

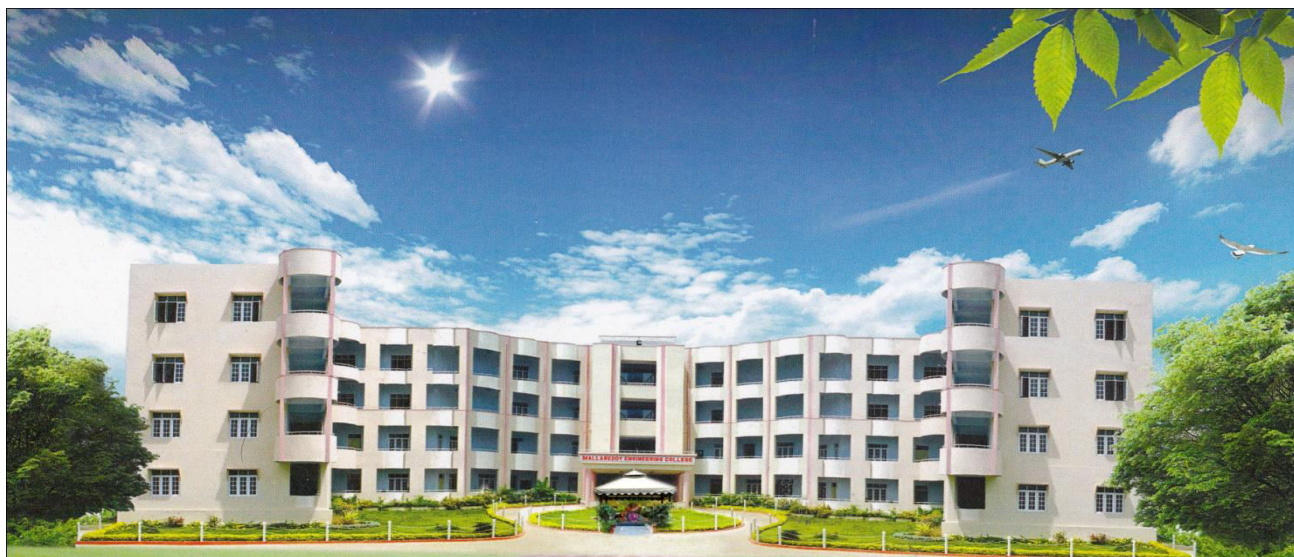
ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2018-19 onwards



National Assessment & Accreditation Council

Department of Mining Engineering (Min.E.)



For
B. Tech. Four Year Degree Programme
(MR18 Regulations)

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

(An UGC Autonomous Institution, Approved by AICTE and Affiliated to JNTUH Hyderabad)
Recognized under section 2(f) & 12 (B) of UGC Act 1956, Accredited by NAAC with 'A' Grade (II Cycle)
Maisammaguda, Dhulapally (Post Via Kompally), Secunderabad-500 100
Website: www.mrec.ac.in E-mail: principal@mrec.ac.in

MALLA REDDY ENGINEERING COLLEGE
(AUTONOMOUS)
MR18 – ACADEMIC REGULATIONS (CBCS)
for B.Tech. (REGULAR) DEGREE PROGRAMME

V Applicable for the students of B.Tech. (Regular) programme admitted from the Academic Year
2018-19 onwards

The B.Tech. Degree of Jawaharlal Nehru Technological University Hyderabad, Hyderabad shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

VISION

To establish a reputable professional education centre, to impart high quality trend setting technologies in an ambience of humanity, wisdom, intellect and innovation to nurture the students to become competent and committed professionals with disciplined ethical values.

MISSION

Commitment to progress in mining new knowledge by adopting cutting-edge technologies to promote academic growth by offering state-of-the-art undergraduate and postgraduate programmes based on well-versed perceptions of global areas of specialization to serve the nation with advanced technical knowledge.

DEPARTMENT VISION

To be a center of excellence in mining education and research to produce competent and committed Mining Engineers to face the challenges of the industry and to create good environmental of nation growth. Constantly thriving to provide quality education with a stress on technologies safety and conservation of minerals

DEPARTMENT MISSION

To train students with latest technologies and equip them with skills to run the industries with safety conservation and productivity .To have regular contacts with industries research organizations and other institutions and to provide technical solutions. Continued research activities to understand and analyze technical issues and to find solutions with a stress on safety and production.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To upgrade students knowledge in Basic science. Earth science, Humanities & Social science, Management, Environmental science and basic engineering domains with objectives of application of these domains in Mining Engineering.

PEO2: To enrich the field oriented knowledge base of the graduates in the areas of geology, exploration, mine planning, management safety, mine valuation, mineral development, exploitation, mineral beneficiation, environmental impact assessment, reclamation, mine closure and socio-economic and legal issues through inter disciplinary inputs and guidance with an aim of producing wholesome mining engineers.

PEO3: To enhance technical and intellectual competence of the students in mining and allied domains and encourage them for pursuing higher education and carry out R&D activities in the area of mining & other earth science disciplines that support environmental compliance and energy security needed for the societal growth.

PEO4: To make the students successful professionals backed with techno-managerial capabilities to address societal needs with regards to the environment, health and safety, and conservation of our natural resources.

PROGRAMME OUTCOMES (POs)

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	Design/ Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Understand the problem and apply design and analysis tools to find solution in the domains of Structural, thermal and Fluid Mechanics.

PSO2: Engage professionally in industries or as an entrepreneur by applying Manufacturing concepts.

PSO3: Systemize the Engineering and manufacturing practices using TQM concepts and Optimization techniques.

- 1. Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T):Malla Reddy Engineering College (Autonomous) (MREC-A) offers Four Year (Eight Semesters) Bachelor of Technology (B.Tech.) Under Graduate Programmes, under Choice Based Credit System (CBCS) in the following Branches of Engineering.**

S. No.	Branch Code	Branch	Intake
1	01	Civil Engineering (CE)	180
2	02	Electrical and Electronics Engineering (EEE)	60
3	03	Mechanical Engineering (ME)	240
4	04	Electronics and Communication Engineering (ECE)	180
5	05	Computer Science and Engineering (CSE)	240
6	06	Information Technology (IT)	60
7	25	Mining Engineering (Mi.E)	60

2. Eligibility for Admission

- 2.1** Admission to the UGP shall be made either on the basis of the merit rank obtained by the qualifying candidate in entrance test conducted by the Telangana State Government (TSEAMCET), or the University, or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government of Telangana from time to time.
- 2.2** The medium of instructions for the entire UGP in E&T will be ENGLISH only.

3. B.Tech. Programme (UGP) Structure & Duration of Study

- 3.1** A student after securing admission shall pursue the Under Graduate Programme in B.Tech. in a minimum period of **four** academic years (8 semesters) and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester. Further 2 years of extension is allowed for appearing examinations, failing which student shall forfeit seat in B.Tech. Course. Each semester is structured to provide around 20 credits, totaling to 160 credits for the entire B.Tech. programme. Each student shall secure 160 credits (with CGPA ≥ 5) required for the completion of the Under Graduate Programme and award of the B.Tech. degree.
- 3.2** UGC/ AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below.

3.2.1 Semester Scheme:

Each Under Graduate Programme is of 4 academic years (8 Semesters), with the academic year divided into two semesters of 22 weeks (≥ 90 instructional days) each, each semester having ‘**Continuous Internal Evaluation (CIE)**’ and ‘**Semester End Examination (SEE)**’. Under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and Curriculum/ Course Structure as suggested by AICTE are followed.

3.2.2 Credit Courses:

All Subjects/ Courses are to be registered by a student in a semester to earn credits. Credits shall be assigned to each Subject/ Course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods: Credits) Structure, based on the following general pattern.

- One Credit - for one hour/ Week/ Semester for Theory/ Lecture (L) Courses/ Tutorials (T).
- One Credit - for two hours/ Week/ Semester for Laboratory/ Practical (P) Courses.

Courses like Environmental Sciences, Induction Programme, Gender Sensitization, Indian Constitution, Essence of Indian Traditional Knowledge and other student activities like Internship, Sports/Yoga and NSS are identified as Mandatory/Audit courses. These courses will not carry any credits.

3.2.3 Subject/ Course Classification:

All subjects/ courses offered for the under graduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows. The Institute has followed almost all the guidelines issued by AICTE/UGC/Affiliating University.

(a) **Foundation Courses (FC)**

(b) **Core Courses (CC)**

(c) **Elective Courses (EC)**

(d) **Mandatory Courses (MC)**

(e) **Audit Courses (AC)**

- **Foundation Courses (FC)** are further categorized as:
 - (i) Humanities and Social Sciences including Management courses (HSMC)
 - (ii) Basic Science Courses (BSC)
 - (iii) Engineering Science Courses (ESC).
- **Core Courses (CC) and Elective Courses (EC)** are categorized as Professional Subjects (PS), which are further subdivided as –
 - (i) Professional Core Courses(PCC)
 - (ii) Professional Elective Courses(PEC)
 - (iii) Open Elective Courses (OEC)
 - (iv) Project (PROJ)
- **Mandatory Courses (MC - Non-credit with evaluation).**
- **Audit Courses (AC – Non- credit without evaluation).**

3.2.4 Course Nomenclature:

The curriculum nomenclature or course structure grouping for each of the UGP in E&T (B.Tech. Degree Programmes), is as listed below (along with AICTE specified range of total credits).

Sl. No.	Classification		Course Work – Subject Area	Distribution of credits	AICTE Suggested Breakup of Credits (Total 160)
	AICTE	UGC			
1	HSMC	Foundation Courses	Humanities and Social sciences including Management courses.	08	12
2	BSC		Basic Sciences (BSC) including Mathematics, Physics, Chemistry and Biology.	21	25
3	ESC		Engineering Science Courses (ESC) including Engineering Workshop, Engineering Graphics, Basics of Electrical and Electronics / Mechanical / Computer Engineering.	30.5	24
4	PCC	Core Courses	Professional core Courses are relevant to the chosen	58.5	48

			specialization/branch; [May be split into Hard (no choice) and Soft (with choice)], if required.		
5	PEC	Professional Electives	Professional electives are relevant to the chosen specialization/ branch.	18	18
6	OEC	Open Electives	Open electives are the courses from other technical and/or emerging subject areas.	9	18
7	PROJ	Project	Mini Project, Project and Seminar	15	15
8	MC	Mandatory Courses	These courses are non-credit courses with evaluation.	-	-
9	AC	Audit Courses	These courses are non-credit courses without evaluation.	-	-
Total credits for UGP (B.Tech.)				160	160

4.0 Course Registration

- 4.1** A 'Faculty Advisor or Counselor' shall be assigned to each student, who will advise him on the Under Graduate Programme (UGP), its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.
- 4.2** Academic section of the College invites 'Registration Forms' from students within 15 days from the commencement of class work for the first semester through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE registration requests for any 'SUBSEQUENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'CURRENT SEMESTER'.
- 4.3** A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from the Faculty Advisor/Counselor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor/Counselor and the Student).
- 4.4** A Student may be permitted to register for the Subjects/ Course of CHOICE with a typical deviation of ± 3 credits of the semester, based on his PROGRESS and SGPA/CGPA and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses in the department course structure and syllabus contents. It needs specific approval and signature of the Faculty Advisor/Counselor and Head of the Department, 'within a period of 15 days' from the beginning of the current semester.
- 4.5** If the student submits ambiguous choices or multiple options or erroneous entries during ON-LINE registration for the Subject(s) / Course(s) under a given specified Course/ Group/ Category as listed in the course structure, only the first mentioned Subject/ Course in that category will be taken into consideration.
- 4.6** Subject/ Course options exercised through ON-LINE registration are final and CANNOT be changed, nor can they be inter-changed; further, alternate choices will also not be considered. However, if the Subject/ Course that has already been listed for registration (by the Head of Department) in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice - either for a new Subject (subject to

offering of such a Subject), or for another existing subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that semester. Such changes are to be intimated to Chief Controller of Examinations/Principal immediately.

- 4.7 Open Electives:** A student has to complete 3 Open Electives during the period of UGP. The students have to choose open electives from III year I semester onwards from the given list. However, the student cannot opt for an open elective subject offered by their own (parent) department, if it is already listed under any category of the subjects offered by parent department in any semester.
- 4.8 Professional Electives:** A student has to complete 6 Professional Electives during the period of UGP. Students have to choose professional electives from III year I semester onwards from the list of professional electives offered by their departments.
- 4.9** For Audit Courses like Sports/Yoga and NSS, MOOC/NPTEL online courses etc, a ‘**Satisfactory Participation Certificate**’ from the authorities concerned for the relevant semester is essential. No Marks or Credits shall be awarded for these activities.
- 4.10** For Mandatory Courses, a ‘**Satisfactory / Not Satisfactory**’ grade is awarded based on the performance in both CIE and SEE.

5.0 Subjects/ Courses to be offered

- 5.1** A typical Section (or Class) strength for each semester shall be 60.
- 5.2** A Subject/ Course may be offered to the students, ONLY IF a minimum of 40 students opt for the same. The maximum strength of a section is limited to 72.
- 5.3** More than ONE TEACHER may offer the SAME SUBJECT (Lab / Practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection choice for students will be based on ‘FIRST COME FIRST SERVE’ basis and ‘CGPA Criterion’(i.e., the first focus shall be on early ON-LINE ENTRY from the student for registration in that semester and the second focus, if needed, will be on CGPA of the student).
- 5.4** If more entries for registration of a subject come into picture, then the concerned Head of the Department shall take necessary actions, whether to offer such a Subject/ Course for TWO (or multiple) SECTIONS or NOT .

6.0 Attendance Requirements:

- 6.1** A student shall be eligible to appear for the Semester End Examinations, if he / she acquire a minimum of 75% of attendance in aggregate of all the Subjects/ Courses (including Non-Credit Courses) for that semester.
- 6.2** Condoning of shortage of attendance in aggregate up to 10% ($\geq 65\%$ and $< 75\%$) in each semester may be granted by the College Academic Committee (CAC) on genuine and **valid grounds** based on the student’s representation with supporting evidence.
- 6.3** A stipulated fee prescribed by the CAC, shall be payable towards condoning of shortage of attendance.
- 6.4** Shortage of attendance below 65% in aggregate shall in NO case be condoned.

