve linear differential equation of first order of the form $\frac{dy}{dx} + Py = Q$, where P and Q are functions of x only or constants.

4.6 Solve homogeneous second order linear differential equations of the type $(aD^2 + bD + c)y = 0$ where $a(\neq 0)$, b , c are real numbers.

4.7 Define complementary function, particular integral and general solution of a non-homogeneous linear differential equation of second order with constant coefficients.

4.8 Describe the methods of solving $f(D) = X$, where $f(D)$ is a polynomial of second order and X is a function of the forms k , e^{ax} , $\sin ax$, $\cos ax$ and x and their linear combinations.

Syllabus for Unit test-II completed

C-23 M-301

Engineering Mathematics – II

(common to A/AA/CER/C/EE/M/MET/MNG/TT)

CO/PO – Mapping

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|------|-----|-----|-----|------|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 2 | 1 | | | | 3 | 2 | 2 |
| CO2 | 3 | 2 | 2 | 2 | | | | 3 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 | | | | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | | | | 3 | 3 | 3 |
| Avg. | 3 | 2.5 | 2.5 | 2.25 | | | | 3 | 2.5 | 2.5 |

3 = Strongly mapped (High), 2 = Moderately mapped (Medium), 1 = Slightly mapped (Low)

Note: The gaps in CO/PO mapping can be met with appropriate activities as follows:

For PO5: Appropriate quiz programmes may be conducted at intervals and duration as decided by concerned faculty.

For PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

For PO7: Plan activities in such a way that students can visit the Library to refer standard books on Mathematics and access the latest updates in reputed national and international journals. Additionally, encourage them to attend seminars and learn mathematical software tools.

C-23 MNG-301
Engineering Mathematics – II
(common to A/AA/CER/C/EE/M/MET/MNG/TT)
PO- CO – Mapping strength

| PO no | Mapped with CO no | CO periods addressing PO in column I | | Level (1,2 or 3) | Remarks |
|-------|-------------------|--------------------------------------|-------|------------------|------------------------------------|
| | | Number | % | | |
| 1 | CO1, CO2, CO3,CO4 | 60 (20+10+10+20) | 100% | 3 | >40% Level 3 Highly addressed |
| 2 | CO1, CO2, CO3,CO4 | 37 (6+6+10+15) | 61.6% | 3 | |
| 3 | CO1, CO2, CO3,CO4 | 37 (6+6+10+15) | 61.6% | 3 | |
| 4 | CO1, CO2, CO3,CO4 | 35 (4+6+10+15) | 58.3% | 3 | |
| 5 | | | | | 5% to 25% Level 1 Low addressed |
| 6 | | | | | |
| 7 | | | | | |
| PSO 1 | CO1, CO2, CO3,CO4 | 60 (20+10+10+20) | 100% | 3 | <5% Not addressed |
| PSO 2 | CO1, CO2, CO3,CO4 | 37 (6+6+10+15) | 61.6% | 3 | |
| PSO 3 | CO1, CO2, CO3,CO4 | 37 (6+6+10+15) | 61.6% | 3 | |

C-23 MNG-301
ENGINEERING MATHEMATICS – II
(common to A/AA/CER/C/EE/M/MET/MNG/TT)
COURSE CONTENTS

Unit-I

Indefinite Integration

1. Integration regarded as anti-derivative, indefinite integrals of standard functions - Properties of indefinite integrals - Integration by substitution or change of variable - Integrals of $\tan x$, $\cot x$, $\sec x$, $\operatorname{cosec} x$.

Evaluation of integrals which are of the following forms:

$$i) \frac{1}{a^2 + x^2}, \frac{1}{a^2 - x^2}, \frac{1}{x^2 - a^2}$$

$$ii) \frac{1}{\sqrt{a^2 + x^2}}, \frac{1}{\sqrt{a^2 - x^2}}, \frac{1}{\sqrt{x^2 - a^2}}$$

$$iii) \sqrt{a^2 + x^2}, \sqrt{a^2 - x^2}, \sqrt{x^2 - a^2}$$

Integration by decomposition of the integrand into simple rational algebraic functions.

Integration by parts, Bernoulli's rule and integrals of the form $\int e^x [f(x) + f'(x)] dx$.

Unit-II

Definite Integration

2. Definite integral, fundamental theorem of integral calculus, properties of definite integrals, evaluation of simple definite integrals.

Unit-III

Applications of Definite Integrals

3. Area bounded by a curve and axes - Mean and RMS values of a function in given intervals - Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a definite integral.

Unit-IV

Differential Equations

4. Definition of a differential equation - Order and degree of a differential equation - Formation of differential equations - Solutions of differential equations of first order and first degree using variables separable method and linear differential equation of the type $\frac{dy}{dx} + Py = Q$ - Solutions of homogeneous and non-homogeneous linear differential equations of second order with constant coefficients.

Textbook:

Engineering Mathematics-II, a textbook for second year third semester diploma courses, prepared & prescribed by SBTET, AP.

Reference Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Schaum's Outlines Differential Equations, Richard Bronson & Gabriel B. Costa
3. M.Vygodsky, Mathematical Handbook: Higher Mathematics, Mir Publishers, Moscow.

C- 23 Engineering Mathematics – II

Subject Title : **Engineering Mathematics – II**
 Subject Code : **MNG-301 (common to A/AA/CER/C/EE/M/MET/MNG/TT)**
 Periods/Week : **04**
 Periods/Semester : **60**

TIME SCHEDULE

| S.No. | Chapter/Unit title | No. of Periods | Marks Allotted | Short Type | Essay Type | COs mapped |
|---|--|----------------|----------------|------------|------------|------------|
| Unit – I: Indefinite integration | | | | | | |
| 1 | Indefinite integration | 20 | 34 | 3 | 2 1/2 | CO1 |
| Unit – II: Definite Integration | | | | | | |
| 2 | Definite Integrals | 10 | 16 | 2 | 1 | CO2 |
| Unit-III: Applications of Definite Integrals | | | | | | |
| 3 | Area of curves | 3 | 3 | 1 | 0 | CO3 |
| 4 | Mean and RMS values | 3 | 8 | 1 | 1/2 | CO3 |
| 5 | Numerical Integration | 4 | 10 | 0 | 1 | CO3 |
| Unit – IV: Differential Equations | | | | | | |
| 6 | Introduction to Differential Equations | 5 | 6 | 2 | 0 | CO4 |
| 7 | Solutions of first order differential equations | 4 | 13 | 1 | 1 | CO4 |
| 8 | Solutions of second order homogeneous differential equations | 4 | 10 | 0 | 1 | CO4 |
| 9 | Solutions of second order non-homogeneous differential equations | 7 | 10 | 0 | 1 | CO4 |
| Total | | 60 | 110 | 10 | 8 | |
| Marks | | | | 30 | 80 | |

C-23 MNG-301
Engineering Mathematics – II
(common to A/AA/CER/C/EE/M/MET/MNG/TT)
Unit Test Syllabus

| Unit Test | Syllabus |
|--------------|-------------------------|
| Unit Test-I | From L.O 1.1 to L.O 2.5 |
| Unit Test-II | From L.O 3.1 to L.O 4.8 |

MNG -302 BASIC ELECTRICAL ENGINEERING

| Course Code | Course Title | No. of periods / Week | Total No. of Periods | Marks for FA | Marks for SA |
|-------------|------------------------------|-----------------------|----------------------|--------------|--------------|
| MNG- 302 | BASIC ELECTRICAL ENGINEERING | 4 | 60 | 20 | 80 |

| S. No. | Unit Title/Chapter | Periods | Weightage of Marks | No.of short questions | No. of Essay questions | CO's Mapped |
|--------|-------------------------------------|---------|--------------------|-----------------------|------------------------|-------------|
| 1 | Electrical Engineering Fundamentals | 10 | 16 | 02 | 01 | CO1 |
| 2 | Electrical Circuits | 11 | 26 | 02 | 02 | CO2 |
| 3 | Electrical Machines | 18 | 29 | 03 | 02 | CO3 |
| 4 | Electrical Measuring Instruments | 11 | 26 | 02 | 02 | CO4 |
| 5 | Electrical Safety Procedures | 10 | 13 | 01 | 01 | CO5 |
| | Total | 60 | 110 | 10 | 08 | |

COURSE OUTCOMES MAPPING

| | |
|--------------------------|--|
| COURSE OBJECTIVES | To familiarize the basic concepts and working principles of electrical engineering to solve various electrical circuits. |
| | To understand the construction and working of different electrical machines and measuring instruments. |
| | To acquire the knowledge to operate different electrical equipment with safety. |

| | | | |
|------------------------|-----|----------|---|
| COURSE OUTCOMES | CO1 | MNG302.1 | Recognizing the basic concepts of electrical engineering and their applications. |
| | CO2 | MNG302.2 | Analyze the various parameters of electrical circuits to know their importance in electrical engineering. |
| | CO3 | MNG302.3 | Analyzing the usage of various electrical machines for different applications. |

| | | | |
|--|-----|----------|---|
| | CO4 | MNG302.4 | Comparing various electrical measuring instruments. |
| | CO5 | MNG302.5 | Identifying and using suitable safety measures and tools at different situations. |

LEARNING OUTCOMES

1.0 Electrical Engineering Fundamentals

- 1.1 Define electric current and state its properties.
- 1.2 Define Ohm's Law and state the laws of resistance.
- 1.3 Define the terms: (a) Magnetic Flux (b) Permeability and (c) Inductance.
- 1.4 Define the terms: (a) Electric Flux (b) Permittivity and (c) Capacitance.
- 1.5 State and explain (a) Faradays laws of Electro Magnetic Induction and (b) Lenz's law.
- 1.6 State and explain dynamically induced EMF and statistically induced EMF.
- 1.7 Define the terms

| | | |
|--------------------------|-------------------------|-------------------|
| (a) Alternating Quantity | (b) Instantaneous Value | (c) Maximum Value |
| (d) Time Period | (e) Frequency | (f) Average Value |
| (g) R.M.S Value | (h) Power | (i) Power Factor |
- 1.8 State and explain (a) Fleming's right hand rule and (b) Fleming's left hand rule

2.0 Electrical Circuits

- 2.1 Explain the procedure to calculate equivalent resistance of DC series circuits and parallel circuits.
- 2.2 Solve simple problems on equivalent resistance of DC series circuits and parallel circuits.
- 2.3 State and explain Kirchhoff's laws.
- 2.4 Solve simple problems on Kirchhoff's laws.
- 2.5 Explain the procedure to calculate domestic monthly energy bill.
- 2.6 Solve simple problems on domestic monthly energy bill.
- 2.7 Explain single phase A.C. circuit with pure R load
- 2.8 Explain single phase A.C. circuit with pure Inductive load.
- 2.9 Explain single phase A.C. circuit with pure capacitive load.
- 2.10 Explain three phase system with voltage, current and power equations.
- 2.11 State the advantages of three phase system over single phase system.

3.0 Electrical Machines

- 3.1 Explain the working of D.C. Generator.

- 3.2 List the type of D.C. Generators and draw the schematic diagram of each type.
- 3.3 Write the currents and voltages equations for different types of D.C. Generators.
- 3.4 Explain the working of D.C. Motor.
- 3.5 List the type of D.C. Motors and draw the schematic diagram of each type.
- 3.6 Write the currents and voltages equations for different types of D.C. Motors.
- 3.7 List various methods of speed control of D.C. Motors.
- 3.8 List the applications of DC Motor.
- 3.9 Explain the working of Transformer.
- 3.10 List the applications of Transformer.
- 3.11 Explain the working of Three Phase Induction Motor.
- 3.12 List the applications of Three Phase Induction motor.
- 3.13 List the types of Single Phase Induction Motors.
- 3.14 List the applications of Single Phase Induction motor.

4.0 Electrical Measuring Instruments

- 4.1 List the types of electrical measuring instruments.
- 4.2 Explain the working of Moving Coil Measuring Instrument.
- 4.3 Explain working of Moving Iron type Measuring Instrument.
- 4.4 compare Moving Coil and Moving Iron type Measuring Instruments.
- 4.5 Explain the working of Dynamometer Type Measuring Instrument.
- 4.6 Explain the working of Induction Type Single Phase Energymeter.

5.0 Electrical Safety Procedures.

- 5.1 Explain the effects of electrical shock and burn.
- 5.2 Explain the procedures to be adopted to avoid electric shock.
- 5.3 Explain the first aid methods to be followed after electrocuted.
- 5.4 State the need of earthing of electrical equipment and machinery and mention its types.
- 5.5 Explain the procedure of pipe earthing with diagram.
- 5.6 Explain the procedure of plate earthing with diagram.

CO'S – PO'S – PSO'S MAPPING STRENGTH

| CO No | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|----------|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| MNG302.1 | 3 | | | | | | | 3 | | |
| MNG302.2 | 3 | 2 | 1 | | | | | 3 | 2 | |
| MNG302.3 | 3 | | | | | | | 3 | 1 | |

| | | | | | | | | | | |
|----------|---|---|-----|---|--|--|--|---|-----|--|
| MNG302.4 | 3 | | 2 | | | | | 3 | | |
| MNG302.5 | 3 | | | 1 | | | | 3 | 1 | |
| Average | 3 | 2 | 1.5 | 1 | | | | 3 | 1.3 | |

3-Strongly Mapped

2- Moderately Mapped 1- Slightly Mapped

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Electrical Engineering Fundamentals

Electric current and its properties - Ohm 's Law and laws of resistance – Magnetic Flux, Permeability and Inductance – Electric Flux, Permittivity and Capacitance - Faradays laws of Electro Magnetic Induction - Lenz's law - dynamically induced EMF and statistically induced EMF - Alternating Quantity - Instantaneous Value - Maximum Value - Time Period - Frequency - Average Value - R.M.S Value - Phase Difference – Power - Power Factor - Fleming's right hand rule - Fleming's left hand rule.

Electrical Circuits

Procedure to calculate equivalent resistance of DC series circuits and parallel circuits - simple problems on equivalent resistance of DC series circuits and parallel circuits - Kirchhoff's laws - simple problems on Kirchhoff's laws - procedure to calculate domestic monthly energy bill - simple problems on domestic monthly energy bill - single phase A.C. circuit –R load, pure L load, pure C load - three phase system with voltage, current and power equations - advantages of three phase system over single phase system.

Electrical Machines

working of D.C. Generator - type of D.C. Generators and the schematic diagram of each type - currents and voltages equations for different types of D.C. Generators - working of D.C. Motor - type of D.C. Motors and schematic diagram of each type - currents and voltages equations for different types of D.C. Motors - List methods of speed control of D.C. Motors - working of Transformer - working of Three Phase Induction Motor - types of Single Phase Induction Motors - application of the DC Motor, Three Phase Induction motor, Single Phase Induction Motor.

Electrical Measuring Instruments

Types of electrical measuring instruments - working of Moving Coil Measuring Instrument - working of Attraction Type Moving Iron Measuring Instrument - working of Moving Iron type Measuring Instrument - Compare Moving Coil Measuring Instrument and Moving Iron Measuring Instrument - working of Dynamometer Type Measuring Instrument - working of Induction Type Single Phase Energymeter.

Electrical Safety Procedures

Effects of electrical shock and burn - procedures to be adopted to avoid electric shock - first aid methods to be followed after electrocuted - need of earthing of electrical equipment and machinery - types of earthing of electrical equipment and machinery - procedure of pipe earthing with diagram - procedure of plate earthing with diagram.

REFERENCE BOOKS

- | | | |
|---|---|--|
| 1. Text Book of Electrical Engineering | - | JB Gupta |
| 2. A Text Book of Electrical Engineering | - | BL Theraja & AK Theraja |
| 3. Basic Electrical and Electronics Engineering | - | DP Kothari & IJ Nagrath |
| 4. Electrical Machinery | - | P.S. Bimbra |
| 5. Electrical Power Systems | - | Chakrabarthy, Sony, Gupta and Bhatnagar |

SYLLABUS TO BE COVERED FOR UNIT TEST-I AND UNIT TEST-II

| Unit Test | Learning Outcomes to be covered |
|--------------|---------------------------------|
| Unit Test-I | From 1.1 to 3.8 |
| Unit Test-II | From 3.9 to 5.6 |

BASIC MECHANICAL ENGINEERING

| Course Code | Course Title | No. of periods / Week | Total No. of Periods | Marks for FA | Marks for SA |
|-------------|------------------------------|-----------------------|----------------------|--------------|--------------|
| MNG- 303 | BASIC MECHANICAL ENGINEERING | 4 | 60 | 20 | 80 |

TIME SCHEDULE

| S No. | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Cos Mapped |
|-------|------------------------------|---------------|--------------------|-----------------------------------|----------------------------------|------------|
| 1 | Friction | 12 | 26 | 2 | 2 | CO1 |
| 2 | Simple Machines | 12 | 16 | 2 | 1 | CO2 |
| 3 | Transmission of the power | 12 | 26 | 2 | 2 | CO3 |
| 4 | Simple stress and strain | 8 | 16 | 2 | 1 | CO4 |
| 5 | IC Engines & Air Compressors | 16 | 26 | 2 | 2 | CO5 |
| | Total | 60 | 110 | 10 | 8 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|--|
| Course Objectives | <p>Upon completion of the course the student shall be able to</p> <p>Understand the basic principles of Friction and simple Machines.</p> <p>Calculate the power, forces and stresses during power transmission.</p> <p>Understand the working of IC Engines and compressors.</p> |
|--------------------------|--|

| | | | |
|------------------------|------------|------------------|---|
| Course Outcomes | CO1 | MNG-303.1 | Explain the resolution of forces and basic concepts of Friction and its applications in various fields |
| | CO2 | MNG-303.2 | Illustrate working principles of simple machines and functioning of simple mechanisms used in day to day needs. |
| | CO3 | MNG-303.3 | Calculate various problems on power developed and forces during the power transmission. |
| | CO4 | MNG-303.4 | Explain the basic concepts of stresses and strain. |
| | CO5 | MNG-303.5 | Enumerate the concept of IC Engines and Air Compressors. |

PO-CO Mapping

| Course Code : MNG-303 | Course Title: Basic Mechanical Engineering | Number of Course Outcomes: 05 | | | No. of Periods: 60 |
|--|---|---|----------|----------------------|---|
| POs | Mapped with CO No. | CO Periods addressing PO in Column 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1, CO2, CO3, CO4,CO5 | 26 | 43 | 3 | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately Addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO2 | CO1, CO2, CO3, CO4,CO5 | 20 | 34 | 2 | |
| PO3 | | | | | |
| PO4 | | | | | |
| PO5 | | | | | |
| PO6 | | | | | |
| PO7 | CO1, CO2, CO3, CO4,CO5 | 14 | 23 | 1 | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | | | | | 1 | 1 | 3 | 1 |
| CO2 | 3 | 2 | | | | | 1 | 1 | 3 | 1 |
| CO3 | 3 | 2 | | | | | 1 | 1 | 3 | 1 |
| CO4 | 3 | 2 | | | | | 1 | 1 | 3 | 1 |
| CO5 | 3 | 2 | | | | | 1 | 1 | 3 | 1 |

3: High, 2: Moderate, 1: Low

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quiz (vii) Industry Visits (viii) Tech Fest (ix) Mini Projects (x) Library Visits.

LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1.0 Statics

- 1.1 Explain the concept of force and system of forces
- 1.2 Explain the types of system of forces-Concurrent and Non concurrent forces
- 1.3 Explain the concept of components of forces, resolution of forces
- 1.4 Determine the resultant force of concurrent forces
- 1.5 Conditions for Equilibrium
- 1.6 Solve the simple problems on resultant force of concurrent forces
- 1.7 Explain the concept of friction
- 1.8 State laws of friction
- 1.9 Define the terms angle of friction, Normal force and angle of repose
- 1.10 Resolve the forces acting on the body moving on rough horizontal surface
- 1.11 Resolve the forces acting on the body moving on inclined surface and force is applied parallel to the plane
- 1.12 Solve the simple problems of the above cases.

2.0 Simple Machines:

- 2.1 Define the terms related to simple machines (i)Simple machine, (ii)velocity ratio, (iii) Mechanical advantage and (iv)efficiency
- 2.2 Identify the different types of levers and examples
- 2.3 Describe the simple machines like simple wheel and axle, differential wheel and axle, Differential pulley block, single purchase crab winch, double purchase winch crab
- 2.4 Write the expression for velocity ratios of above simple machines.(Derivations omitted)
- 2.5 Define ideal machine, self-locking machine
- 2.6 Distinguish between ideal machine and practical machine
- 2.7 Calculate the simple problems involving mechanical advantage, velocity ratio, and efficiency

3.0 Power transmission elements:

- 3.1 List different power transmission drives.
- 3.2 Classify the belt drives and list the belt materials.
- 3.3 Distinguish between open belt drive and cross belt drive.
- 3.4 Define the expression for velocity ratio for a belt drive
- 3.5 Explain the term Slip-in-belt and its effect on velocity ratio.
- 3.6 Explain the combined effect of belt thickness and slip and velocity ratio
- 3.7 Write the expression for length of open belt drive and crossed belt drive.
- 3.8 Write the expression for ratio between belt tensions.
- 3.9 Solve simple numerical problems on length of belt drive, velocity ratio and ratio between tensions.
- 3.10 List the advantages and disadvantages of chain drive
- 3.11 List the suitable materials for chain drive
- 3.12 List the different types of chain drive
- 3.13 Explain the rope drive
- 3.14 Select suitable materials for rope
- 3.15 Explain the merits of chain drive and belt drive
- 3.16 List the advantages and disadvantages of gear drive over belt drives
- 3.17 Define gear trains and list the different types of gear trains

- 3.18 Discuss the simple and compound gear trains
- 3.19 Explain the nomenclature of spur gear.
- 3.20 Simple problems on simple and compound gear train.

4.0 Simple stresses and strains

- 4.1 Explain the concept of stress and strain, shear stress and shear strain, lateral strain and volumetric strain and Poisson's ratio.
- 4.2 State the concept working stresses and factor of safety
- 4.3 State and explain the Hooke's law
- 4.4 Explain the stress-strain diagram for ductile material and brittle material.
- 4.5 Define elastic constants Young's modulus, shear modulus and Bulk Modulus.
- 4.6 Write the expression for relation between three elastic constants and Poisson's ratio.
- 4.7 Solve the simple problems on stress, strain Poisson's ratio and Young's modulus
- 4.8 Discuss the mechanical properties of materials: (i) Tensile and compressive strength (ii) Ductility (iii) Hardness (iv) Toughness (v) Brittleness (vi) Fatigue

5.0 I.C. engines and Air compressors:

- 5.1 Define Internal combustion Engine and classify the I.C. Engines based on type of fuel used, number of strokes, type of ignition, type of cooling system and number of cylinders.
- 5.2 Explain the working of four stroke petrol engine with the help of neat sketch,
- 5.3 Explain the working of four stroke diesel engine with the help of neat sketch.
- 5.4 Explain the working of two stroke petrol engine with the help of neat sketch
- 5.5 Explain the working of two stroke diesel engine with the help of neat sketch.
- 5.6 Compare the four stroke and two stroke engines,
- 5.7 Explain the I.C. Engine systems: air cooling system, water cooling system, pressure lubrication system, fuel supply system, Diesel fuel injection pump.
- 5.8 Define fuel and list various types of fuels with examples
- 5.9 Define Higher calorific value and lower calorific value of fuel.
- 5.10 Define I.C. Engine performance parameters Indicated power, Brake Power, Mechanical efficiency and indicated thermal efficiency.
- 5.11 Explain the maintenance of diesel engines.
- 5.12 Define compressor and classify the compressors
- 5.13 State the uses of compressed air
- 5.14 Explain the working of single stage air compressor with the help of neat sketch.
- 5.15 Explain the multi stage air compressor and mention its advantages.

COURSE CONTENTS:

1.0 Statics

concept of force and system of forces - classification of system of forces-Concurrent and Non concurrent forces - components of force - resolution of forces-resultant force of concurrent forces-conditions for Equilibrium- simple problems on resultant force of concurrent forces-concept of friction-laws of friction-angle of friction, Normal force and angle of repose-Resolve the forces acting on the body moving on rough horizontal surface-Resolve the forces acting on the body moving on inclined surface and force is applied parallel to the plane-simple problems of the above cases.

2.0 Simple Machines:

Terms related to simple machines-Simple machine, velocity ratio, Mechanical advantage and efficiency-different types of levers and examples-simple machines like simple wheel and axle, differential wheel and axle, Differential pulley block, single purchase crab winch, double purchase winch crab-expression for velocity ratios of above simple machines.(Derivations omitted)-ideal machine, self-locking machine-distinguish between ideal machine and practical machine-simple problems involving mechanical advantage, velocity ratio, and efficiency

3.0 Power transmission elements:

List different power transmission drives-Classification of the belt drives -belt materials-Distinguish between open belt drive and cross belt drive-expression for velocity ratio for a belt drive-Slip-in-belt and its effect on velocity ratio-combined effect of belt thickness and slip and velocity ratio- expression for length of open belt drive and crossed belt drive-ratio between belt tensions-simple numerical problems on length of belt drive, velocity ratio and ratio between tensions-advantages and disadvantages of chain drive-suitable materials for chain drive-different types of chain drive-rope drive-suitable materials for rope-merits of chain drive and belt drive-advantages and disadvantages of gear drive over belt drives- gear trains and classification-simple and compound gear trains-nomenclature of spur gear-simple problems on simple and compound gear train.

4.0 Simple stresses and strains

concept of stress and strain, shear stress and shear strain, lateral strain and volumetric strain and Poisson's ratio-working stresses and factor of safety-Stress-strain diagram for ductile and brittle materials-Hooke's law-elastic constants Young's modulus, shear modulus and Bulk Modulus-relation between three elastic constants and Poisson's ratio-Solve the simple problems on stress, strain Poisson's ratio and Young's modulus-mechanical properties of materials: Tensile and compressive strength, Ductility, Hardness, Toughness, Brittleness and Fatigue.

5.0 I.C. Engines and Air Compressors:

Internal combustion Engine-Definition and classification based on type of fuel used, number of strokes, type of ignition, type of cooling system and number of cylinders- four stroke petrol and diesel engines-two stroke petrol and diesel engines- Comparison of four stroke and two stroke engines-I.C.Engine systems: air cooling system, water cooling system, pressure lubrication system, fuel supply system, Diesel fuel injection pump-fuel and classification with examples-Higher calorific value and lower calorific value of fuel-I.C. Engine performance parameters Indicated power, Brake Power, Mechanical efficiency and indicated thermal efficiency-maintenance of diesel engines.

Air compressor-Definition and classification-uses of compressed air-single stage air compressor -multi stage air compressor and its advantages.

REFERENCE BOOKS:

| | | | |
|----|-----------------------|---|-------------|
| 1 | Thermal Engineering | : | R.S.Khurmi |
| 2 | Hydraulics | : | R.S.Khurmi |
| 3 | Strength of Materials | : | I.B.Prasad |
| 4 | Engg. Mechanics | : | Ramamrutham |
| 5 | Thermal Engineering | : | R.K. Rajput |
| 6 | Strength to Materials | : | B.C.Punmia |
| 7. | Engineering Mechanics | : | Singer |

Table specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 3.9 |
| Unit Test –II | From 3.10 to 5.15 |

UNDERGROUND COAL MINING METHODS

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|---------------------------------|----------------------|---------------------|--------------|--------------|
| MNG-304 | Underground Coal Mining Methods | 05 | 75 | 20 | 80 |

TIME SCHEDULE

| S. No | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapped CO's |
|-------|-------------------------------|---------------|--------------------|-----------------------------------|----------------------------------|---------------|
| 1 | Bord and Pillar - Development | 14 | 16 | 02 | 01 | CO1, CO2 |
| 2 | Bord and Pillar - Depillaring | 14 | 26 | 02 | 02 | CO2, CO3 |
| 3 | Longwall mining | 15 | 26 | 02 | 02 | CO1, CO3, CO4 |
| 4 | Thick seam mining | 20 | 26 | 02 | 02 | CO2, CO3 |
| 5 | Special methods | 12 | 16 | 02 | 01 | CO3, CO4, CO5 |
| | Total | 75 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes:

| | |
|--------------------------|---|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - To familiarize the Bord and pillar development - To explain the Bord and pillar Depillaring - To explain the Longwall mining - To familiarize thick seam mining - To familiarize Special methods of mining |
|--------------------------|---|

| | | |
|------------------------|-----|--|
| Course Outcomes | CO1 | Explain the Bord and pillar development and Depillaring |
| | CO2 | Explain the methods of Depillaring |
| | CO3 | Describe the Longwall mining , Thick seam mining |
| | CO4 | To familiarize the Thick seam mining |
| | CO5 | To Explain the Special methods of mining, Calculation of |

| | | |
|--|--|---|
| | | percentage of extraction during development and Depillaring. Production calculation from Longwall panel extraction |
|--|--|---|

PO-CO Mapping:

| Course Code: 304 | | Course Title: Underground Coal Mining Methods | | | No of Periods: 75 |
|------------------|-------------------|---|------|---------------|--|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | - | - | - | - | >40% Level 3 Highly addressed 25 to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO2 | CO2 CO3 | 9 | 12.1 | 1 | |
| PO3 | - | - | - | - | |
| PO4 | CO2 CO3 | 19 | 25.3 | 2 | |
| PO5 | CO1 CO2 CO3 | 47 | 62.6 | 3 | |
| PO6 | - | - | - | - | |
| PO7 | - | - | - | - | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | - | - | - | - | 3 | - | - | - | - | - |
| CO2 | - | 1 | - | 2 | 3 | - | - | - | - | - |
| CO3 | - | 1 | - | 2 | 3 | - | - | - | - | - |
| CO4 | - | - | - | - | - | - | - | - | - | - |
| CO5 | - | - | - | - | - | - | - | - | - | - |

3: High, 2: Moderate, 1: Low

Learning Outcomes

Upon on completion of the course the student shall be able to:

1.0 Bord and Pillar method of working - Development

- 1.1 Define the term Bord and Pillar mining method
- 1.2 List the applicable conditions, merits, demerits and limitations of Bord and Pillar method
- 1.3 Define the terms caving and stowing
- 1.4 Explain the term panel indicating the types, applicable conditions, merits and demerits

- 1.5 Define the terms local fall and main fall, induced methods local fall
- 1.6 Explain the term air-blast and state its dangers and precautions
- 1.7 List the factors influencing the size and number of openings of panel
- 1.8 List the different factors governing the selection of development method
- 1.9 List the factors to be considered while opening out a district or panel
- 1.10 Explain the development stage of Bord and Pillar method with sketch
- 1.11 Explain the method of development by blasting-off solid with five headings , development along dip and strike
- 1.12 Explain the method of development with the help of cross-cuts in steeply dipping seams in Bord and Pillar method
- 1.13 Explain the method of development in Bord and Pillar mining with side discharge loader and load haul dumper
- 1.14 Calculate the percentage of extraction of development in Bord and Pillar mining by assuming your own dimensions

2.0 Bord and Pillar method of working - Depillaring

- 2.1 Classifies the methods of depillaring
- 2.2 List the preparatory arrangements before commencement of depillaring operation.
- 2.3 Explain diagonal line of extraction and step diagonal line of extraction, Knife Edge line of extraction and straight line of extraction
- 2.4 Define the terms split, rib, Chowkidar pillar, Goaf edge line of extraction
- 2.5 Explain the depillaring stage in Bord and Pillar mining with splitting, stoking and slice mining
- 2.6 Explain the method of extraction of pillar by caving under weak roof conditions using LHD and SDL
- 2.7 Define Air-blast, dangers due to air blast, precautions to prevent them
- 2.8 Calculate the percentage of extraction of depillaring in Bord and Pillar mining by assuming your own dimensions
- 2.9 State the necessity of stowing and list the different methods of stowing practice and their applicability conditions
- 2.10 Explain precautions against the dangers of water while working below goaved areas, precautions against fire during and after depillaring
- 2.11 Explain hydraulic sand stowing methods
- 2.12 Explain the preparatory arrangements for depillaring by stowing.
- 2.13 Describe the method of extraction of contiguous seams.

3.0 Longwall mining

- 3.1 Define the terms Longwall mining, Gate roads, Main gate, Tail gate, Stable, Pack wall
- 3.2 State the applicable conditions, merits, demerits and limitations of longwall method
- 3.3 Explain the development of gate roads by drill and blast-by manual loading
- 3.4 Explain the development of gate roads by cut and load- by Road headers
- 3.5 Classify the methods of longwall mining, and various machinery employed in longwall mining
- 3.6 Explain the Longwall advancing and its applicable conditions
- 3.7 List the different factors governing the length of Longwall face
- 3.8 Explain the layout of Longwall face advancing with caving and stowing
- 3.9 Explain Longwall retreating with sketch and list its applicable conditions, merits , de-merits
- 3.10 Explain the layout of longwall face retreating with caving and stowing
- 3.11 Explain single unit and double unit layouts of Longwall mining.
- 3.12 Differences between Longwall advancing and Longwall retreating
- 3.13 Explain push-sumping, and inclined push-sumping in Longwall mining.

4.0 Thick seam mining

- 4.1 List the difficulties and principle of working thick seams
- 4.2 List the different thick seam workings and state its applicability
- 4.3 Define the term slicing and list its methods
- 4.4 State the applicable conditions, merits and demerits of inclined slicing
- 4.5 Explain the method of inclined slicing in descending order with caving and ascending order with stowing
- 4.6 State the applicable conditions, merits and demerits of horizontal slicing
- 4.7 Explain the horizontal slicing in ascending order with stowing and descending order with caving
- 4.8 List the applicable conditions, merits and demerits of sub-level caving
- 4.9 Explain the method of sub-level caving
- 4.10 List the applicable conditions, merits and demerits of room and pillar mining
- 4.11 Explain the Room and Pillar method
- 4.12 List the applicable conditions, merits and demerits of horizon mining
- 4.13 Explain the method of horizon mining
- 4.14 List the applicable conditions, merits, demerits and limitations of Blasting Gallery method
- 4.15 Explain the working of thick seam by Blasting Gallery method.

5.0 Special methods

- 5.1 List the applicable conditions for Hydraulic mining of coal
- 5.2 List the merits and demerits of hydraulic mining of coal
- 5.3 Explain hydraulic breaking of coal Explain hydraulic transport in hydraulic mining of coal
- 5.4 Explain hydraulic mining in thick seams and steeply inclined seams
- 5.5 List the applicable conditions for underground gasification of coal
- 5.6 List the merits and demerits of underground gasification
- 5.7 Explain the principle and process of underground gasification of coal
- 5.8 Explain opening up of coal seams for underground gasification
- 5.9 Explain the methods of establishing linkages between bore holes in underground coal gasification

COURSE CONTENT

1.0 Bord and Pillar – Development

Bord and pillar system – applicability – merits – demerits – caving & stowing – panel - applicability of panel system – types of panels – merits – demerits -local fall, main fall – air blast, dangers, precautions – factors influencing the size of panel system – factors influencing the no. of openings of panel – factors governing the selection of development method – factors governed while opening of a district – development stage – panel development with three headings and – different methods of development systems along dip, along strike, side discharge loader, and load haul dumpers – percentage of extraction calculation.

2.0 Bord and Pillar – Depillaring

Depillaring methods – preparatory arrangements – different terms – Pillar extraction under weak roof condition -local fall, main fall – air blast, dangers, precautions – percentage of extraction calculation – method of stowing conditions required for adopting stowing – preparation arrangement for stowing – contiguous seams extraction- depillaring LHD- SDL- Air blast – precautions

3.0 Longwall mining

Longwall –Related Terms –Applicability, merits, demerits, limitations – Gate roads development – classification of Longwall methods –Longwall advancing indicating its applicability- machinery employed on a mechanised Longwall face – different factors governing the length of longwall face – Longwall advancing with caving and stowing – Longwall retreating and its applicability – merits and demerits – Longwall retreating with caving and stowing – single unit and double unit layouts – differences – comparison between Longwall advancing and Longwall retreating- Longwall-push sumping –inclined sumping methods

4.0 Thick seam mining

Difficulties with thick seams – classification of thick seam working – principles – slicing methods – applicability – inclinedslicing with caving and stowing – Horizontalslicing – applicability merits and demerits – Horizontalslicing with caving and stowing – sub-level caving – applicability merits and demerits – Room and pillar – applicability merits and demerits – Horizon mining – applicability merits and demerits - Blasting Gallery method -applicability merits and demerits.

5.0 Special methods

Applicability merits and demerits of hydraulic mining of coal – hydraulicbreaking of coal – hydraulictransport – layoutof hydraulic mining – applicable conditions of underground gasification of coal – meritsdemerits of gasification of coal – principles and process underground gasification – openingup of coal seams for underground gasification – establishing linkages between bore holes – Hydraulic mining- thick seam- steep seam

REFERENCE BOOKS

- | | | |
|--|---|--|
| 1. Elements of Mining, Vol. 1 | : | D.J. Deshmukh |
| 2. Principle &Practices of Coal Mining | : | R.D. Singh |
| 3. Wining and working coal | : | R.T. Deshmukh &D.J.Deshmukh ,Vol. 1& 2 |
| 4. Longwall Mining | : | Samir Kumar das |
| 5. Modern coal Mining Technology | : | Samir Kumar Das |
| 6. Coal Mining practice | : | Stathum |

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 3.3 |
| Unit Test –II | From 3.4 to 5.8 |

MINE SURVEYING -I

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|----------------|--------------------------|----------------------|---------------------|--------------|--------------|
| MNG-305 | Mine Surveying -I | 04 | 60 | 20 | 80 |

TIME SCHEDULE

| S. No. | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapped CO's |
|--------|--------------------------|---------------|--------------------|-----------------------------------|----------------------------------|---------------|
| 1 | Introduction | 04 | 03 | 01 | | CO1 |
| 2 | Measurement of distances | 10 | 16 | 02 | 01 | CO1, CO2,CO4 |
| 3 | Chain Surveying | 10 | 16 | 02 | 01 | CO2, CO3, CO4 |
| 4 | Compass Surveying | 12 | 26 | 02 | 02 | CO3,CO4,CO 5 |
| 5 | Levelling | 18 | 36 | 02 | 03 | CO3,CO4,CO 5 |
| 6 | Contouring | 06 | 13 | 01 | 01 | CO4,CO5 |
| | Total | 60 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|--|
| Course Objectives | Upon completion of the course the student shall be able to: Apply the principles and concepts of chain surveying, compass surveying and levelling |
|--------------------------|--|

| | | |
|------------------------|------------|--|
| Course outcomes | CO1 | Basic understanding of linear , angular measurements, level survey |
| | CO2 | Application of linear measurements, angular measurements, principle of surveying, leveling |
| | CO3 | Problems, limitations of linear, angular and level survey. |
| | CO4 | Leveling, Subsidence survey, application in mining |
| | CO5 | Numerical problems in linear, angular, leveling survey |

PO-CO Mapping

| Course Code: 305 | | Course Title: Mine Surveying-I | | | No of Periods: 60 |
|------------------|---------------------|-----------------------------------|----|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1,CO2,CO3,CO4,CO5 | 26 | 43 | 3 | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO 2 | CO2,CO3,CO4,CO5 | 27 | 45 | 3 | |
| PO 3 | CO5 | 7 | 12 | 1 | |
| PO 4 | | | | | |
| PO 5 | | | | | |
| PO 6 | | | | | |
| PO 7 | | | | | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | | | | | | | 1 |
| CO2 | 3 | 3 | | | | | | 1 | | 2 |
| CO3 | 3 | 3 | | | | | | | | 2 |
| CO4 | 3 | 3 | | | | | | 1 | | 2 |
| CO5 | 3 | 3 | 1 | | | | | 2 | | 2 |

3: High, 2: Moderate,1: Low

LEARNING OUTCOMES

Upon completion of the course, student shall be able to:

- 1.0 **Know the fundamentals in Surveying**
 - 1.1 Define the term Surveying.
 - 1.2 List the objectives of surveying.
 - 1.3 State the principles of surveying.
 - 1.4 List the primary divisions of surveying.
 - 1.5 Give the broad classification of surveying.
 - 1.6 Define the terms Geodetic survey and Plane survey.

2.0 **Know the measurement of distances**

- 2.1 Classifies the methods of measuring distances.
- 2.2 List the instruments for direct measurement of distances.
- 2.3 Describe the constructional details of chain and tape.
- 2.4 List the various types of chains and tapes.
- 2.5 List the reasons for incorrect length of chain.
- 2.6 Define the term ranging, different methods of ranging
- 2.7 Describe the method of direct ranging, in-direct ranging
- 2.8 Explain the method of measuring distances on level ground, sloping ground
- 2.9 List the sources of errors in measuring distances.
- 2.10 State the corrections to be applied to the measured length for obtaining true length.
- 2.11 Solve the problems to obtain true length, true area and true volumes.
- 2.12 List the common mistakes in measuring distances and permissible limits of error in linear measurements

3.0 **Know the chain Surveying**

- 3.1 State the purpose of chain surveying.
- 3.2 State the principle of chain surveying.
- 3.3 List the steps in chain surveying.
- 3.4 Define the term Reconnaissance.
- 3.5 List the factors governing the selection of station in chain surveying
- 3.6 Explain the term Reference sketch.
- 3.7 List the types of survey stations.
- 3.8 Define the terms (a) Base line (b) Check line (c) Tie line (d) Offset.
- 3.9 List the types of Offsets and applicability of each.
- 3.10 Name the instruments for setting offsets.
- 3.11 Describe degree of accuracy in chaining.

4.0 **know the Compass Surveying**

- 4.1 List the types of compasses and their field applications
- 4.2 State the parts of Prismatic compass, Surveyor's compass with sketch.
- 4.3 Define the terms (a) True Meridian (b) Magnetic Meridian (c) Arbitrary meridian (d) True bearing (e) Magnetic bearing (f) Arbitrary bearing
- 4.4 Classify the types of bearings (Whole circle bearing, Quadrantal bearing, Fore bearing, Back bearing) and conversion of WCB to QB –vice versa
- 4.5 Explain the method of measuring the magnetic bearing of line, with prismatic compass and traversing of given area
- 4.6 Explain the terms (a) included angle (b) interior angle (c) exterior angle.
- 4.7 Define the terms 'Traverse', 'closed traverse' and 'Open Traverse'
- 4.8 Compute the included angles from the bearings of the lines.
- 4.9 Define the term local attraction, magnetic declination and dip.
- 4.10 List the reasons for local attraction,
- 4.11 Solves the problems on local attraction and magnetic declination
- 4.12 State the permissible limit of the error in (prismatic) compass survey.

5.0 Understand the Levelling

- 5.1 Define the term levelling , objective of Levelling, types of levelling instruments
- 5.2 Explain the principle of levelling.
- 5.3 Define of terms : level surface, level line, horizontal plane, Horizontal line, Vertical plane, Vertical line, datum surface or datum line, Elevation bench mark, line of collimation, axis of telescope, axis of bubble tube, Vertical axis, back sight, foresight, intermediate sight, Change point, Station, Height of instrument, Reduced level.
- 5.4 Describe the Dumpy level.
- 5.5 List the temporary adjustments , fundamental lines of dumpy level and relation between fundamental lines
- 5.6 List the types of levelling staves.
- 5.7 List the methods of Levelling
- 5.8 Explain the terms simple levelling, compound levelling, profile levelling , reciprocal levelling
- 5.9 Explain the methods of reducing levels from the observed staff readings.
- 5.10 Calculate the reduced levels by rise and fall methods, Height of the instrument method
- 5.11 Describe the profile levelling method and its applicabilities.
- 5.12 Explain the effects of curvature and refraction in levelling.
- 5.13 State the correction for curvature and refraction and combined effect of both of them.
- 5.14 Describe the method of reciprocal levelling, applicability and merits-demerits
- 5.15 State the permissible limits of error in ordinary levelling, rough levelling, precise levelling, and underground levelling in establishing bench marks of important nature

6.0 Contouring and subsidence

- 6.1 State the purpose of subsidence levelling.
- 6.2 State the purpose of highest flood level.
- 6.3 Define the term contour
- 6.4 Define the term contour interval and horizontal equivalent of contour.
- 6.5 List the methods of contouring.
- 6.6 Describe the direct method of contouring.
- 6.7 Describe the square method of contouring.
- 6.8 List the uses of contour for mining engineer.
- 6.9 List the characteristics of contours.
- 6.10 Define the terms stratum contours Isopachyte and grade contour.

COURSE CONTENTS:

- 1. **Introduction:** Definition – Objectives – Classification – Principle – Surveying.
- 2. **Methods of Measuring Distances:-** Classification – Instruments – Constructional details – Reasons for incorrect Length of Chain – Ranging – Direct – Indirect – Measuring Distances on level Ground – Sloping Ground – Sources of Errors – Corrections – Problems – Mistakes – Permissible Limits.
- 3. **Chain Surveying:-** Purpose – Principle – Steps – Reconnaissance – Factors Governing Selection of Stations – Definitions of offset – Baseline – Tie line – Reference sketch – Instruments for setting offsets – Degree of accuracy in chaining, Triangulation survey, Instruments, method of calculation of the area.

4. **Compass Surveying:-** Uses – Types – Sketch – Purpose of parts – Terms – True meridian – Magnetic Meridian – Arbitrary Meridian – Bearing Whole Circle – Quadrantal – F. B – B. B – Methods of Measuring Bearing- conversion W.C.B to Q.B, Q.B to W.C.B- Computes Included Angle – Local Attraction – Reasons – solves Problems on Local Attraction – Magnetic Declination and Dip – Open & Closed Traverse – Traversing with Compass and chain – Permissible errors.
5. **Levelling :-** Definitions – Type of Instruments - Adjustments – Fundamental Lines – Relations – Principles of levelling – Methods –Effects of Curvature and Refraction Reciprocal Levelling – Merits – Applicability – Problems – Permissible Errors
6. **Contouring and Subsidence:-.** Purpose of Subsidence Levelling-Purpose of H.F.L – Contouring – Method of contouring, Interpolation of contours – Terms

REFERENCE BOOKS:

1. Mine Surveying : S.Ghattak Vol. 1
2. Surveying and Levelling : T.P.Kanetkar&S.VKulkarni Vol. 1
3. Surveying and Levelling : B.C.Punmiya Vol. 1

Table Specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 4.8 |
| Unit Test –II | From 4.8 to 6.10 |

MINING GEOLOGY

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|----------------|-----------------------|----------------------|---------------------|--------------|--------------|
| MNG-306 | Mining Geology | 05 | 75 | 20 | 80 |

TIME SCHEDULE

| S. No. | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapped CO's |
|--------|------------------------|---------------|--------------------|-----------------------------------|----------------------------------|-------------------|
| 1 | Stratigraphy | 15 | 26 | 02 | 02 | CO1, CO2 |
| 2 | Economic Geology | 20 | 36 | 02 | 03 | CO2, CO3 |
| 3 | Prospecting Techniques | 15 | 13 | 01 | 01 | CO2,CO3,CO4 ,CO5 |
| 4 | Coal Geology | 10 | 13 | 01 | 01 | CO3,CO4 ,CO5 |
| 5 | Petroleum Geology | 5 | 6 | 02 | | CO2, CO3,CO4 ,CO5 |
| 6 | Hydro geology | 10 | 16 | 02 | 01 | CO2, CO3,CO4 ,CO5 |
| | Total | 75 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|---|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <p>Explain the concepts of stratigraphy</p> <p>To familiarized economic geology</p> <p>To discribe the prospecting techniques</p> <p>Explain the coal geology</p> <p>To familiarized petroleum geology.</p> <p>Explain ground water table , Aquifier, Aquifuge</p> |
|--------------------------|---|

| | | |
|------------------------|------------|---|
| Course outcomes | CO1 | Explain Basic concepts of stratigraphy, economic geology, prospecting |
|------------------------|------------|---|

| | | |
|--|------------|---|
| | CO2 | Explain Stratigraphy of geology, origin of earth, internal composition, |
| | CO3 | Describe the Stratigraphy of mineral , rock formations, oxidation and super gene enrichment |
| | CO4 | Explain Prospecting and their importance in mining |
| | CO5 | Explain Coal geology, formation petroleum geology, composition of mineral and rocks |

PO-CO Mapping

| Course Code: 306 | | Course Title: Mining Geology | | | No of Periods: 75 |
|------------------|-------------------|-----------------------------------|----|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1,CO2,CO4,CO5 | 44 | 59 | 3 | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately Addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO 2 | CO4 | 8 | 11 | 1 | |
| PO 3 | | | | | |
| PO 4 | | | | | |
| PO 5 | CO4,CO5 | 8 | 10 | 1 | |
| PO 6 | | | | | |
| PO 7 | CO3 | 15 | 20 | 2 | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | | | | | | | 1 |
| CO2 | 3 | | | | | | | | | 1 |
| CO3 | | | | | | | 2 | | 1 | |
| CO4 | 3 | 1 | | | 1 | | | 2 | | 1 |
| CO5 | 3 | | | | 1 | | | 1 | | 1 |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Upon completion of the course, student shall be able to:

1.0 Understand Basic concepts of Stratigraphy

- 1.1 Define the term Stratigraphy
- 1.2 State the objectives of Stratigraphy
- 1.3 Explain Geological Time Scale
- 1.4 State and explain the physiographic divisions of India.
- 1.5 Describe each of the following systems with their distribution and economic importance -
Archaean – Dharwar - Cuddapah - Vindhyan - Gondwana systems
- 1.6 Explain the stratigraphy of Andhra Pradesh.

2.0 Understand the Basic concepts of Economic Geology

- 2.1 Define Economic Geology
- 2.2 Define the terms Ore, Gangue, Tenor, Associated Minerals, Resource, Reserves, Proved, Probable and Possible reserves.
- 2.3 Explain the term economic geology.
- 2.4 List the various processes of mineralization
- 2.5 Explain Magmatic Concentration process of mineralization and list the minerals formed in the process.
- 2.6 Explain Sublimation and Metasomatic replacement of country rocks by invading magmas processes of mineralization and list the minerals formed in the processes.
- 2.7 Explain the metamorphic process of mineralization and list the minerals formed in the process.
- 2.8 Explain the sedimentation, evaporation and mechanical concentration processes of mineralization and list the minerals formed in the processes.
- 2.9 Explain the Residual concentration and oxidation & secondary sulphide enrichment processes of mineralization and list the minerals formed in the processes. Also list out the favourable conditions of mineralization.
- 2.10 Explain the Hydrothermal and cavity filling processes of mineralization and list the minerals formed in the processes with suitable examples and figures.

3.0 Know about Prospecting Techniques

- 3.1 State the objectives of Geological and Geophysical prospecting of minerals/ore deposits
- 3.2 List the equipment required for preliminary prospecting of minerals/ore deposits
- 3.3 List the various guides for location of mineral deposits in the field
- 3.4 List the different geophysical methods of prospecting
- 3.5 List the different electrical methods of geophysical prospecting
- 3.6 Explain the Self-potential, Resistivity, Potential drop ratio, Electromagnetic and Induced polarization methods of geophysical prospecting for minerals/ore deposits.
- 3.7 Explain the Gravity methods of geophysical prospecting for minerals/ore deposits.
- 3.8 Explain the Seismic reflection and Seismic refraction methods of geophysical prospecting for minerals/ore deposits.
- 3.9 Explain the Radiometric method of geophysical prospecting for minerals/ore deposits.

4.0 Know about the Coal Geology

- 4.1 State the Periods of coal formation
- 4.2 State the different Stages of coal formation
- 4.3 Explain the Origin of Coal Seams
- 4.4 Explain the In situ and Drift Theories of coal seams formation
- 4.5 Describe the various structural features of coal seams
- 4.6 Give the classification of coal based on formation and rank
- 4.7 Describe the coalfields of India

5.0 Know about the Petroleum Geology

- 5.1 List the uses of Petroleum
- 5.2 Describe the Origin of Petroleum
- 5.3 State the migration and accumulation of petroleum
- 5.4 State the distribution of major Oil fields in the world
- 5.5 State the distribution of Oil fields in India

6.0 Hydro geology

- 6.0 Importance of the Hydrogeology
- 6.1 Outline the Occurrence of ground water, vertical distribution of ground water
- 6.2 Explain the Water Table
- 6.3 Compare the different types of Ground water and explain Hydrological cycle

- 6.4 Classify the types of Precipitation
- 6.5 Function the Rain fall measurements and records.
- 6.6 What is Evaporation and Evapo-transpiration
- 6.7 Classify the factors controlling evapo-transpiration
- 6.8 Define Runoff, Infiltration
- 6.9 Function the different factors affecting infiltration
- 6.10 Distinguish the Zone of Saturation and Zone of Aeration
- 6.11 Elaborate the Water bearing properties of Rocks
- 6.12 Explain Aquifer, Aquifuge and Aquiclude

COURSE CONTENTS:

- 1.0 Stratigraphy:** Definition –objectives of stratigraphy – Geological time scale – Physiographic divisions of India - major Stratigraphical divisions of India – Archaean- Dharwar - Cuddapah – Vindhyan – Gondwana systems – Stratigraphy of A.P state.
- 2.0 Economic Geology:** Definition of terms – ore – gauge, tenor, associated mineral, resources, proved – probable, possible reserves – different process of Mineralisation – important economic minerals associated with each process.
- 3.0 Prospecting Techniques:** Objectives – Guides for location of mineral deposits –Geophysical methods–Electrical, Gravity, Seismic, and Radiometric.
- 4.0 Know about the Coal Geology:** State the periods of coal formation, mention the different stages of coal formation, explain the origin of coal seams, and explain the in situ theory and drift theory. Describe the structural features of coal seams. Give the classification of Coal. List the world coal fields. Describe the coalfields of India
- 5.0 Know about the Petroleum Geology:** know the importance of Petroleum as Fuel. State the Origin of Petroleum. State the Migration and Accumulation of Petroleum. State the distribution of Oil fields in the world. State the distribution of Oil fields in India.
- 6.0 Hydro Geology :** Introduction, Occurrence and source of ground water. Vertical distribution of ground water. Water Table and Types of Ground water. Hydrological cycle. Types of Precipitation- Rain fall measurements and records. Evaporation – Factors controlling evapo-transpiration. Runoff. Infiltration and factors affecting infiltration. Zone of Saturation and Zone of Aeration. Water bearing properties of rocks: Porosity and Permeability of Rocks Aquifer, Aquifuge and Aquiclude.

REFERENCE BOOKS:

- | | | |
|--------------------------------------|---|-------------------|
| 1. Text book of Geology | : | P.K.Mukharjee |
| 2. Mining Geology | : | Arogyaswamy |
| 3. Engineering Geology | : | Parbin Singh |
| 4. Economic Geology | : | Batemen |
| 5. Coal Geology | : | R.S.Sharma |
| 6. Principles of Stratigraphy | : | A. Ravindra Kumar |
| 7. Principles of Engineering Geology | : | K.M.Bangar |
| 8. Geology of petroleum | : | Leverson |

Table Specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|------------------|-------------------------------------|
| Unit Test -I | From 1.1 to 3.6 |
| Unit Test –II | From 3.7 to 6.10 |

BASIC ELECTRICAL ENGINEERING LABORATORY

| Course Code | Course Title | No. of periods / Week | Total No. of Periods | Marks for FA | Marks for SA |
|-------------|--|-----------------------|----------------------|--------------|--------------|
| MNG-307 | BASIC ELECTRICAL ENGINEERING LABORATORY PRACTICE | 3 | 45 | 40 | 60 |

COURSE OUTCOMES MAPPING

| S.No | Major Topics | No. of periods | CO's Mapped |
|------|-------------------------------------|----------------|-------------|
| 1. | Electrical Engineering Fundamentals | 6 | CO1 |
| 2. | Electrical Circuits | 6 | CO2 |
| 3. | Electrical Machines | 18 | CO3 |
| 4 | Electrical Measuring Instruments | 6 | CO4 |
| 5. | Electrical Safety Procedures | 9 | CO5 |
| | Total | 45 | |

| | |
|--------------------------|--|
| COURSE OBJECTIVES | To familiarize the basic concepts and working principles of electrical engineering to solve various electrical circuits. |
| | To understand the working and performance of different electrical machines and measuring instruments. |
| | To acquire the knowledge of operating electrical equipment with safety and performing the first aid methods. |

| | | | |
|------------------------|-----|----------|---|
| COURSE OUTCOMES | CO1 | MNG307.1 | Recognizing the basic concepts of electrical engineering and their applications. |
| | CO2 | MNG307.2 | Calculating various parameters of electrical circuits to know their importance in electrical engineering. |
| | CO3 | MNG307.3 | Operating various electrical machines for different applications. |
| | CO4 | MNG307.4 | Examining errors in electrical measuring instruments. |
| | CO5 | MNG307.5 | Practicing safety measures and first aid methods in different situations. |

LEARNING OUTCOMES

Electrical Engineering Fundamentals

- 1.1 Verification of Ohm's Law.
- 1.2 Finding Power and Power Factor in Resistive Load.

Electrical Circuits

- 2.1 Verification of Kirchhoff's laws.
- 2.2 Finding Power and Power Factor in Single Phase RL Load..

Electrical Machines

- 3.1 Speed Control of D.C. Shunt Motor.
- 3.2 Load test on Single Phase Transformer.
- 3.3 Load test on Three Phase Induction motor.

Electrical Measuring Instruments

- 4.1 Calibration of Dynamometer Type Wattmeter.
- 4.2 Calibration of Induction Type Single Phase Energymeter.

Electrical Safety Procedures.