- 6.5** Students, whose shortage of attendance is not condoned in any semester, are not eligible to register their Semester End Examinations, they get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester. They may seek re-registration for all those Subjects registered in that Semester in which he got detained, by seeking re-admission for that semester as and when offered; in case if there are any Professional Electives and/ or Open Electives, the same may also be **re-registered** if offered, however, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.
- 6.6** If any student fulfills the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7.0 Academic Requirements:

The following Academic Requirements have to be satisfied, in addition to the attendance requirements mentioned in item No.6.

- 7.1** A student shall be deemed to have satisfied the Academic Requirements and earned the credits allotted to each Subject/ Course, if he / she secures not less than 35% marks in the Semester End Examination and with a minimum of 40% of the total marks allocated for the course; in terms of Letter Grades, this implies securing 'P' Grade or above in that Subject/ Course. If the student secured 'F' grade in any subject he/she can apply for recounting / revaluation by paying prescribed fee. If the student is not satisfied after the results declaration of recounting / revaluation he/she can apply for challenge valuation with the prescribed fee. College appoints a faculty member; student can bring another faculty member who taught the respective subject at least once (proof should be provided). The faculty member should be from any autonomous college affiliated to JNTUH or JNTUH constituent colleges.
- 7.2** A student shall be deemed to have satisfied the Academic Requirements and earned the credits allotted to Mini Project/ Technical Seminar/ Project, if he / she secure not less than 40% of the total marks to be awarded for each. The student would be treated as failed, if he (i) does not submit a report on his / her Mini Project / Technical Seminar / Project or does not make a presentation of the same before the Evaluation Committee as per schedule or (ii) secures less than 40% of marks in industry oriented Mini Project/ Technical Seminar/ Project evaluations. He / She may reappear once for each of the above evaluations, when they are scheduled again; if he / she fails in such '**one-reappearance**' evaluation also, he / she has to reappear for the same in the next subsequent semester, as and when it is scheduled.
- 7.3 Promotion Rules:** Every student has to fulfil the Attendance and Academic requirements by securing the required credits against registered credits as shown below:

S. No.	Promotion	Conditions to be fulfilled
1.	First year first semester (I Semester) to first year second semester (II Semester)	<ul style="list-style-type: none"> • Regular course of study of first year first semester. (I Semester)
2.	First year second semester (II Semester) to second year first semester (III Semester)	<ul style="list-style-type: none"> • Regular course of study of first year second semester (II Semester). • Must have secured at least 50% credits up to first year second semester (II Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Second year first semester (III Semester) to second year second semester (IV Semester)	<ul style="list-style-type: none"> • Regular course of study of second year first semester (III Semester)
4.	Second year second semester (IV Semester) to third year first semester (V Semester)	<ul style="list-style-type: none"> • Regular course of study of second year second semester (IV Semester). • Must have secured at least 60% credits up to second year second semester (IV Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5.	Third year first semester (V Semester) to third year second semester (VI Semester)	<ul style="list-style-type: none"> • Regular course of study of third year first semester (V Semester).
6.	Third year second semester (VI Semester) to fourth year first semester (VII Semester)	<ul style="list-style-type: none"> • Regular course of study of third year second semester (VI Semester). • Must have secured at least 60% credits up to third year second semester (VI Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7.	Fourth year first semester (VII Semester) to fourth year second semester (VIII Semester)	<ul style="list-style-type: none"> • Regular course of study of fourth year first semester (VII Semester).

7.4 A Student shall register for all subjects covering 160 credits as specified and listed (with the relevant Course/ Subject Classifications as mentioned) in the Course Structure, fulfils all the Attendance and Academic requirements for 160 credits securing a minimum of 'P' Grade (Pass Grade) or above in each subject and earn 160 credits securing SGPA ≥ 5.0 (in each semester) and CGPA (at the end of each successive semester) ≥ 5.0 , to successfully complete the UGP.

- 7.5** After securing the necessary 160 credits as specified for the successful completion of the entire under graduate programme, the student can avail exemption of two subjects up to 6 credits, that is, one open elective and one professional elective subject or two professional elective/open electives subjects for optional drop out from these 160 credits earned; resulting in 154 credits for under graduate programme performance evaluation, i.e., the performance of the student in these 154 credits shall alone be taken into account for the calculation of the final CGPA (at the end of under graduate programme, which takes the SGPA of the IV year II semester into account) and shall be indicated in the grade card of IV year II semester. However, the performance of student in the earlier individual semesters, with the corresponding SGPA and CGPA for which grade cards have already been given will not be altered.
- 7.6** If a student registers for some more ‘**Extra Subjects**’ (in the parent Department or other Departments/ Branches of Engineering) other than those listed subjects totaling to 160 credits as specified in the Course Structure of his / her department, the performances in those ‘extra Subjects’ (although evaluated and graded using the same procedure as that of the required 160 credits) will not be taken into account while calculating the SGPA and CGPA. For such extra subjects registered, Letter Grade alone will be indicated in the Grade Card, as a performance measure, subject to completion of the Attendance and Academic Requirements as stated in items No.6 and 7.1 to 7.5.
- 7.7** When a student is detained due to shortage of attendance in any semester, he / she may be re-admitted when the same semester is offered in the next academic year for fulfillment of academic requirements. The academic regulations under which student has been readmitted shall be applicable. However, no Grade Allotments or SGPA/ CGPA calculations will be done for that entire semester in which he / she got detained.
- 7.8** When a student is detained due to lack of credits in any year, shall be promoted to the next academic year only after acquiring the required academic credits. The academic regulations under which student has been readmitted shall be applicable to him.
- 7.9** A student eligible to appear in the Semester End Examination in any Subject/ Course, but absent from it or failed (thereby failing to secure ‘P’ Grade or above) may reappear for that Subject/ Course at the supplementary examination as and when conducted. In such cases, his / her Internal Marks (CIE) assessed earlier for that Subject/ Course will be carried over and added to the marks to be obtained in the SEE supplementary examination, for evaluating his / her performance in that subject.

8.0 Evaluation, Distribution and Weightage of Marks

- 8.1.1** The performance of a student in each semester shall be evaluated subject - wise (irrespective of credits assigned) for 100 marks for Theory, Practicals, Seminar, Drawing / Design, Minor Project, Major Project and Minor Courses etc.,. The Theory / Practical courses are evaluated with two components. 1. Continuous Internal Evaluation (CIE), 2. Semester End Examination (SEE). The distribution of 30 Marks for CIE and 70 Marks for SEE decided in the Academic Council.

8.2 Theory Courses:

8.2.1 Continuous Internal Evaluation (CIE):

CIE shall be carried out for all courses of UG Programmes twice in a semester (2 Midterm examinations) with the help of objective evaluation, subjective evaluation, regular assignments and Attendance. Each mid term examination shall consist of objective test with a duration of 20 minutes, subjective paper shall be conducted with a duration of 90 minutes and one assignment. The composition of objective test, subjective test, assignment and attendance shall be evaluated for 40%, 40%, 10% and 10% of the allocated internal marks.

Mid - Term Examination - UG				
Part	Type of Questions	No. of Questions	Marks per Question	Total
Part - A	Multiple – Choice Questions	20	1	20
Part - B	Choice questions (4 out of 6)	4	5	20
Mid Term Exam Total				40
Assignment				5
Attendance				5
Grand Total				50

*The CIE will be conducted for 50 marks and scaled to 30 marks.

The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus. First Assignment should be submitted before the conduct of the first mid-term examinations, and the Second Assignment should be submitted before the conduct of the second midterm examinations. The subject wise attendance of each spell of instruction should be considered for the allocation of marks for attendance before each midterm examinations.

Percentage of Attendance	Marks
>90 and ≤100	5
>85 and ≤90	4
>80 and ≤85	3
>78 and ≤80	2
>75 and ≤78	1

The weightage for the midterm examination shall be given as 70% of the best performing midterm examination and 30% of the other midterm examination. The student shall appear for both midterm examinations, in case of any specific reason the student appears only one midterm examination, 70% weightage of that examination shall be considered.

8.2.2 Semester End Examination (SEE):

Semester End Examination (SEE) shall be conducted for all courses of UG Programmes at the end of the Semester. Duration of the examination is 3 hours. The paper setting and evaluation of all courses carried out by external examiners. The examiners will be selected by the Chief Controller of Examinations/Principal, from the panel of examiners submitted

by the head of the respective department

Semester End Examination - UG			
Type of Questions	No. of Questions	Marks per Question	Total
Choice Questions: For each question there will be an 'either or choice', which means that there will be two questions from each module and the student should answer either of the two questions.	5	14	70

8.3 Practical Courses:

8.3.1 Continuous Internal Evaluation (CIE):

CIE marks shall be awarded with a distribution of 40% for day - to-day performance and timely submission of lab records, 40% for internal lab exam (best out of two exams) and 20% for viva-voce. The CIE will be conducted for 50 marks and scaled to 30 marks.

8.3.2 Semester End Examination (SEE):

SEE marks shall be awarded with a distribution of 20% for design/procedure/schematic diagram of the given experiment, 40% for conduction of experiment, 20% for results and 20% for viva-voce. For conducting SEE (with duration of 3hours), one internal examiner and one external examiner will be appointed by the Chief Controller of Examinations/Principal of the college. The external examiner should be selected from the outside college among the autonomous/reputed institutions from a panel of three examiners submitted by the concerned Head of the Department.

8.4 Engineering Graphics:

CIE: There will be 30% of total marks for CIE shall be awarded with a distribution of 40% of the CIE marks for day to day performance and timely submission of drawing sheets and remaining 60% of CIE marks for midterm examinations.

The distribution of marks for CIE is given below

CIE for Engineering Graphics				
Part	Type of Questions	No. of Questions	Marks per Question	Total
Part - A	Day – to – Day Work			20
Mid – Term Examinations				
Part - B	Choice questions (4 out of 6)	4	7.5	30
Total				50

*The CIE will be conducted for 50 marks and scaled to 30 marks.

The distribution of marks for SEE is given below

SEE for Engineering Graphics			
Type of Questions	No. of Questions	Marks per Question	Total

Either or Choice from Each Module	5	14	70
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8.5 Machine Drawing:

CIE: There will be 30% of total marks for CIE shall be awarded with a distribution of 40% of the CIE marks for day to day performance and timely submission of drawing sheets and remaining 60% of CIE marks for midterm examinations.

The distribution of marks for CIE is given below

CIE for Machine Drawing			
Type of Questions	No. of Questions	Marks per Question	Total
Day to Day Work			20
I Mid Term Examination			
Part Drawing (4 out of 6)	4	7.5	30
II Mid Term Examination			
Assembly Drawing (1 out of 2)	1	30	30
Total			50

*The CIE will be conducted for 50 marks and scaled to 30 marks.

The distribution of marks for SEE is given below

SEE for Machine Drawing			
Type of Questions	No. of Questions	Marks per Question	Total
Part A – Part Drawing (2 out of 4)	2	15	30
Part B – Assembly Drawing (Compulsory Question)	1	40	40
Total			70

8.6 Projects:

8.6.1 Internship-III/ Mini Project:

There shall be an Internship-III/Mini Project, in collaboration with an industry of their specialization. Students will register for this immediately after III year II semester (VI Semester) end examinations and pursue it during summer vacation. The evaluation of Mini project will be done at the end of IV Year I semester (VII semester). It shall be evaluated internally for 100 marks. The committee consisting Project Coordinator, Supervisor of the project and one senior faculty of the department will evaluate the mini Project and award appropriate Grade, based on the report submitted to the department and presentation provided by the student in front of the committee.

8.6.2 Project:

UG project work shall be carried out in two stages: Project Stage – I shall be evaluated internally during IV Year I Semester, Project Stage – II shall be evaluated externally during IV Year II Semester. Each stage will be evaluated for 100 marks. Student has to submit project work report at the end of each semester. First report includes project work carried out in IV Year I semester and second report includes project work carried out in IV Year I & II Semesters. SEE for both project stages shall be completed before the commencement of SEE Theory examinations.

The topics for industrial oriented mini project, seminar and Project Stage – I shall be different from one another.

8.6.2 (a) For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall evaluate the project work for 70 marks and project supervisor shall evaluate for 30 marks. Two reviews shall be conducted. Review-I will be conducted within a month from the commencement of class work (problem definition, objective, literature survey) and Review-II will be conducted before second mid examination (brief description and sample case study, progress of work, presentation and report submission). Average of the two reviews will be taken for 100 marks. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) secures less than 40% marks. A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such ‘one reappearance’ evaluation also, he has to reappear for the same in the subsequent semesters, as and when it is scheduled.

8.6.2 (b) Project Stage – II is the continuation of project stage -I. It shall be evaluated by the external examiner for 70 marks and the project supervisor shall evaluate it for 30 marks. Two reviews should be conducted. Review-I will be conducted within a month from the commencement of class work (progress of work, discussion and presentation) and Review-II will be conducted before second mid examination (progress of work, results, discussion, presentation and report submission). Average of the two reviews will be taken for CIE. The Project Viva-voce (SEE) shall be conducted by a committee comprising of an External Examiner, Head of the Department and Project Supervisor. In SEE marks, 20% for working model/ simulation/ data collection, 20% for report preparation and 60% for presentation and viva-voce. The external examiner should be selected by Chief Controller of Examinations/Principal from outside the college among the autonomous/reputed institutions from a panel of three examiners submitted by the concerned Head of the Department.