- 5.1 Practice the procedures to be adopted to avoid electric shock.
- 5.2 Practice the first aid methods to be followed after electrocuted.
- 5.3 Practice the procedure of plate earthing.

KEY COMPETENCIES TO BE ACHIEVED BY THE STUDENT

| S.No | Major Topic | Key Competency |
|------|-------------------------------------|--|
| 1 | Electrical Engineering Fundamentals | <ul style="list-style-type: none">➤ Identification of the usage of various measuring instruments.➤ Verification of Ohm's law➤ Finding the power and power factor in a resistive load |
| 2 | Electrical Circuits | <ul style="list-style-type: none">➤ Verification of Kirchhoff's laws➤ Finding the power and power factor in a single phase RL series load |
| 3 | Electrical Machines | <ul style="list-style-type: none">➤ Identification of the terminals of a DC Shunt Motor.➤ Controlling the speed of a DC Shunt Motor below the rated speed using Armature Voltage control method➤ Controlling the speed of a DC Shunt Motor above the rated speed using Field Flux control method➤ Identification of the terminals of a single phase transformer.➤ Finding efficiencies of a single phase transformer at various conditions by conducting load test.➤ Identification of the terminals of a single phase induction motor.➤ Finding efficiencies of a single phase induction motor at various conditions by conducting load test. |
| 4 | Electrical Measuring Instruments | <ul style="list-style-type: none">➤ Identification of the requirement of calibration of measuring instruments.➤ Finding the percentage of error in the readings of a dynamometer type wattmeter by calibrating it.➤ Performing connections between the service mains and load through Energymeter.➤ Finding the percentage of error in the readings of an induction type Energymeter by calibrating it. |

| | | |
|---|------------------------------|--|
| 5 | Electrical Safety Procedures | <ul style="list-style-type: none"> ➤ Practicing the procedures to be adopted to avoid electric shock. ➤ Practicing the first aid methods to be followed after electrocuted. ➤ Performing pipe earthing to the electrical machinery. |
|---|------------------------------|--|

CO'S – PO'S – PSO'S MAPPING STRENGTH

| CO No | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|----------|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| MNG307.1 | 3 | | | | | | | 3 | | |
| MNG307.2 | 3 | 2 | 1 | | | | | 3 | 2 | |
| MNG307.3 | 3 | | | | | | | 3 | 1 | |
| MNG307.4 | 3 | | 2 | | | | | 3 | | |
| MNG307.5 | 3 | | | 1 | | | | 3 | 1 | |
| Average | 3 | 2 | 1.5 | 1 | | | | 3 | 1.3 | |

3-Strongly Mapped

2- Moderately Mapped 1- Slightly Mapped

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

Basic Mechanical Engineering Laboratory Practice

| Subject Title | Subject Code | Periods/Week | Periods/Semester |
|--|--------------|--------------|------------------|
| Basic Mechanical Engineering laboratory practice | MNG-308 | 03 | 45 |

TIME SCHEDULE

| S.NO | EXPERIMENT TITLE | NO. OF PERIODS |
|--------------|--|----------------|
| 1 | Hooks Law verification | 8 |
| 2 | Study of Hydraulic Pumps | 12 |
| 3 | Determination of Flash and Fire points of Fuels and Lubricants | 10 |
| 4 | Determination of Calorific Values of Fuels | 6 |
| 5 | Performance of IC engines | 9 |
| TOTAL | | 45 |

Course Objectives and Course Outcomes

| COURSE OBJECTIVE | Upon the completion of the course the student shall be able to understand the working of various equipments. | | |
|------------------------|--|-----------|---|
| COURSE OUTCOMES | CO1 | MNG-308.1 | Operate the UTM to verify the Hooks law |
| | CO2 | MNG-308.2 | Conduct the tests on Hydraulic Pumps. |
| | CO3 | MNG-308.3 | Determine the flash point and fire points of various fuels and lubricants |
| | CO4 | MNG-308.4 | Determine the calorific values of various fuels |
| | CO5 | MNG-308.5 | Conduct the tests on IC Engines to study its performance. |

PO-CO Mapping

| Course Code : MNG-308 | Course Title: Basic Mechanical Engineering Laboratory practice Number of Course Outcomes: 05 | | | | No. of Periods 45 |
|------------------------------|---|--------------------------------------|----|------------------|---|
| POs | Mapped with CO No. | CO Periods addressing PO in Column 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1 – CO5 | 12 | 27 | 2 | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately Addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO2 | | | | | |
| PO3 | | | | | |
| PO4 | CO1 – CO5 | 27 | 60 | 3 | |
| PO5 | | | | | |
| PO6 | | | | | |
| PO7 | CO1 – CO5 | 6 | 13 | 1 | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|------------|----------|-----|-----|----------|-----|-----|----------|----------|----------|----------|
| CO1 | 2 | | | 3 | | | 1 | 2 | 2 | 2 |
| CO2 | 2 | | | 3 | | | 1 | 2 | 2 | 2 |
| CO3 | 2 | | | 3 | | | 1 | 2 | 2 | 2 |
| CO4 | 2 | | | 3 | | | 1 | 2 | 2 | 2 |
| CO5 | 2 | | | 3 | | | 1 | 2 | 2 | 2 |

3: High, 2: Moderate, 1: Low

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quiz (vii) Industry Visits (viii) Tech Fest (ix) Mini Projects (x) Library Visits.

LEARNING OUTCOMES

After the completion of these topics the student should be able to

LIST OF EXPERIMENTS:

1.0 Hooks Law verification

- 1.1 Draw the stress and strain diagram for Mild Steel and verify Hooks Law
- 1.2 Conduct compression test on timber
- 1.3 Conduct bending test on timber

2.0 Study of Hydraulic Pumps

- 2.1 Study of reciprocating pumps
- 2.2 Study of centrifugal pumps
- 2.3 Study of jet pump
- 2.4 Determine the pump characteristics of centrifugal pump
- 2.5 Determine the pump characteristics of reciprocating pump

3.0 Determination of Flash and Fire points of Fuels and Lubricants

- 3.1 Determine the flash and fire points of kerosene and diesel oils using Able's flash and fire point tester
- 3.2 Determination of flash and fire points of given lubricating oil using Cleaveland's Flash and Fire point tester

4.0 Determination of Calorific values of fuels

- 4.1 Study of Bomb calorimeter and determine calorific value of a given fuel.
- 4.2 Study Junkers gas calorimeter to determine calorific value of gaseous fuel

5.0 Performance of IC engines

- 5.1 Study of given Petrol engine and determination of IHP, BHP and mechanical efficiency
- 5.2 Study of given diesel engine and determination of IHP, BHP and mechanical efficiency

COURSE CONTENTS:

1. Hooks Law verification

Draw the stress and strain diagram for Mild Steel specimen and verify Hooks Law- compression test on timber- bending test on timber.

2. Study of Hydraulic Pumps

Reciprocating pumps-Study of centrifugal pumps- jet pump- pump characteristics of centrifugal pump- pump characteristics of reciprocating pump

3. Determination of Flash and Fire points of Fuels and Lubricants

Determine the flash and fire points of kerosene and diesel oils using Ables flash and fire point tester-Determination of given lubricating oil using Cleavelands Flash and Fire point tester

4. Determination of Calorific values of fuels

Bomb calorimeter and determine calorific value of a given fuel- Junkers gas calorimeter to determine calorific value ``+of gaseous fuel

5. Performance of IC engines

Study of given Petrol engine and determination of IHP, BHP and mechanical efficiency- diesel engine and determination of IHP, BHP and mechanical efficiency

| Experiments | Key Competences |
|-----------------------------|--|
| 1.Hooks law verification | <ol style="list-style-type: none">1. Understand Regarding UTM2. Understand size of specimen, calculation of %elongation and contraction3. Understand how to calculate stress and strain.4. Understand to draw stress-strain diagram.5. Understand marking various properties on stress-strain diagram of mild steel specimen6. Understand how to apply tensile load and compressive load on timber. |
| 2. Study of Hydraulic Pumps | <ol style="list-style-type: none">1. Understand working principle of Reciprocating and centrifugal pumps.2. Understand various parts of pumps and their condition. |

| | |
|---|--|
| | <p>3. Understand working principle of jet pump.</p> <p>4. Understand various characteristics of pumps and their efficiency.</p> <p>5. Understand to plot graph representing various characteristics of pumps.</p> |
| <p>3. Determination of flash and fire points of fuels and lubricants.</p> | <p>1. Understand various types of fuels and their densities.</p> <p>2. Understand flash and fire points of fuels and their limits.</p> <p>3. Understand various flash and fire point tester like Ables flash and fire point tester and Cleaveland's Flash and Fire point tester.</p> <p>4. Understand to tabulate readings of different fuels and lubricants.</p> |
| <p>4. Determination of Calorific values of Fuels</p> <p>5. Performance of I.C. Engine</p> | <p>1. Understand various types of solid, liquid and gaseous fuels and their calorific values.</p> <p>2. Understand combustion process of various fuels.</p> <p>3. Understand different types of calorimeters and their working process.</p> <p>4. Understand condition of different parts of Bomb calorimeter and Junker's gas calorie meter.</p> <p>5. Understand formula's of Higher Calorific Value and Lower Calorific Value and calculation.</p> <p>1. Understand different types of engines and various components of engine.</p> <p>2. Understand two stroke and four stroke petrol and diesel engines and their working principles.</p> <p>3. Understand to record speed, stroke and area of the engine cylinder.</p> <p>4. Understand to tabulate and calculate B.H.P, I.H.P, and Mechanical efficiency of the engine.</p> <p>5. Understand to plot graphs representing various characteristics of engines.</p> |

MINE SURVEYING PRACTICE-I

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|----------------|-----------------------------------|----------------------|---------------------|--------------|--------------|
| MNG-309 | Mine Surveying Practice -I | 04 | 60 | 40 | 60 |

TIME SCHEDULE

| S. No. | Major Components | Periods |
|--------|------------------------------------|---------|
| 1. | Identification of Survey Equipment | 04 |
| 2. | Chain Surveying | 16 |
| 3. | Compass Surveying | 16 |
| 4. | Leveling and contouring | 24 |
| | Total | 60 |

Course Objectives and Course Outcomes

| | |
|--------------------------|--|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> (i) To familiarise with the Survey Equipment. (ii) To familiarize with the concepts of chain surveying (iii) To familiarize compass surveying (iv) To familiarize levelling and contouring (v) Applications of contouring in Mining |
|--------------------------|--|

| | | |
|------------------------|------------|--|
| Course Outcomes | CO1 | Familiarize different types of surveying equipments |
| | CO2 | Explain Surveying using chain. Tape, and other linear measurements |
| | CO3 | Explain Simple, compound levelling |
| | CO4 | Explain Level survey , Compass traversing |
| | CO5 | Calculation of areas of given area, Levelling survey in mining |

PO-CO Mapping

| Course Code: MNG-309 | | Course Title: Mine Surveying Practice-I | | | No of Periods: 60 |
|----------------------|-------------------|---|----|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1,CO2,CO3,CO4 | 32 | 54 | 3 | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO2 | | | | | |
| PO3 | CO2,CO3,CO4 | 28 | 46 | 3 | |
| PO4 | | | | | |
| PO5 | | | | | |
| PO6 | | | | | |
| PO7 | | | | | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | | | | | | | |
| CO2 | 3 | | 3 | | | | | | | |
| CO3 | 3 | | 3 | | | | | | | |
| CO4 | 3 | | 3 | | | | | | | |
| CO5 | | | | | | | | | | |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Up on Completion of the course the student shall be able to:

1.0 Identify the equipment in survey Laboratory

- 1.1 Identify the Survey field book and familiarize its use
- 1.2 Ranging of survey line by a) direct method (by eye) b) indirect method.
- 1.3 Measure distances by judgement, pacing, chaining, taping on a fairly level ground.

2.0 Know Chain surveying

- 2.1 Identifies the equipment required for chain survey
- 2.2 Sets the perpendicular offsets to various objects from chain line with chain and tape, cross-staff.
- 2.3 Carry out chain triangulation in a given area of Institute campus.
- 2.4 Prepare the plan of chain triangulation.
- 2.5 Carries out cross-staff survey
- 2.6 Plots the cross-staff survey
- 2.7 Determines the area from cross-staff survey plotting
- 2.8 Draws the conventional signs used in surveying.

3.0 Know Compass survey

- 3.1 Identify the parts of the prismatic compass
- 3.2 Measure the magnetic bearing of a line.
- 3.3 Measure the bearing of the line of closed figures and records the observations.
- 3.4 Calculate the included angles of the traverse and perform arithmetic check
- 3.5 Plot the traverse.
- 3.6 Calculate the local attraction of traverse and balance the traverse.

4.0 Know the levelling

- 4.1 Identifies the parts of a Dumpy level.
- 4.2 Practices taking reading on levelling staff with Dumpy level.
- 4.3 Conduct simple levelling and determine the R.L of a given point from a known B.M
- 4.4 Conduct compound levelling and determine the R.L of a given point from a known B.M
- 4.5 Carryout Fly levelling and determines R.L of a given point from a known B.M
- 4.6 Carry out profile levelling.
- 4.7 Plots the profile levelling and finds the gradient of the line.
- 4.8 Conduct cross-section levelling.
- 4.9 Plots the cross-section from the observations.
- 4.10 Understand the Contours and their interpolation
- 4.11 Conduct Contouring by Direct method with plotting.
- 4.12 Conduct Contouring by square method.

MINING GEOLOGY LABORATORY PRACTICE

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|----------------|---|----------------------|---------------------|--------------|--------------|
| MNG-310 | Mining Geology Laboratory Practice | 03 | 45 | 40 | 60 |

TIME SCHEDULE

| S. No. | Major Components | Periods | Mapped CO's |
|--------|---|---------|---------------|
| 1. | Identification of minerals by studying their megascopic properties | 15 | CO1 |
| 2. | Identification of rocks by studying their megascopic properties | 15 | CO1, CO2, CO3 |
| 3. | Identification of thin sections of rocks by studying their microscopic properties | 06 | CO1, CO2, CO3 |
| 4 | Mapping | 06 | CO3, CO4, CO5 |
| 5 | Field Activities | 03 | CO4, CO5 |
| | Total | 45 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|--|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - To familiarise with the megascopic properties of minerals - Identification of various rock formations based on megascopic properties - To familiarise with the microscopic properties of minerals - To analyse various features of contour maps, determination of profile or cross section of contour maps at various locations on the map - Field visit to understand above concepts |
|--------------------------|--|

| | | |
|------------------------|------------|--|
| Course outcomes | CO1 | Explain megascopic, microscopic properties of minerals |
| | CO2 | Identification of megascopic and microscopic properties of various minerals, rocks |
| | CO3 | Identification of Minerals, Rocks based on megascopic, microscopic properties |
| | CO4 | Study of contour maps, cross sectional features of various locations on the map |
| | CO5 | Field visit to study the properties of various rocks (Megascopic properties and structural features) |

PO-CO Mapping

| Course Code: MNG-310 | | Course Title: Mining Geology Laboratory | | | No of Periods: 45 |
|----------------------|-------------------|---|----|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1,CO2,CO5 | 22 | 49 | 3 | >40% Level 3 Highly addressed |
| PO2 | CO3 | 2 | 4 | | |
| PO3 | CO4 | 3 | 7 | 1 | 25% to 40% Level 2 Moderately Addressed |
| PO4 | CO5 | 8 | 18 | 1 | |
| PO5 | | | | | 5 to 25% Level 1 Low addressed |
| PO6 | | | | | |
| PO7 | CO5 | 10 | 22 | 1 | <5% Not addressed |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | | | | | | | 1 |
| CO2 | 3 | | | | | | | | | 1 |
| CO3 | | | | | | | | | | |
| CO4 | | | 1 | | | | | 1 | | |
| CO5 | 3 | | | 1 | | | 1 | 2 | | 1 |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Up on Completion of the course the student shall be able to:

1.0 Identify the Minerals based on Megascopic properties

- 1.1 Use Streak plate, Penknife, Jolly's spring Balance/Walker's steel yard, Glass piece
- 1.2 Identify the form, colour, streak, lustre, cleavage and hardness of minerals with examples
- 1.3 Observe the megascopic/physical properties of minerals through which the minerals are identified.
- 1.4 Analyse the diagnostic properties of minerals

2.0 Identify the Megascopic properties of Rocks

- 2.1 Identify the colour of Igneous Rocks
- 2.2 Understand the texture of Igneous Rocks with the aid of magnifying lens if necessary.
- 2.3 Observe the structure of Igneous Rocks
- 2.4 Identify the minerals-essential, accessory present in Igneous Rocks
- 2.5 Infer the mode of formation of Igneous Rocks
- 2.6 Identify the colour of Sedimentary Rocks
- 2.7 Understand the texture of Sedimentary Rocks

- 2.8 Identify the minerals present in Sedimentary Rocks
- 2.9 Identify the agent of transport and cementing material present in Sedimentary Rocks
- 2.10 Infer the mode of formation of Sedimentary Rocks
- 2.11 Identify the colour of Metamorphic Rocks
- 2.12 Understand the texture and structure of Metamorphic Rocks
- 2.13 Identify the minerals present and grade of metamorphism of Metamorphic Rocks
- 2.14 Infer the mode of formation of Metamorphic Rocks

3.0 Identify the Microscopic properties of Rocks

- 3.1 Identifies the different parts of Petrological microscope and develop skills to use.
- 3.2 Identify of thin section of Rocks.
- 3.3 Identify the properties of Igneous, Sedimentary and Metamorphic rocks under microscope
- 3.4 Infer the mode of formation of rocks observed

4.0 Mapping

- 4.1 Study of topography and contours maps.
- 4.2 Find out strike and Dip of the structures.
- 4.3 Drawing of profiles.
- 4.4 Understand the maps showing different geological features such as
a) Folds b) Faults c) Unconformities d) Dykes e) Sills
- 4.5 Understanding the Geological History of the area based on maps.

5.0 Undertaking of field activities

- 5.1 Identifies the tools equipment used in field.
- 5.2 Identify and collect the important mineral and rock samples in the field.
- 5.3 Determine Strike and Dip of Formation with the help of Brunton's compass
- 5.4 Identify the following features in field
 - a) Fold and its parts b) Fault and its parts
 - c) Joint and its parts d) Unconformities
- 5.5 Identify the following structures.
 - a) Current bedding b) Inliers
 - c) Outliners d) Exfoliation
 - e) Ripple marks f) Out crops

IV SEMESTER

DIPLOMA IN MINING ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
IV SEMESTER (SECOND YEAR)

| Subject Code | Name of the Subject | Instruction period / week | | Total Period / Sem | Scheme of Examination | | | |
|---|--|---------------------------|---------------------|--------------------|-----------------------|-----------------|----------------|-------------|
| | | Theory | Practical/ Tutorial | | Duration (hours) | Sessional Marks | End Exam Marks | Total Marks |
| THEORY | | | | | | | | |
| MNG- 401 | Mine Legislation -1 | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-402 | Underground Metal Mining Methods | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-403 | Mine Environmental Engineering | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-404 | Mining Machinery-I | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-405 | Mine Surveying – II | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-406 | Surface Mining -I | 4 | | 60 | 3 | 20 | 80 | 100 |
| PRACTICAL | | | | | | | | |
| MNG-407 | Mine Environmental Engineering Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-408 | Communication Skills | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-409 | Mine Surveying Practice - II | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-410 | Mine Planning and Design Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-411 | Mining Machinery Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| | Activities | - | 3 | 45 | - | - | - | - |
| | TOTAL | 24 | 18 | 630 | | 320 | 780 | 1100 |
| Note: MNG- 408 Common with all branches | | | | | | | | |

MINE LEGISLATION I

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|---------------------|----------------------|---------------------|--------------|--------------|
| MNG-401 | Mine Legislation -I | 04 | 60 | 20 | 80 |

TIME SCHEDULE

| S. No. | Unit Title/Chapter | No.of Periods | Weight age of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapping CO's |
|--------|--|---------------|---------------------|-----------------------------------|----------------------------------|--------------|
| 1 | Mines Act 1952, and Mines Rules 1955 | 10 | 22 | 04 | 01 | CO1 |
| 2 | Coal Mines Regulations, 2017 and Metalliferous Mines Regulations,1960-I | 25 | 49 | 03 | 04 | CO2,CO3 |
| 3 | Coal Mines Regulations, 2017 and Metalliferous Mines Regulations,1960-II | 25 | 39 | 03 | 03 | CO2,CO3 |
| | Total | 60 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|--|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - Explain the acts and rules used in mines and provisions related to them - Explain the importance of Coal mines regulations -2017 and various provisions - Explain the importance of Metalliferous Mines Regulations |
|--------------------------|--|

| | | |
|-----------------|-----|--|
| Course Outcomes | CO1 | Explain mines act and mine rules |
| | CO2 | Explain application of coal mines regulations |
| | CO3 | Explain application of metalliferous mines regulations |

PO CO Mapping

| Course Code: 401 | | Course Title: Mine Legislation - I | | | No of Periods: 60 |
|------------------|-------------------|------------------------------------|------|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | - | 10 | - | - | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately Addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO 2 | CO1, CO2, CO3, | 25 | 44.4 | 3 | |
| PO 3 | CO1,CO2,CO3 | 25 | 26.6 | 2 | |
| PO 4 | CO1,CO2,CO3 | 24 | 26.6 | 2 | |
| PO 5 | CO3 | 2 | 2.4 | - | |
| PO 6 | - | - | - | - | |
| PO 7 | - | | | | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | | 3 | 2 | 2 | | | | | 2 | 1 |
| CO2 | | 3 | 2 | 2 | | | | | | |
| CO3 | | 3 | 2 | 2 | | | | | 2 | 1 |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Upon completion of the course, student shall be able to

1.0 Mine Act 1952 and Mine Rules 1955

- 1.1
 - a) State the necessity of Mine Legislation
 - b) List the different laws applicable to mines-(Mines Act 1952, Mines Rules 1955, Coal Mines Regulations 2017 and Metalliferous Mines Regulations 1961, Mines Vocational Training Rules, 1966, Mines Crush Rules, 1966, Oil Mines Regulations 1984, Mineral Concession Rules 1960, Mines and Minerals (Reg. & Dev.) Act 1957, Granite Conservation and Development Rules 1999, Indian Electricity Rules 1956)
- 1.2 State the areas of application and date of commencement short title and extent of mines Act, important terms of Mines Act
- 1.3 Define the term Adult, Agent, Chief Inspector, Employer, Inspector, Relay and Shift, Serious bodily injury, reportable injury
- 1.4 List the situations exempted from application of the Mines Act
- 1.5 List the provisions related to the drinking water.
- 1.6 List the provisions of Act in respect of notice to be given about accidents
- 1.7 List the provisions related to hours and limitations of employment above ground
- 1.8 List the provisions related to hours of work below ground and above ground
- 1.9 List the provisions of limitations of daily hours of work including overtime
- 1.10 Enumerates the provisions of Act, related to leave wages, related to drinking water
- 1.11 Define the terms, leave, calendar year, certifying surgeon, court of enquiry

1.12 List the rules related to First Aid, Medical appliances

2.0 Know the provisions of CMR -2017/MMR -1961 – Part I

- 2.1 Define the terms; approved safety lamp, Banks man, competent person, machinery, Ventilating District, Working place
- 2.2 Know the other terms limited to CMR only.
Define the terms shot firer, over man, assistant or under manager, on setter, fiery seam flame proof apparatus, gassy seam of first, second and third degree, General body of air
- 2.3 Know the other terms limited to M.M.R. only.
Define the terms Assistant Manager, Underground Manager, Blasters, Bell man, Single Man, Metalliferous Mine, Mine foremen, Mine mate.
- 2.4 List the duties and responsibilities of manager, Safety officer, Oven-man under CMR/MMR
- 2.5 List the provisions related to Haulage roads, travelling road ways under CMR/MMR
- 2.6 List the provisions related to open cast working under CMR/MMR
- 2.7 List the provisions related to workings near mine boundaries, setting of supports under CMR/MMR
- 2.8 List the provisions related to steep workings, development, depillaring under CMR
- 2.9 List the provisions related to extractions of coal by method other than the bord and pillar system, Multi sections and contiguous seams under CMR
- 2.10 List the provisions related to workings under railways roads, systematic timbering rules under CMR/MMR
- 2.11 List the provisions related to precautions after a fire has broken out, general precautions against fire, surface precautions against fire under CMR/MMR
- 2.12 List the provisions related to precaution against dust , eruption of gas , dangers from surface water under CMR/MMR
- 2.13 List the provisions related to dangers from underground inundation, intentional flooding under CMR/MMR

3.0 Know the provisions of CMR -2017/MMR -1961 - Part II

- 3.1 List the provisions related to underground precautions against fire under CMR/MMR
- 3.2 List the provisions related to further precautions against spontaneous heating, precautions after a fire has broken out under CMR/MMR
- 3.3 List the provisions related to equipment, precautions for fire fighting under CMR/MMR
- 3.4 Know the provisions related to standards of ventilation under CMR/MMR
- 3.5 List the precautions against gas during dewatering and reopening under CMR/MMR
- 3.6 List the precautions against inflammable gases and noxious gases under CMR
- 3.7 Determination of percentage of inflammable gas and of, environment conditions, general precautions in gassy, Mines, Management etc., of gassy mines under CMR/MMR
- 3.8 List the provisions related to storage of explosives, magazines and transport of explosives under CMR/MMR
- 3.9 List the provisions reserve station, drilling, charging stemming. Shot holes electrical shot firing under CMR/MMR
- 3.10 List the provisions related to inspections before shot firing , after shot firing and misfires under CMR/MMR
- 3.11 List the provisions related to additional precautions in gassy mines, stone drifts under CMR/MMR

- 3.12 List the provisions to use, and maintenance of protective footwear, supply of helmets under CMR/MMR
- 3.13 List the provisions related to use and supply of other protective equipment. under CMR/MMR

COURSE CONTENTS:

1.0 Mines Act 1952 and Mines Rules 1955

Meaning of the terms, Mine Act, Regulations, Rules, Bye-laws, standing orders, and situations under which act does not apply. Provisions of Mines Act in respect of Drinking water health and hygiene conservancy, Medical Appliances, Hour and limitations of Employment - Leave with wages.

Mine Rules related to drinking water, lavatories, urinals with on surface and in underground first aid, - Ambulance, Hours, and limitations of Employment - leave with wages - with wages and over time.