The student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the external examiner as per schedule, or (ii) secures less than 40% marks in the sum total of the CIE and SEE taken together. A student who has failed may reappear once for the above evaluation, when it is scheduled again; if student fails in such ‘one reappearance’ evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.7 Seminar:

For Seminar presentation, the student shall collect the information on a specialized topic, prepare a Technical Report and submit to the department at the time of seminar presentation. The seminar

presentation (along with the technical report) shall be evaluated by a committee consisting of Seminar coordinator and two senior faculty members with appropriate grade. The seminar report shall be evaluated internally for 100 marks. There shall be no semester end examination for the seminar.

8.8 Non-Credit Courses

8.8.2 Mandatory Courses:

Mandatory Non-Credit Courses offered in any semester, a ‘Satisfactory / Not Satisfactory’ shall be awarded to the student based on the performance in both CIE and SEE.

8.8.3 Audit Courses:

Audit Courses offered in any Semester, a ‘**Satisfactory Participation Certificate**’ shall be issued to the student from the concerned authorities, only after securing $\geq 65\%$ attendance in such a course. Internship program is also conducted under the category of Audit Courses. The student needs to submit a detailed report to the department after internship program. No marks or Letter Grade shall be allotted for these activities.

9 Grading Procedure

- 9.1** Grades will be awarded to indicate the performance of each student in each theory subject, or Lab/ Practical or Seminar or Project or Mini-Project or Minor Course etc., based on the % of marks obtained in CIE + SEE both taken together as specified in Item No. 9 and a corresponding Letter Grade shall be given.
- 9.2** As a measure of the student’s performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed.

% of Marks	Grade Points	Letter Grade
≥ 90	10	O (Out Standing)
≥ 80 to < 90	9	A ⁺ (Excellent)
≥ 70 to < 80	8	A (Very Good)
≥ 60 to < 70	7	B ⁺ (Good)
≥ 50 to < 60	6	B (Average)
≥ 40 to < 50	5	C(Pass)
< 40	0	F (Fail)
Absent	0	Ab

- 9.3** A student obtaining ‘F’ Grade in any subject shall be considered ‘Failed’ and will be required to reappear as ‘Supplementary Candidate’ in the Semester End Examination (SEE) as and when conducted. In such cases, his / her Internal Marks (CIE Marks) in those subject(s) will remain same as those he / she obtained earlier.
- 9.4** A Letter Grade does not imply any specific % of marks.
- 9.5** In general, a student shall not be permitted to repeat any Subject/ Course (s) only for the sake of ‘Grade Improvement’ or ‘SGPA / CGPA Improvement’. However, he / she has to repeat all the

Subjects/ Courses pertaining to that semester, when he / she is detained (as listed in Items Nos.7.7 &7.8).

- 9.6** A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course (excluding Mandatory non-credit Courses).Then the corresponding ‘Credit Points’ (CP) are computed by multiplying the Grade Point with credits for that particular Subject/ Course.

Credit Points (CP) = Grade Point (GP) x Credits ...For a Course

- 9.7** The Student passes the Subject/ Course only when he / she gets $GP \geq 5$ (‘C’ Grade or above).
- 9.8** The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a semester by the Total Number of Credits registered during that semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

$$SGPA = \{\sum_{i=1}^N C_i G_i\} / \{\sum_{i=1}^N C_i\} \dots \text{for each semester}$$

where ‘i’ is the subject indicator index (takes into account all subjects in a semester), ‘N’ is the number of Subjects ‘REGISTERED’ for the semester (as specifically required and listed under the Course Structure of the parent Department) is the number of credits allotted to the i^{th} subject and represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} subject.

- 9.9** The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered courses in ALL semesters and the total number of credits registered in ALL the semesters. CGPA is rounded off to TWO decimal places. CGPA is thus computed from the II semester onwards, at the end of each semester, as per the formula.

$$CGPA = \{\sum_{j=1}^M C_j G_j\} / \{\sum_{j=1}^M C_j\} \dots \text{for all ‘S’ semesters registered}$$

(i.e., up to and inclusive of ‘S’ semesters, $S \geq 2$)

where ‘M’ is the TOTAL number of subjects (as specifically required and listed under the course structure of the parent department) the student has ‘REGISTERED’ from the 1st Semester onwards up to and inclusive of the semester ‘S’ (obviously $M > N$), ‘j’ is the subject indicator index (takes in to account all subjects from ‘1’ to ‘S’ semesters) is the number of credits allotted to the j^{th} subject, and represents the Grade Points (GP) corresponding to the Letter Grade awarded for that j^{th} subject. After registration and completion of I Year I Semester however, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

ILLUSTRATION OF CALCULATION OF SGPA

Course/ Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	3	A	8	3 x 8 = 24
Course 2	3	O	10	3 x 10 = 30
Course 3	3	C	5	3 x 5 = 15
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	1.5	B	6	1.5 x 6 = 09
Course 7	1.5	A	8	1.5 x 8 = 12

Course 8	2	A	8	2 x 8 = 16
	Total = 20			Total Credit Points = 151

$$\text{SGPA} = 151/20 = 7.55$$

ILLUSTRATION OF CALCULATION OF CGPA:

Semester	Credits	SGPA	Credits X SGPA
Semester I	18	7	18 X 7 = 126
Semester II	20	6	20 X 6 = 120
Semester III	20	6.5	20 X 6.5 = 130
Semester IV	20	6	20 X 6 = 120
Semester V	21	5.75	21 X 5.75 = 120.75
Semester VI	20	7.25	20 X 7.25 = 145
Semester VII	21	8	21 X 8 = 168
Semester VIII	20	8.5	20 X 8.5 = 170
	160		1099.75

$$\text{CGPA} = 1099.75/ 160 = 6.87$$

9.10 For merit ranking or comparison purposes or any other listing, ONLY the ‘ROUNDED OFF’ values of the CGPAs will be used.

9.11 For calculations listed in Item Nos.9.6 to 9.10, performance in failed Subjects/ Courses (securing ‘F’ Grade) will also be taken into account and the credits of such Subjects/Courses will also be included in the multiplications and summations. However, Mandatory Courses will not be taken into consideration.

9.12 Passing Standards:

9.12.2 A student shall be declared successful or ‘passed’ in a semester, only when he / she gets a SGPA ≥ 5.00 (at the end of that particular semester); and a student shall be declared successful or ‘passed’ in the entire UGP, only when he / she gets a CGPA ≥ 5.00 ; subject to the condition that he / she secures a GP ≥ 5 (‘C’ Grade or above) in every registered Subject/ Course in each semester (during the entire UGP) for the degree award, as required.

9.12.3 In spite of securing ‘P’ Grade or above in some (or all) Subjects/ Courses in any semester, if a student receives a SGPA < 5.00 and/ or CGPA < 5.00 at the end of such a semester, then he / she ‘may be allowed’ (on the ‘specific recommendations’ of the Head of the Department and subsequent approval from the Principal) (i) to go into the next subsequent semester (subject to fulfilling all other attendance and academic requirements as listed under Items Nos. 7&8);(ii) to ‘improve his / her SGPA of such a semester (and hence CGPA) to 5.00 or above’, by reappearing for ONE or MORE (as per student’s choice) of the same course(s) in which he / she has secured ‘P’ Grade(s) in that semester, at the Supplementary Examinations to be held in the next subsequent semester(s). In such cases, his / her Internal Marks (CIE Marks) in those subject(s) will remain same as those he / she obtained earlier. In these

considerations, the newly secured Letter Grades will be recorded and taken into account for calculation of SGPA and CGPA, only if there is an improvement.

9.12.4 A student shall be declared successful in any Non-Credit Course, if he / she secures a ‘Satisfactory Participation Certificate’ for that Audit Course and ‘Satisfactory Grade’ for Mandatory Course.

9.13 After the completion of each semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the registered students of that semester, indicating the Letter Grades and credits earned. It will show the details of the courses registered (Course Code, Title, No. of Credits and Grade Earned etc.), Credits earned, SGPA and CGPA.

10 Declaration of Results

10.1 Computation of SGPA and CGPA are done using the procedure listed in items 9.6 to 9.10.

10.2 For final % of marks equivalent to the computed final CGPA, the following formula may be used ...

$$\% \text{ of Marks} = (\text{final CGPA} - 0.5) \times 10$$

11.0 Award of Degree

11.1 A student who register for all the specified courses as listed in the Course Structure, satisfies all the course requirements, passes all the examinations prescribed in the entire UG Programme (UGP) within the specified period (refer 4.1) and secures the required 160 Credits (with CGPA ≥ 5.0) shall be declared to have ‘QUALIFIED’ for the award of the B.Tech. Degree in the chosen branch of engineering as selected at the time of admission.

11.2 A student who qualifies for the award of the degree as listed in Item 11.1, shall be placed in the following classes:

Class Awarded	CGPA
First Class with Distinction	≥ 8.00
First Class	≥ 6.50 and < 8.00
Second Class	≥ 5.50 and < 6.50
Pass Class	≥ 5.00 and < 5.50

11.3 A student with final CGPA (at the end of the UGP) < 5.00 will not be eligible for the award of the degree.

11.4 Students will be eligible for the award of ‘**Gold Medal**’, if he/she should have passed all the subjects/courses in first appearance within the first academic years (or eight sequential semesters) from the date of commencement of first year first semester and should have secure CGPA ≥ 8.00 at the end of eight sequential semesters.

11.5 A student will be eligible to get under graduate degree with honours or additional minor engineering, if he / she completes an additional 20 credits through MOOCs.

12 Withholding of Results

If the student has not paid fees to college at any stage or has pending dues against his / her name due to any reason whatsoever or if any case of indiscipline is pending against him, the result of the student may be with held and he / she will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

13 Transitory Regulations

A. For students detained due to shortage of attendance:

1. A student who has been detained in I year of MR14/ MR15/ MR17 regulations due to lack of attendance, shall be permitted to join I year I Semester of MR18 regulations and he / she is required to complete the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.
2. A student who has been detained in any semester of II, III and IV years of MR14/ MR15 regulations for want of attendance shall be permitted to join the corresponding semester of MR18 regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The MR18 academic regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further transitory regulations.

B. For students detained due to shortage of credits:

1. A student of MR14/ MR15 (2015-16 and 2016-17 admitted students)/ MR 17 regulations, who has been detained due to lack of credits, shall be promoted to the next semester of MR18 regulations only after acquiring the required credits as per the corresponding regulations of his/her first admission. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The MR18 academic regulations are applicable to a student from the year of readmission onwards. See rule (C) for further Transitory Regulations.

C. For readmitted students in MR 18 regulations:

1. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
2. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including MR18 regulations. The performance evaluation of the student will be done after the exemption of two subjects if total credits acquired are ≤ 206 , three subjects if total credits acquired are > 206 (see MR18 regulations for exemption details).
3. If a student readmitted to MR18 regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in MR18 regulations will be substituted by another subject to be suggested by the College Academic Committee (CAC).
Note: If a student readmitted to MR18 regulations, has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in MR18 regulations, the departments concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

14 Student Transfers

14.1 There shall be no branch transfers after the completion of admission process.

14.2 The students seeking transfer to MALLA REDDY ENGINEERING COLLEGE (Autonomous)-MREC(A) from various other Universities/ Institutions have to pass the failed subjects which are equivalent to the subjects of MREC(A) and also pass the subjects of MREC(A) which the students have not studied at the earlier institution. Further, though the

students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of MREC(A), the students have to study those subjects in MREC(A) inspite of the fact that those subjects are repeated.

14.3 The transfer students from other Universities / Institutions to MREC(A) who are on rolls will be provided one chance to write internal examinations in the failed subjects and/or subjects not studied as per the clearance letter issued by the JNTUH.

15 Scope

- (i) Where the words “he”, “him”, “his”, occur in the write – up of regulations, they include “she”, “her”, “hers”.
- (ii) Where the words “Subject” or “Subjects”, occur in these regulations, they also imply “Course” or “Courses”.
- (iii) The academic regulations should be read as a whole, for the purpose of any interpretation.
- (iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the College Academic Committee headed by the Principal is final.

Academic Regulations for B.Tech.(Lateral Entry Scheme)

w.e.f the A.Y. 2019-20

1. Eligibility for award of B. Tech. Degree(LES)

The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.

- 2. The student shall register for 122 credits and secure 122 credits with CGPA ≥ 5 from II year to IV year B.Tech. programme (LES) for the award of B.Tech. degree. **Out of the 122 credits secured, the student can avail exemption up to 6 credits**, that is, one open elective subject and one professional elective subject or two professional elective subjects resulting in 114 credits for B.Tech. programme performance evaluation.
- 3. The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.
- 4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech.(LES).

5. Promotion Rule:

Sl. No.	Promotion	Conditions to be fulfilled
1	Second year first semester (III Semester) to second year second semester (IV Semester)	Regular course of study of second year first semester (III Semester).
2	Second year second semester (IV Semester) to third year first semester (V Semester).	(i) Regular course of study of second year second semester (IV Semester) (ii) Must have secured at least 60% credits up to second year second semester (IV Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.

3	Third year first semester (V Semester) to third year second semester (VI Semester)	Regular course of study of third year first semester (V Semester).
4	Third year second semester (VI Semester) to fourth year first semester (VII Semester)	(i) Regular course of study of third year second semester (VI Semester) (ii) Must have secured at least 60% credits up to third year second semester (VI Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester (VII Semester) to fourth year second semester (VIII Semester)	Regular course of study of fourth year first semester (VII Semester)

6. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

MALPRACTICES RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

Sl. No.	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the student has

	form of material relevant to that course of the examination (theory or practical) in which the candidate is appearing.	already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that semester. The hall ticket of the candidate shall be cancelled.
3	Impersonates any other candidate in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The student is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.

6	<p>Refuses to obey the orders of the Chief Controller of Examinations (CCE) / Controller of Examinations (CE) / Assistant Controller of Examinations (ACE) / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-incharge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination</p>	<p>In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police cases registered against them.</p>
7	<p>Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.</p>	<p>Expulsion from the examination hall and cancellation of performance in that course and all the other courses the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the student is subject to the academic regulations in connection with forfeiture of seat.</p>
8	<p>Possess any lethal weapon or firearm in the examination hall.</p>	<p>Expulsion from the examination hall and cancellation of the performance in that course and all other courses the student has</p>

		already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the student has appeared including practical examinations and project work of that SEE.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the CCE for further action toward suitable punishment.	

Note: The student(s) found indulging in malpractices during the CIE also will be punished based on the recommendations of the College Academic Committee.

Malpractices identified by squad or special invigilators

1. Punishments to the students as per the above guidelines.

MALLA REDDY ENGINEERING COLLEGE (Autonomous)

COURSE STRUCTURE – B.Tech. MINING ENGINEERING (Effective from Academic Year 2018-19 onwards)

SEMESTER I

S.No.	Category	Course Code	Course Name	L	T	P	Credits
1			Induction Programme				-
2	BSC	80B01	Engineering Mathematics-I	3	1	-	4
3	BSC	80B03	Engineering Chemistry	3	1	-	4
4	ESC	80201	Basic Electrical and Electronics Engineering	3	-	-	3
5	ESC	80301	Engineering Graphics	1	-	2	2
6	ESC	80304	Engineering Mechanics	3	-	-	3
7	BSC	80B05	Engineering Chemistry Lab	-	-	2	1
8	ESC	80202	Basic Electrical and Electronics Engineering Lab	-	-	2	1
9	ESC	80305	Engineering Mechanics Lab	-	-	2	1
10	ESC	80302	Engineering Graphics Lab	-	-	2	1
11	AC	80A01	NSS/SPORTS/YOGA	-	-	3	-
				13	2	13	20
				Contact Periods 28			

SEMESTER II

S.No.	Category	Course Code	Course Name	L	T	P	Credits
1	HSMC	80H01	English	3	-	-	3
2	BSC	80B06	Engineering Mathematics-II	3	1	-	4
3	BSC	80B07	Engineering Physics	3	1	-	4
4	ESC	80501	Programming for problem Solving	3	-	-	3
6	HSMS	80H02	English Language Lab	-	-	2	1
7	BSC	80B08	Engineering Physics Lab	-	-	2	1
8	ESC	80502	Programming for problem Solving Lab	-	-	2	1
9	ESC	80303	Engineering workshop	-	-	2	1
			Total	12	2	8	18
				Contact Periods 22			

SEMESTER III

S.No.	Category	Course Code	Course Name	L	T	P	Credits
1	ESC	80316	Fluid Mechanics and Hydraulic Mechanics	3	-	-	3
2	ESC	80239	Electrical machines and Controls	3	-	-	3
3	PCC	82501	Mine Surveying	3	1	-	4
4	PCC	82502	Mining Geology	3		-	3
5	PCC	82503	Development of Mineral deposits	3	-	-	3
6	ESC	80319	Fluid Mechanics and Hydraulic Mechanics Lab	-	-	2	1
7	PCC	82504	Mining Geology Lab	-	-	3	1.5
8	PCC	82505	Mine Surveying – I Lab	-	-	3	1.5
9	MCC	80M01	Environmental Sciences	2	-	-	0
10	AC	80A02	Internship – I	-	-	-	-
			Total	17	1	08	20
				Contact Periods 26			

SEMESTER IV

S.No.	Category	Course Code	Course Name	L	T	P	Credits
1	BSC	80B09	Probability and Statistics	3	-	-	3
2	ESC	80306	Mechanics of Solids	3	-	-	3
3	ESC	80311	Machine Drawing	1	-	2	2
4	PCC	82506	Mine Environmental Engineering - I	3	-	-	3
5	PCC	82507	Drilling and Blasting	3		-	3
6	PCC	82508	Mining Machinery - I	3	-	-	3
7	ESC	80352	Mechanics of solids Lab	-	-	3	1.5
8	ESC	80312	Machine Drawing Lab	-	-	2	1
9	PCC	82509	Mine Surveying – II Lab	-	-	3	1.5
10	MC	80M02	Gender Sensitization	2	-	-	-
			Total	18	-	10	21
				Contact Periods 28			

SEMESTER V

S.No	Category	Course Code	Course Name	L	T	P	Credits
1	PCC	82510	Mine Environmental Engineering - II	3	-	-	3
2	PCC	82511	Underground Coal Mining	3	-	-	3
3	PCC	82512	Rock Mechanics	3	-	-	3
4	PCC	82513	Mining Machinery - II	3	-	-	3
5	PCC	82514	Surface Mining Technology	3	-	-	3
6	PEC-I	82515	Rock Excavation Engineering	3	-	-	3
		82516	Mineral Exploration				
		82517	Small Scale Mining and Marine Engineering				
	HSMC	80H03	English Communication and Presentation Skills Lab	-	-	2	1
7	PCC	81518	Mining Machinery Lab	-	-	4	2
9	AC	80A03	Internship – II	-	-	-	-
10	MC	80M03	Essence of Indian traditional knowledge	2	-	-	-
Total				20	0	6	21
				Contact Periods 26			

SEMESTER VI

S.No.	Category	Course Code	Course Name	L	T	P	Credits
1	HSMC	80H06	Industrial Management	3	-	-	3
2	PCC	82519	Mine Economics	3	-	-	3
3	PCC	82520	Computer Applications in mining	2	-	-	2
4	PCC	82521	Underground Metal Mining	3	-	-	3
5	PEC-II	82522	Mine Ground Control	3	-	-	3
		82523	Long wall Mining				
		82524	Mine Systems Engineering				
6	PEC-III	82525	Environmental Impact and Management	3	-	-	3
		82526	Mine Subsidence Engineering				
		82527	Advanced Coal Mining and Mechanization				
7	PCC	82528	Mine Environmental Engineering Lab	-	-	3	1.5
8	PCC	82529	Rock Mechanics Lab	-	-	3	1.5
10	MC	80M04	Indian Constitution	2	-	-	-
Total				19	0	6	20
				Contact Periods 25			

SEMESTER VII

S.No.	Category	Course Code	Course Name	L	T	P	Credits
1	PCC	82530	Mine Legislation	2	-	-	2

2	PCC	82531	Mineral Processing	2	-	-	2
3	PEC-IV	82532	Disaster Management	3	-	-	3
		82533	Rock Slope Engineering				
		82534	Mine Planning and Design				
4	PEC-V	82535	Advanced Surface Mining	3	-	-	3
		82536	Advanced Metal Mining and Mechanization				
		82537	Material Handling				
5	OEC - I			3	-	-	3
6	PCC	82538	Mineral Processing Lab	-	-	3	1.5
7	PCC	82539	Computer application in Mining Lab	-	-	3	1.5
8	PROJ	80P01	Internship-III/Mini Project	-	-	-	2
9	PROJ	80P02	Project Stage I	-	-	4	2
Total				13	0	10	20
				Contact Periods 23			

SEMESTER VIII

S.No.	Category	Course Code	Course Name	L	T	P	Credits
1	PEC-VI	82540	Numerical Modelling in Mining	3	-	-	3
		82541	Geo-statistics				
		82542	Coal Bed Methane and Underground Coal Gasification				
2	OEC-II			3	-	-	3
3	OEC-III			3	-	-	3
4	PROJ	80P03	Seminar	-	-	2	1
5	PROJ	80P04	Project Stage II	-	-	20	10
Total				9	-	22	20
				Contact Periods 31			

LIST OF OPEN ELECTIVES

Sl. No.	Branch	Course Code	Name of the Course	No. of Credits
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1.	CIVIL	80139	Environmental Impact Assessment and life cycle analysis	3
2.		80148	Green Buildings	3
3.		80149	Disaster Management & Mitigation	3
4.	EEE	80234	Electrical Energy Conservation and Auditing	3
5.		80240	Electrical Safety and Energy Management	3
6.		80241	Energy Storage Systems	3
7.	MECH	80352	Total Quality Management	3
8.		80356	Industrial Safety	3
9.		80357	Renewable Energy Sources	3
10.	ECE	80435	Embedded System Design	3
11.		80446	Principles of Communication Engineering	3
12.		80447	Basics of VLSI	3
13.	CSE	80512	Database Management Systems	3
14.		80521	Big Data Analytics	3
15.		80535	Cloud Computing	3
16.	IT	80617	Artificial Intelligence	3
17.		80605	Android application development	3
18.		80606	Python programming	3
19.	MINING	82507	Drilling and Blasting	3
20.		82537	Material Handling	3
21.		82542	Tunneling Engineering	3
22.	ENGLISH	80H04	English language skills	3
23.		80H05	Interpretation skills and analytical writing	3
24.		80H06	English for academic and research writing	3
25.	MATHEMATICS	80B11	Computational Mathematics	3
26.		80B12	Applied Statistics	3
27.		80B13	Optimization Techniques	3
28.	PHYSICS	80B14	Advanced Physics for Engineers	3
29.		80B15	Nano Materials	3
30.		80B16	NDT and Vacuum Technology	3
31.	CHEMISTRY	80B17	Chemistry of Engineering Material	3
32.		80B18	Nano Chemistry	3
33.		80B19	Polymer Chemistry	3

2018-19 Onwards	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester
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(MR-18)				
Code: 80B01	ENGINEERING MATHEMATICS - I (Common for CE,EEE,ME,ECE,CSE ,IT and Min.E)	L	T	P
Credits: 4		3	1	-

Prerequisites: Basics of Matrices and Calculus

Course Objectives: To learn types of matrices and their properties, rank of the matrix to know the consistency and solving the system of linear equations. To find Eigen values, Eigen vectors and to reduce the quadratic form to canonical form. To understand the concept of Sequence and series, Geometrical approach to the mean value theorems and their application to the mathematical problems.

Module - I: Matrices

12 Periods

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. LU - Decomposition Method.

Module - II: Eigen values and Eigen vectors

14 Periods

Linear Transformation and Orthogonal Transformation: Eigen values and Eigen vectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

Module - III: Sequences & Series

12 Periods

A: Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.

Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert's ratio test

B: Raabe's test; Cauchy's Integral test; Cauchy's root test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

Module - IV: Fourier Series

12 Periods

Determination of Fourier coefficients- fourier series –even and odd function-Half range Fourier sine and cosine series expansions. Fourier series in an arbitrary interval – even and odd periodic continuation - Half range Fourier sine and cosine series expansions.

Module - V: Calculus

14 Periods

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series. Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

References:

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

2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

E- Resources:

1. <http://www.yorku.ca/yaoguo/math1025/slides/chapter1/Kuttler-LinearAlgebra-Slides-SystemsofEquations-Handout.pdf> (Systems of linear equations, matrices)
2. <https://www.math.cmu.edu/~wn0g/2ch6a.pdf> (Differential Calculus)
3. <http://tutorial.math.lamar.edu/Classes/CalcII/ConvergenceOfSeries.aspx> (Sequences & Series)
4. <http://www.aidic.it/cet/16/51/055.pdf> (Differential Calculus)
5. <http://nptel.ac.in/courses/108106075/8> (Fourier Series)

Course Outcomes:

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

1. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations.
2. Find the Eigen values and Eigen vectors and reduce the quadratic form to canonical form using orthogonal transformations.
3. Analyse the nature of sequence and series.
4. Determine Fourier series for different functions
5. Solve the applications on the mean value theorems and evaluate the improper integrals using Beta and Gamma functions.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	3				2			3			
CO2	3	2	2	3	2				2			3			
CO3	3	2	2	3	2				2			2			
CO4	3	2	2	3	3				2			2			
CO5	3	2	2	3	3				2			2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech I Semester		
Code: 80B03	ENGINEERING CHEMISTRY (Common for CE, ME and Min.E)		L	T	P
Credits: 4			3	1	-

Prerequisites: Nil

Course Objectives:

The purpose of this course is to emphasize the relevance of fundamentals of chemical sciences in the field of engineering and to provide basic knowledge on atomic- molecular orbital's, electrochemistry, batteries, corrosion and the role of water as an engineering material in domestic-

industrial use. They will also impart the knowledge of stereochemistry, understanding the chemical reaction pathway mechanisms and synthesis of drugs.

Module I: Water and its treatment

12 Periods

Introduction to water, hardness of water, causes of hardness, expression of hardness, units and types of hardness-Numerical Problems. Alkalinity of water, specifications of potable water (BIS); Estimation of temporary & permanent hardness of water by EDTA method. Boiler troubles - Scale & Sludge, Priming and foaming, caustic embrittlement and boiler corrosion; Treatment of boiler feed water - Internal treatment (colloidal, phosphate, carbonate and calgon conditioning). External treatment - Lime Soda process (cold & hot) and ion exchange process, Numerical Problems. Disinfection of water by chlorination and ozonization. Desalination by Reverse osmosis and its significance.

Module II: Molecular structure and Theories of Bonding:

12 Periods

Introduction to Molecular orbital Theory. Linear Combination of Atomic Orbital's (LCAO), significance of bonding and anti-bonding molecular orbital, Conditions for the formation of molecular orbital's. Molecular orbital energy level diagrams of diatomic molecules -, N_2 , O_2 and F_2 . Introduction to coordination compounds-ligand-coordination number (CN) - spectrochemical series. Salient features of crystal field theory, Crystal field splitting of transition metal complexes in octahedral (CoF_6^{3-} and $Co(CN)_6^{3-}$) and tetrahedral ($NiCl_4^{2-}$ and $Ni(CN)_4^{2-}$) fields - magnetic properties of complexes. Band structure of solids and effect of doping on conductance.

Module III: Electrochemistry and Corrosion

16 Periods

A. Electrochemistry:

Introduction to Electrochemistry-Conductance (Specific and Equivalent) and units. Types of cells-electrolytic & electrochemical cells (Galvanic Cells)-Electrode potential- cell potential (EMF).Electrochemical series and its applications, Nernst equation its applications and numerical problems. Reference electrodes - Calomel Electrode, Quinhydrone electrode and Glass electrode-determination of pH using glass electrode. Batteries: Primary (dry cells) and secondary (Lead-Acid cell, Ni-Cd cell) - applications of batteries. Fuel cells: Hydrogen - Oxygen fuel cell and its applications.