2.0 Coal Mines and Metalliferrous Mines Regulations Part -I

Important definitions, regulations related to notice of accidents duties of managers, Asst/under Managers, Overman, foreman and surveyor, Mine plans and sections. Means of Access and egress ladder and Ladder ways under M.M.R. Transport of men and material by Haulage mine

3.0 Coal Mines and Metalliferrous Mines Regulations Part -II

Working precautions against dangers from gas and water Mine ventilation, mine lighting and safety equipment and types of fences(Miscellaneous)

REFERENCE BOOKS:

1. Mine Management, Legislation and Ground safety : S.Ghattak.
2. Mines act 1952
3. Mines rules 1955
4. CMR/MMR 1957 / 61
5. Critical Appraisal : Rakesh& Prasad

Blue Print of a Question Paper

| S. No | Chapter Name | Periods Allocated | Weightage Allocated | Marks Wise Distribution of Weightage | | | | Question Wise Distribution of Weightage | | | | CO's Mapped |
|--------------|--|-------------------|---------------------|--------------------------------------|-----------|-----------|----|---|-----------|-----------|----|-------------|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Mines Act 1952, Mines Rules 1955 | 10 | 22 | 06 | 06 | 10 | | 02 | 02 | 01 | | CO1,CO3 |
| 2 | Coal Mines Regulations, 2017 and Metalliferous Mines Regulations, 1960- Part –I | 25 | 49 | 03 | 06 | 40 | | 01 | 02 | 04 | | CO1,CO3 |
| 3 | Coal Mines Regulations, 2017 and Metalliferous Mines Regulations, 1960- Part –II | 25 | 39 | 03 | 06 | 30 | | 01 | 02 | 03 | | CO3 |
| TOTAL | | 60 | 110 | 12 | 18 | 80 | | 04 | 06 | 08 | | |

R-Remember; U-Understanding; Ap-Application ;An- Analyzing

Table Specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 2.8 |
| Unit Test –II | From 2.9 to 3.13 |

UNDERGROUND METAL MINING METHODS

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|----------------------------------|----------------------|---------------------|--------------|--------------|
| MNG-402 | Underground Metal Mining Methods | 04 | 60 | 20 | 80 |

TIME SCHEDULE

| S. No | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapped CO's |
|-------|---------------------------------------|---------------|--------------------|-----------------------------------|----------------------------------|---------------|
| 1 | Metal Mining – Basics and Development | 10 | 13 | 01 | 01 | CO1, CO2 |
| 2 | Raising methods | 14 | 29 | 03 | 02 | CO2, CO3 |
| 3 | Stoping Methods | 14 | 29 | 03 | 02 | CO2, CO3, CO4 |
| 4 | Advanced Stoping Methods | 14 | 23 | 01 | 02 | CO3,CO4 |
| 5 | Deep mining – Problems | 8 | 16 | 02 | 01 | CO3,CO4 |
| | Total | 60 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes:

| | |
|--------------------------|--|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - Explain basic terminology of metal mining - Describe the development of Metalliferous deposits - To familiarize various Raising method used during development - To analyze various problems in Deep mining, their analysis, precautions and preventive measures |
|--------------------------|--|

| | | |
|------------------------|------------|--|
| Course Outcomes | CO1 | Explain basic terminology and various activities in metal mining |
| | CO2 | Describe the development of Metalliferous deposits |

| | | |
|--|------------|---|
| | CO3 | Applicability of Raises, winzes , Ore pass, Ore chute, Ore bins during stoping operations |
| | CO4 | Analyze different types of stoping methods, Deep mining problems |

PO-CO Mapping:

| Course Code: MNG-402 | | Course Title: Underground Metal Mining Methods | | | No of Periods: 60 | |
|----------------------|--------------------|--|------|---------------|--|--|
| PO No | Mapped with CO No. | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks | |
| | | No | % | | | |
| PO1 | - | - | - | - | >40% Level 3 Highly addressed 25 to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed <5% Not addressed | |
| PO2 | CO1,CO2 | 12 | 20 | 1 | | |
| PO3 | - | - | - | | | |
| PO4 | CO3,CO2 | 8 | 13.3 | 1 | | |
| PO5 | CO3,CO4 | 40 | 66.7 | 3 | | |
| PO6 | - | - | - | - | | |
| PO7 | - | - | - | - | | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | - | 1 | - | - | - | - | - | 1 | - | - |
| CO2 | - | 1 | - | 1 | - | - | - | - | - | - |
| CO3 | - | - | - | 1 | 3 | - | - | - | 1 | 1 |
| CO4 | - | - | - | - | 3 | - | - | - | - | - |
| CO5 | - | - | - | - | - | - | - | - | - | - |

3: High, 2: Moderate,1: Low

LEARNING OUTCOMES

Upon on completion of the course the student shall be able to:

1.0 Metal Mining – Basics and Development

- 1.1 Define the terms related to metal mining with sketches: Mineral, Ore, Ore body, Gangue, Ore forming minerals, Rock forming minerals, Foot wall, Hanging wall, Raise, Winze, Level, Level interval, Back, Crown pillar, Sill pillar, Ore pass, Ore bin, Ore chute, Ore shoot, Cross-cut, Vein, Sub level, Load
- 1.2 Explain the term Mine Development with respect to Metal mine
- 1.3 Explain the division of ore body along the dip by levels or horizons
- 1.4 Explain the division of ore body along the strike by raises and winzes
- 1.5 Explain the factors considered for selection of level intervals
- 1.6 List the purposes of driving ore drives, winzes, raises and haulage inclines
- 1.7 Define the term shaft station and mention its purpose
- 1.8 List the purposes of ore pass, ore bin and ore chute
- 1.9 List the application, merits and demerits of tunnel boring method
- 1.10 Explain the method of drivage with tunnel boring machine with sketch

2.0 Raising methods

- 2.1 Define the terms up-reaming, down reaming and drop raising with sketches
- 2.2 List the conventional methods of raising (open and compartmental)
- 2.3 Explain the open raising method with sketch and state its applicability
- 2.4 Explain the two compartmental raising method with sketch and state its applicability
- 2.5 Explain the three compartmental raising method with sketch and state its applicability
- 2.6 State the merits and demerits of open raising
- 2.7 State the merits and demerits of two compartmental raising
- 2.8 State the merits and demerits of three compartmental raising
- 2.9 List the mechanised methods of raising (Swedish ladder, Jora raising, Alimak climber, long hole drilling, raise boring)
- 2.10 Explain the Jora- hoist raise method, Alimak raising method with sketch and state its applicability
- 2.11 Explain the long hole raising method with sketch and state its applicability
- 2.12 List the applicability of raise boring

3.0 Stopping Methods

- 3.1 Explain the term 'Stopping'
- 3.2 List the different preparatory arrangements for stopping
- 3.3 Give the classification of Stopping methods
- 3.4 List the factors governing the selection of Stopping methods
- 3.5 Explain the method of Breast stopping with a sketch
- 3.6 Mentions applicability, merits, demerits and limitations of Breast stopping
- 3.7 Explain the method underhand stopping systems with a sketch
- 3.8 Mentions applicability, merits, demerits and limitations of underhand stopping
- 3.9 Explain the method of overhand stopping with sketch
- 3.10 Mentions applicability, merits, demerits and limitations of overhand stopping
- 3.11 Compare Under hand stopping with Overhand stopping method

4.0 Advanced Stopping Methods

- 4.1 Explain the method Open stopping
- 4.2 List applicability, merits, demerits and limitations of open method of stopping

- 4.3 Sketch and explain Cut and fill stoping
- 4.4 List applicability, merits, demerits and limitations of Cut and fill method of stoping
- 4.5 Explain the method of Shrinkage stoping with a sketch
- 4.6 List applicability, merits, demerits and limitations of Shrinkage stoping
- 4.7 Explain the method of Sub-level stoping with a sketch
- 4.8 List the applicability, merits, demerits and limitations of Sub-level stoping.
- 4.9 Explain the method of VCR method with sketch, its applicability, merits, demerits and limitations
- 4.10 List the caving methods used in metal mining
- 4.11 List the applicabilities of different caving methods used in metal mining
- 4.12 Compare Coal Mining with Metal Mining

5.0 Deep mining – Problems

- 5.1 Define the term Deep mining and list the difficulties associated with it.
- 5.2 Define the terms a) Vapour pressure, b) Saturation deficit, c) Relative humidity, d) Dew point, e) Specific humidity, f) Mixing ratio, g) Absolute humidity
- 5.3 List the difficulties associated with strata control in deep mines
- 5.4 Explain the adverse effects of heat and humidity in deep workings.
- 5.5 List the effects of dust and state the remedial measures for effects of dust.
- 5.6 List the difficulties associated with strata control in deep mines.
- 5.7 Define rock burst, the causes and preventive measures of rock burst
- 5.8 List the causes for raise of body temperature
- 5.9 Define the term heat stroke, causes, effects of heat stroke and treatment of a person effected with heat stroke
- 5.10 Explain the changes in cardio vascular system of the miners due to raise of temperature and list its effects
- 5.11 List the causes of mental fatigue and falling of working efficiency in deep mines

COURSE CONTENT

1.0 Metal Mining – Basics and Development

Metal mining terminology – definitions – mine development – division of ore body along dip and strike – factors for level interval – drives, winzes, raises and haulage inclines – shaft station – ore pass – ore bin – ore chute – tunnel boring – applications, merits and demerits

2.0 Raising methods

Up-reaming, down reaming and drop raising - conventional methods of raising - applicability - open raising – two compartmental and three compartmental raising method- applicability - merits - demerits - mechanised methods of raising- Jora raising - Alimak raise climber - applicability - Long hole raising method-reaming – applicability – raise boring applicabilities

3.0 Stoping Methods

Stoping- preparatory arrangements stope development - classifications of Stoping methods- factors governing the selection of stoping methods. Classification of stoping methods with respect to its attack - Breast stoping with a sketch- applicability- merits - demerits - method underhand stopping with a sketch- Applicability - merits -demerits - limitations - method of Overhand stoping with sketch- Applicability - limitations –merits-demerits-Comparison

4.0 Advanced Stoping Methods

Open stopes - applicability, merits demerits and limitations - Cut and fill stoping - applicability - merits –demerits-limitations - Shrinkage - Applicability - merits – demerits-limitations - Sub-level stoping – applicability – merits – demerits - limitations - vertical crater method – Applicability –

merits – demerits – limitations - caving methods - applicability - comparison between coal Mining and Metal Mining

5.0 Deep mining – Problems

Deep mining – difficulties associated – Heat and humidity and dust in deep mines – effects and remedial measures – difficulties with strata control – rock burst – causes and preventive measures – raise in body temperature – causes – heat stroke – causes, effects and treatment – change in cardiovascular system – mental fatigue and fall of working efficiency. a) Vapour pressure, b) Saturation deficit, c) Relative humidity, d) Dew point, e) Specific humidity, f) Mixing ratio, g) Absolute humidity

REFERENCE BOOKS

- | | | |
|--|---|----------------|
| 1. Elements of mining Technology Vol 2 | : | D.J.DESHMUKH |
| 2. Metalliferous Mining Methods | : | Y.P.CHACHARKAR |
| 3. S.M.E hand book | : | Vol 1,2,3 |
| 4. Mining Engineers Hand Book | : | Peele. Vol 1,2 |
| 5. Rock Mechanics | : | VARMA. |

Table specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 3.5 |
| Unit Test –II | From 3.6 to 5.11 |

MINE ENVIRONMENTAL ENGINEERING

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|--------------------------------|----------------------|---------------------|--------------|--------------|
| MNG-403 | Mine Environmental Engineering | 04 | 60 | 20 | 80 |

TIME SCHEDULE

| S. No. | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapping CO's |
|--------|---|---------------|--------------------|-----------------------------------|----------------------------------|-----------------|
| 1 | Introduction and Systems of Ventilation | 08 | 6 | 02 | | CO1, CO2 |
| 2 | Mechanical Ventilation | 10 | 26 | 02 | 02 | CO1,CO4,C05 |
| 3 | Distribution of Mine Air | 15 | 26 | 02 | 02 | CO2, CO3 |
| 4 | Auxiliary Ventilation | 07 | 16 | 02 | 01 | CO2,CO3,C04,C05 |
| 5 | Ventilation survey | 10 | 13 | 01 | 01 | CO2,CO3,C04,C05 |
| 6 | Mine Gases | 10 | 23 | 01 | 02 | CO2,CO3,C04,C05 |
| | Total | 60 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|--|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <p>Explain the systems of ventilation</p> <p>Analyze distribution of mine air</p> <p>Describe auxiliary ventilation,</p> <p>Familiarize ventilation survey and mine gases</p> |
|--------------------------|--|

| | | |
|-----------------|-----|--|
| Course Outcomes | CO1 | Explain Basic concepts of ventilation systems |
| | CO2 | Familiarize various devices used for the distribution of ventilation |
| | CO3 | Describe Various laws of ventilation , auxiliary ventilation systems |
| | CO4 | Explain the essence of ventilation survey |

| | | |
|--|-----|---|
| | CO5 | Analysis of variation of overall resistance of the mine using various ventilation devices |
|--|-----|---|

PO-CO Mapping

| Course Code: MNG-403 | | Course Title: Mine Environmental Engineering | | | No of Periods: 60 |
|----------------------|-------------------|--|------|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1,CO2, | 30 | 50 | 3 | >40% Level 3 Highly addressed |
| PO 2 | CO2,CO3 | 10 | 16.6 | 1 | |
| PO 3 | CO3,CO4 | 10 | 16.6 | 1 | 25% to 40% Level 2 Moderately Addressed |
| PO 4 | CO5 | 10 | 16.6 | 1 | |
| PO 5 | | | | | 5 to 25% Level 1 Low addressed |
| PO 6 | | | | | |
| PO 7 | | | | | <5% Not addressed |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | | | | | | | 1 |
| CO2 | 3 | 1 | | | | | | 1 | | 1 |
| CO3 | | 1 | 1 | | | | | 2 | | |
| CO4 | | | 1 | | | | | 1 | | |
| CO5 | | | | 1 | | | | 1 | | |

3: High, 2: Moderate,1: Low

LEARNING OUTCOMES

Upon completion of the course, student shall be able to

1.0 Introduction and systems of ventilation

- 1.1 Define the term Ventilation, purpose of ventilation, various ventilation systems used in Mines
- 1.2 Define Natural ventilating pressure, Motive column
- 1.3. Define the terms down cast and up cast shafts with sketches
- 1.4 List the conditions suitable for N.V
- 1.5 List the factors influencing the production of N.V.P
- 1.6 Applies the formula to determine the height of motive column, NVP
- 1.7 Converts height of motive column into pressure and vice versa
- 1.8 List the Limitations N.V.

- 1.9 Explain the terms-Natural ventilation system
- 1.10 Solve the numerical problems related to N.V.P and Motive column
- 2.0 Mechanical Ventilation**
 - 2.1 Define the term mechanical ventilation
 - 2.2 Classifies the mechanical ventilation fans basing on the principle of working, location, forcing or exhausting.
 - 2.3 Classifies the Centrifugal fans basing on the direction of bent of blades.
 - 2.4 Explain the principle of working of Centrifugal Fan, air screw fan and their merits and demerits
 - 2.5 Describe the constructional details of backward bladed centrifugal fan and function of each part and drive.
 - 2.6 Explain the reasons for preferring backward bladed fan over others
 - 2.7 List the methods of controlling the quantity of air delivered by the Fan
 - 2.8 Compares Air Screw Fan with centrifugal Fan
 - 2.9 Define the laws of mechanical ventilation
 - 2.10 Define the terms Manometric efficiency, theoretical depression, effective depression, mechanical efficiency and over-all efficiency of mine fan and formula for each of them
 - 2.11 Solve the numerical problems for each of the above
 - 2.12 Compares between forcing Vs exhaust fans
 - 2.13 List the factors for selection of fan for given mine conditions
- 3.0 Understand the distribution of mine air**
 - 3.1 Explain the distribution of mine air, purpose.
 - 3.2 List the ventilation devices used for coursing the air current – Brattices, stopping's, doors, regulators, air crossing. Explain the construction, location, field of application of each of the above devices Explain the effects of regulator on mine ventilation system.
 - 3.3 Explain the accessional and declensional Ventilation systems, merits and demerits
 - 3.4 Explain the Homotropical and Antitropical Ventilation
 - 3.5 State the purpose of air lock, location of installation, sources of leakage of air in a mine, preventive measures of leakage of air
 - 3.6 State the laws of mine air friction
 - 3.7 Explain the mine air friction and list the factors affecting the mine air friction
 - 3.8 Define the term “Equivalent Orifice”, formula for Equivalent orifice, corresponding numerical problems
 - 3.9 State the laws and Atkinson’s Equation to determine the pressure required to overcome the friction to the air passage in a mine road way. Relation between pressure, quantity, resistance of mine.
 - 3.10 Enumerates the methods of reducing the mine air resistance
 - 3.11 Explain the effects of mine air ways in series and parallel
 - 3.12 State formula for total resistance in series and parallel
 - 3.13 Explain the splitting of air with sketch, merits of splitting of air, ideal conditions of splitting, limitations
 - 3.14 Simple problem to calculate effective resistance when roadways connected in series, parallel and due to splitting, change in ventilation pressure and Quantity
- 4.0 Understand the necessity of Auxiliary ventilation**
 - 4.0 Explain the Auxiliary ventilation
 - 4.1 List the Conditions requiring auxiliary ventilation system.
 - 4.2 List the different methods of arranging auxiliary ventilation
 - 4.3 Explain the different methods of arranging auxiliary ventilation systems with sketches

- 4.4 Explain the location of auxiliary fans
- 4.5 List the precautions in installing auxiliary fans
- 4.6 Applies the system of auxiliary ventilation under the following situations
 - a) Single Heading
 - i) With Brattice cloth
 - ii) With Ducting
 - b) Double Heading
- 4.7 State the necessity of Booster fans in underground mines.
- 4.8 Define the term Booster Fan, conditions requiring the use of Booster Fan
- 4.9 List the factors to be consider for location of Booster fans
- 4.10 Define the term Neutral line, effects of installation of Booster Fans
- 4.11 Explain ventilation system in Long wall face
- 4.12 Simple numerical problem on change in resistance, pressure and Quantity with the installation of booster fan

5.0 Know the ventilation survey

- 5.1 Define the ventilation survey , objectives of ventilation survey, pressure survey
- 5.2 List the different components of ventilation survey
- 5.3 Explain the different methods of conducting pressure survey
- 5.4 List the equipment required for ventilation survey, precautions for accurate work
- 5.5 Explain the objectives of quantity survey and methods of quantity survey
- 5.6 Sketch and Explain the instruments required for quantity survey and qualitative survey
- 5.7 Determines the quantity of Air Flow in Mine Air Way by ventilation survey
- 5.8 Explain the term Ventilation Efficiency Quotient (VEQ)
- 5.9 Explain the objects of qualitative survey
- 5.10 List the different components of qualitative survey
- 5.11 Explain the term Kata Factor
- 5.12 Determines cooling power of Mine Air with help of Kata Thermometer

6.0 Knows different Mine gases

- 6.1 State the composition of surface air and mine air.
- 6.2 List the reasons for changes in the composition of air while passing through mine workings.
- 6.3 Give the classification of mine gases
- 6.4 List the poisonous , noxious and inflammable gases
- 6.5 State the occurrence and mention the chemical, physical and physiological effects of poisonous, noxious and inflammable gases.
- 6.6 Explain the purpose of flame safety lamp.
- 6.7 Explain the principle of safety lamp-wire gauge principle
- 6.8 Describe the constructional details of flame safety lamp.
- 6.9 Explain the accumulation and percentage tests conducted with flame safety lamp
- 6.10 List different detectors used for detecting poisonous, noxious and inflammable gases

COURSE CONTENTS

1. Introduction and Systems of ventilation

Know the Ventilation- purpose- types-Down cast and up cast shafts-Natural ventilation and Mechanical Ventilation-Conditions suitable for Natural Ventilation, factors influencing the production of Natural ventilation-Definition of N.V.P and motive column and their derivations and its applications in related calculations limitations of N.V.P

2. Mechanical Ventilation

Classification of Mechanical ventilation, classification of centrifugal fan, constructional details of backward bladed fan Principle of working off air screw fan controlling the quantity of air delivered, fittings of mine fan, loss relating to quantity water gauge etc.-Definition of terms – Manometric

efficiency, theoretical depression, effective depression, mechanical efficiency, overall efficiency, Factors for selection of mine fans.

3. Distribution of mine air

Objects of distribution and coursing the air, ventilation devices – its construction, location, application regulators- Ascentional- Descensional ventilation Homotrope and Antitrope ventilation systems, leakage of air, air lock, computer basis analysis of mine air distribution.

4. Auxiliary ventilation and booster ventilation

Auxiliary ventilation methods, conditions required for the system and different methods location of auxiliary fan Booster fan location, neutral line, effects of installation off booster fans.

5. Ventilation survey

Objectives of ventilation survey, different methods of pressure, quality, quantity surveys – precautions, accessories etc., Kata thermo meter.

6. Mine Gases

Atmospheric and mine air – composition, changes, reasons Classification of mine –poisonous, inflammable and noxious, their physical and chemical properties physiological effects, occurrence.

Testing for the presence of mine gases, flames safety lamp-Principle constructional details, transfer of heat in the lamp, Accumulation and percentage tests- Listing of detectors.

REFERENCE BOOKS:

- | | | |
|---|---|--------------|
| 1. Elements of mining, Vol. 2 | : | D.J.Deshmukh |
| 2. Mine Ventilation, Vol. 1 & 2 | : | S.Ghatak |
| 3. Mine ventilation | : | G.B.Mishra |
| 4. Fines in coal seams | : | L.C.Kaku |
| 5. Ventilation problems | : | LC Kaku |
| 6. Mine fires explosions recovery, inundation | : | M.A.Ramulu |
| 7. Mine ventilation | : | Hartman |

Table Specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 3.14 |
| Unit Test –II | From 4.0 to 6.10 |

MINING MACHINERY – I

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|----------------|-----------------------------|----------------------|---------------------|--------------|--------------|
| MNG-404 | Mining Machinery - I | 04 | 60 | 20 | 80 |

TIME SCHEDULE

| S. No. | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapped CO's |
|--------|---|---------------|--------------------|-----------------------------------|----------------------------------|--------------|
| 1 | Wire ropes | 10 | 16 | 02 | 01 | CO1,CO2 |
| 2 | Rope Capping | 10 | 13 | 01 | 01 | CO2,CO3, CO4 |
| 3 | Transportation in Mines -Rope Haulages | 15 | 29 | 03 | 02 | CO2,CO3, CO4 |
| 4 | Transportation in Mines -Conveyors , Locomotives and aerial rope ways | 10 | 26 | 02 | 02 | CO3, CO4 |
| 5 | Mine Pumps | 15 | 26 | 02 | 02 | CO2,CO3, CO4 |
| | Total | 60 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|---|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - Explain the wire ropes, construction, method of manufacture of wire ropes. - Familiarize the methods of capping, re- capping, splicing. Field application of different types rope capel used in mining - Familiarize the transportation systems used in underground mines, Types of haulage systems, Conveyors, Locomotives, Aerial rope ways - Describe different types of pumps used in underground mines, Constructional details and principle of working of Centrifugal pumps, Turbine pumps, |
|--------------------------|---|

| | | |
|------------------------|-----|---|
| Course Outcomes | CO1 | Basic understanding of different types machinery used in mines, such as underground transportation, wire ropes. |
| | CO2 | Explain Constructional details of wire ropes, methods of manufacture of wire ropes, types of transportation systems used in mines, Mine pumps |
| | CO3 | Explain Applicability of different types of wire ropes, haulage systems |
| | CO4 | Explain Field application of different types of rope capel, Haulages, Transportation systems, mine pumps |

| | | |
|--|-----|--|
| | CO5 | Simple numerical problems in determination of Factor of safety of ropes, Power required for different haulage systems, Conveyors, Tractive effort of locomotive, Safety devices used in Haulages, Conveyors. |
|--|-----|--|

PO-CO Mapping

| Course Code: 404 | | Course Title: Mining Machinery-I | | | No of Periods: 60 |
|------------------|-------------------|-----------------------------------|------|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | | | | | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately Addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO 2 | CO2,CO3 | 30 | 50 | 3 | |
| PO 3 | CO2 | 08 | 13.3 | 1 | |
| PO 4 | CO2,CO3 | 16 | 26.6 | 2 | |
| PO 5 | CO2 | 06 | 10 | 1 | |
| PO 6 | | | | | |
| PO 7 | | | | | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | | | | | | | | | | |
| CO2 | | 3 | 1 | 2 | 1 | | | 2 | 1 | 1 |
| CO3 | | 3 | | 2 | | | | | 1 | 1 |
| CO4 | | | | | | | | | | |
| CO5 | | | | | | | | | | |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Upon completion of the course, student shall be able to

1.0 Understand the manufacture of mine ropes used in mines

- 1.1 State the uses of wire ropes in mines
- 1.2 Classifies wire ropes basing on place of application and construction.
- 1.3 State the composition of material of wire ropes.
- 1.4 Explain the field tests to be conducted on wires in rope
- 1.5 Explain the stages of manufacturing of wires of ropes
- 1.6 Describe the constructional details of different types of ropes.
- 1.7 Explain space factor, factor of safety, capacity factor bending factor
- 1.8 State the applicability of different types of wire ropes in Mining.
- 1.9 List the causes of deterioration of wire ropes
- 1.10 List the preventive measures against deterioration of ropes
- 1.11 State the formulate for finding the size, weight and strength wire ropes
- 1.12 Solves numerical problems related to the above formulae.

2.0 Know Rope Capping

- 2.1 Define the terms capping and recapping
- 2.2 List the different methods of capping the wire ropes
- 2.3 State the applicability of different capping types.
- 2.4 State the composition of White metal used for capping
- 2.5 Describe the method of inter locking wedge type capping
- 2.6 State the purpose of splicing of wire ropes
- 2.7 Describe the methods of splicing of wire ropes.
- 2.8 Mention the care and maintenance of wire ropes.

3.0 Understand methods of rope haulage in underground mines

- 3.1 State the purpose of transportation in mines and factors governing the selection of various haulages systems
- 3.2 Give comprehensive classification of transportation systems in mines
- 3.3 Explain different methods of transportation by rope haulage in underground
- 3.4 List the types of rope haulage and applicability of each type of rope haulage
- 3.5 Describe the direct rope haulage system, advantages , dis-advantages and safety devices used
- 3.6 Describe the endless rope haulage system including safety devices used, advantages and disadvantages.
- 3.7 Explain over-rope and under-rope endless system including the applicability
- 3.8 Describe rope clips commonly used for under rope haulage and over rope haulage
- 3.9 State the necessity of tensioning arrangements; describe tensioning arrangement for endless rope haulage
- 3.10 Describe the main and tail rope haulage system including safety devices used and advantages, disadvantages
- 3.11 Explain Gravity rope haulage/Self-acting incline rope haulage, and advantages , disadvantages
- 3.12 Simple numerical problems in determination of capacity of tubs, HP of motor, number of tubs.

4.0 Understand transportation in mines by conveyors, Locomotives & Aerial ropeways

- 4.1 Give the comprehensive classification of conveyors based on their applicability
- 4.2 Explain the belt conveyors with their tensioning arrangements
- 4.3 State limitations, merits and demerits of belt conveyor system
- 4.4 Explain scraper chain conveyor system, merits, de-merits of scraper chain conveyor
- 4.5 Simple problems to calculate the capacity of belt conveyor
- 4.6 Classify locomotive haulage systems
- 4.7 State merits, demerits, applicability and limitations of diesel locomotives system
- 4.8 Explain exhaust conditioner and flame trap fitted to diesel locomotive
- 4.9 State merits, demerits, applicability and limitations of battery locomotives system
- 4.10 Explain trolley wire locomotive, merits, demerits and limitations of trolley wire locomotives system
- 4.11 Simple numerical problems in calculation of tractive effort of locomotive
- 4.12 Classify aerial rope ways, applicability of mono cable, Bi-cable aerial rope way

5.0 Understand various Pumps used in Mines

- 5.1 Define various terms with regards to pumps a) Pump b) Head c) Static suction head d) Static discharge head e) Total static head f) Friction head g) Manometric head h) Effective head i) Internal head j) Hydraulic head k) Water hammer l) End thrust
- 5.2 Give the comprehensive classification of mine pumps with their applicability

- 5.3 Explain the principle of working, constructional details of reciprocating pump and purpose of Air vessel
- 5.4 Describe the principle of working and constructional details of centrifugal pumps
- 5.5 Describe the methods of starting and stopping of centrifugal pump
- 5.6 Explain the constructional details and principle of working of turbine pump
- 5.7 Describe the method of starting and stopping of turbines pump, method of balancing end thrust using – hydraulic balance disc
- 5.8 Explain the constructional details/fittings of submersible pump.
- 5.9 Explain the principle of working and constructional details of mono pump.
- 5.10 List out the considerations for the selection of pumps.
- 5.11 List differences between reciprocating pump and centrifugal pump
- 5.12 Simple numerical problems on calculation of head, capacity and H.P of mine pumps

COURSE CONTENTS:

1.0 Wire Ropes

Usage, classification of wire ropes, applicability of different ropes - selection parameters - computation of numerical problems on size - Weight and strength of wire ropes

2.0 Rope Capping

Capping and recapping of wire ropes, classification - description of capping methods - splicing methods, description of splicing

3.0 Transportation in Mines -Rope Haulages

Purpose of transportation, comprehensive classification of transportation - ROPE HAULAGE - direct Rope Haulage System, merits, demerits and applications - safety

Devices in Direct Rope Haulage System-Endless Rope Haulage System, merits, demerits and applicability's safety devices - Laying and maintenance of track- constructional details of mine tub/car -factors of selection for rope haulage serial rope ways- computation problems for determination of H.P. rope size breaking strength, Tub capacity, number of tubs.

4.0 Transportation in Mines -Conveyors, Locomotives & Areal Rope ways

Conveyor usage, classification - belt conveyor system, different types of belt constructions, safety devices merits, demerits and limitations of conveying system - Scraper chain convey or system, protective devices-merits, demerits and limitation, computation of numerical problems on size of the conveyor for a given output and computation of motor HP.Classify loco haulage systems, merits, demerits, applicability of different system – classify aerial roper ways, the applicable conditions of aerial ropeways.

5.0 Mine Pumps

Pumping - Various terms of pumping, classification of pumps - centrifugal pump fittings - Turbine pump, fittings – End thrust - submersible pump –fittings merits limitation - Mono Pump-Selection of pumps - computation of numerical problems on Head, Quantity, H.P. Frictional losses.