B. Corrosion:

Causes and effects of corrosion: Theories of corrosion - Chemical & Electrochemical corrosion, Pilling-Bedworth rule, Types of corrosion: Galvanic and Water-line corrosion. Factors affecting rate of corrosion-Nature of metal and Nature of Environment, Corrosion control methods - Cathodic protection (Sacrificial anodic and impressed current cathodic methods). Surface coatings: Methods of metallic coatings - hot dipping (Galvanization), Electroplating (Copper) and Electroless plating (Nickel).

Module IV: Stereochemistry & NMR Spectroscopy:

12 Periods

Introduction to Isomers - classification of isomers - structural (chain, positional & functional) and stereoisomerism-geometrical (cis-trans & E-Z system) - characteristics of geometrical isomerism, optical isomerism (chirality - optical activity, specific rotation, enantiomers and diastereomers) of

tartaric acid and lactic acid. Conformational isomerism of n-Butane. Introduction to Spectroscopy, Basic concepts of nuclear magnetic resonance spectroscopy, chemical shift, spin-spin splitting, coupling constant in 2-butene.

Module V: Reaction mechanism and synthesis of drug molecules **12 Periods**

Introduction to bond cleavage (homo & hetero cleavage) - reaction intermediates and their stability. Types of organic reactions - Mechanism of substitution (SN^1 & SN^2) - addition (Ad_E) -elimination (E_1 & E_2) reactions with suitable example. Ring opening (Beckmann rearrangement-preparation of Nylon-6), oxidation and reduction (Cannizaro reaction), cyclization (Components of Diels-Alder reaction-Mechanism of Diels-Alder reaction with suitable example) reactions. Synthesis of Paracetamol, Ibuprofen and their applications.

Text Books

1. P.C.Jain and Monica Jain, “**A Text Book of Engineering Chemistry**”, DhanpatRai Publications, New Delhi, 16th Edition 2014.
2. S.S. Dara and S.S. Umare, “**A Text Book of Engineering Chemistry**”, S Chand Publications, New Delhi, 12th Edition 2010.
3. A.Jaya Shree, “Text book of Engineering Chemistry”, Wiley, New Delhi, 2018.

References

1. B.Rama Devi, Ch.VenkataRamana Reddy and PrasanthaRath, “**Text Book of Engineering chemistry**”, Cengage Learning India Pvt.Ltd,2016.
2. M.G. Fontana and N. D. Greene, “**Corrosion Engineering**”, McGraw Hill Publications, New York, 3rd Edition, 1996.
3. K. P. C. Vollhardt and N. E. Schore, “**Organic Chemistry: Structure and Function**”, 5th Edition, 2006.

E-Resources:

1. <https://books.google.co.in/books?isbn=0070669325> (Engineering chemistry by Sivasankar).
2. https://archive.org/stream/VollhardtOrganicChemistryStructureFunction6th/Vollhardt_Organic_Chemistry_Structure_Function_6th_djvu.txt.
3. <http://americanhistory.si.edu/fuelcells/sources.htm> (Fuel Cell Information Sources)
4. <https://www.abctlc.com/downloads/courses/WaterChemistry.pdf> (Water Chemistry)
5. nptel.ac.in/courses/113108051/ (corrosion & electrochemistry web course)

Course Outcomes:

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

1. Understand water treatment, specifically hardness of water and purification of water by various methods.
2. Acquire knowledge on electrochemical cells, fuel cells, batteries and their applications.
3. Analyze microscopic chemistry in terms of atomic and molecular orbital's splitting and band theory related to conductivity.
4. Acquire basic knowledge on the concepts of stereochemistry.
5. Acquire basic knowledge on chemical reaction mechanisms and that are used in the synthesis of molecules.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	3	1	2									
CO2	3	2	1	1											
CO3	3	3	1	3	1	2	1	1	1						
CO4	1		1		1	1		1							
CO5	3	3	3	2	2	1	1		1						

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: 80201	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P
Credits: 3	(Common for CE, ME and Min.E)	3	-	-

Prerequisites: Nil

Course Objectives: To introduce the concept of electrical circuits and its components. To introduce the characteristics of various electronic devices. To impart the knowledge of various configurations, characteristics and applications of electrical & electronic components.

Module I: DC Circuits

9 Periods

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws - Series, parallel, series-parallel, star-to-delta and delta-to-star transformation- analysis of simple circuits with dc excitation. Superposition, Thevenin's and Maximum Power Transfer Theorems with DC excitation.

Module II: AC Circuits

9 Periods

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel).

Module III: Introduction to Electrical Machines

10 Periods

A: DC Machines : Construction & Principle of Operation of DC Generators – E.M.F Equation. Principle of operation DC Motors – Back E.M.F. - Torque equation – Brake Test -Characteristics.

B: AC Machines: Construction and Principle of operation of Transformer- EMF Equation. Construction and Principle of Operation of 3 Phase Induction Motors - Brake test on 3-Phase Induction Motor – Applications.

Module IV: P-N Junction Diode

10 Periods

P-N Junction Diode: Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances. Zener diode operation, Zener diode as voltage regulator.

Rectifiers : P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier.

Filters : Filters – Inductor Filters, Capacitor Filters, L- section Filters, π - section Filters.

Module V: BJT and Junction Field Effect Transistor (JFET)

10 Periods

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations and Input-Output Characteristics, Comparison of CE, CB and CC configurations

Junction Field Effect Transistor and MOSFET: Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET.

Text Books

1. M.Surya Kalavathi, Ramana Pilla, Ch. Srinivasa Rao, Gulinindala Suresh, “ **Basic Electrical and Electronics Engineering**”, S.Chand and Company Limited, New Delhi, 1st Edition, 2017
2. R.L.Boylestad and Louis Nashlesky, “**Electronic Devices & Circuit Theory**”, Pearson Education, 2007.

References

1. V.K. Mehtha and Rohit Mehta, “**Principles of Electrical Engineering and Electronics**”, S.Chand & Co., 2009.

2. Jacob Milliman, Christos C .Halkias, Satyabrata Jit (2011), “**Electronic Devices and Circuits**”, 3rd edition, Tata McGraw Hill, New Delhi
3. Thomas L. Floyd and R. P. Jain, “**Digital Fundamentals**”, Pearson Education, 2009.
4. David A. Bell, “**Electronic Devices and Circuits**”, Oxford University Press, 2008
5. Nagrath I.J. and D. P. Kothari, “**Basic Electrical Engineering**”, Tata McGraw Hill, 2001
6. Mittle N., “**Basic Electrical Engineering**”, Tata McGraw Hill Education, New Delhi, 2nd Edition, 2005.

E - Resources

1. <https://www.electrical4u.com/ohms-law-equation-formula-and-limitation-of-ohms-law/>
2. <https://www.eeweb.com/passives>
3. <http://nptel.ac.in/courses/108108076/>
4. <http://nptel.ac.in/downloads/108105053/>

Course Outcomes:

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

1. Apply basic laws in electrical circuit.
2. Analyze the single phase circuits.
3. Comprehend the construction and Operation of DC and AC machines.
4. Know the practical importance of Diode and its characteristics.
5. Recognize the construction and operation of BJT and JFET

CO- PO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3									3			
CO2	3	3	3									3			
CO3	3	3	3									3			
CO4	3	3	3									3			
CO5	3	3	3									3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: 80301	ENGINEERING GRAPHICS (Common for CE, ME and Min.E)	L	T	P
Credits: 2		1	-	2

Prerequisites: Nil

Course Objectives:

To develop in students, graphic skills for communication of concepts and ideas of engineering products.

MODULE I: Introduction to Engineering Drawing, Curves and Projection of Points
10 Periods

Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance. Lettering and dimensioning. Geometrical Constructions: Regular polygons only.

Curves: Conic Sections - eccentricity method. Cycloid and Involutés.

Projection of Points: Principles of Orthographic Projections – Conventions – First and Third Angle projections. Projection of points including all four quadrants.

MODULE II: Projection of Lines & Planes

10 Periods

Projection of Lines: Projection of Lines - parallel, perpendicular, inclined to one reference plane and inclined to both reference planes. True length and true angle of a line.

Projection of Planes: Projection of Planes - Axis inclined to one reference plane.

MODULE III: Projection of Solids & Section of Solids

10 Periods

A. Projection of Solids: Projections of regular solids like cube, prism, pyramid, cylinder and cone by rotating object method. Axis inclined to one reference plane.

B. Section of Solids: Sectioning of single solid with the cutting plane inclined to one plane and perpendicular to the other - true shape of section

MODULE IV: Development of Surfaces & Isometric Projections

9 Periods

Development of Surfaces: Development of lateral surfaces of simple Solids.

Isometric Projections: Principles of Isometric Projection – Isometric Views– Conventions –Plane Figures, Simple Solids.

MODULE V: Transformation of Projections

9 Periods

Transformation of Projections: Conversion of Isometric Views to Orthographic Views and vice versa– simple objects.

TEXT BOOKS

1. K.L.Narayana, S.Bheemanjaneyulu “**Engineering Drawing with Auto CAD-2016**” New Age International Publishers, 1st Edition, 2018.
2. N.D. Bhat, “**Engineering Drawing**”, Charotar Publishing House, 53rd Edition, 2014.

REFERENCES

1. K.L.Narayana, P.Kannaiah, “**Engineering Drawing**”, SciTech Publishers. 2nd Edition, 2017
2. K.Venugopal, “**Engineering Drawing**”, NewAge International Publishers, 3rd Edition, 2014.
3. K. V. Natarajan, “**A text book of Engineering Graphics**”, Dhanalakshmi Publishers, 2015.
4. M.S. Kumar, “**Engineering Graphics**”, D.D. Publications, 2011.
5. Trymbaka Murthy, “**Computer Aided Engineering Drawing**”, I.K. international Publishing House, 3rd Edition, 2011.

E - RESOURCES

1. <https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing>
2. <https://www.wiziq.com/tutorials/engineering-drawing>
3. <http://freevideolectures.com/Course/3420/Engineering-Drawing>
4. <http://www.worldcat.org/title/journal-of-engineering-graphics/oclc/1781711>
5. <http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphics>
6. <http://nptel.ac.in/courses/112103019/>

Course Outcomes

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

1. Understand the basics of drawings and importance of curves.
2. Draw the projection of lines and planes.
3. Draw the projection of solids and section of solids.
4. Produce development of surface and isometric projections.
5. Convert orthographic views to isometric views and vice-versa.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1							3		3			
CO2	3		1							3		3			
CO3	3		1							3		3			
CO4	3		1							3		3			
CO5	3		1							3		3			

2018-19 Onwards (MR18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: 80304	ENGINEERING MECHANICS (Common for CE, ME and Min.E)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objectives:

The objective of this subject is to provide the basic concepts and effect of system forces on rigid bodies, Geometrical Properties of Planes and Solids, problem solving in kinematics and kinetics using different methods and to analyze the types of friction for moving bodies and problems related to friction.

MODULE I: Introduction to Mechanics & System of Forces 12 Periods

Introduction: Basic Concepts, Laws of Motion, Force - types, characteristics - Principle of transmissibility - Types of Forces - Concurrent and non-concurrent Forces - Composition of force – Resultant - Triangle, Polygon and Parallelogram Law of Forces - Moment of Force and its Application - Varignon's theorem, Couples - Free Body Diagrams, Types of Supports and their reactions, Internal and External Forces - Types of Equilibrium, Equations of Equilibrium, Conditions of Equilibrium - Lami's Theorem.

MODULE II: Friction, Centroid and Center of Gravity 12 Periods

Friction: Types of friction, Limiting friction, Laws of friction, static and dynamic friction, application of laws of friction. Motion of bodies - wedge, screw, screw jack.

Centroid and Center of Gravity: Introduction, Centroids of Lines and Areas - simple figures - Centroid of composite figures. Pappus theorem - Centre of gravity of simple solids, composite solids - Centroids of volumes.

MODULE III: Moment of Inertia **12 Periods**

A: Area Moment of Inertia: Definition - Moment of Inertia of plane areas, Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures.

B: Mass Moment of Inertia: Introduction-moment of inertia of masses - Radius of gyration- Transfer formula for mass moment of inertia- by integration - Moment of Inertia of composite bodies.

MODULE IV: Kinematics & Kinetics **12 Periods**

Kinematics: Rectilinear motion - Motion of Rigid Body under uniform and variable accelerations - motion under gravity- curvilinear motion – Projectiles - rotary motion.

Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation - D'Alemberts Principle - Connected bodies- Kinetics of rotating bodies.

MODULE V: Work, Power, Energy & Mechanical Vibrations **12 Periods**

TEXT BOOKS
Work, Power and Energy: Introduction, work-energy equation - motion of connected bodies - Work done by a force.
1. **S. TIMOSHENKO, D.H. YOUNG, J.V. RAO AND SUKUMAR PATI, "ENGINEERING MECHANICS", Mechanical Engineering, TATA MCGRAW-HILL EDUCATION, 5TH EDITION, 2013.**

Simple and compound pendulums.
2. **K.Vijaya Kumar Reddy, J. Suresh Kumar, "Engineering Mechanics", B S Publications, 3rd Edition, 2013.**

REFERENCES

1. Beer, F.P and Johnston Jr. E.R. "**Vector Mechanics for Engineers**", Tata McGraw-Hill Education 10th Edition (India) Pvt Ltd.. 2013.
2. Fedinand. L. Singer, "**Engineering Mechanics**", Harper & Row Publishers, 3rd Edition, 1975.
3. R.S. Khurmi, "**A Text Book of Engineering Mechanics**", S.Chand Publications, 21st Edition, 2007.
4. K L Kumar, "**Engineering Mechanics**", Tata McGraw Hill Education, 4th Edition, 2011.
5. D.S.Kumar Patil, "**Engineering Mechanics**", SK Kataria & Sons Publishers, 2nd Edition, 2009.