REFERENCE BOOKS

- | | |
|--------------------------|----------------------|
| 1. Elements of Mining | : D.J.Deshmukh Vol.3 |
| 2. Mine pumps | : Rakesh and Lee |
| 3. Mine pumps | : S.Ghattak |
| 4. U.M.S.Volumes | : UMS Series |
| 5. Statham series VOL II | : Statham |
| 6. Mine transportation | : Kerlin |

- 7 Introduction to mining engineering : Hartman
8 Mine winding and Transport : S.C Walker

Table specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 3.7 |
| Unit Test –II | From 3.8 to 5.12 |

MINE SURVEYING – II

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|---------------------|----------------------|---------------------|--------------|--------------|
| MNG-405 | Mine Surveying - II | 04 | 60 | 20 | 80 |

TIME SCHEDULE

| S. No. | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapping of CO's |
|--------|---|---------------|--------------------|-----------------------------------|----------------------------------|--------------------|
| 1 | Theodolite surveying | 18 | 26 | 02 | 02 | CO1, CO2, CO5 |
| 2 | Setting out curves | 12 | 26 | 02 | 02 | CO2, CO3, CO4, CO5 |
| 3 | Correlation Survey and Triangulation Survey | 14 | 26 | 02 | 02 | CO2, CO3, CO4 |
| 4 | Tacheometry | 08 | 16 | 02 | 01 | CO3, CO4, CO5 |
| 5 | Fundamentals of Advanced survey | 08 | 16 | 02 | 01 | CO2, CO3, CO4, CO5 |
| | Total | 60 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|---|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - Describe the theodolite survey, traversing of an area by Theodolite - Familiarize setting out curves, application of different types of curves in underground mines. - Familiarize correlation survey, applicability in underground mines - Explain the Methods of triangulation survey - Familiarize tachometry survey - Familiarize the basic operations of Total station |
|--------------------------|---|

| | | |
|------------------------|------------|--|
| Course Outcomes | CO1 | Explain the basic principle of operation of theodolite, setting out curves, correlation survey, Total station |
| | CO2 | Explain the methods of Traversing of given area by Theodolite. Setting out curves both on surface and in underground, Triangulation survey |
| | CO3 | Describe the correlation survey in Mines, Important components of Theodolite, Total station |
| | CO4 | Describe the total station surveying |

| | | |
|--|------------|--|
| | CO5 | Solving various numerical problems in Theodolite, Tachometry, Correlation. |
|--|------------|--|

PO-CO Mapping

| Course Code: 405 | | Course Title: Mine Surveying-II | | | No of Periods: 60 |
|------------------|-------------------|-----------------------------------|----|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO2,CO3 | 22 | 37 | 2 | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately Addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO 2 | | | | | |
| PO 3 | CO2,CO3 | 26 | 43 | 3 | |
| PO 4 | | | | | |
| PO 5 | CO2,CO3 | 12 | 20 | 1 | |
| PO 6 | | | | | |
| PO 7 | | | | | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | | | | | | | | | | |
| CO2 | 2 | | 3 | | 1 | | | 1 | 1 | 1 |
| CO3 | 2 | | 3 | | 1 | | | 1 | 1 | 1 |
| CO4 | | | | | | | | | | |
| CO5 | | | | | | | | | | |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Upon completion of the course, student shall be able to

1.0 Understand the theodolite survey.

- 1.1 Describe transit Vernier theodolite., fundamental lines of transit theodolite and relation between them
- 1.2 List the Essentials (parts) of a transit theodolite, permanent adjustments of a transit theodolite
- 1.3 Define the terms, transiting, swinging face left, face right and changing face as used in theodolite, index error, centring, telescope normal, telescope vertical
- 1.4 List methods of measurement of horizontal angles, Describe the repetition and reiteration methods of measurement of horizontal angle, magnetic bearing of line their applicability
- 1.5 State the applicability of repetition and reiteration methods the method of measuring vertical angle.

- 1.6 List the method of traversing with theodolite and explain continuous Azimuth method, double foresight method of traverse
- 1.7 Computes the bearing of the lines of traverse in double foresight method.
- 1.8 State the checks on the accuracy of angular measurements in closed figures
- 1.9 Explain the term 'Permissible error of Closure' and permissible errors in a) Surface traverse b) Underground traverse
- 1.10 Explain the term rectangular co-ordinates and compute latitude, departure from the traverse.
- 1.11 Solves the problems related with rectangular co-ordinates, calculating the length and bearing of the closing line of the traverse. Determination of area of closed traverse.
- 1.12 State the rules for distribution of error of closure. Different methods of distribution of error of closure, Bowditch rule of balancing the traverse
- 2.0 **Setting Out Curves**
 - 2.1 Classifies the curves
 - 2.2 Define simple curve, reverse curve, compound curve, transition curve and vertical curve, super elevation
 - 2.3 State the elements of simple curve
 - 2.4 List the methods of setting out curve,
 - 2.5 Explain the method of setting out curve by chord and offset method on surface and underground
 - 2.6 Explain the method of setting out curve by chord and angle Method on surface and underground
 - 2.7 Explain the method of setting out road way in underground from a main road at a given bearing (direction) and gradient
- 3.0 **Correlation Survey and Triangulation survey**
 - 3.1 Define the term correlation, triangulation survey
 - 3.2 State the purpose of correlation.
 - 3.3 List the different methods of correlation.
 - 3.4 Describe the method of correlation by Direct traversing
 - 3.5 Describe the method of correlation by Co-Planning or Exact alignment method
 - 3.6 Describe the methods of correlation by Weissbach triangle or approximate alignment method
 - 3.7 State the principle of triangulation survey
 - 3.8 Explain different triangulation schemes
 - 3.9 Explain the method of measuring base line in centenary
 - 3.10 Explain the method of extension of base line
 - 3.11 List the (checks) adjustments for measured angles of a triangle
- 4.0 **Tacheometry**
 - 4.1 State the principle of tacheometric Surveying
 - 4.2 List merits and demerits of tacheometric survey
 - 4.3 List the systems of tacheometric survey
 - 4.4 Explain the tacheometric constants
 - 4.5 Explain the stadia method of tacheometric survey
 - 4.6 List the errors in stadia method
 - 4.7 Derives the relation (formula) among stadia reading, horizontal distance and vertical distances when the line of sight is inclined and the staff is held vertical
 - 4.8 Solve problems for horizontal distances and vertical heights.
- 5.0 **Knows the fundamentals of advanced surveying**
 - 5.1 State the basics of Surveying with Electronic instruments
 - 5.2 State the basic principles of surveying with Electronic instruments

- 5.3 List the types of EDM instruments.
- 5.4 Explain the working principle of Electromagnetic distance measuring system.
- 5.5 State the various applications of remote sensing.
- 5.6 State the fundamentals of GPS.
- 5.7 List the applications of GPS in Mining
- 5.8 List the uses of total station
- 5.9 List the parts of total station
- 5.10 State the function of each part of total station
- 5.11 Explain the procedure for measurement of distance and angle between the given points using Total station
- 5.12 Explain the procedure for measurement of area between the given points using Total station

COURSE CONTENTS:

1. **Theodolite:** Magnetic bearing of lines. Traversing – continuous Azimuth, double fore sight methods – computation of bearings of traverses check of accuracy in angular measurements – permissible error – distribution – calculation of latitude and departure – problems on rectangular coordinates – calculation of areas – Bowditch Rule
2. **Setting Curves:** Classification – Definitions – elements of simple curve – Method of setting out curves – by chord and offset, chord and angle.
3. **Correlation survey and Triangulation surveying** - Purpose – methods of correlation – Direct Traversing – Co – planning – weisbach Triangle-Definition – Principles – Different triangulation schemes – Base line measurement – Adjustments – Extension of base line
4. **Tacheometry:** Principles – systems – Constants Methods – Stadia method, substance method, Tangential method – merits and demerits of Tachometry – relation between stadia reading, Horizontal distance, vertical distance, solves problems.
6. **Fundamentals of advanced survey:** basics of Surveying with Electronic instruments- principles of surveying with Electronic instruments- Essentials- Applications of remote sensing- Fundamentals and applications of GPS in Mining- Uses and parts of Total station- measurement of angle between the given points using Total station

REFERENCE BOOKS:

1. Surveying : S.Ghatak Vol-1,2,3
2. Surveying : Kanetkar&KulkarniVol -1 and Vol-2
3. Surveying : B.C.PunmiaVol- 1,2,3
4. U.M.S. Volumes

Table Specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 3.6 |
| Unit Test –II | From 3.7 to 5.12 |

SURFACE MINING-I

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|----------------|----------------------|---------------------|--------------|--------------|
| MNG-406 | Surface Mining | 04 | 60 | 20 | 80 |

TIME SCHEDULE

| S. No | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapped CO's |
|--------------|--|---------------|--------------------|-----------------------------------|----------------------------------|-----------------|
| 1 | Surface mining - Basics | 13 | 26 | 02 | 02 | CO1,CO2,CO4 |
| 2 | Surface mining - Machinery | 20 | 39 | 03 | 03 | CO4,CO5 |
| 3 | Surface mining – Drilling and Blasting | 15 | 26 | 02 | 02 | CO2,CO3,CO4,CO5 |
| 4 | Slope stability | 12 | 19 | 03 | 01 | CO3,CO4,CO5 |
| Total | | 60 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes:

| | |
|--------------------------|--|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - Explain the basic operations involved in Surface Mining - Familiarize the methods of opening the deposits for Surface Mining - Explain various machinery used in opencast mines and their applicability in Surface Mining - Familiarize the Drilling and Blasting operations in Surface Mining - Analysis of stability of slopes in Overburden dumps as well as pit slope stability |
|--------------------------|--|

| | | |
|------------------------|-----|---|
| Course Outcomes | CO1 | Explain Basic terminology involved Surface Mining, machinery used. |
| | CO2 | Explain Various operations involved in Surface Mining, Machinery used , Drilling and blasting operation |
| | CO3 | Describe the Operation of various machinery used in Surface Mining |
| | CO4 | Explain drilling and Blasting operation involved in Surface mining and Production calculations. Factors influencing the |

| | | |
|--|-----|---|
| | | stability of slope. |
| | CO5 | Determination of production from Surface Mining, Slope stability analysis |

PO-CO Mapping:

| Course Code: 406 | | Course Title: Surface Mining | | | No of Periods: 60 |
|------------------|-------------------|-----------------------------------|----|---------------|--|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1 | 18 | 29 | 2 | >40% Level 3 Highly addressed 25 to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO2 | | | | - | |
| PO3 | CO2,CO3,CO4 | 25 | 42 | 3 | |
| PO4 | | | | - | |
| PO5 | CO2,CO3 | 17 | 28 | 2 | |
| PO6 | - | - | - | - | |
| PO7 | - | - | - | - | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | - | - | - | - | - | - | - | 1 | - |
| CO2 | - | - | 3 | - | 2 | - | - | - | 1 | 1 |
| CO3 | - | - | 3 | - | 2 | - | - | - | 1 | 1 |
| CO4 | - | - | 3 | - | - | - | - | - | - | 1 |
| CO5 | - | - | - | - | - | - | - | - | - | - |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Upon on completion of the course the student shall be able to:

1.0 Surface mining - Basics

- 1.1 Define the term surface mining and classify its types.
- 1.2 Define the following terms related to open cast mining with sketches, outcrop, overburden, face, bench, floor of bench, toe, crust, angle of repose, stripping ratio, Break even stripping ratio, placer mining, alluvial Mining, strip mining, , slope stability, back filling, box cut, trench cut.
- 1.3 List the major surface coal and metal mines in India.
- 1.4 List the different Geo – mining situations under which surface mining is adopted.
- 1.5 List the different merits, demerits and limitations of surface mining.
- 1.6 List and explain the different stages of surface mining (vegetation clearance, levelling, formation of approach roads, formation of benches on OB and coal or mineral, drilling, blasting, loading & transportation, dumping and back filling operations).
- 1.7 Explain haul roads and write about the location and design of haul roads.

- 1.8 Describe curves, super elevation, dividers, berms, drainage system, escape lanes, lighting on haul roads.
- 1.9 Define dumps in surface mines and mention the types.
- 1.10 Explain internal and external dumps.
- 1.11 Explain safety berms on dumps.

2.0 Surface mining - Machinery

- 2.1 List the different machinery for preparing the ground (dozer, scraper, Ripper, road grader, compacting equipment like road rollers etc.).
- 2.2 Classify dozers, scrapers, rippers, road graders and list its applicable conditions.
- 2.3 Classify and list the applications of HEMM deployed in surface mines (Drills, Excavators, Transport equipment, Road making equipment etc)
- 2.4 Classify the types of shovels and list their general components with functions.
- 2.5 Explain the operation and place of application of Shovels with sketch.
- 2.6 List and define the operating parameters of shovel (dumping height, cutting height, and dumping radius, maximum digging radius, bucket fill factor, Swell factor, bucket factor, swing factor, cycle time, loading time)
- 2.7 Classify the types of draglines and list their general components with functions
- 2.8 Explain the operation and place of application of Draglines with sketch.
- 2.9 Compare shovels with draglines
- 2.10 List the main components, their functions and place of application of Bucket Wheel Excavator with a neat sketch
- 2.11 List the types of Transport system (dumpers, belt conveyors, rails, pipeline transport, high angle sand witch conveyors and aerial rope ways).
- 2.12 Explain the general construction of dumper with neat sketch.
- 2.13 List the applicable conditions, merits and demerits of surface continuous miner, In-pit crusher technology and spreaders

3.0 Surface mining – Drilling and Blasting

- 3.1 List and explain different parameters connected to drilling of blast holes.
- 3.2 List and explain the different pattern of drill holes, based on depth, diameter, spacing and burden of drill holes.
- 3.3 List the applications, merits and demerits of vertical, inclined and sub-grade drilling.
- 3.4 List the blasting tools and accessories used in surface mine blasting.
- 3.5 Explain the use of nonels, raydets, electric detonators, boosters, detonating cords.
- 3.6 Explain method of giving connections and firing procedure in surface mines.
- 3.7 Explain the deck charging /deck loading and its applicability.
- 3.8 Estimate the charges required for blasting a round.
- 3.9 Explain the controlled blasting techniques to control fly rocks (muffled blasting), vibrations (cushion blasting), and sound (chamber blasting).
- 3.10 Define the term sleeping holes and list the situation for their existence.
- 3.11 Define the term secondary blasting., methods of secondary blasting
- 3.12 List the dangers due to blasting practice in surface mines and preventive measures

4.0 Slope stability

- 4.1 Define slope stability and list the factors influencing the slope stability of a bench.
- 4.2 Define the terms slope angle, angle of repose, overall slope of bench.

- 4.3 List and explain types of slope failures.
- 4.4 List and explain parameters required for slope design.
- 4.5 List and explain the methods of preventing slope failures.
- 4.6 State the formula to calculate the factor of safety of bench slope
- 4.7 Simple numerical problems to calculate the factor of safety of bench slope (Planer failure)
- 4.8 State the effect of water in bench slope stability

COURSE CONTENTS:

1.0 Surface mining - Basics

Define Surface Mining, different terms used in surface mining - forms of Surface mining – Geo mining situation under which surface mining adopted - major coal and metal opencasts – Limitations – merits and demerits – preparation of ground, de-vegetation – clearance – formation of OB benches – coal benches – drilling – blasting – loading – transportation – back filling- box cut, trench cut, haul roads dumps- internal and external dumps, safety berms on dumps - dividers, berms, drainage system, escape lanes on haul roads.

2.0 Surface mining - Machinery

Different machinery for preparing the ground for mining operation, dozer, scraper, ripper, road grader, classification of dozers - application of dozer in mines.-classification of rippers-- road graders- application of road grader - classification of road rollers (compacting equipment) - classification of excavators - types of shovels - components and their functions of shovels - operating parameters of shovel - define dumping height, cutting height, dumping radius, maximum digging radius, bucket fill factor, swell factor, bucket factor, swing factor, cycle time, loading time - operation and place of application of shovels - list types of draglines - Main components and their functions, of dragline - operation and place of application of dragline - comparison of shovel vs dragline - main components and their functions, of bucket wheel excavator - operation and place of application of bucket wheel excavator- applicable conditions, merits and demerits of surface miner

3.0 Surface mining – Drilling and Blasting

Classify drill holes – vertical inclined drilling – merits – demerits – various parameters for drill blast holes – drill patterns – application estimation of charges for blasting round of holes – blasting tools for shot firing procedure - patterns - transportation, storage, charging of bulk explosives - use of accessories such are nonels, electronic detonators, boosters, detonating cords-- methods of giving connection and firing procedure -deck charging and its applicability - controlled blasting techniques to control of fly rocks, vibrations sound, dust generation - muffled blasting, cushion blasting - chamber blasting and deck blasting and their applicability - Secondary Blasting-Pop shooting, plaster blasting -Dangers due to blasting practice in open cast mines--preventive measures due to blasting practice in open cast mines.

4.0 Slope stability

Slope stability and Factors influencing the slope stability of a bench - Define the terms: Slope angle, Angle of Repose, Over all slope of bench - Simple numerical problems to calculate the overall slope

of the bench -Types of slope failures - Parameters required for slope design - Methods of preventing slope failures - Formula to calculate the factor of safety of bench slope - Simple numerical problems to calculate the factor of safety of bench slope

REFERENCE BOOKS:

- | | | |
|--|---|-----------------|
| 1. Surfacing Mining | : | G.B.Mishra |
| 2. Blasting in Mines | : | Samir Kumar Das |
| 3. Surfacing Mining | : | Samir Kumar Das |
| 4. Mine Management | : | S. Ghatak |
| 5. Heavy earth mining Machinery | : | Amitosh de |
| 6. Principles & practices of coal mining | : | R.D.Singh |

Table Specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 2.13 |
| Unit Test –II | From 3.1 to 4.8 |

MINE ENVIRONMENTAL ENGINEERING LABORATORY PRACTICE

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|--|----------------------|---------------------|--------------|--------------|
| MNG-407 | Mine Environmental Engineering Laboratory Practice | 03 | 45 | 40 | 60 |

TIME SCHEDULE

| S. No. | Major Components | Periods | Mapped CO's |
|--------|--|---------|-----------------------|
| 1. | Flame Safety Lamp and Gas Detectors | 15 | CO1,CO2,CO4,CO5 |
| 2. | Coursing of air with ventilation devices | 15 | CO1,CO2,CO3, CO4,CO5 |
| 3. | Rescue and Reviving apparatus | 15 | CO1,CO2, CO3, CO4,CO5 |
| | Total | 45 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|---|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - To familiarise various components of Flame safety lamp - Explain various detectors used in underground mines and their applicability - Familiarise various devices used in Ventilation - Explain principle of operation various Rescue apparatus used in mines - Familiarise various Rescue and Reviving apparatus |
|--------------------------|---|

| | | |
|------------------------|------------|---|
| Course Outcomes | CO1 | Describe Flame safety lamp, gas detectors and rescue apparatus |
| | CO2 | Explain precise operations with flame safety lamp, gas detectors and rescue operation |
| | CO3 | Observe various parameters, their variations and graphically represent the same |
| | CO4 | Explain coursing of the air with various ventilation devices |
| | CO5 | Determine the percentage of different gases |

PO-CO Mapping

| Course Code: MNG-407 | | Course Title: Mine Environmental Engineering Laboratory Practice | | | No of Periods: 45 |
|----------------------|-------------------|--|------|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1,CO2,CO3 | 15 | 33.3 | 2 | >40% Level 3 Highly addressed |
| PO2 | CO1,CO3,CO4 | 10 | 22.2 | 1 | |
| PO3 | CO2 | 10 | 22.2 | 1 | |
| PO4 | CO2 | 10 | 22.2 | 1 | |
| PO5 | - | - | - | - | 25% to 40% Level 2 Moderately Addressed |
| PO6 | - | - | - | - | |
| PO7 | - | - | - | - | 5 to 25% Level 1 Low addressed |
| | | | | | <5% Not addressed |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | 1 | - | - | - | - | - | 1 | 1 | - |
| CO2 | 2 | - | 1 | 1 | - | - | - | 2 | 1 | - |
| CO3 | 2 | 1 | - | - | - | - | - | 1 | 1 | - |
| CO4 | - | 1 | - | - | - | - | - | 1 | - | - |
| CO5 | - | - | - | - | - | - | - | - | - | - |

3: High, 2: Moderate, 1: Low

Learning Outcomes

Up on Completion of the course the student shall be able to:

1.0 Flame Safety Lamp and Gas Detectors

- 1.1 Identifies and sketches the parts of flame safety lamp
- 1.2 Disassembles and assembles the flame safety lamp
- 1.3 Tests for the presence of inflammable gas accumulation and percentage of tests.
- 1.4 Sketches the size and shape of the gas caps with varying percentages of inflammable gas
- 1.5 Determines the percentage of methane using Methanometer
- 1.7 Determines the percentage of CO using CO Detectors (chemicals)
- 1.8 Determines the percentage of other gases using multi-gas detectors

2.0 Coursing of air with ventilation devices

- 2.1 Sketches the ventilation devices
- 2.3 Conducts the ventilation survey for quantity of air using Anemometer, Velometer, Smoke test, Pitot tube
- 2.4 Conducts the ventilation survey for pressure using inclined manometer
- 2.5 Determines the ventilation efficiency quotient (VEQ)
- 2.6 Conducts the qualitative survey for determining the temperature, relative humidity and cooling power of air.

2.7 Draws the ventilation plan

3.0 Studies various Rescue and Reviving apparatus used in mines

- 3.1 Identify various rescue and reviving apparatus
- 3.2 Sketch and study self-contained breathing apparatus
- 3.3 Sketch and study gas mark
- 3.4 Sketch and study the self-rescuer used in mines
- 3.5 Sketch and study the dragger Pulmotor reviving apparatus.

C23-MNG-408: English Communication Skills (Lab Practice)

| | |
|--|---|
| Course Title : English Communication Skills | Course code: C23-Common- 408 (Common to all Branches) |
| Year/ Semester : IV Semester | Number of Periods : 45 (3 periods per week) |
| Type of Course : Practical | Max Marks : 100 (Internal 40 + External 60) |

| | |
|---------------------------|--|
| Course Objectives: | - to communicate effectively in diverse academic, professional and everyday situations |
| | - exhibit appropriate body language and etiquette at workplace |
| | - be employable through preparing appropriate job applications and attend interviews confidently with all necessary skills |

| | |
|---------------|--|
| CO No. | |
| CO1 | Listen and comprehend the listening inputs related to different genres effectively |
| CO2 | Communicate effectively in interpersonal interactions, interviews, group discussions and presentations |
| CO3 | Acquire employability skills: job hunting, resume writing, attending interviews |
| CO4 | Practise appropriate body language and professional etiquette |

Course Delivery: Text book: “English Communication Skills”

by State Board of Technical Education and Training, AP

| Sl No | Unit | Teaching Hours |
|--------------|---------------------------------|-----------------------|
| 1 | Listening Skills | 6 |
| 2 | Workplace Etiquette | 3 |
| 3 | Introducing Oneself | 3 |
| 4 | Short presentation (JAM) | 6 |
| 5 | Group Discussion | 6 |
| 6 | Resume Writing and Cover Letter | 3 |
| 7 | Interview Skills | 9 |
| 8 | Presentation Skills | 9 |
| <i>Total</i> | | <i>45</i> |

Course Content:

UNIT I: Listening Skills

6 periods

Pre – While- Post-listening activities- Listening to audio content (dialogues/ speech/ narrations) - answering the questions and fill in the blanks- vocabulary

UNIT 2: Workplace Etiquette

3 periods

Basics of Etiquette- politeness/ courtesy, good manners- features of work place etiquette- adaptability, positive attitude, body language.

UNIT 3: Introducing Oneself

3 periods

Speak about oneself - introduce oneself to a gathering/ formal & informal situations- Know about others- filling in the grid- introducing oneself in interviews

UNIT 4: Short Presentation

6 periods

Dos and Don'ts in short presentation- speak for a minute without repetition, deviation & hesitation - the techniques to speak fluently – defining and describing objects, people, phenomena, events.- speaking on randomly chosen topics.

UNIT 5: Group Discussion

6 periods

Fundamentals of Group Discussion- Dos and Don'ts- filling the Grid- possible list of topics- practice sessions- sample videos-Group activity

UNIT 6: Resume Writing and Cover Letter

3 periods

Pre activity: answer the questions- jotting down biographical information- sample resumes- tips, Dos and Don'ts- model resumes- practice exercises on Resume writing

UNIT 7: Interview Skills

9 periods

Pre –while-post activities: - things to do at three stages – respond to notifications- know the information about the organisation-practice FAQs - preparation of good/ suitable C V, Body language, tips for success in interviews, model / mock interviews.

UNIT 8: Presentation Skills

9 periods

Preparatory work: observe pictures and answer questions- different kinds of presentations- PPTs, Flash cards, Posters, Charts. - tips to prepare aids, slide show, model PPTs, - checklist on pre, while and post presentations.

Mapping Course Outcomes with Programme Outcomes:

| PO | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----|---|---|---|---|---|---------|---------|
| CO | POs 1 to 5 are applications of Engineering Principles, can't be directly mapped to English Communication Skills | | | | | 1,2,3,4 | 1,2,3,4 |

Unit wise Mapping of CO –PO

| CO | Course Outcome | COs / Unit Mapped | POs mapping | Cognitive levels as per Bloom's Taxonomy R/U/A/An (Remembering / Understanding / Applying/ Analysing) |
|------|--|---------------------|-------------|--|
| CO 1 | Listen and comprehend listening inputs related to different genres effectively | Unit 1 | 6,7 | R/U/A |
| CO2 | Communicate effectively in interpersonal interactions, interviews, group discussions and presentations | Units 3,4,5,7,8 | 6,7 | R/U/A/An |
| CO3 | Acquire employability skills: job hunting, resume writing, attending interviews | Units 6,7 | 6,7 | R/U/A/An |
| CO4 | Practise appropriate body language and professional etiquette | Units 2, 3, 4,5,7,8 | 6,7 | R/U/A |

MINE SURVEYING PRACTICE II

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|-----------------------------|----------------------|---------------------|--------------|--------------|
| MNG-409 | Mine Surveying Practice -II | 03 | 45 | 40 | 60 |

TIME SCHEDULE

| S. No. | Major Components | Periods | Mapped CO's |
|--------|-----------------------|---------|-------------|
| 1. | Theodolite Traversing | 27 | CO1,CO2,CO5 |
| 2. | Triangulation | 03 | CO5 |
| 3. | Curve setting | 06 | CO2,CO5 |
| 4. | Tacheometry | 09 | CO4,CO5 |
| | Total | 45 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|---|
| Course Objectives | Upon completion of the course the student shall be able to: -To familiarise with the Theodolite, various operation of theodolite -To familiarize with the concepts of triangulation -To familiarize the methods of curve setting both surface as well as underground mines -To familiarize computation of distance using tacheometry -Hands on experience of various surveying instruments |
|--------------------------|---|

| | | |
|------------------------|------------|---|
| Course Outcomes | CO1 | Demonstrate various operations of theodolite |
| | CO2 | Compute horizontal and vertical angles |
| | CO3 | Compute the distance and elevation for different conditions |
| | CO4 | Explain Setting out curves by different methods |
| | CO5 | Explain Concept of triangulation |

PO-CO Mapping

| Course Code: MNG-409 | | Course Title: Mine Surveying Practice-II | | | No of Periods: 45 |
|----------------------|-------------------|---|----|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | - | - | - | - | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO2 | - | - | - | - | |
| PO3 | CO2,CO3,CO4 | 8 | 17 | 1 | |
| PO4 | CO1,CO2,CO3,CO4 | 30 | 66 | 3 | |
| PO5 | - | - | - | - | |
| PO6 | - | - | - | - | |
| PO7 | CO2 | 7 | 17 | 1 | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | | | | 3 | | | | | | 1 |
| CO2 | | | 1 | 3 | | | 1 | 2 | | 1 |
| CO3 | | | 1 | 3 | | | | | | |
| CO4 | | | 1 | 3 | | | | 1 | | 1 |
| CO5 | | | | | | | | | | |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Up on Completion of the course the student shall be able to:

- 1.0 Know the parts, functions and uses of Transit theodolite.**
 - 1.1 Practices the centering, leveling the theodolite over a station and reads the Vernier.
 - 1.2 Practices the measurement of horizontal angle over a station and reads the Vernier.
 - 1.3 Practices the prolongation of straight line with theodolite.
 - 1.4 Measures the horizontal angle by repetition.
 - 1.5 Measures the horizontal angle by reiteration.
 - 1.6 Practices the measurement of vertical angle.
 - 1.7 Determines the height of pole when its base is inaccessible.
 - 1.8 Conducts traverse survey by direct bearing method.
 - 1.9 Conducts traverse survey by double foresight method
 - 1.10 Plot the traverse by meridian method and rectangular co- ordinate
- 2.0 Know the Triangulation**
 - 2.1 Carries out Extension of the given base line.
- 3.0 Know the Curve Setting**
 - 3.1 Sets out curve by chord and offset.
 - 3.2 Sets out curve by Chord and Angle.
- 4.0 Know the Tacheometry survey**
 - 4.1 Determines the tacheometric constants.
 - 4.2 Determines the R.L of points by fixed hair method.
 - 4.3 Determines the R.L.s of points by tangential method.

MINE PLANNING AND DESIGN LABORATORY PRACTICE

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|--|----------------------|---------------------|--------------|--------------|
| MNG-410 | Mine Planning and Design Laboratory Practice | 03 | 45 | 40 | 60 |

TIME SCHEDULE

| Sl. No | Major topics | Periods | Mapped CO's |
|--------|--|-----------|-------------|
| 1 | Drawing of layouts of underground mine | 15 | CO1 |
| 2 | Drawing of layouts of open cast mine and blasting design | 10 | CO2,CO4 |
| 3 | Calculation of output for surface mine | 10 | CO2,CO5 |
| 4 | Design of mine transport for surface mine | 10 | CO4,CO5 |
| | Total | 45 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|--|
| Course Objectives | Upon completion of the course the student shall be able to: <ul style="list-style-type: none"> - To familiarise with the Underground mine layout - To familiarise with Surface mine layouts - Explain various cross-sectional plans of a mine - Output calculation - To familiarize various systems of mine transportations |
|--------------------------|--|

| | | |
|------------------------|------------|---|
| Course Outcomes | CO1 | Salient features of various plans and sections used in mines |
| | CO2 | Familiarise Various features of Mine plans |
| | CO3 | Explain the systems of transportation of a mine, Estimation of reserves, life of the mine |
| | CO4 | Analyse the features of cross-sectional plans |
| | CO5 | Determination of production of mine based on the given data |

PO-CO Mapping

| Course Code: MNG-410 | | | Course Title: Mine Planning and Design Laboratory Practice | | | | | No of Periods: 45 | | |
|----------------------|----------------------|-----|---|------|------------------|--|-----|-------------------|------|------|
| PO No | Mapped with CO no | | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks | | | | |
| | | | No | % | | | | | | |
| PO1 | CO1,CO3 | | 13 | 28.8 | 2 | <div>>40% Level 3 Highly addressed</div> <div>25% to 40% Level 2 Moderately addressed</div> <div>5 to 25% Level 1 Low addressed</div> <div><5% Not addressed</div> | | | | |
| PO2 | | | | | | | | | | |
| PO3 | CO1,CO3 | | 20 | 44.4 | 3 | | | | | |
| PO4 | | | | | | | | | | |
| PO5 | | | | | | | | | | |
| PO6 | CO1,CO3 | | 12 | 26.6 | 2 | | | | | |
| PO7 | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| CO1 | 2 | | 3 | | | 2 | | | 2 | 1 |
| CO2 | | | | | | | | | | |
| CO3 | 2 | | 3 | | | 2 | | | 2 | 1 |
| CO4 | | | | | | | | | | |
| CO5 | | | | | | | | | | |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Up on Completion of the course the student shall be able to:

1.0 Draw the layouts of underground and surface mine

- 1.1 Draw a pit-top & pit Bottom layouts of shaft
- 1.2 Draw a layout for a surface mine with an output 10,000 tonne/day in a flat deposit. Shovel dumper combination. Assume required data.
- 1.3 Explain and draw the Layout of Dragline mining combinations in opencast mines
- 1.4 Draw the Layout of Bucket wheel excavator combinations in opencast mines
- 1.5 Draw a layout for a surface coal mine with an output of 1000 tonne /day in a deposit having a gradient of 4 degree. Assume your own conditions.
- 1.6 Design of blasting sequence in surface mine.

2.0 Prepares a Mining Plan for a small B category Mine

- 2.1 States the Introduction of the mine, Location and accessibility
- 2.2 Explain the regional Geology and the geology of the deposit
- 2.3 Estimates the Reserves
- 2.4 States the mining method adopted
- 2.5 Designs the production from the mine
- 2.6 Estimates Manpower and machinery requirement
- 2.7 Progressive Mine Closure Plan

3.0 Knows Calculate output for surface mine

- 3.1 Calculation of No. of shovels, dumpers, drills require for given output.
- 3.2 Calculation of bucket capacity of the shovel, dragline capacity, Bucket wheel excavator capacity, capacity of the dumper for the above problem.

4.0 Design of Mine transport for surface mine

- 4.1 Draw the transport layout of haul roads in a mechanised surface mine
- 4.2 Draw the sketches of the following machinery
 - a) Shovel b) Bucket wheel excavator c) Surface miner d) Dragline

MINING MACHINERY LABORATORY PRACTICE

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|--------------------------------------|----------------------|---------------------|--------------|--------------|
| MNG-411 | Mining Machinery Laboratory Practice | 03 | 45 | 40 | 60 |

TIME SCHEDULE

| S. No. | Major Components | Periods | Mapped CO's |
|--------|-----------------------------------|---------|-----------------|
| 1. | Rope haulage systems - Equipment | 20 | CO1,CO2,CO5 |
| 2. | Mine pumps | 15 | CO3,CO4,CO5 |
| 3. | Drilling machines and accessories | 10 | CO2,CO3,CO4,CO5 |
| | Total | 45 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|---|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - To familiarise with the rope haulage system used in mines - To familiarise mine pumps - To familiarise various parts of drilling machine - Describe various operations of drilling machines |
|--------------------------|---|

| | | |
|------------------------|------------|--|
| Course Outcomes | CO1 | Explain constructional details of different wire ropes |
| | CO2 | Describe different haulage system used in underground mines |
| | CO3 | Describe the different safety devices used in haulage system |
| | CO4 | Explain different drilling machinery used in underground mines |
| | CO5 | Explain different types of pumps used in mines |

PO-CO Mapping

| Course Code: MNG-411 | | Course Title: Mining Machinery Laboratory Practice | | | No of Periods: 45 | |
|----------------------|-------------------|--|----|---------------|---|--|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks | |
| | | No | % | | | |
| PO1 | CO1 | 5 | 11 | 1 | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed <5% Not addressed | |
| PO2 | CO1,CO2,CO3 | 18 | 40 | 3 | | |
| PO3 | CO1,CO2,CO3 | 17 | 38 | 2 | | |
| PO4 | CO1 | 5 | 11 | 1 | | |
| PO5 | - | - | - | - | | |
| PO6 | - | - | - | - | | |
| PO7 | - | - | - | - | | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 1 | 3 | 2 | 1 | - | - | - | 2 | 1 | 1 |
| CO2 | - | 3 | 2 | - | - | - | - | - | 1 | 1 |
| CO3 | - | 3 | 2 | - | - | - | - | - | 1 | 1 |
| CO4 | - | - | - | - | - | - | - | - | - | - |
| CO5 | - | - | - | - | - | - | - | - | - | - |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Up on Completion of the course the student shall be able to:

1.0 Rope haulage systems - Equipments

- 1.1 Sketch the direct rope haulage system used in mines and observe the types of motor used, braking system present in it.
- 1.2 Sketch the endless rope haulage system used in mines and also sketch various attaching devices like small man clip
- 1.3 Sketch the various safety devices used in haulage system.
- 1.4 Draw the circuit diagram of signalling system used in Haulages

2.0 Mine pumps

- 2.1 Sketch the reciprocating pump and know about the method of starting and stopping of reciprocating pump
- 2.2 Sketch the centrifugal and turbine pump and observe the functioning of balancing disk

3.0 Drilling machines and accessories

- 3.1 Sketch the electrical coal drill used in mine
- 3.2 Sketch and know the working of sun and planet gear used in coal drill
- 3.3 Sketch the different types of drill rods used in mining.

V SEMESTER

**DIPLOMA IN MINING ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
V SEMESTER (THIRD YEAR)**

| Subject Code | Name of the Subject | Instruction period / week | | Total Period / Sem | Scheme of Examination | | | |
|---|---------------------------------------|---------------------------|---------------------|--------------------|-----------------------|-----------------|----------------|-------------|
| | | Theory | Practical/ Tutorial | | Duration (hours) | Sessional Marks | End Exam Marks | Total Marks |
| THEORY | | | | | | | | |
| MNG-501 | Mine Management and Entrepreneurship | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-502 | Mine Legislation-II | 4 | - | 60 | 3 | 20 | 80 | 100 |
| MNG-503 | Mine Hazards and Rescue | 5 | - | 75 | 3 | 20 | 80 | 100 |
| MNG-504 | Mining Machinery-II | 5 | - | 75 | 3 | 20 | 80 | 100 |
| MNG-505 | Rock Mechanics and Strata Control | 5 | - | 75 | 3 | 20 | 80 | 100 |
| MNG-506 | Surface Mining -II | 4 | - | 60 | 3 | 20 | 80 | 100 |
| PRACTICAL | | | | | | | | |
| MNG-507 | Rock Mechanics Laboratory Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-508 | Life Skills | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-509 | Total Station Survey and CAD Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| MNG-510 | Project Work | - | 3 | 45 | 3 | 40 | 60 | 100 |
| | Activities | - | 3 | 45 | - | - | - | - |
| | TOTAL | 27 | 15 | 630 | | 300 | 700 | 1000 |
| Note: MNG- 508 Common with all branches | | | | | | | | |

MINE MANAGEMENT AND ENTREPRENEURSHIP

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|--------------------------------------|----------------------|---------------------|--------------|--------------|
| MNG-501 | Mine Management and Entrepreneurship | 04 | 60 | 20 | 80 |

TIME SCHEDULE

| S. No. | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapped CO's |
|--------|---------------------------|---------------|--------------------|-----------------------------------|----------------------------------|--------------------|
| 1 | Mine Management | 10 | 26 | 02 | 02 | CO1, CO2 |
| 2 | Entrepreneurship | 18 | 26 | 02 | 02 | CO2, CO3, CO4, CO5 |
| 3 | Recruitments and Training | 8 | 16 | 02 | 01 | CO2, CO3, CO4, CO5 |
| 4 | Network analysis | 15 | 26 | 02 | 02 | CO3, CO4, CO5 |
| 5 | Smart Technologies | 9 | 16 | 02 | 01 | CO4, CO5 |
| | Total | 60 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|--|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - Familiarise the concepts of management, ownership styles and organisation structures - Exposure to organisational behavioural concepts, basics of project and operational management - Familiarize recruitment and training - Explain network analysis and its usage in salvage operation of Mining machinery - Describe the necessity and functioning of smart technologies. |
|--------------------------|--|

| | | |
|------------------------|------------|--|
| Course Outcomes | CO1 | Explain Basic terminology management, entrepreneurship, network analysis |
|------------------------|------------|--|

| | | |
|--|------------|--|
| | C02 | Explain recruitment and training |
| | C03 | Explain network analysis |
| | C04 | Explain mining operations and transportation |
| | C05 | Describe the necessity and functioning of smart technologies |

PO-CO Mapping

| Course Code: MNG-501 | | Course Title: Mine Management and Entrepreneurship | | | No of Periods: 60 |
|----------------------|-------------------|--|----|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO2,CO4 | 3 | 5 | 1 | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately Addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO 2 | CO4 | 5 | 8 | 1 | |
| PO 3 | CO1,CO2,CO3 | 19 | 32 | 2 | |
| PO 4 | CO2,CO5 | 2 | 3 | - | |
| PO 5 | CO1,CO3 | 16 | 27 | 1 | |
| PO 6 | CO1 | 15 | 25 | 1 | |
| PO 7 | | | | | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | | | 2 | | 1 | 1 | | 2 | 1 | |
| CO2 | 1 | | 2 | | | | | 2 | 1 | |
| CO3 | | | 2 | | 1 | | | 1 | 1 | |
| CO4 | 1 | 1 | | | | | | 2 | | |
| CO5 | | | | | | | | 1 | | |

3: High, 2: Moderate,1: Low

Learning Outcomes

Upon completion of the course, student shall be able to:

1.0 Know Principle of Management applied to mining Industry.

- 1.1 State the role of Mining Industry in economic development of our country.
- 1.2 State the Applicability of different types of ownership of Industries with reference to mining.
- 1.3 Define the term Management
- 1.4 Explain the different functions of Management
- 1.5 State the Principle of Scientific Management
- 1.6 List its characteristics of Scientific Management.
- 1.7 Define the term organisation
- 1.8 List the different departments in Mining Industry.
- 1.9 Draw the organisation chart of a conventional Underground mine
- 1.10 Draw the organisation chart of a mechanised long wall mine
- 1.11 Draw the organisation chart of a mechanised Opencast mine.

2.0 Understand Entrepreneurship and organisational structure

- 2.1 Define the term Entrepreneurship and Explain the concepts of Entrepreneurship
- 2.2 List the factors that motivate entrepreneur
- 2.3 State the risks and rewards encountered by an entrepreneur in respect of finance, career, personality and requirements of an entrepreneur
- 2.4 Explain the Maslow's theory of motivation
- 2.5 Explain Traits theory of leadership and Behavioural theory of leadership
- 2.6 Explain the method of product and site selection
- 2.7 Explain decision making and communication process
- 2.8 List the financial assistance programs
- 2.9 Explain the role of banks in the development of entrepreneur
- 2.10 State the statutory requirement in setting up a mining industry
- 2.11 Conduct demand and market surveys
- 2.12 Explain the Break-even Analysis, terminology used in Break-even analysis and numerical problems on Break even analysis

3.0 Recruitments and Training

- 3.1 Define the term recruitment and training
- 3.2 State various methods of recruitment process.
- 3.3 State Essential Qualification of persons recruited in mines under various category.
- 3.4 Explain different category training as per VTC Rules and various training programmes

4.0 Network analysis

- 4.1 Define network analysis
- 4.2 State the objectives of network analysis
- 4.3 Define the various terms CPM, Activity, Predecessor event, Merge and burst event, dummy activity
- 4.4 List the guide lines for construction of network diagrams
- 4.5 List the merits and demerits of CPM
- 4.6 Solve simple problems on CPM
- 4.7 Define the term PERT
- 4.8 List the time estimate in PERT
- 4.9 State the methodology of PERT
- 4.10 List the merits and demerits of PERT
- 4.11 Compare PERT Vs CPM
- 4.12 Solve the simple problems on PERT

5.0 Knows the Smart Technologies

- 5.1 Understand the overview of Internet of Things (IoT)
- 5.2 Define the term IoT, principle of working of IoT and key features of IoT
- 5.3 List the components of IoT (hardware, software, technology and protocols)
- 5.4 Mention the use of IoT in Mines
- 5.5 List the advantages and disadvantages of IoT, applications of IoT in Mining engineering

COURSE CONTENTS:

1. Mine management

Role of mining Industry in country's economic development, ownerships of Industries, Management, organisation, in the context of mining Industry.

2. Entrepreneurship and organisational structure

Motivating factors, Risks and Rewards, requirements of entrepreneur, products selection. site solution, setting of a Mine-Theory of motivation-Leader ship-Decision making process-communication process- Market survey., Demand survey techno-economic-Break even analysis.

3. Recruitments and training

Recruitment and training, Methods of recruitment - Essential Quality of person different category training as per VTC Rules - Training programmes

4. Network analysis

Definition and Objectives of network analysis-construction of network diagrams-Definitions of various terms-Merits and demerits of CPM-Simple problems on CPM-PERT-Definition, methodology, time estimates –Simple problems on PERT-Compression CPM Vs PERT

5. Knows the Smart Technologies

Overview of Internet of Things (IoT)-working principle - key features -- components - advantages and disadvantages of IoT-applications of IoT in Mining engineering

REFERENCE BOOKS:

- 1. Mine Management, Legislation and Ground safety : S.Ghattak.
- 2. Mine Management : V.N.Singh
- 3. Industrial Management : O.P.Khanna

Table Specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 3.4 |
| Unit Test –II | From 4.0 to 5.5 |

MINE LEGISLATION-II

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|----------------------|----------------------|---------------------|--------------|--------------|
| MNG-502 | Mine Legislation -II | 04 | 60 | 20 | 80 |

TIME SCHEDULE

| S. No. | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapping CO's |
|--------|--|---------------|--------------------|-----------------------------------|----------------------------------|--------------|
| 1 | The Mines and Minerals (Development and Regulation) Act, 2015 Mineral Concession Rules, 2016 | 15 | 26 | 02 | 02 | CO1 |
| 2 | Industrial Dispute Act-1947and Mine safety | 15 | 29 | 03 | 02 | CO2 |
| 3 | Environment Protection Act 1986 and Environment Protection Rules 1986 | 15 | 29 | 03 | 02 | CO3 |
| 4 | Environment Impact Assessment Notification 2006 | 15 | 26 | 02 | 02 | CO3, CO4 |
| | Total | 60 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes

| | |
|-------------------|---|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - Describe the scope and importance of Mines and Minerals Development act 1957, and Mineral concession rules 1960 - Explain Industrial Dispute Act 1947 - Explain Environment Protection Act, 1986 and Environment Protection Rules, 1986 - Explain Environment Impact Assessment Notification 2006 |
|-------------------|---|

| | | |
|-----------------|-----|---|
| Course Outcomes | CO1 | Explain application of Mines and Mineral concession rules |
| | CO2 | Explain Industrial Dispute Act 1947 |
| | CO3 | Explain Environment Protection Act, 1986 and Environment Protection Rules, 1986 |
| | CO4 | Explain Environment Impact Assessment Notification 2006 |

PO-CO Mapping

| Course Code: 502 | | Course Title: Mine Legislation - II | | | No of Periods: 60 |
|------------------|-------------------|-------------------------------------|----|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | - | - | - | - | >40% Level 3 Highly addressed |
| PO 2 | CO1,CO3 | 22 | 37 | 3 | |
| PO 3 | CO1,CO3 | 18 | 30 | 2 | |
| PO 4 | CO1,CO3 | 18 | 30 | 2 | 25% to 40% Level 2 Moderately Addressed |
| PO 5 | - | - | - | - | 5 to 25% Level 1 Low addressed |
| PO 6 | CO4 | 2 | 3 | - | |
| PO 7 | - | | | | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | | 3 | 2 | 2 | | | | | 2 | 1 |
| CO2 | | | | | | | | | | |
| CO3 | | 3 | 2 | 2 | | | | | 2 | 1 |
| CO4 | | | | | | | | | | |
| CO5 | | 3 | 2 | 2 | | | | | 2 | 1 |

3: High, 2: Moderate,1: Low

LEARNING OUTCOMES

Upon completion of the course, student shall be able to

1.0 Knows about the Mines and Minerals (Development and Regulation) Act-2015 and Mineral(Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules-2016

- 1.1 Define the terms- Mining Lease, Minor minerals, Prospecting license and reconnaissance permit as per MMDR Act, 2015.
- 1.2 List the provisions related to Prospecting or mining operations to be under license or lease as per MMDR Act, 2015.
- 1.3 List the provisions related to Restrictions on the grant of prospecting licenses or mining leases as per MMDR Act, 2015.
- 1.4 List the provisions related to application of prospecting licenses or mining leases as per MMDR Act, 2015.
- 1.5 List the provisions related to Application for reconnaissance permit as per Mineral Concession Rules, 1960
- 1.6 List the provisions related to Application for prospecting license and its renewal as per Mineral Concession Rules, 2016
- 1.7 List the provisions related to Applications for grant of mining leases as per Mineral Concession Rules, 2016
- 1.8 List the provisions related to Renewal of mining lease as per Mineral Concession Rules, 2016

2.0 Know the Industrial Dispute Act-1947 and importance of safety in mines

- 2.1 Define the term Industrial Dispute act-1947
- 2.2 State various causes and adverse effects of Industrial Dispute, various provisions of ID act
- 2.3 List the provisions related to Strike, lockout
- 2.4 Define the terms-safety, unsafe act, unsafe conditions, safety campaign, safety awareness.
- 2.5 Define the term Accidents, Injury, serious bodily injury, Accidents rate.
- 2.6 List direct losses (costs) and indirect losses (costs) due to accidents in mines.
- 2.7 Classify accidents in mines basing on causes, responsibility, and place wise, degree of severity, category wise, age wise, shift wise and time wise.
- 2.8 Explain the importance of safety in mines, factors influencing safety in mines
- 2.9 Explain the need of vocational training to promote safety.
- 2.10 Describe pit safety committee.
- 2.11 State the term of office, scope and functions of pit safety committee.
- 2.12 Explain safety organization at pit level.

3.0 Knows the provisions related to Environment Protection Act 1986 and Environment Protection Rules 1986

- 3.1 Define the terms Environment, Environment Pollutant, Handling, Hazardous Substances
- 3.2 List the Provision related to power of central government to take measures to Protect and improve environment.
- 3.3 List the Provision related to regulate environmental pollution.
- 3.4 List the Provision related to prevention, control, and abatement of environmental pollution
- 3.5 List the Provisions related to Powers of entry and inspection
- 3.6 List the provisions related to Penalty for contravention of the provisions of the act and the rules, orders and directions.
- 3.7 Knows the Environment Protection Rules 1986
- 3.8 Define the terms Central Board, Government Analyst, Person, recipient system, Standards, State Board

- 3.9 Knows the Standards for emissions or discharge of environmental pollutants, Ambient Air Quality and Ambient Noise Quality standards in India.
- 3.10 Mentions the procedure to take samples under EPA rules.

4.0 Know about the Provisions related to Environmental Impact Assessment(EIA) Notification, 2006

- 4.1 Define MoEF &CC, Environment Impact Assessment, Prior Environmental Clearance
- 4.2 List the Provisions on requirements for prior Environmental Clearance
- 4.3 Mention the State level Environmental Impact Assessment Authority and its functions
- 4.4 List the provisions related to Categorization of Projects and activities.
- 4.5 List the Provision related Stages in the Prior Environmental Clearance process for New Projects Screening, Scoping, Public Consultation, Appraisal
- 4.6 List the Provision related Prior Environmental Clearance process for Expansion or Modernization or change of product mix in existing projects.
- 4.7 List the Provision related Grant or Rejection of Environmental Clearances
- 4.8 List the Provision related Validity of Environmental Clearance
- 4.9 List the Provision related Post Environmental Clearance Monitoring.

COURSE CONTENTS:

1.0 Knows about The Mines and Minerals (Development and Regulation) Act, 2015 and Mineral(Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016

Define the terms- Mining Lease, Minor minerals, Prospecting license and reconnaissance permit as per MMDR Act, 2015-List the provisions related to Prospecting or mining operations to be under license or lease , Restrictions on the grant of prospecting licenses or mining leases , application of prospecting licenses or mining leases as per MMDR Act, 2015. - List the provisions related to Application for reconnaissance permit --Application for prospecting license and its renewal - Applications for grant of mining leases as per Mineral Concession Rules, 2016-Renewal of mining lease as per Mineral Concession Rules, 2016.

2.0 Industrial Dispute Act-1947 and Importance of Safety in mines

Industrial Dispute act-1947, causes f or Industrial Dispute adverse effects for Industrial Dispute various provisions of ID act -strike and lockout-Define the terms-safety, unsafe act, unsafe conditions, safety campaign, safety awareness.- importance of safety in mines- factors that influence safety in mines- need of vocational training to promote safety-mine safety week celebrations- pit safety committee- term of office, scope and functions of pit safety committee- safety organization at pit level-Define the term Accidents, Injury, serious bodily injury, Accidents rate- direct losses (costs) and indirect losses (costs) due to accidents- Classify accidents in mines basing on causes, responsibility, place wise, degree of severity, category wise, age wise, shift wise and time wise- Pit safety committee.

3.0 Knows the provisions related to Environment Protection Act 1986 and Environment Protection Rules 1986

Meaning of terms EPA Act, Environment, Environment Pollutant, Handling, Hazardous Substances, Power of central government to Protect and improve environment, regulate environmental pollution, prevention, control, and abatement of environmental pollution, Powers of entry and inspection, Penalty for contravention of the provisions of the act and the rules. Meaning of terms, Environment Protection Rules,Central Board, Government Analyst, Person, recipient system,

Standards, State Board, Standards for emissions or discharge of environmental pollutants, Ambient Air Quality and Ambient Noise Quality standards in India, procedure to take samples under EPA rules

REFERENCE BOOKS:

1. Mine Management, Legislation and Ground Safety : S.Ghattak.
2. Critical Appraisal : Rakesh& Prasad
3. MMDR Act 2015 : Indian Bureau of Mines
4. MCR 2016 : Indian Bureau of Mines
5. EPA Act 1986 & EPA Rules 1986 : Parivesh.in
6. EIA Notification 2006 : Parivesh.in

Table Specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 2.12 |
| Unit Test –II | From 3.1 to 4.9 |

MINE HAZARDS AND RESCUE

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|-------------------------|----------------------|---------------------|--------------|--------------|
| MNG-503 | Mine Hazards and Rescue | 05 | 75 | 20 | 80 |

TIME SCHEDULE

| S. No | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapped CO's |
|-------|--------------------------------|---------------|--------------------|-----------------------------------|----------------------------------|-------------|
| 1 | Mine Fires | 15 | 16 | 02 | 01 | CO1, CO2 |
| 2 | Mine Explosions and Inundation | 20 | 26 | 02 | 02 | CO2, CO3 |
| 3 | Miner's diseases& First Aid | 15 | 26 | 02 | 02 | CO4, CO5 |
| 4 | Rescue and recovery | 15 | 26 | 02 | 02 | CO1, CO5 |
| 5 | Gas detectors | 10 | 16 | 02 | 01 | CO5 |
| | Total | 75 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes:

| | |
|--------------------------|---|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - Explain various sources of mine fires, causes, preventive measures - Explain different types of explosions, causes, preventive measures - Describe inundation, safety provisions - Familiarize different types of miner's diseases and First Aid - Describe the usage of different gas detectors, - Familiarize various rescue apparatus and recovery procedure |
|--------------------------|---|

| | | |
|------------------------|------------|---|
| Course Outcomes | CO1 | Explain various sources of mine fires, causes, preventive measures |
| | CO2 | Explain different types of explosions, causes, preventive measures |
| | CO3 | Describe inundation, safety provisions |
| | CO4 | Familiarize different types of miner's diseases and First Aid |
| | CO5 | Describe different gas detectors, rescue apparatus and recovery procedure |

PO-CO Mapping:

| Course Code: MNG-503 | | Course Title: Mine Hazards and Rescue | | | No of Periods: 75 |
|----------------------|-------------------|---------------------------------------|------|---------------|--|
| PO No | Mapped with CO no | CO Periods addressing PO in Column 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO2 | 8 | 10.6 | 1 | >40% Level 3 Highly addressed 25 to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO2 | CO1, CO2, CO3 | 41 | 54.6 | 3 | |
| PO3 | CO2 | 7 | 9.3 | 1 | |
| PO4 | CO1, CO2 | 19 | 25.3 | 2 | |
| PO5 | - | - | - | - | |
| PO6 | - | - | - | - | |
| PO7 | - | - | - | - | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | - | 3 | - | 2 | - | - | - | - | 1 | 1 |
| CO2 | 1 | 3 | 1 | 2 | - | - | - | 2 | 1 | 1 |
| CO3 | - | 3 | - | - | - | - | - | - | - | 1 |
| CO4 | - | - | - | - | - | - | - | - | - | - |
| CO5 | - | - | - | - | - | - | - | - | - | - |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Upon on completion of the course the student shall be able to:

1.0 Mine Fires

- 1.1 Define mine fires and list the types of mine fires.
- 1.2 List the causes and preventive measures of surface and underground mine fires
- 1.3 Explain the term 'Spontaneous heating' and list the signs of spontaneous heating
- 1.4 List the factors for developing spontaneous heating.
- 1.5 List the causes and preventive measures of spontaneous heating
- 1.6 List and explain different methods of dealing with fires and their applicability
- 1.7 Explain the procedure of permanent sealing of fire in I, II, III degree gassy mines.
- 1.8 Explain the method of collecting samples behind the Fire Seals
- 1.9 Calculate the CO/O₂ and CO₂/O₂ deficiency ratio
- 1.10 Describe and interpret the Coward diagram for finding the explosibility of methane air mixture.
- 1.11 List and explain the different methods of re-opening of sealed off areas.
- 1.12 List different fire fighting equipment and describe it in fire fighting organisation

2.0 Mine Explosions and Inundation

- 2.1 Define mine explosion and list the different types of mine explosions.
- 2.2 List the causes and preventive measures of fire damp and coal dust explosions.
- 2.3 Explain the method of treating the coal dust.
- 2.4 Explain the purpose of construction of stone dust barriers and their locations.
- 2.5 State the application and functions of water barriers.
- 2.6 Classify the sources of water in mines.
- 2.7 List the precautions against inundation due to surface and underground water.
- 2.8 List the precautions to be taken while approaching water logged area with sketch.
- 2.9 Explain the function and the use of Burnside safety boring apparatus.
- 2.10 List the different types of dams and state the purpose and applicability of water dams in mines.
- 2.11 Describe the constructional details of sump and barriers.