E - RESOURCES

1. <http://www.mathalino.com/reviewer/engineering-mechanics/equilibrium-force-system>
2. <http://nptel.ac.in/courses/112103109/>
3. <http://ascelibrary.org/journal/jenmdt>
4. <https://tll.mit.edu/sites/default/files/SUTDVideoThumb/freebodydiagrams.pdf>

5. <http://nptel.ac.in/courses/112106180/>
6. <http://nptel.ac.in/courses/115104094/>

Course Outcomes

At the end of the course students will be able to

1. Determine the resultant of a system of forces and draw free body diagrams and can frame appropriate equilibrium equations from the free body diagram.
2. Understand and solve the fundamental static problems and able to find centroid and centre of gravity.
3. Determine area and mass moment of inertia for various sections.
4. Apply fundamental concepts of kinetics and kinematics of particles to the analysis of simple practical problems.
5. Understand and solve fundamental work, power and energy related problems and know the concepts of mechanical vibrations.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	3								3	2		
CO2	3	3	1	3								3	2		
CO3	3	3	1	3								3	2		
CO4	3	3	1	3								3	2		
CO5	3	3	1	3								3	2		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: 80B05	ENGINEERING CHEMISTRY LAB (Common for CE, ME and Min.E)	L	T	P
Credits: 1		-	-	2

Course objectives:

To provide the students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

List of Experiments:

1. Calibration of Volumetric apparatus.
2. Estimation of Total Hardness of water by EDTA Method.
3. Estimation of pH of an acid (Three methods).
4. Estimation of alkalinity of water.
5. Estimation of strength of an acid by Conductometry.
6. Estimation of strength of an acid by Potentiometry.
7. Estimation of Mn^{+2} ion in $KMnO_4$ by Colorimetry.
8. Determination of viscosity of given liquids by Ostwald's viscometer.
9. Determination of surface tension of given sample using stalagmometer.
10. Estimation of iron (II) by dichrometry.
11. Determination of rate constant of hydrolysis of methyl acetate.
12. Preparation of Aspirin.

Course outcomes:

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

1. Estimate the hardness of given water samples.
2. Select lubricants for various purposes.
3. Prepare advanced polymers & drug materials.
4. Know the strength of an acid present in batteries.
5. Calculate the amount of Mn^{+2} present in unknown substances/ores using instrumental methods.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	2	1	1											
C02	2	1	2												
C03	2	2		1											
C04	2	2	1												
C05	2	1	2												

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)					B.Tech. I Semester		
Code: 80202	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB					L	T	P
Credits: 1	(Common for CE, ME and Min.E)					-	-	2

Course Objective: To get practical

knowledge about basic electrical circuits, electronic devices like Diodes, BJT, JFET and also analyse the performance of DC Motors, AC Motors and Transformers.

List of Experiments:

1. Verification of Kirchhoff's Laws.
2. Verification of Maximum Power Transfer Theorem.
3. Determination of Phase Angle for RC series circuit.
4. Brake Test on DC-Shunt Motor. Determination of Performance curves
5. Load Tests on Single Phase Transformer
6. Brake Test on Three Phase Induction Motors. Determination of Performance curves
7. V-I Characteristics of PN junction Diode
8. V-I Characteristics of Zener Diode
9. Half Wave Rectifier and Full Wave rectifier.
10. Input and Output characteristics of BJT with CE configuration
11. Input and Output characteristics of BJT with CB configuration
12. Input and Output Characteristics of JFET.

Course Outcomes:

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

1. Analyse electrical circuits by applying basic laws
2. Analyse the performance of DC Motor, three phase Induction motor and transformer
3. Understand V-I Characteristics of various diodes
4. Design Different Rectifier Circuits
5. Differentiate the Transistors and their Operations

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO1	3	3	3	3					3			3			
CO2	3	3	3	3					3			3			
CO3	3	3	3	3					3			3			
CO4	3	3	3	3					3			3			
CO5	3	3	3	3					3			3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)											B.Tech. I Semester		
Code: 80305	ENGINEERING MECHANICS LAB (Common for CE, ME and Min.E)											L	T	P
Credits: 1												-	-	2

Course Objectives:

The objective of this subject is to provide the basic concept of force, moment of inertia, reaction and moments by practically.

List of Exercises

1. Verify the triangle law and polygon law of forces.
2. To find the equilibrium of coplanar concurrent force system-forces in the jib crane.
3. To determine the support reaction for a beam.
4. To determine the moment of inertia of a flywheel.
5. To verify the law of moments by disc apparatus.
6. To determine the coefficient of friction.
7. To verify the equilibrium of Non Concurrent forces.
8. To verify the equilibrium of forces using force table.
9. To determine the efficiency of a simple screw jack apparatus.
10. To estimate the value of acceleration due to gravity by using compound pendulum.
11. To determine the efficiency of Worm and Worm Wheel apparatus.
12. To determine the efficiency of a Differential Wheel and Axle apparatus.

Course Outcomes

At completion of the course, students will be able to

1. Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
2. Apply basic knowledge of mathematics and physics to solve real-world problems.
3. Determine the coefficient of friction.
4. Determine the efficiency of a simple screw jack apparatus, Worm and Worm Wheel apparatus and Differential Wheel and Axle.
5. Estimate the value of acceleration due to gravity.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)											PSOS			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	3					3			2	2		

CO2	3	1	1	3					3			2	2		
CO3	3	1	1	3					3			2	2		
CO4	3	1	1	3					3			2	2		
CO5	3	1	1	3					3			2	2		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: 80302	ENGINEERING GRAPHICS LAB (Common for CE, ME and Min.E)	L	T	P
Credits: 1		-	-	2

Course Objective
s:
To devel

op student's skill in Computer graphics for communicating the concepts and ideas in Engineering products by using drafting software.

List of Exercises

Any 12 exercises out of fourteen should be done by using drafting software

1. Drawing of basic drawing elements and Regular polygons.
2. Drafting projections of lines- parallel, perpendicular, inclined to one reference plane.
3. Drafting projections of lines - inclined to both reference planes.
4. Drafting projections of lines inclined to both reference planes - obtaining true length.
5. Drafting Projections of planes – Surface inclined to one reference plane.
6. Drafting of regular solids - cube, prism, pyramid, cylinder and cone.
7. Drafting projection of solids inclined to one plane.
8. Drafting projection of section of solids - cutting plane inclined to one plane.
9. Drafting development of surface of regular solids - prism
10. Drafting development of surface of regular solids - cylinder, cone
11. Drafting Isometric Projection – Isometric Views- Plane Figures
12. Drafting Isometric Projection – Isometric Views- Simple Solids.
13. Conversion of Isometric Views to Orthographic Views.
14. Conversion of Orthographic Views to Isometric Views.

Course Outcomes:

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

1. Draft basic drawings elements.
2. Draw the projection of points, lines and planes on Cartesian coordinates using drafting software.
3. Draw the projection solids on Cartesian coordinates using drafting software.
4. Develop surfaces of regular solids, sectional solids and solids inclined to one axis using drafting software.
5. Convert and develop the isometric views on to orthographic projections using drafting software.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1		3				2	3		2			

CO2	3		1		3				2	3		2			
CO3	3		1		3				2	3		2			
CO4	3		1		3				2	3		2			
CO5	3		1		3				2	3		2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)						B.Tech. I Semester		
Code: 80A01	NSS / SPORTS / YOGA						L	T	P
Credits: NIL	(Common for CE, ME and Min.E)						-	-	3

Prerequisites: NIL

Course Objectives: To develop physical skills and fitness specific to a particular sport. Provide them the training and coaching towards achieving their group goals. To give the students health and physical fitness to ensure mental and emotional balance. NSS (**National Service Scheme**) provides ample opportunities for the students to participate in the community service programs. To encourage them to become socially and environmentally sensitive, empathetic and responsible individuals of the nation.

MODULE-I

6 Periods

Introduction and Basic concepts of NSS: History, Philosophy, aims & Objectives of NSS, Emblem, Motto, Song and Other Components of NSS, **NSS Programmes and Activities- Concept of regular activities**, Special camping, Day camps. Basis of adoption of villages/ slums & methodology of survey.

MODULE-II

6 Periods

Volunteerism and Shramdan- needs & Importance of Volunteerism, Motivation and Constraints of Volunteerism, Shramdan as a part of Volunteerism.

MODULE-III

6 Periods

Introduction of physical education: Importance of physical education, Athletics (Track events and combined events), Basket ball, Throw ball, Foot ball.

MODULE-IV

6 Periods

Youth and yoga- yoga as a tool for healthy lifestyle, Yoga as a preventive, promotive & curative method. Pranayam and Different Yoga traditions and their impacts.

Various competitions at different levels- Athletics (field events), volleyball, handball, cricket. Indoor games: Table Tennis, Caroms, chess

MODULE-V

6 Periods

Environmental Issues- Natural Resource Management (Rain water Harvesting, energy conservation etc.). Waste Management, Disaster Management- Role of youth in Disaster Management.

Civil / Self Defense- Aims and objectives of Civil defense and need for self-defense training.

Text Books:

1. Christopher G. Petre, “**Social Work with Children and Their Families: Pragmatic Foundations**“, Journal Vol:24, No.3, September 18th, 2003, 2nd Edition.

References:

1. Pamela Grundy & Susan Shackelford, “**Shattering the Glass: The Remarkable History of Women in Basketball**” Published 15th May, 2007.
2. Roger Kahn, “**The Boys of Summer**”, 1st Edition, May 9th 1973.
3. Jaci Burton, “**Perfect Play**”, 1st Edition, Feb 1st 2011, series 1.
4. Silva Mehta, Mira Mehta and Shyam Mehta, “**Yoga: The Iyengar Way**”, Published by Knopp, 7th April, 1990.
5. Vishnu-Devananda, “**The Complete Illustrated Book of Yoga**”, 18th April, 1995.
6. Timothy McCall, “**Yoga as Medicine: The Yogic Prescription for Health and Healing**”, published by Harmony, 31st July 2007.
7. Rashmi Bansal, “**Stay Hungry Stay Foolish**”, 1st December 2008.
8. Beverly Schwartz, “**Rippling: How Social Entrepreneurs Spread Innovation Throughout the World**”, Published by Jossey – Bass, May 27th 2012.

E-Resources:

1. <http://nptel.ac.in/courses/109106059/11>
2. <http://nptel.ac.in/courses/109106059/12>
3. <http://nptel.ac.in/courses/109106059/13>
4. <http://nptel.ac.in/courses/109106059/14>

Course Outcomes

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

1. Understand the concepts of National Service Scheme (NSS) and its activities.
2. Gain the essence of volunteerism and shramdan
3. Understand the rules and procedures of physical education and its events.
4. Learn the basics of yoga and its benefits to the youth in personality development.
5. Gain the knowledge of managing the environmental issues and self-defense activities.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
COS	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						2		2	2			
CO2						2		2	2			
CO3						2		2	2			
CO4						2		2	2			
CO5						2		2	2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester
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Code: 80H01	ENGLISH (Common for CE, ME and Min.E)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objectives:

The objective of this course is to improve the English Language competency of the students, which emphasizes on all language components namely grammar, vocabulary, prose, short stories. Further, it also helps in developing the skills of Reading and Writing. As a result students are equipped to study the academic subjects more effectively using the theoretical and practical components of the English syllabus.

MODULE – I: 10 Periods

- Essay** : “Minimalism—Live a Meaningful Life” by Joshua Millburn and Ryan Nicodemus
- Poem** : “Road Not Taken” by Robert Frost
- Vocabulary** : Formation of Words, Prefixes, Suffixes, and Root Words
- Grammar** : Articles and Prepositions
- Reading** : Skimming and Scanning
- Writing** : Introduction to Writing Skills, Characteristics of Effective Writing

MODULE - II: 10 Periods

- Essay** : “Knowledge Society” an excerpt from *Ignited Minds* by A.P.J Abdul Kalam
- Poem** : “Life” by Sarojini Naidu
- Vocabulary** : Homonyms, Homophones, Homographs
- Grammar** : Sentence Structures, Voice – Exercises
- Reading** : Intensive Reading and Extensive Reading
- Writing** : Paragraph Writing- use of cohesive devices; Arranging Jumbled Sentences into Paragraph and Punctuation

Module - III: 10 Periods

- Short Story** : “ Half a Rupee Worth” by R.K Narayan .
- Poem** : “ If” by Rudyard Kipling
- Grammar** : Tense, Aspect and Concord
- Vocabulary** : Idiomatic Expressions; Phrasal Verbs
- Reading** : Reading for Theme and Gist.
- Writing** : Essay Writing, Describing, Defining and Classifying

MODULE - IV: 9 Periods

- Biography** : “Jesse Owens”
- Poem** : “I too Sing America” by Langston Hughes
- Grammar** : Question Tags; Degrees of Comparison
- Vocabulary** : One Word Substitutions; Synonyms and Antonyms
- Reading** : Reading for Interpretation

Writing : Letter Writing- Both Formal and Informal

Module - V:

9 Periods

Essay : “ Pecuniary Independence” by P.T Barnum

Poem : “ Human Family” by Maya Angelou

Grammar : Direct and Indirect Speech, Misplaced Modifiers

Vocabulary : Integrated Exercises in Vocabulary

Reading : Reading for Specific Purposes, Reading Comprehension

Writing : Summarizing, Redundancies and Clichés

* Exercises from the texts not prescribed shall also be used for classroom tasks.

Text books:

1. T.V.Surendranatha Reddy, B.Vijay Kumar and K.James. “**Effective English**”, First Edition, Maruthi Publications, 2017.

References:

1. Azar, Betty and Stacy A, Hagen, *Understanding and Using English Grammar*, Foundation Books, 4th Edition, 2009.
2. Chaudhuri, Santanu Sinha, *Learn English: A Fun Book of Functional Language, Grammar and Vocabulary*, New Delhi: Tata McGraw Hill Education, , Paper Back Edition. 2013.
3. Eastwod, John: *Oxford Guide to English Grammar*, Oxford University Press, 4th Edition, 1994.
4. Field, Marion, *Improve Your Written English*, Kindle books, 5th Edition, 2009.
5. G. Leech and J. Svartvik , *A Communicative Grammar of English*, London: Longman, 3rd Edition, 2002.

E-Resources:

1. <http://www.slideshare.net/aszardini/word-formationroot-words-prefixes-and-suffixes>
2. <http://www.scribd.com/doc/37085980/Circulars-Circular-Letters-Notices-Memo#scribd>.
3. <http://www.zsme.tarnow.pl/jezykiobce/wp-content/uploads/2013/11/writing-letters1.pdf>.

Course Outcomes:

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

- 1: Use English considerably well in written and spoken.
- 2: Enrich language accurately and fluently.
- 3: Employ extensive and intensive reading skills

4: Gain confidence in using English language and skills for writing in real life situations.

5: Use standard grammar, punctuation, and spelling in documents.

CO- PO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								2	2	3					
CO2										3	2				
CO3		1	1												
CO4							1	2		2		2			
CO5		1	2				1			2					

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: 80B06	ENGINEERING MATHEMATICS - II (Common for CE,EEE,ME,ECE,CSE ,IT and Min.E)	L	T	P
Credits: 4		3	1	-

Prerequisites: Basics of Calculus

Course Objectives: To learn

- Methods of solving the differential equations of first and higher order.
- Evaluation of multiple integrals and their applications
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables

Module - I: First Order ODE

13 Periods

Exact, linear and Bernoulli's equations; Applications: Newton's law of cooling, Law of natural growth and decay; Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Module - II: Ordinary Differential Equations of Higher Order

13 Periods

Rules for finding Complementary function-Particular integral (Non-homogeneous term of the type e^{ax} , $\sin bx$ / $\cos bx$, x^n , $e^{ax}V(x)$, $x^nV(x)$ only), Method of variation of parameters. Equations reducible to constant coefficients - Cauchy - Euler and Legendre's equations.

Module - III: Multivariable Calculus

12 Periods

A:Definitions of Limit and continuity. Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence & independence.

B:Maxima and minima of functions of two variables and three variables using Lagrange's method of undetermined multipliers.

Module - IV: Multiple Integrals

13 Periods

Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Module - V: Vector Calculus

13 Periods

Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Scalar potential functions. Solenoidal and Irrotational vectors. Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edit ion, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002

References

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

E-Resources

1. <https://www.math.ust.hk/~machas/differential-equations.pdf> (Differential equations)

2. <http://www.staff.ttu.ee/~lpallas/multipleintegrals.pdf> (Multiple Integrals)
3. <http://www.mecmath.net/calc3book.pdf> (Vector Calculus)
4. <http://www.sciencedirect.com/science/article/pii/0022247X7690216X>(Multiple Integrals)
5. <http://nptel.ac.in/courses/122107037/20> (Differential Equations of first order and first degree)
6. <http://nptel.ac.in/courses/122104017/28> (Multiple Integrals)

Course Outcomes

At the end course, students will be able to

1. Identify whether the given differential equation of first order is exact or not
2. Solve higher differential equation and apply the concept of differential equation to real world problems
3. Determine extreme values of a function
4. Evaluate the multiple integrals and apply the concept to find areas, volumes.
5. Evaluate the line, surface and volume integrals and converting them from one to another.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2			2	2		3			
CO2	3	3	3	3	2	2			2			3			
CO3	3	3	3	3	2	2			2	2		3			
CO4	3	3	3	3	3				2			3			
CO5	3	3	3	3	2	3			2	2		3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B.Tech. II Semester		
Code: 80B07	Engineering Physics			L	T	P
Credits: 4	(Common to CE,ME and Min.E)			3	1	-

Prerequisites: Fundamentals of Physics

Course Objectives:

The main objective of this course is to provide the basic physics principles, would help engineers to understand the tools and techniques used in the industry and provide the necessary foundations for inculcating innovative approaches. This would create awareness about the vital role played by science and engineering in the development of new technologies.

Module -I Waves & Oscillations

12 periods

Waves-Mechanical and electrical simple harmonic oscillators Damped harmonic Oscillator: heavy, critical and light damping, Energy decay in damped harmonic oscillator, Quality factor, Mechanical and electrical oscillators, Mechanical and electrical impedance

Module –II Wave optics

12 periods

Huygens' principle, superposition of waves and interference of light by division of wave front and division of amplitude; Young's double slit experiment, Interference in thin films due to reflected light, Newton's rings: Concept of diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction from a single slit and double a slit; Diffraction grating-resolving power

Module -III Dielectric Properties of Materials

14 Periods

A: Electric dipole, Dipole moment, Dielectric constant, Polarizability, Electric Susceptibility, Displacement Vector, Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities - Electronic and ionic.

B: Qualitative treatment of Internal Fields in solids, Clausius - Mossotti Equation, Piezo-electricity, Ferro- electricity, Barium titanate, Applications of Ferroelectric materials.

Module – IV Lasers and Fiber Optics

14 periods

Lasers: Characteristics of LASER, relation between Einstein's coefficients. Population Inversion, lasing action, Ruby Laser, He- Ne Laser, applications of Lasers.

Fiber Optics: Introduction, Optical fiber as a dielectric wave guide, Total Internal Reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibers, Losses associated with optical fibers, Applications optical fibers.

Module - V Magnetic Properties of materials

12 Periods

Introduction, origin of magnetic moment, Bohr magneton, classification of dia, para and ferro magnetic materials, hysteresis curve, soft and hard ferromagnetic materials, properties of anti-ferro and ferri magnetic materials. Concept of Perfect Diamagnetism; Meissner effect.

Text Books:

1. M N Avadhanulu, P G Kshirsagar, "A Textbook of Engineering Physics", Revised Edition 2014.
2. K Vijaya Kumar, S Chandralingam, "Modern Engineering Physics" Volume I & II, S. Chand, 1st Edition, 2017.

References:

1. P K Palanisamy, "Engineering Physics", 4th Edition, SciTech Publications, 2014.
2. G Prasad and Bhimashankaram, "Engineering Physics", B S Publications
3. M.K.Verma, "Introduction to Mechanics", Universities Press.
4. Ajoy Ghatak, "Optics", McGraw-Hill Education, 2012

E-Resources

1. http://www.gistrayagada.ac.in/gist_diploma/PHYSICS-StudyMaterial.pdf
2. <http://www.faadooengineers.com/threads/3300-Applied-Physics-Ebooks-pdf-free-download?s=1b6cb6b1de4e7152298bd9d60156cd11>
3. <http://aip.scitation.org/journal/jap>
4. <http://www.springer.com/physics/journal/340>

5. <http://nptel.ac.in/courses/115101005/1>
6. <http://nptel.ac.in/courses/115106061/13>

Course Outcomes:

After completion of the course students will be able to:

1. Distinguish free, damped and forced vibrations,
2. Be aware of the concepts of Interference, diffraction and its applications.
3. Understand the importance of Dielectrics and their properties.
4. Be aware of the concepts and applications of LASER and Optical fibers.
5. Distinguish ferro, ferri and anti-ferro magnetic materials and understands different types of superconductors.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1												
CO2	2	2	1												
CO3	3	2	2												
CO4	3	1	2												
CO5	3	2	2												

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B.Tech. II Semester		
Code: 80501	PROGRAMMING FOR PROBLEM SOLVING (Common for CE, ME and Min.E)			L	T	P
Credits: 3				3	-	-

Prerequisites: NIL

Course Objectives:

This course provides the fundamental concepts of computers and introduce to the students to the field of programming using C language, apply the control structures, iterations statements, arrays, functions, strings, pointers, structures, unions and files. This course also explains the concepts of searching and sorting techniques in C language.

MODULE I: Fundamentals and Introduction to ‘C’ Language 11 Periods

Fundamentals: Hardware, Software, Programming languages, Number Systems, Translators, Introduction to Operating System, Program Development steps - Algorithm, Flow charts.

Introduction to ‘C’ Language: History, Simple C Program, Identifiers, Preprocessor Directives- Include and define, Basic data types, User-defined data types, Variables, Constants, Type qualifiers,

Managing Input / Output, Operators, Precedence and Associativity, Expression Evaluation, Type conversions, Simple 'C' Programming examples.

MODULE II: Control Statements & Arrays

09 Periods

Control Statements: Conditional statements- if and switch statements, ternary operator?., Loop Control Statements – while, for, do-while, break, continue and goto statements.

Arrays: Basic concepts, One-dimensional arrays, Two-dimensional arrays, Multi-dimensional arrays.

MODULE III: Strings & Pointers

09 Periods

A: Basic concepts, String Input / Output functions, Arrays of strings, String handling functions.

B: Basic concepts, Pointer arithmetic, Pointers and strings, Pointers and arrays, Dynamic Memory Allocation.

MODULE IV: Functions & Derived Types

09 Periods

Functions - Basics, User defined functions, Inter function communication, Library functions, Storage Classes-auto, register, static, extern, Scope rules, Array and string manipulations using functions, Recursive functions, Pointers and functions.

Derived types - Structures – Basic concepts, Nested structures, Arrays of structures, Structure manipulations using functions, Pointers to structures, Self-referential structures, Unions, bit fields

MODULE V: File I/O, Sorting and Searching

10 Periods

File I/O: Basic concepts, Text files and Binary files, File input / output operations, File status functions (error handling), Command-Line Arguments, C programming examples.

Sorting and Searching: Sorting - selection sort, bubble sort, insertion sort, searching - linear and binary searching methods.

TEXTBOOKS

1. Pradip Dey, Manas Ghosh, “**Programming in C**”, Oxford University Press, 2nd Edition, 2011.
2. E. Balagurusamy, “**Computer Programming in C**”, Tata McGraw Hill, 1st Edition, 2013.

REFERENCES

1. Brian W. Kernighan, Dennis M. Ritchie, “**The C Programming Language**”, PHI, 2nd Edition, 1990.
2. Greg Perry and Dean Miller, “**C Programming Absolute beginner's guide**”, QUE Publishers, 3rd Edition, 2013.
3. Paul Deitel and Harvey Deitel, “**C How to Program**”, PHI, 7th Edition, 2012.
4. Behrouz A. Forouzan, E.V.Prasad, Richard F. Gilberg, “**C programming: A Problem- Solving Approach**”, Cengage Learning Press, 1st Edition, 2011.

E-RESOURCES

1. [http://oxford.universitypress.ac.in/eBooks/ Programming in C](http://oxford.universitypress.ac.in/eBooks/Programming%20in%20C).
2. <https://www.journals.elsevier.com/science-of-computer-programming>
3. <http://www.ejournalofsciences.org>
4. http://onlinecourses.nptel.ac.in/iitk_cs-101
5. <http://onlinevideolecture.com/ebooks/?subject=C-Programming>

Course Outcomes:

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

1. Understand the basic terminology, write, compile and debug programs in computer programming.
2. Apply different types of control structures and arrays in a computer programming.
3. Develop programs that make use of concepts such as strings and pointers in C language.
4. Compare parameter passing techniques, structures and unions in computer programming.
5. Analyze file operations, searching and sorting methods.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	2	2											
CO2			3		2										
CO3		2	2		2										
CO4			3		3										
CO5		2	2		3										

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B.Tech. II Semester		
Code: 80H02	ENGLISH LANGUAGE LAB			L	T	P
Credits: 1	(Common for CE, ME and Min.E)			-	-	2

Course Objectives:

To sensitize the students to the intelligibility in their pronunciation of English, speech sounds, word accent, intonation and rhythm. It also helps to improve the fluency in spoken English and make them aware of nuances of major skills, viz listening and speaking skills. Hence it helps to train the students to understand nuances of both verbal and non verbal communication during all activities. The purpose of this course is to develop confidence levels of the students and to face the audience and participate in public speaking.

Listening Skills:

Objectives:

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language to be able to recognize them, awareness regarding stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives:

1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.

- Oral practice
- Describing objects/situations/people
- Just A Minute (JAM) Sessions.

a. Computer Assisted Language Learning (CALL) Lab

b. Interactive Communication Skills (ICS) Lab

The following course content is prescribed for the English Language Communication Skills Lab

Module - I:

CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants

ICS Lab: Ice-Breaking activity and JAM session

Listening: listening for sounds in context, for ideas.

Speaking: ideation and translation of ideas into sentences.

Module - II:

CALL Lab: Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.

ICS Lab: Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette.

Listening: listening for specific purposes, for details.

Speaking: speaking in the above situations with clarity, connectivity, maintaining voice characters.

Module - III:

CALL Lab: Word accent and Listening Comprehension-reading(aloud) meaningfully.

ICS Lab: Descriptions- Narrations- Giving Directions and guidelines.

Listening: listening for intelligible English

Speaking: formal and informal conversations, register.

Module - IV:

CALL Lab: Intonation and Common errors in Pronunciation- reading aloud(evaluating through recording).

ICS Lab: Extempore- Public Speaking, Oral Presentation Skills

Listening: note taking and listening for speaker's tone/attitude

Speaking: organizing, connecting ideas and sentences, short forms in spoken English, errors in spoken English

Module - V:

CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice

ICS Lab: Information Transfer, Debate

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

REFERENCES:

1. Gairns ,Ruth and Redman , Stuart: *Oxford Word Skills, Learn and Practice English Vocabulary*, 2nd Edition, 2008.
2. Hughes , John and Mallett , Andrew: *Successful Presentations: DVD and Student's Book Pack: A Video Series Teaching Business Communication Skills for Adult Professionals*
3. Hamcock, *English pronunciation in use* (Intermediate),Cambridge university Press,2009
4. Karia , Akash: *Public Speaking Mastery, Speak Like a Winner* , Kindle Edition, 2013.
5. Lucas, Stephen: *The Art of Public Speaking”* : Tata McGraw Hill, 11th Edition, 2011.