3.0 Miner's diseases and First Aid

- 3.1 Explain about various forms of pollution due to mining and explain about control methods.
- 3.2 List various miner's diseases.
- 3.3 List the causes, symptoms and Miners diseases
- 3.4 Define the terms: First Aid, Medical Aid, First Aider, Victim, Symptom and Sign.
- 3.5 Describe the scheme of First Aid in mining industry and state its objectives.
- 3.6 State the importance of First Aid Training in mining industry.
- 3.7 State the role and responsibility of First Aider.
- 3.8 Explain the stages of action during emergency (approach, assessment, examination and management).
- 3.9 Explain the procedure for CPR (Cardio-Pulmonary Resuscitation).
- 3.10 State the causes of respiratory emergencies.
- 3.11 State the signs, symptoms of respiratory emergencies like suffocation, choking, drowning and toxic inhalation.
- 3.12 State the signs, symptoms of bone and joints injuries.
- 3.13 State the signs, symptoms of heat stroke, general poisonings.

4.0 Rescue and recovery

- 4.1 Define the terms rescue and recovery.
- 4.2 List the situations requiring rescue operations.
- 4.3 Classify rescue apparatus.
- 4.4 Explain the constructional details and principle of working of compressed oxygen self-contained breathing apparatus.
- 4.5 Describe the constructional details of smoke helmet and state the purpose of it.
- 4.6 Describe the constructional details of gas mask and state the purpose of it.
- 4.7 Explain the functions of self-rescuer.
- 4.8 Define resuscitation.
- 4.9 State the purpose of resuscitation apparatus and rescue station.
- 4.10 List the equipment required to be kept in mine rescue station.
- 4.11 Describe rescue operations at mine level.

5.0 Gas detectors

- 5.1 Classifies the different methods of gas detection.
- 5.2 Explain the principles on which the detectors are developed or designed.
- 5.3 List the recent techniques of gas detection (remote sensing devices, continuous recorders, remote monitoring, infrared spectrometer and sensors).
- 5.4 List the method of CO detectors.
- 5.5 Explain the method of CO detection by warm blooded creature.
- 5.6 Explain the method of detection CO by chemical detectors.

- 5.7 List and explain the methods of detecting CH₄.
- 5.8 Explain the multi gas detector and its use.

COURSE CONTENT

1.0 Mine fires

Classification, causes, preventive measures, spontaneous heating- causes and preventive measures. Different methods of dealing with fire Permanent sealing of Fire. Collection of samples behind fire seals – Interpretation of samples – Coward's diagram, calculation of CO/O₂ deficiency ratios, reopening of sealed off areas Firefighting equipment and organisation- Nitrogen infusion

2.0 Mine Explosions and Inundation

Types of mine explosions-Causes and preventive measures, coal dust explosion-causes and preventive measures, treating coal dust by watering and stone dust barriers – water barriers - Inundation in mines-dangers different sources of water-precautions against surface and underground water-precautions-while approaching water logged area - Burn side safety boring apparatus - purpose of dams. - Design of a dam construction of concrete dam. Accident due to Inundation.

3.0 Miner's diseases and First Aid

Various forms of environmental pollution due to mining- various forms of pollution due to mining- pollution control methods- various miners' diseases- causes, symptoms. Meaning of the terms First Aid, Medical Aid, First Aider, Victim, Symptom and Sign, Scheme of First Aid in mining and its objectives, importance of First Aid Training, role and responsibility of First Aider, stages of action during emergency, procedure for CPR, Symptoms and causes of respiratory emergencies, symptoms of bone and joints injuries, symptoms of heat stroke, general poisoning.

4.0 Rescue and recovery

Define the terms rescue and recovery- situations requiring rescue operations- rescue apparatus- constructional details of compressed oxygen self-contained breathing apparatus (proto IV apparatus)- principle of function- tests, care and maintenance of compressed O₂ apparatus- purpose of smoke helmet- constructional details --the purpose and constructional details of gas mask functions of self-rescuer- resuscitation- purpose of resuscitation apparatus- purpose of rescue station- equipment required to be kept in mine rescue station- details of rescue stations- rescue organization at mines level.

5.0 Gas Detectors

Gas detectors, Uses, – principle on which designed, determination of percentage of gas with them- Recent techniques of gas detection – remote sensing devices, continuous recorders, monitors, infra-red spectrometers, sensors-Carbon Monoxide detection – Warm blooded birds, chemical detectors, Multi gas detector.

REFERENCE BOOKS

- | | | |
|--|---|-------------|
| 1. Mine fires, Rescue, Recovery and Inundation | : | M A. Ramulu |
| 2. Mine ventilation | : | S. Ghatak |
| 3. Mine environment and its control | : | G B Mishra |
| 4. Mines Rescue rules | | |
| 5. Mine ventilation | : | Hartmen |
| 6. UMS Volumes | | |
| 7. Statham series | | |

Table specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 2.11 |
| Unit Test –II | From 3.1 to 5.8 |

MINING MACHINERY-II

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|-----------------------|----------------------|---------------------|--------------|--------------|
| MNG-504 | Mining Machinery - II | 05 | 75 | 20 | 80 |

TIME SCHEDULE

| S. No | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapped CO's |
|-------|--|---------------|--------------------|-----------------------------------|----------------------------------|-------------|
| 1 | Conventional Face machinery | 15 | 16 | 02 | 01 | CO1, CO2 |
| 2 | Longwall Face machinery | 15 | 26 | 02 | 02 | CO2, CO4 |
| 3 | Flame proofing, intrinsic safety and Cables in mines | 15 | 26 | 02 | 02 | CO2, CO3 |
| 4 | Winding system- Part-I | 15 | 26 | 02 | 02 | CO2, CO5 |
| 5 | Winding system Part-II | 15 | 16 | 02 | 01 | CO4, CO5 |
| | Total | 75 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes:

| | |
|--------------------------|---|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - Familiarize different machinery, principle of operation - Familiarize the scope and importance of flame proofing, constructional details - Explain various intrinsic safety apparatus used in mines and their constructional details. Methods of making circuit intrinsically safe - Familiarize different types of cables used in mines, their construction, field usage, - Describe the winding system used in mines, various components, principle of working, safety precautions |
|--------------------------|---|

| | | |
|------------------------|------------|--|
| Course Outcomes | CO1 | Explain different drilling machinery |
| | CO2 | Describe different cables used in mines, their construction and mode of operation. |
| | CO3 | Explain various intrinsic safety apparatus used in mines and their construction |
| | CO4 | Describe the winding system used in mines, various components, principle of working, and safety precautions. |
| | CO5 | Explain the different braking systems in winding and speed control in winding |

PO-CO Mapping:

| Course Code: MNG-504 | | Course Title: Mining Machinery-II | | | No of Periods: 75 |
|-------------------------|----------------------|--|------|------------------|--|
| PO No | Mapped with CO no | CO Periods addressing PO in Column 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | - | - | - | - | >40% Level 3 Highly addressed 25 to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO2 | CO1,CO2 | 15 | 20.0 | 2 | |
| PO3 | CO1,CO2 | 15 | 20.0 | 2 | |
| PO4 | CO1,CO2 | 15 | 20.0 | 2 | |
| PO5 | CO2,CO3 | 15 | 20.0 | 2 | |
| PO6 | CO4, CO5 | 15 | 20.0 | 2 | |
| PO7 | - | - | - | - | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | - | 2 | 2 | 2 | - | - | - | - | 3 | - |
| CO2 | - | 2 | 2 | 2 | 2 | - | - | - | 4 | - |
| CO3 | - | - | - | - | 2 | - | - | - | 1 | - |
| CO4 | - | - | - | - | - | - | - | - | | - |
| CO5 | - | - | - | - | - | - | - | - | | - |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Upon on completion of the course the student shall be able to:

1.0 Conventional face machinery

- 1.1 List the different drills used in mines and mention the field of use of each.
- 1.2 Explain the working of electric rotary drill with neat sketch.
- 1.3 Explain the working of hammer rock drill with sketch.
- 1.4 Write down the function of each part of hammer rock drill.
- 1.5 State the purposes of air-leg and coal cutting machines.
- 1.6 List the types of power loaders used mines and mention the field use of each.
- 1.7 Explain the principle of working of Side Discharge Loaders used in mines
- 1.8 Explain the principles of working of Load Haul Dumpers used in mines
- 1.9 Explain the principles of working of Rocker shovel used in metal mines
- 1.10 Explain the principles of working of Road headers used in underground mines.

2.0 Long wall face machinery

- 2.1 Explain the working of Single Ended Ranging Drum Shearer (SERDS) with sketch.
- 2.2 Explain the working of Double Ended Ranging Drum Shearer (DERDS) with sketch
- 2.3 Write down the applications of SERDS and DERDS.

- 2.4 Explain the principle of working of Armoured Face Conveyor (AFC)
- 2.5 State the principle of lump breaker
- 2.6 State purpose of power pack.
- 2.7 List the factors governing the selection of power supports.
- 2.8 Draw and state the purpose of the following in power supports
 - a) Canopy b) Caving Shield c) Double acting Advancing Ram
 - d) Face Guard e) Extension Canopy f) Lemniscates Links
- 2.9 Explain various components of AFC
- 2.10 State the purpose of Bottom opened and Bottom closed AFC and their applicability
- 2.11 State the applicable conditions of Twin-In-Bord and Twin-Out-Bord AFC and their advantages, disadvantages.

3.0 Flame proofing, Intrinsic safety, Signalling and Cables in mines

- 3.1 Define the terms flame proof apparatus and intrinsically safe apparatus.
- 3.2 State the necessity of flame proofing and intrinsic safety to apparatus used in mines.
- 3.3 List the field use of flame proof apparatus and intrinsically safe apparatus,
- 3.4 Describe the constructional features of flame proofing.
- 3.5 Explain the methods of intrinsic safety
- 3.6 Describe the gate-end switch gear (box) used for coal drills.
- 3.7 Classify the types of cables used in mines.
- 3.8 Explain the constructional details of mine cables with cross sectional sketch
- 3.9 Explain cable jointing methods in vertical shaft.
- 3.10 Write down the care and maintenance steps to be taken for protection of mine cables.

4.0 Winding system – Part -I

- 4.1 Define the term winding and state the purpose of winding in shafts.
- 4.2 List the equipment required in a winding system and state the purpose of each.
- 4.3 Explain the types of head gear frames and state the purpose of head gears
- 4.4 Explain the arrangement for loading and unloading of skip at pit-top and pit-bottom respectively.
- 4.5 State the necessity of guides for cage or skip
- 4.6 Explain the erection of flexible and rigid guides to cage or skip.
- 4.7 List the applicable conditions, merits and demerits of rigid and flexible guides
- 4.8 Explain the working of keps and safety catches with sketch.
- 4.9 List the types of safety hooks
- 4.10 Explain the working of kings-safety hook (detaching hook) with sketch.
- 4.11 Explain the constructional details of cage suspension gear
- 4.12 Explain the purpose of each component of cage suspension gear
- 4.13 Explain the constructional details of sheave or pulley

5.0 Winding system – Part -II

- 5.1 Compare cage winding with skip winding.
- 5.2 List the types of winding systems (drum and koepe)
- 5.3 Explain the drum winding with drum construction and list the types of drums.
- 5.4 List the safety devices used on winding system.
- 5.5 Explain the koepe or friction winding.
- 5.6 Describe the single rope and multi-rope friction winding with sketch.
- 5.7 List the merits and demerits of koepe or friction winding.
- 5.8 Compare drum winding with friction winding.
- 5.9 State the principle of braking in winding.
- 5.10 Explain the suspended calliper brake and anchored post brake
- 5.11 Explain the dynamic electrical breaking , Regenerative breaking
- 5.12 Explain the method of speed control by Lilly controller and other automatic contrivances

COURSE CONTENTS:

1. **Conventional Face machinery**
Handheld drills – electronic rotary drills - hammer rock drills - power loader – field of applications, working operation – air leg – coal cutters
2. **Longwall face machinery**
Principle, design and application of long wall face machinery shearer, AFC, Lump breaker – stage loader, power pack self-advancing chock shield supports- SERDS and DERDS- their applications- principle of working of AFC (Armoured Face conveyor)- principle of lump breaker- purpose of power pack.
3. **Flame proofing, Intrinsic safety, Signalling and Cables in mines**
Necessity of flame proofing- intrinsic safety apparatus - field of application – constructional features - methods of intrinsic safety - field of application -cables– types – constructional details – cable jointing – care and maintenance.
4. **Winding systems- Part-I**
Winding in shafts – purpose, equipment - types of had gear frames – shaft fittings – guides in the shafts – pit – top arrangement – keps and suspension gear – Types of drums - head gear pulley, care skip winging-pit-top and pit-bottom arrangements – cage suspension gear- sheave -pulley
5. **Winding systems – Part –II**
Drum winding and skip winding, multi-deck winding and friction winding – drum and friction winding – winding engine – depth - methods of speed control – breaking in winding – types of breaks- automatic contrivances – dynamic –regenerative breaking

REFERENCE BOOKS:

- | | |
|-------------------------------------|----------------|
| 1. Elements of Mining Vol.3 | : D.J.Deshmukh |
| 2. Mine Pumps, Haulages and Winding | : S.Ghatak |
| 3. Mining Machinery | : S.Ghatak |
| 4. Statham series VOL III | |
| 5. U.M.S.Volumes | |
| 6. Mine transportation | : KERLIN |

Table Specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 3.8 |
| Unit Test –II | From 3.9 to 5.12 |

ROCK MECHANICS AND STRATA CONTROL

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|-----------------------------------|----------------------|---------------------|--------------|--------------|
| MNG-505 | Rock Mechanics and Strata control | 05 | 75 | 20 | 80 |

TIME SCHEDULE

| S. No | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapped CO's |
|-------|---|---------------|--------------------|-----------------------------------|----------------------------------|-------------|
| 1 | Basics, Ground Forces and stress analysis | 12 | 16 | 02 | 01 | CO1,CO2 |
| 2 | Rock properties and rock classifications | 13 | 26 | 02 | 02 | CO2,CO4 |
| 3 | Rock failures, behaviour and measurements | 15 | 16 | 02 | 01 | CO3,CO4 |
| 4 | Ground movements and subsidence | 15 | 26 | 02 | 02 | CO4,CO5 |
| 5 | Strata control | 20 | 26 | 02 | 02 | CO4,CO5 |
| | Total | 75 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes:

| | |
|--------------------------|---|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - Analyze the different ground forces, - Explain stress analysis, - Describe rock properties and classifications, - Analyze different types of rock failures and behavior, - Explain different ground moments due to mining activity - Analyze different methods of subsidence and strata control |
|--------------------------|---|

| | | |
|------------------------|------------|---|
| Course Outcomes | CO1 | Analyse Ground Forces and stress analysis |
| | CO2 | Describe rock properties and classifications |
| | CO3 | Explain the different ground forces, rock failures and behavior |

| | | |
|--|------------|--|
| | CO4 | Explain different ground moments due to mining activity |
| | CO5 | Explain different methods of subsidence and strata control |

PO-CO Mapping:

| Course Code: 505 | | Course Title: Rock Mechanics and Strata Control | | | | | | No of Periods: 75 | | |
|------------------|-------------------|---|-----|---------------|--|-----|-----|-------------------|------|------|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks | | | | | |
| | | No | % | | | | | | | |
| PO1 | CO3 | 10 | 14 | 1 | >40% Level 3 Highly addressed 25 to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed <5% Not addressed | | | | | |
| PO2 | CO1, CO3 | 15 | 20 | 1 | | | | | | |
| PO3 | CO1,CO3 | 19 | 25 | 2 | | | | | | |
| PO4 | CO2,CO3 | 31 | 41 | 3 | | | | | | |
| PO5 | - | - | - | - | | | | | | |
| PO6 | - | - | - | - | | | | | | |
| PO7 | - | - | - | - | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| CO1 | - | 1 | 2 | - | - | - | - | 1 | 1 | - |
| CO2 | - | - | - | 3 | - | - | - | - | - | 1 |
| CO3 | 1 | 1 | 2 | 3 | - | - | - | 2 | 1 | 1 |
| CO4 | - | - | - | - | - | - | - | - | - | - |
| CO5 | - | - | - | - | - | - | - | - | - | - |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Upon on completion of the course the student shall be able to:

1.0 Basics, Ground Forces and stress analysis

- 1.1 Define the term Rock mechanics.
- 1.2 State the scope and areas of application of rock mechanics in mining.
- 1.3 State forces due to the weight of strata
- 1.4 State tectonic, orogenic, residual and thermic origin forces
- 1.5 List the ground forces acting on a block of in-situ rock in three dimensions
- 1.6 Define the terms stress – field, principal stress, principal strain, plane stress and plane strain
- 1.7 Explain the relation between vertical and lateral stresses
- 1.8 Explain hydrostatic and lithostatic states of rock.
- 1.9 Lists the induced stresses due to mining operations.
- 1.10 Explain stress distribution around a mine workings
- 1.11 Explain stress concentration around shaft of different shapes
- 1.12 Explain stress concentration on pillars.

2.0 Rock properties and rock classifications

- 2.1 List the physical and mechanical properties of rocks.
- 2.2 Explain about compressive strength of rocks.
- 2.3 Explain about tensile strength of rocks.
- 2.4 Explain about shear strength of rocks.
- 2.5 Lists the strength indices of rocks.
- 2.6 Explain about point load strength index.
- 2.7 Explain about Protodyaknov strength index.
- 2.8 Explain porosity, permeability and anisotropy of rocks.
- 2.9 Define the term rock mass.
- 2.10 Classify rocks by Moh's hardness scale.
- 2.11 Classify the rocks by RQD(Rock Quality Designation).
- 2.12 Classify the rocks by RMR (Rock Mass Rating).
- 2.13 List the factors considered for estimation of RMR and RQD.

3.0 Rock failures, behaviour and measurements

- 3.1 List the theories of rock failure.
- 3.2 List the confining pressures
- 3.3 State the effect of water ,time and temperature on failure of rocks
- 3.4 Explain the deformability of rock
- 3.5 Explain the concept of coal bumps and rock bursts.
- 3.6 List the causes of rock bursts and coal bumps.
- 3.7 List the preventive measures against coal bumps and rock bursts.
- 3.8 List the instruments used for measurement of stress
- 3.9 List the instruments used for measurement of strain
- 3.10 List and explain the instruments used for measurement of load.

4.0 Ground movements and subsidence

- 4.1 Differentiate the strata conditions before and after mining operations.
- 4.2 Explain the pressure arch theory
- 4.3 Explain Normal theory
- 4.4 Explain Dome theory
- 4.5 Explain Rzhijaz theory
- 4.6 Explain the strata pressure in and around bord and pillar and longwall workings.
- 4.7 Explain the term subsidence.
- 4.8 Define the different terminology used in subsidence.
- 4.9 Explain angle of draw positive and negative.
- 4.10 List the factors influencing angle of draw.
- 4.11 List the factors effecting subsidence.
- 4.12 List the effects and protective measures related to subsidence.
- 4.13 Explain the method of subsidence measurement.

5.0 Strata control

- 5.1 States the necessity of supports in mine.
- 5.2 List the various materials used for supporting in mines (timber, iron, steel, building stone, brick and concrete).
- 5.3 Classify the types of supporting systems.
- 5.4 List the applicable conditions and write the size of props, chocks, cogs, stulls, bars, linked bars.
- 5.5 States the principles of roof bolting.
- 5.6 Explain the system of roof bolting.
- 5.7 Lists the applicable conditions, merits and demerits of roof bolting.

- 5.8 Explain about the rigid and yield props.
- 5.9 Describe the constructional details of friction and hydraulic props.
- 5.10 Explain the method of setting props, bars and chocks at different situations.
- 5.11 Explain the method of fore-poling, roof stitching and state its applicability.
- 5.12 Explain the method of safari supporting, road way junction and state its applicability.
- 5.13 Explain the method of supporting after heavy roof collapse while clearing the debris, withdrawal of supports by safety prop with drawer with sketch

COURSE CONTENTS:

1. Basics, Ground Forces and stress analysis

Definition of rock mechanics – scope of rock mechanics- application of Rock mechanics to mining – field and ground forces - various forces acting on block – types of Stress – Relation between vertical and lateral stresses – Stress field – hydrostatic and lithostatic stage of rock - induced stresses due to mining – stress – field, principal stress, principal strain, plane stress and plane strain - stress distribution around a mine workings.

2. Rock properties and rock classifications

Rock properties – physical and mechanical properties of rocks – compressive strength – tensile strength - shear strength – strength indices of rocks – point load strength index - protodyakonov's strength index – porosity – permeability - anisotropy –RQD (Rock Quality Designation) - Mohr's Hardness scale. -RMR (Rock mass rating), factors consider for estimation of RMR – classification of rock based on RMR.

3. Theories of Rock failure, Rock Behaviour and Measuring Devices

Theories of failure of rocks - confining pressures - the effect of water, time and temperature - deformability of Rock - instruments used for measurement of stress measuring load, stress and strain - bumps and rock bursts.

4. Ground movements and subsidence

Strata conditions before and after mining operations - pressure arch theory - normal theory - dome theory - rhizaz theory -strata pressure in and around bord and pillar and longwall workings – subsidence – terminology - angle of draw-positive and negative - factors influencing angle of draw - factors effecting subsidence - effects of subsidence - protective measures on surface and underground to minimise damages due to subsidence - method of subsidence measurement.

5. Strata control

Supports – necessity – materials used – classification of supporting systems – applicability of various types of supports – size, shape of supports – principle of roof bolting, stitching – merits and demerits of bolting – rigid and yield props – constructional details of friction, hydraulic props – methods of setting various supports at different situations – fore poling - safari supporting- junction supports – clearance of heavy roof collapse – withdrawal of supports.

REFERENCE BOOKS:

- | | |
|--------------------------------------|------------------------------|
| 1. Rock Mechanics | : Richard E. Goodman. |
| 2. Introduction of Rock mechanics. | : V.P.Varma |
| 3. Rock mechanics and strata control | : Peng |
| 4. Long Wall Mining | : Peng |
| 5. Mining technology 1,2,3 | :D.J.Deshmukh&R.T.DeshmukVol |
| 6. S.M.E. Hand Books Vol. 1,2,3. | |
| 7. Soil mechanics | : Punmiya&Kulkarni. |

Table Specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 3.5 |
| Unit Test –II | From 3.6 to 5.13 |

SURFACE MINING-II

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|-------------------|----------------------|---------------------|--------------|--------------|
| MNG-506 | Surface Mining-II | 04 | 60 | 20 | 80 |

TIME SCHEDULE

| S. No | Unit Title/Chapter | No.of Periods | Weightage of Marks | No.of Short Answer Questions (3M) | No of Essay Type Questions (10M) | Mapped CO's |
|-------|-----------------------------|---------------|--------------------|--------------------------------------|-------------------------------------|---------------|
| 1 | Dimensional Stone Quarrying | 20 | 36 | 02 | 03 | CO1, CO2, CO3 |
| 2 | Machinery | 10 | 26 | 02 | 02 | CO2 |
| 3 | Sampling | 15 | 19 | 03 | 01 | CO4 |
| 4 | Environment and Ecology | 15 | 29 | 03 | 02 | CO5 |
| | Total | 60 | 110 | 10 | 08 | |

Course Objectives and Course Outcomes:

| | |
|--------------------------|---|
| Course Objectives | Upon completion of the course the student shall be able to: <ul style="list-style-type: none"> - Explain the basic operations involved in Dimensional Stone Quarrying - Familiarize the methods of opening the deposits for Dimensional Stone Quarrying - Explain various machinery used in Dimensional Stone Quarrying and their applicability - To analyse different Sampling procedures used for grading of minerals - Familiarizes with the terms Environment and Ecology and their importance in Mining |
|--------------------------|---|

| | | |
|------------------------|-----|--|
| Course Outcomes | CO1 | Explain Basic terminology involved in Dimensional Stone Quarrying. |
| | CO2 | Explain Various operations involved in Dimensional Stone Quarrying, Machinery used, Drilling and cutting operation |
| | CO3 | Describe the Operation of various machinery used in Dimensional Stone Quarrying |
| | CO4 | Analyze various sampling methods |
| | CO5 | Importance of Environment and Ecology in Mining |

PO-CO Mapping:

| Course Code: 406 | | Course Title: Surface Mining | | | No of Periods: 60 |
|------------------|-------------------|-----------------------------------|----|---------------|--|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1, CO5 | 15 | 25 | 2 | >40% Level 3 Highly addressed 25 to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed <5% Not addressed |
| PO2 | CO4 | 8 | 14 | 1 | |
| PO3 | CO1, CO2, CO3 | 23 | 39 | 2 | |
| PO4 | CO4 | 7 | 11 | 1 | |
| PO5 | CO5 | 7 | 11 | 1 | |
| PO6 | - | - | - | - | |
| PO7 | - | - | - | - | |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | - | 2 | - | - | - | - | - | 1 | - |

| | | | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|---|---|
| CO2 | - | - | 2 | - | - | - | - | - | 1 | 1 |
| CO3 | - | - | 2 | - | - | - | - | - | 1 | 1 |
| CO4 | - | 1 | - | 1 | - | - | - | - | - | 1 |
| CO5 | 2 | - | - | - | 1 | - | - | - | - | - |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Upon on completion of the course the student shall be able to:

1.0 Dimensional Stone Quarrying

- 1.1 Define Dimensional Stone Quarrying
- 1.2 Classify dimensional stone Quarrying in India.
- 1.3 List the uses of Granite, Marble, Limestone, & Sandstone.
- 1.4 List the merit and demerits of dimensional stone quarry in India.
- 1.5 List the operations involved in Dimensional Quarry.
- 1.6 Explain the operations involved in Dimensional Quarry, preparation of site, development
- 1.7 Lists the splitting Techniques used in Dimensional Quarrying.
- 1.8 Explain Plugs and Feather, Mechanical Splitting, Expansive Mortar and Explosive used for splitting in Dimensional Stone Quarry.
- 1.9 Explain Jet Flame Cutting, slot drilling and diamond wire sawing.
- 1.10 List and explain the problems related to dimensional stone quarry.

4.0 Dimensional Stone Quarrying - Machinery

- 4.1 List the different HEMM used in dimension stone quarry.
- 4.2 Explain the constructional details of a wire saw cutting machine
- 4.3 Explain the constructional details of a chain saw machine
- 4.4 Explain the constructions details of a mechanical splitter.
- 4.5 Explain the constructional details of a fork wheel loader.
- 4.6 Explain Industry 4.0 automation system for quarry machines.

6.0 Sampling Methods

- 6.1 Define the term Sampling and state its objectives.
- 6.2 List the mining situations under which samplings are employed.
- 6.3 Classifies sampling methods basing on method of collections (Channel sampling, Chip sampling, Bulk sampling)
- 6.4 Explain channel sampling and state its applicability.
- 6.5 Explain chip sampling and state its applicability.
- 6.6 Explain Bulk sampling and state its applicability.
- 6.7 Define the terms Core drill sampling, Radio metric sampling, Stope sampling, Conveyor sampling, Wagon sampling, Truck sampling.
- 6.8 Explain the technique of coning and quartering with sketch.
- 6.9 State the purpose and application of coning and quartering.
- 6.10 Explain the term salting and list its preventive measures.
- 6.11 Define the terms Assaying, Assay value, Assay plan, Assay average.
- 6.12 List the objectives of Assay plans and details to be shown on Assay plans.

8.0 Environment and Ecology

- 8.1 Define the term Environment.
- 8.2 State the impact on environment due to opencast mining operations.

- 8.3 State and explain the various environmental pollutions (Water, Air, Land Pollutions) due to mining operations.
- 8.4 Explain the prevention and control of various pollutions (Water, Air, Land pollutions) due to mining.
- 8.5 Define the term Ecology and impact on ecology due to Surface Mining operations.
- 8.6 Explain the relation between Environment and Ecology
- 8.7 State the purpose of EIA (Environmental Impact Assessment)
- 8.8 Explain the salient features of EIA.
- 8.9 State the necessity of EMP (Environmental Management Plan)
- 8.10 Explain the salient features of EMP.
- 8.11 Define the term "Reclamation".
- 8.12 Explain land reclamation operations in Surface Mines

COURSE CONTENTS:

1.0 Dimensional Stone Quarrying

Dimensional Stone Quarrying, Classification of Dimensional stone quarrying, uses of dimensional stones, merits and demerits of dimensional stone quarry, operations involved, splitting techniques, jet flame cutting, slot drilling and diamond wire sawing, problems related to dimensional stone quarrying

2.0 Dimensional Stone Quarrying - Machinery

Different HEMM used in dimension stone quarry, Constructional details of wire saw cutting machine, chain saw machine, mechanical splitter, fork wheel loader, Industry 4.0 automation in quarries.

3.0 Sampling Methods

Sampling- objectives - Mining situations - classification- channel sampling - Applicability - chip sampling- Applicability - Bulk sampling- Applicability different definitions - technique of coning and quartering - purpose – application- salting- preventive measures – Assaying- Assay value- Assay plan- Assay average- objectives of Assay plans- details shown on Assay plans

4.0 Environment and Ecology:

Definition- Impact on environment due to opencast mining operations - Various environment pollutions (water, air, land pollutions) due to mining operations - Prevention and control of various environment pollutions (water, air, land pollutions) due to mining operations –Ecology and impact on ecology due to OC Mining operations - Relationship between Environment & Ecology- EIA (Environmental Impact Assessment) - EMP land Reclamation operations in opencast mines

REFERENCE BOOKS:

- | | | |
|---------------------------------|---|-----------------------------------|
| 1. Surfacing Mining | : | G.B.Mishra |
| 2. Surfacing Mining | : | Samir Kumar Das |
| 3. Heavy earth mining Machinery | : | Amitosh de |
| 4. Dimensional stone Technology | : | SS Rathore, GS Bharadwaj, SC Jain |

Table Specifying the scope of syllabus to be covered for Unit Tests

| Unit Test | Learning outcomes to covered |
|---------------|------------------------------|
| Unit Test -I | From 1.1 to 2.6 |
| Unit Test –II | From 3.1 to 4.12 |

ROCK MECHANICS LABORATORY PRACTICE

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|------------------------------------|----------------------|---------------------|--------------|--------------|
| MNG-507 | Rock Mechanics Laboratory Practice | 03 | 45 | 40 | 60 |

TIME SCHEDULE

| S. No. | Major Components | Periods | Mapping CO's |
|--------|---|---------|--------------|
| 1 | Sample collection and specimen preparation | 10 | CO1,CO2 |
| 2 | Determination of Compressive, Tensile and Shear strengths | 10 | CO3 |
| 3 | Determination of hardness of specimens | 15 | CO4 |
| 4 | Determination of abrasive resistance of the rocks | 10 | CO4 |
| | Total | 45 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|--|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - To familiarise with the specimen preparation - Analysis of compressive strengths, tensile strength and shear strength - Familiarize determination of various strength indices - Determination of hardness and abrasion |
|--------------------------|--|

| | | |
|------------------------|------------|--|
| Course Outcomes | CO1 | Explain specimen preparation |
| | CO2 | Familiarize determination of various strength indices |
| | CO3 | Analysis of compressive strengths, tensile strength and shear strength |
| | CO4 | Operation equipment and Determination of hardness and abrasion |
| | CO5 | Determination of hardness and abrasion |

PO-CO Mapping

| Course Code: MNG-507 | | Course Title: Rock Mechanics Laboratory | | | No of Periods: 45 |
|----------------------|-------------------|---|----|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | - | - | - | - | >40% Level 3 Highly addressed |
| PO2 | CO2,CO3 | 10 | 22 | 2 | |
| PO3 | - | - | - | - | 25% to 40% Level 2 Moderately Addressed |
| PO4 | CO2,CO3 | 15 | 33 | 2 | |
| PO5 | CO2,CO3 | 20 | 45 | 3 | 5 to 25% Level 1 Low addressed |
| PO6 | - | - | - | - | |
| PO7 | - | - | - | - | <5% Not addressed |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | - | - | - | - | - | - | - | - | - | - |
| CO2 | - | 2 | - | 2 | 3 | - | - | - | 2 | 1 |
| CO3 | - | 2 | - | 2 | 3 | - | - | - | 2 | 1 |
| CO4 | - | - | - | - | - | - | - | - | - | - |
| CO5 | - | - | - | - | - | - | - | - | - | - |

3: High, 2: Moderate, 1: Low

LEARNING OUTCOMES

Up on Completion of the course the student shall be able to:

1.0 Sample collection and specimen preparation

- 1.1 Collection of cores of rock samples.
- 1.2 Preparation of Samples for various tests test as per ISRM standards.

2.0 Determination of Compressive, Tensile and Shear Strength

- 2.1 Determination of area of the specimen.
- 2.2 Measuring load and determination of compressive strength of Rock specimen
- 2.3 Measuring load and determination of Brazilian tensile strength of rock specimen
- 2.4 Measuring load and determination of Shear Strength for given Specimen

3.0 Determination of hardness of specimens

- 3.1 Determination of Point Load Strength Index of Rocks
- 3.2 Determination of Protodyknov's Strength Index of Rocks
- 3.3 Determination of Schmidt Hammer Number of the rocks

4.0 Determination of abrasive resistance

- 4.1 Determine the abrasive resistance of the rocks using Los Angeles Abrasivity machine

C23- MNG-508: Life Skills

| | |
|--|--|
| Course Title : Life Skills | Course code : C23- Common-508 (Common to all Branches) |
| Year/ Semester : V/ VI Semester | Total periods : 45 |
| Type of Course : Lab Practice | Max Marks : 100 (Sessional 40 + External 60) |

| | |
|---------------------------|--|
| Course Objectives: | understand the relevance of life skills in both personal and professional lives practise life skills complementarily in life-management to lead a happy and successful life |
|---------------------------|--|

| | |
|------------|--|
| | Course Outcomes: |
| CO1 | exhibit right attitude and be adaptable in adverse and diverse situations |
| CO2 | set appropriate goals and achieve them through proper planning, time management and self-motivation |
| CO3 | solve diverse real-life and professional problems with critical thinking and creativity for a stress-free life |
| CO4 | be an ideal team player and manifest as a leader |

Course Delivery:

Text book: “**Life Skills**” – by State Board of Technical Education and Training, AP

| Sl no | Unit | Teaching Hours |
|--------------|--------------------------|-----------------------|
| 1 | Attitude | 4 |
| 2 | Adaptability | 4 |
| 3 | Goal Setting | 4 |
| 4 | Motivation | 4 |
| 5 | Time Management | 4 |
| 6 | Critical Thinking | 4 |
| 7 | Creativity | 4 |
| 8 | Problem Solving | 5 |
| 9 | Team work | 4 |
| 10 | Leadership | 4 |
| 11 | Stress Management | 4 |
| | Total | 45 |

Course Content:

UNIT 1: Attitude *matters!*

Preparatory activity-Role play; Generating word bank; Types of attitude. Read the passage and answer the related questions, read the story and discuss issues raised; Express opinions on the given topic and fill the grid with relevant words.

UNIT 2: Adaptability... *makes life easy!*

Pair work-Study the given pictures and understand adaptability -read the anecdote and discuss, read the story and answer the questions, role play

UNIT 3: Goal Setting... *life without a goal is a rudderless boat!*

Short term goals and long term goals-SMART features, observe the pictures and answer questions-matching- read the passage and answer questions-filling the grid.

UNIT 4: Motivation... *triggers success!*

Types of motivation-difference between motivation and inspiration- matching different personalities with traits - dialogue followed by questions - writing a paragraph based on the passage.

UNIT 5: Time Management ... *the need of the hour!*

Effective Time Management- Time quadrant - Group task on management of time- Time wasters-fill in the grid, read the story and answer the questions- prioritising tasks.

UNIT 6: Critical Thinking... *Logic is the key!*

Preparatory activity-read the passage and answer the questions- differentiate between facts and assumptions- components of critical thinking- complete the sets of analogies- choose the odd one out- true or false statements- decide which of the conclusions are logical.

UNIT 7: Creativity.... *The essential YOU!!*

Definition- Pre-activity-read the anecdote and answer the questions- matching celebrities with their fields of specialisation- think of creative uses of objects- think creatively in the given situations.

UNIT 8: Problem Solving... *there is always a way out!*

Preparatory activity-read the story and answer the questions- discuss the given problem and come out with three alternative solutions- group activity to select the best solution among available alternatives- discuss the problem and plan to analyse it.

UNIT 9: Team Work... *Together we are better!*

Advantages of team work- Characteristics of a team player- Activity-Observe the pictures and classify them into two groups- team game - read the story and answer the questions- fill in the grid.

UNIT 10 : Leadership... the *making of a leader!*

Characteristics of effective leadership- styles of leadership- Activity-read the dialogue and answer the questions- identify the people in the picture and describe them- discuss leadership qualities of the given leaders- filling the grid- read the quotes and write the name of the leader.

UNIT 11: Stress Management ... *live life to the full !!*

Types of stress- Strategies for Stress Management- Activity-read the passage and answer the questions, read the situation and write a paragraph about how to manage stress.

Mapping COs with POs

| POs | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----|--|---|---|---|---|---------|---------|
| COs | POs 1 to 5 are applications of Engineering Principles, can't directly be mapped with Life Skills | | | | | 1,2,3,4 | 1,2,3,4 |

Unit wise Mapping of COs- POs

| CO | Course Outcome | CO Unit Mapped | PO mapped | Cognitive levels as per Bloom's Taxonomy R/U/Ap/An/Ev/Cr (Remembering / Understanding/ Applying/Analysing/ Evaluating/ Creating) |
|------|---|-------------------------|-----------|---|
| CO 1 | To exhibit right attitude and be adaptable to adverse and diverse situations | All Units (1 to 11) | 6,7 | U/Ap/ An |
| CO2 | To set appropriate goals and achieve them through proper planning, time management and self-motivation | Units 3,4,5 | 6,7 | U/Ap/An |
| CO3 | To solve diverse real-life and professional problems with critical thinking and creativity for a stress-free life | Units 6,7,8,11 | 6,7 | U/Ap/An/ Ev/ Cr. |
| CO4 | To be an ideal team player and manifest as a leader | Units 9,10 | 6,7 | U/Ap/An/ Ev |
| | | | | |

TOTAL STATION SURVEY AND CAD PRACTICE

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|--|----------------------|---------------------|--------------|--------------|
| MNG-509 | TOTAL STATION SURVEY AND CAD PRACTICE | 03 | 45 | 40 | 60 |

TIME SCHEDULE

| S.No | Major Topics | No. of Periods | Mapped CO's |
|------|--|----------------|-------------|
| 1 | Understand various menu options of total station | 3 | CO1 |
| 2 | Field exercises using total station -I | 6 | CO1 |
| 3 | Field exercises using total station -II | 6 | CO1 |
| 4 | Transferring the field observation into Auto CAD | 3 | CO1, CO3 |
| 5 | Understand Various CAD commands | 9 | CO4 |
| 6 | Practice Geometric Constructions Using CAD, R2V conversion | 15 | CO4, CO5 |
| 7 | Surveying with GPS | 3 | CO2 |
| | Total | 45 | |

Course Objectives and Course Outcomes

| | |
|--------------------------|--|
| Course Objectives | <p>Upon completion of the course the student shall be able to:</p> <ul style="list-style-type: none"> - To familiarise with various menu options and functional features of Total station - Hands on experience of traversing of given area using total station - Identify the surveying station of known location - Stakeout point and stake out lines using total station - Transformation of filed data from total station into CAD and vice versa - To familiarise with CAD commands, - Hands on experience on geometric constructions, R2V conversion - Hands on experience of identifying the co-ordinates of given location using GPS |
|--------------------------|--|

| | | |
|------------------------|------------|---|
| Course Outcomes | CO1 | Explain Various parts of Total station and traversing for field observation by Total Station to get Length, breath and given area |
|------------------------|------------|---|

| | | |
|--|------------|--|
| | CO2 | Identifying the co-ordinates of given location using GPS |
| | CO3 | Understand CAD commands |
| | CO4 | Hands on experience on geometric constructions |
| | CO5 | Understand salient features of CAD Map |

PO-CO Mapping

| Course Code: MNG-509 | | Course Title: Total Station Survey and CAD PRACTICE | | | No of Periods: 45 |
|----------------------|-------------------|---|----|---------------|---|
| PO No | Mapped with CO no | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1, CO3 | 16 | 34 | 2 | >40% Level 3 Highly addressed 25% to 40% Level 2 Moderately Addressed |
| PO2 | CO1, CO2 | 6 | 14 | 1 | |
| PO3 | CO4, CO5 | 14 | 32 | 2 | |
| PO4 | CO5 | 9 | 20 | 1 | |
| PO5 | - | | | | 5 to 25% Level 1 Low addressed |
| PO6 | - | | | | |
| PO7 | - | | | | <5% Not addressed |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | 1 | - | - | - | - | - | 1 | 1 | 1 |
| CO2 | - | 1 | - | - | - | - | - | 1 | 1 | 1 |
| CO3 | 2 | - | - | - | - | - | - | 1 | 1 | 1 |
| CO4 | - | - | 2 | - | - | - | - | - | - | - |
| CO5 | - | - | 2 | 1 | - | - | - | - | - | - |

3: High, 2: Moderate, 1: Low

OBJECTIVES:

1.0 Understand Various Menu Options of Total Station

- 1.1 Familiarize various menu options of total station
- 1.2 Creation of new job
- 1.3 Open an existing job
- 1.4 Key In survey points
- 1.5 Options present under survey
- 1.6 Options present under COGO
- 1.7 Copy the surveying points from one job to another job

- 1.8 Linking of one survey job to another survey job
- 1.9 Options to take readings with Prism and without prism
- 2.0 Field Exercises using total station –I**
 - 2.1 Centering of total station over a given surveying station using optical plummet
 - 2.2 Leveling of total station
 - 2.3 Station setup given one known co-ordinate and one angle
 - 2.4 Station setup using two known co-ordinates
 - 2.5 Setting out orientation of total station by using resection method
 - 2.6 Orientation of total station to true north
 - 2.7 To measure distance between two given points and angle using total station
 - 2.8 To measure multiple sets (rounds) of observations with total station
 - 2.9 To carry out the surveying of given area by radiation method
 - 2.10 To perform a station setup on a known point by making observation to one or more back sight points
 - 2.11 To establish the position of an occupied point by total station relative to a baseline or boundary line
 - 2.12 Calculation of traverse area, perimeter, and balancing of errors using total station
- 3.0 Field Exercises using total station –II**
 - 3.1 Stake out of a given surveying point
 - 3.2 To carryout stakeout of a line
 - 3.3 Carryout widening of given road way using stakeout line
 - 3.4 To carryout stakeout of an arc connecting two roadways for a given radius and angle
 - 3.5 Transferring the B.M located at an in accessible location into surveying area
 - 3.6 Find out the height of remote object using Remote elevation method
 - 3.7 Marking the surveying point of a given building plan using total station
- 4.0 Transferring the field observation into CAD**
 - 4.1 To Transfer the surveying points of a job into USB drive
 - 4.2 To transfer the surveying points of job into the system
 - 4.3 Conversion of total station job file to CAD file format
 - 4.4 Conversion of job file into .csv file
 - 4.5 Importing the .csv file surveying points into total station
 - 4.6 Calculation of area and volume of a given job using CAD
 - 4.7 Earth work calculation to fill or cut the profile a given area based on the pre-defined datum.
- 5.0 Understand various CAD Commands**
 - 5.1 Study of drawing editor screen.
 - 5.2 Practice the methods of selecting/entering commands to start new drawing accessing CAD commands by selecting from menus, tool bars and entering Commands on command line.
 - 5.3 Sets the limits of the drawing to get the needed working area.
 - 5.4 Practice the 'setting commands' Grid, Snap, & Ortho Commands.
 - 5.5 Practice 'Draw commands'- point, line, pline, rectangle, circle, tangent, ellipse, arc, polygon and spline.
 - 5.6 Dimensions the given figures

- 5.7 Practice 'modify commands' – erase, copy, mirror, move, rotate, scale, stretch, trim, extend, break, chamfer, fillet, explode, Pedit, Mledit.
- 5.8 Practice 'construct commands' – offset, array, Divide, measure.
- 5.9 Practice 'edit commands' – Undo, Redo, Oops, Copy Clip, Paste Clip, Del.
- 5.10 Practice 'view commands' – Redraw, Regen, Zoom, Pan.
- 5.11 Practices 'Hatch commands' – Bhatch, Hatch
- 5.12 Practices 'insert commands' – Block, Wblock, Insert, Minsert.
- 6.0 **Practice Geometric Constructions Using CAD**
 - 6.1 Practices dividing a line into number of segments.
 - 6.2 Practices drawing external/internal common tangents for circles of same/different radii.
 - 6.3 Practices drawing external/internal common arcs for circles of same/different radii.
 - 6.4 Practices construction of ellipse, parabola, hyperbola, cycloid, and helix.
- 7.0 **Global positioning system**
 - 7.1 Identifies the parts and the functions of Global Positioning System
 - 7.2 Determine the Coordinates of various points on the ground using GPS
 - 7.3 Carryout of surveying to locate various geo special co-ordinates using DGPS
 - 7.4 Link the G.P.S data with Total Station.
 - 7.5 Link the GPS data with GIS software.

COURSE CONTENTS

1. **Understand Various Menu Options of Total Station** – Various menu options of total station – Creating new survey job – Open an existing survey job – Options for station setup- Options to carryout surveying- Options to take readings – Options for survey calculations – Options to draw the map – Options to transfer the survey job information to USB, system. Menu option to take reading without prism (if present with the instrument)- With prism.
2. **Field Exercises using total station –I** – Station setup – by angle and survey station- by two stations – by two or more points (Resection method) – Single station setup and carry out surveying (radiation method), - Carry out traverse. Measurement of –angle between the stations –distance between the two given survey stations- Balancing the errors of the traverse.
3. **Field Exercises using total station –II-** Stake out – point, Line, stake out an arc with the given angle and radius – Transferring the bench present in an accessible location to survey area – Remote object height by remote elevation method- Marking the given surface plan location on the ground.
4. **Transferring the field observation into CAD-** Method of transferring the field observation to – USB, into system. Conversion survey job into csv file and the file format required by Auto CAD- Loading the AutoCAD drawing points into total station to mark them in the field. Calculation of area and perimeter of the given surveyed area using total station. Earth work calculations using AutoCAD based on the given datum
5. **Understand various CAD Commands-**Sets the limits of the drawing- Draw commands- Modify commands- Edit commands- View commands- Hatch commands
6. **Practice Geometric Constructions Using CAD-**Draws simple geometrical shapes like circles, tangents
7. **Surveying with GPS -** Various features of GPS and DGPS, Procedure to capture geo-spacial co-ordinates using GPS, DGPS – Method to transfer the GPS info into Total station and GIS software

PROJECT WORK

| Course Code | Course Title | No of periods / week | Total no of periods | Marks for FA | Marks for SA |
|-------------|--------------|----------------------|---------------------|--------------|--------------|
| MNG-510 | PROJECT WORK | 03 | 45 | 40 | 60 |

OBJECTIVES:

1. Identify different works to be carried out in the project.
2. Collect data relevant to the project.
3. Arrive at efficient method from the available choices based on preliminary investigation.
4. Design the required elements of the project as per standard practices.
5. Prepare working drawing for the project by CAD.
6. Prepare schedule of time and sequence of operations by PERT and CPM.
7. Prepare charts or models for each project.
8. Prepare project report
9. Prepare the production mathematical calculation /capacities of various operation (output ventilation, machinery and man power) in mines during period of project
10. Prepare the layout /Drawing of various operations by CAD

COURSE CONTENTS:

Identification of the Project- Collection of data- Organization of the data- Design of Project elements - Preparation of drawings- Schedules and sequence of operations- Preparation of charts and models- Preparation of report-calculation /capacities of various operation-Drawing of various operations by CAD-time and sequence of operations by PERT and CPM

Note :

Students shall be divided into groups of five and each group shall be assigned a problem that calls for application of the knowledge. Project work will be allotted by the concerned Head of Section and assign a staff member as guide at the beginning of V semester. The students are exposed to the U/G workings or Industries for collecting relevant data from respective areas during the entire V semester, after the institutional working hours or during holidays – second Saturdays / Sundays/ Winter/ Pongal holidays and prepare project report under the supervision of guide. Project report will be assessed at the end of V Semester for final examination.

Project may be selected from among the following suggested topics

Underground mining (coal)

- a) Bord and pillar mining method
- b) Longwall mining method.
- c) Blasting gallery method.

Opencast mining

- a) Pillars extracting by open cast method(coal)
- b) Mechanized opencast mining.
- c) In Pit crushing technology
- d) Surface mining technology
- e) Blasting technology

Metal Mining

- a) Stoping methods
- b) Mechanized stoping methods

Other Methods

Any other method identified and suggested by the HOD

VI SEMESTER

MNG-601 INDUSTRIAL TRAINING

| Assessment no | Upon completion of | By | Based on | Max Marks |
|------------------------------|--------------------|---|---|-----------|
| 1 | 12 weeks | 1.The faculty concerned and 2. Training Mentor of the industry | Learning outcomes as given in the following scheme of assessment | 120 |
| 2 | 20-22 weeks | | | 120 |
| 3.Final summative Evaluation | 23 weeks | 1.The faculty member concerned, 2.HoD concerned and 3. An external examiner | 2. Demonstration of any one of the skills listed in learning outcomes, other than S.No. 2 | 30 |
| | | | 2.Training Report | 20 |
| | | | 3.Viva Voce | 10 |
| TOTAL | | | | 300 |

INDUSTRIAL TRAINING

| Course Code | Course Title | Duration | Marks for Formative Assessment | Marks for Summative Assessment |
|-------------|---------------------|----------|--------------------------------|--------------------------------|
| MNG-601 | Industrial Training | 24 weeks | 240 | 60 |

Time schedule

| S. No | Code | TOPICS | Duration |
|-------|---------|--|------------|
| 1 | MNG-601 | <ul style="list-style-type: none">Practical training in MinesTraining Report Preparation Report Preparation: Title Page, Certificate, Acknowledgements, Abstract. Contents: analysis organisational setup of a mine, Geology of the mine, mine transportation, method of working, mine equipment /machinery, ventilation system/lighting, drilling and blasting, safety aspects, Charts, Diagrams, Plans etc., pertaining to organization, Literature. | Six Months |

COURSE OBJECTIVES:

| | |
|--|--|
| Upon completion of the course the student shall be able to | |
| COURSE OBJECTIVES | <ol style="list-style-type: none">Expose to real time working environmentEnhance knowledge and skills already learnt in the institution.Acquire new skills of man and material supervising safety aspects and working in mines.Develop qualities like team & work culture, integrity, responsibility and self-confidence. |

COURSE OUTCOMES:

| | | | |
|------------------------|-----|----------|---|
| COURSE OUTCOMES | CO1 | MNG601.1 | Apply theory to practical work situations |
| | CO2 | MNG601.2 | Cultivate sense of responsibility and good work habits |
| | CO3 | MNG601.3 | Exhibit the strength, teamwork spirit and self-confidence |
| | CO4 | MNG601.4 | Write report in technical projects |

PO-CO Mapping

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | | | | 2 | | 1 | 3 | | 2 |
| CO2 | | | | | | 3 | | 3 | | 2 |
| CO3 | | | | | | 3 | | 3 | | 2 |
| CO4 | | | | | | 3 | | 3 | | 2 |

Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions
(vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

LEARNING OUTCOMES:

The student shall be able to display the following skill sets

- 1) Technical Skills(*Drilling/Blasting/Method of working/Maintenance*etc.)
- 2) Preparing*Surveying* plans, drawings and analyzing*method of working*
- 3) Recognize and Practice safety Measures
- 4) Handling Tools/*Instruments/Drilling andBlasting (ore/rock/coal)/Machines*
- 5) Implementation of mine*legislation* in mines
- 6) Planning, Organizing and safety Skills

Scheme of Internal Assessment and Summative Evaluation for Industrial Training

| Assessment no | Upon completion of | By | Based on | Max Marks |
|------------------------------|--------------------|---|--|-----------|
| 1 | 12 weeks | 1.The faculty concerned and 2. Training Mentor of the industry | Learning outcomes as given in the following scheme of assessment | 120 |
| 2 | 20-22 weeks | | | 120 |
| 3.Final summative Evaluation | 23 weeks | 1.The faculty member concerned, 2.HoD concerned and 3. An external examiner | 1.Demonstration of any one of the skills listed in learning outcomes, other than S.No. 2 | 30 |
| | | | 2.Training Report | 20 |
| | | | 3.Viva Voce | 10 |
| TOTAL | | | | 300 |

Weightage of marks for Assessment of Skill sets during first and second assessment.

| <i>Skill Set S.No</i> | <i>SKILL SET</i> | <i>Max Marks Allotted For each parameter</i> |
|------------------------------|--|---|
| <i>1</i> | <i>Technical Skills (Drilling/Blasting/Method of working/Maintenanceetc.)</i> | <i>20</i> |
| <i>2</i> | <i>Prepare different plans, drawings and analyzing Specifications</i> | <i>20</i> |
| <i>3</i> | <i>Recognize and Practice safety Measures</i> | <i>15</i> |
| <i>4</i> | <i>Handling Tools/Instruments/ Drilling and Blasting (ore/rock/coal)/machines</i> | <i>25</i> |
| <i>5</i> | <i>Implementation of minelegislation in mines</i> | <i>20</i> |
| <i>6</i> | <i>Planning, Organizing and safety Skills</i> | <i>20</i> |
| | <i>Total</i> | <i>120</i> |

During assessment the performance of the students shall be assessed in those skills in which the student has been trained and be awarded the marks as per the weightage assigned as above. In case the student has undergone training in a few skill sets then the total marks obtained shall be raised to 120 marks for the given assessment i.e., either assessment 1 or 2. However the performance of the student shall be assessed at the most skill sets listed above but not less than three skill sets.

Illustration

If the student has undergone training in only 4 skill sets (namely serial number 1, 2, 5,6 of above skill sets) and marks awarded during assessment is 50 out of 80 marks, then the marks of 50 shall be enhanced to 120 proportionately as $(50/80) * 120 = 75$

GUIDELINES FOR INDUSTRIAL TRAINING

1. Duration of the training: 6 months.
2. Eligibility: The As per SBTET norms
3. Training Area: Students may be trained in the fields Underground coal mines/Underground metal mines/Granite quarry/Cement quarry/ Road metal quarry/Open cast mines etc.
4. The candidate shall put a minimum of 90% attendance during Industrial Training.
5. If the student fails to secure 90% attendance during industrial training, the student shall reappear for 6 months industrial training.
6. Formative assessment at industry level shall be carried out by the Mentor from of the industry, where the student is undergoing training and the faculty in charge (Guide) from the concerned section in the institution.
7. The Industrial training shall carry 300 marks and pass marks is 50% in assessments at industry (first and second assessment) and final summative assessment at institution level put together i.e., 150 marks out of 300 marks.
8. If the student fails to secure 50% marks in final summative assessment at institution level, the student should reappear for final summative assessment in the subsequent board examination.
9. Final Summative assessment at institution level is done by a committee including Head of the section of respective branch/ discipline, External examiner and Faculty members who assessed the students during Industrial Training as members.

Guidelines and responsibilities of the faculty members who are assessing the students' performance during Industrial Training:

1. Every Teacher (Including HoD, if not holding any FAC) shall be assigned a batch of students of 10 to 15 for Industrial Training irrespective of students' placements for training
2. Shall guide the students in all aspects regarding training.
3. Shall create awareness regarding safety measures to be followed in the industry during the training period, and shall check it scrupulously.
4. Shall check the logbook of the students during the time of their visit for the assessment.
5. Shall monitor progress at regular intervals and make appropriate suggestions for improvement.
6. Shall visit the industry and make first and second assessments as per stipulated schedules.
7. Shall assess the skill sets acquired by the students during their assessment.
8. Shall award the marks for each skill set as per the marks allotted for that skill set during 1st and 2nd assessments
9. Shall voluntarily supplement students learning through appropriate materials like photographs, articles, videos etc.
10. Shall act as co-examiner along with other examiners in the final assessment at institution.
11. Shall act as liaison between the student and mentor.
12. Shall maintain a diary indicating his observation with respect to the progress of students learning in all three domains (Cognitive, Psychomotor and Affective).

Guidelines to the Training Mentor in the Industry:

1. Shall train the students in all the skill sets as far as possible.
 2. Shall assess and award the marks in both the assessments along with the faculty member.
 3. Shall check and approve the log books of the students.
 4. Shall approve the attendance of each student at the end of the training period.
- Shall report to the guide about student's progress, personality development or any misbehavior as the case may be

| Format for Internal assessment for INDUSTRIAL TRAINING | | | |
|--|---|--|---------------|
| DEPARTMENT OF TECHNICAL EDUCATION GOVERNMENT POLYTECHNIC: INDUSTRIAL TRAINING ASSESSMENT | | | |
| NAME OF THE STUDENT | | PIN | |
| S.No | Learning Outcome | Max Marks | Marks awarded |
| 1 | <i>Technical Skills (Drilling/Blasting/Method of working/Maintenance etc.).</i> | 20 | |
| 2 | <i>Prepare different plans, drawings and analyzing Specifications</i> | 20 | |
| 3 | <i>Recognize and Practice safety Measures.</i> | 15 | |
| 4 | <i>Handling Tools/Instruments/ Drilling and Blasting (ore/rock/coal)/machines</i> | 25 | |
| 5 | Implementation of mine legislation in mines. | 20 | |
| 6 | <i>Planning, Organizing and safety Skills</i> | 20 | |
| | Total | 120 | |
| (Marks in words:) | | | |
| Signature of the Training In-charge(Mentor) | | Signature of the faculty concerned (Guide) | |
| Name: | | Name | |
| Designation | | Designation | |