E - RESOURCES:

1. <http://www.mindtools.com/CommSkill/ActiveListening.htm>
2. <http://www.slideshare.net/alisonkis/dialogue-and-roleplay-activity>
3. [http://www.hse.ru/pubs/lib/data/access/ram/ticket/2/14309868938d576a532b71360b7354268380727a22/An%20article%20for%20Monika%20\(2010\).pdf](http://www.hse.ru/pubs/lib/data/access/ram/ticket/2/14309868938d576a532b71360b7354268380727a22/An%20article%20for%20Monika%20(2010).pdf)

Course Outcomes:

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

1. Understand the nuances of language through audio- visual experience and group activities
2. Neutralize the accent for intelligibility
3. Realize the importance of listening skills and speaking skills and their application in real life situations.
4. Recognize significance of non-verbal communication and develop confidence to face audience and shed inhibitions.
5. Speak with clarity and confidence thereby enhance employability skills of the students.

CO- PO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		1				1		1	2	2		1			
CO2										1		1			
CO3							1		1	2		2			
CO4								1	1	2		2			
CO5										2		2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: 80B08	ENGINEERING PHYSICS LAB (Common for CE, ME and Min.E)	L	T	P
Credits: 1		-	-	2

Course objectives:

The main objective of this course is to provide the necessary exposure to the practical aspects, which is an essential component for learning science.

List of Experiments:

- 1. Melde's Experiment – Longitudinal and Transverse modes.**
To determine frequency of electrically maintain Tuning fork using Melde's apparatus
- 2. RLC series circuit :**
To determination of resonant frequency, bandwidth and quality factor.
- 3. Newton's Rings Experiment**
To determine the wavelength of Monochromatic light using Newton's Ring's Experiment.
- 4. Numerical Aperture of an Optical Fiber**
To determine the Numerical aperture of the given fiber
- 5. Bending loss of the given fiber.**
To determine the bending loss of the given fiber.
- 6. Diffraction grating**
To determination of the wavelength of Sodium vapour lamp.
- 7. B-H Curve.**
To study the Magnetization of Ferro magnetic material in presence of magnetic field
- 8. Dispersive Power:**
To determine the dispersive power of glass prism
- 9. LASER**
To determination of pitch of the screw gauge using LASER.
- 10. Torsional Pendulum**
To determine the rigidity modulus of a given wire.
- 11. Sonometer**
To verify the frequency of AC power supply
- 12. Michelson interferometer (Demonstration only)**
To observe the Optical interference pattern.

Course Outcomes:

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

1. Develop skills to impart practical knowledge in real time solution.
2. Understand principle, concept, working, application and comparison of results with theoretical calculations.
3. Design new instruments with practical knowledge.
4. Understand measurement technology.
5. Use new instruments and real time applications in engineering studies.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1												
CO2	3	1	1												
CO3	3														
CO4	3														
CO5	3														

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: 80502	PROGRAMMING FOR PROBLEM SOLVING LAB (Common for CE, ME and Min.E)	L	T	P
Credits: 1		-	-	2

Course Objectives:

This course provides the fundamental concepts of programming using C language, apply the control structures, iterations statements, arrays, functions, strings, pointers, structures, unions and files. This course also explains the concepts of searching and sorting techniques in C language.

Software Requirements: Turbo C

List of Programs:

1. a. Practice various Internal and External DOS Commands.
b. Implement various programs logics using algorithms and flowcharts.
c. Write sample examples of C programs to implement basic operations.
2. a. Write a C program to find smallest and largest of given three numbers.
b. Write a C program to find the roots of a quadratic equation.
3. a. Write a C program to find the sum of individual digits of a positive integer.
b. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.
c. Write a C program to generate the first n terms of the sequence.
4. a. Write a C program to find whether the given number is palindrome, perfect, Armstrong or strong.
b. Write a C program to generate all the prime numbers between n1 and n2, where n1 and n2 are values supplied by the user.
5. Write C programs that use both recursive and non-recursive functions
a. To find the factorial of a given integer.
b. To find the GCD (greatest common divisor) of two given integers.
6. a. Write a C program to find both the largest and smallest number in a list of integers.
b. Write a C program that uses functions to perform the following:
 - i. Addition of Two Matrices
 - ii. Multiplication of Two Matrices
7. a. Write a C program that uses functions to perform the following operations:
 - i. To insert a sub-string into given main string from a given position.
 - ii. To delete n characters from a given position in a given string.
b. Write a C program to determine if the given string is a palindrome or not
c. Write a C program to find substring in a given string.
d. Write a C program to count the lines, words and characters in a given text.
8. a. Write a C program to implement functions arguments with different returns values.
b. Write a C program to implement call by value and call by reference using functions.

- 9 a. Write a C program to find grades of a student's using structures and unions.
- b. Write a C program to implement nested structures.
- 10 a. Write a C program which copies one file to another.
- b. Write a C program to command line arguments.
- 11 a. Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search.
- b. Write a C program that uses recursive and non -function to search for a Key value in a given sorted list of integers using Binary search.
- 12 a. Write a C program that implements the Selection sort method to sort a given array of integers in ascending order.
- b. Write a C program that implements the Bubble sort method to sort a given list of names in ascending order.

Text Books

1. PradipDey, ManasGhosh, "**Programming in C**", Oxford University Press, 2nd Edition, 2011.
2. E.Balaguruswamy, "**Computer Programming in C**", Tata McGraw Hill, 1st Edition, 2013.

References

1. Brian W. Kernighan, Dennis M. Ritchie, "**The C Programming Language**", PHI, 2nd Edition, 1990.
2. Greg Perry and Dean Miller, "**C Programming Absolute beginner's guide**", QUE Publishers, 3rd Edition, 2013.
3. Paul Deitel and Harvey Deitel, "**C How to Program**", PHI, 7th Edition, 2012.
4. Behrouz A. Forouzan, E.V.Prasad, Richard F.Gilberg, "**C programming: A Problem- Solving Approach**", Cengage Learning Press, 1st Edition, 2011.

Course Outcomes:

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

1. Analyze concepts in problem solving do programming in C language and write diversified solutions using C language.
2. Identify situations where computational methods and computers would be useful.
3. Understand the programming tasks using techniques learned and write pseudo-code.
4. Compare the program on a computer, edit, compile, debug, correct, recompile and run it.
5. Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

CO- PO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO1		2	3	2											
CO2			3		2										
CO3		2	2		2										
CO4			3		3										
CO5		2	2		3										

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: 80303	ENGINEERING WORKSHOP	L	T	P

Credits: 1	(Common for CE, ME and Min.E)	-	-	2
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Course Objectives:

To understand the usage of hand tools, acquire the skills in model / pattern making and familiarize with various work materials and tools.

I. Trades for Exercises:

At least two exercises from each trade:

- | | | |
|-----------------|------------|----------------|
| 1. Carpentry | 2. Fitting | 3. Tin-Smithy |
| 4. House-wiring | 5. Foundry | 6. Arc welding |

II. Trades for Demonstration & Exposure

1. Machine shop
2. Plumbing
3. Wood working lathe
4. Identification of Electronic Components
5. Black smithy
6. Computer Peripherals

Course Outcomes

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

1. Knowledge of carpentry process and methods used in the design and fabrication, installation, maintenance and repair of structures and fixtures (e.g., furniture, cabinets) to accomplish work assignments.
2. Assembling together of part and removing metals to secure the necessary joint by using fitting and welding.
3. Understand the hardware components of house wiring.
4. Understand the manufacturing process using machine shop.
5. Analyze the different types of computer Peripherals

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3				2	2	1		3			3			
CO2	3				2	2	1		3			3			
CO3	3				2	2	1		3			3			
CO4	3				2	2	1		3			3			
CO5	3				2	2	1		3			3			

2018-19 Onwards (MR-18))	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80316	FLUID MECHANICS AND HYDRAULIC MACHINES	L	T	P
Credits: 3	[Common to EEE and Min.E]	3	-	-

Prerequisites: Nil

Course Objectives:

The objective of this subject is to provide the knowledge of fluid power and analyze the performance of various hydraulic machines like turbines, compressors and pumps.

MODULE I: Fluid statics

10 Periods

Dimensions and units: physical properties of fluids- specific gravity, viscosity surface tension- vapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers.

Hydro static forces on plane and curved surfaces. Buoyancy and floatation: Meta center, stability of floating body, Submerged bodies, Calculation of metacentric height.

MODULE II: Fluid Kinematics & Fluid Dynamics

10 Periods

Fluid kinematics: Stream line, path line and streak lines and stream tube, classification of flows- steady & unsteady, uniform & non uniform, laminar & turbulent, rotational and irrotational flows-equation of continuity for one dimensional flow. Velocity potential and stream function – flow net.

Fluid dynamics : Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, Measurement of flow: pitot tube, venturimeter and orifice meter, Flow nozzle, Turbine flow meter, momentum equation and its application on pipe bend.

MODULE III: Closed Conduit Flow & Boundary Layer Concepts

10 Periods

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

B: Boundary Layer Concepts: Definition, thickness, characteristics along thin plate, laminar and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.

MODULE IV: Turbo machinery and Hydraulic Turbines

09 Periods

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

Hydraulic Turbines : Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, workdone, efficiencies, hydraulic design – draft tube theory - functions and efficiency. Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

MODULE V: Centrifugal Pumps & Reciprocating Pumps

09 Periods

Centrifugal pumps: Classification, working, workdone – manometric head- losses and efficiencies specific speed- pumps in series and parallel-performance characteristic curves, NPSH.

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

TEXT BOOKS

1. Modi and Seth, “**Hydraulics, fluid mechanics including hydraulic machines**”, Standard Publishers, 19th Edition, 2013
2. R.K. Bansal, “**Fluid Mechanics and hydraulic Machines**”, Laxmi Publications, 9th Edition, 2010.

REFERENCES

1. R.K. Rajput, “**Fluid Mechanics and Hydraulic Machines**”, S.Chand, 5th Edition, 2013.
2. D. Rama Durgaiyah, “**Fluid Mechanics and Machinery**”, New Age International (P) Ltd, 1st editions, 2007
3. James W. Dally, William E. Riley “**Instrumentation for Engineering Measurements**”, John Wiley & Sons Inc. 3rd editions, 1989.
4. Vijay Gupta and S.K.Gupta, “**Fluid Mechanics and Applications**”, New-Age International Ltd. 1999.
5. Banga & Sharma, “**Hydraulic Machines**”, Khanna Publishers, 7th Edition, 2007

E - RESOURCES

1. nptel.ac.in/courses/112105183/
2. www.nptelvideos.in/2012/11/fluid-mechanics.htm
3. nptel.ac.in/courses/112104117/
4. www.sanfoundry.com/best-reference-books-fluid-mechanics-and-machinery/
5. <https://www.elsevier.com/journals>

Course Outcomes:

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

1. Know the dimension and units of fundamental properties.
2. Understand the concept of fluid kinematics and dynamics.
3. Understand and solve the problems of closed conduit flow & boundary layer concepts.
4. Analyze the performance of turbo machinery and hydraulic turbines.
5. Understand the principles of centrifugal and reciprocating pumps.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		3	2	1						3	3		
CO2	3	3		3	2	1						3	3		
CO3	3	3		3	2	1						3	3		
CO4	3	3		3	2	1						3	3		
CO5	3	3		3	2	1						3	3		

2017-18 Onwards	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech III Semester
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(MR-18)				
Code: 80239	ELECTRICAL MACHINES AND CONTROLS	L	T	P
Credits: 3		3	-	-

Prerequisite: Nil

Course Objectives:

To impart knowledge on Basics of electric drives, Different speed control methods, various motor starters and controllers, instrumentation and its applications.

MODULE-I: Introduction

10 Periods

Fundamentals of electric drives – advances of electric drive-characteristics of loads – different types of mechanical loads – choice of an electric drive – control circuit components: Fuses, switches, circuit breakers, contactors. Relay – control transformers.

MODULE-II: Speed Control Of Dc Machines

10 Periods

DC shunt motors – Speed Torque characteristics - Ward Leonard method, DC series motor – series parallel control – solid state DC drives – Thyristor bridge rectifier circuits chopper circuits.

MODULE-III: Speed Control Of Ac Machines

10 Periods

A: Induction motor – Speed torque Characteristics – pole changing, stator frequency variation - slip-ring induction motor – stator voltage variation - Rotor resistance variation,

B: Slip power recovery – basic inverter circuits- variable voltage frequency control.

MODULE-IV: Motor Starters And Controllers

09 Periods

DC motor starters using voltage sensing relays, current sensing relays and time delay relays - wound rotor induction motor starters – starters using frequency sensing relays -DOL -starter

MODULE-V: Instrumentation

09 Periods

Flame proof equipments, intrinsically safe equipments,
Dissolved O₂ Analyzer: Conductivity meter – pH meter – Dissolved oxygen analyser – Silica analyser – Turbidity meter – Gas analyser – NOx analyser – H₂S analyser – CO and CO₂ monitor, Dust & Smoke measurement.

TEXT BOOKS:

1. N.K De and P .K Sen ‘Electric Drives’ Prentice Hall of India Private Ltd, 2002.
2. Vedam Subramaniam ‘Electric Drives’ Tata McGraw Hill , New Delhi,2007
3. G.K.Dubey. ‘Fundamentals of Electrical Drives’ Narosa, Second Edition.
4. Alan S. Morris. Principles of Measurement and Instrumentation, Print ice-Hall of India Pvt., Ltd. New Delhi, 1999.
5. Ernest O Doebelin. Measurement Systems Application & Design, Tata McGraw Hill Publishing Co., New. Delhi, 1999

REFERENCES:

1. S.K Bhattacharya, Brinjinder Singh 'Control of Electrical Machines' New Age International Publishers,2002.
2. John Bird 'Electrical Circuit theory and technology' Elsevier, First Indian Edition, 2006.
3. Murthy, D.V.S. Transducers and Instrument and Instrumentation, Prentice Hall of India Pvt. Ltd. New Delhi.
4. Liptak B.G. Instrumentation Engineers Hand Book (Measurement), Chilton Book Co., 1994.

E - Resources

1. <https://www.electrical4u.com/induction-motor-types-of-induction-motor/>
2. <https://www.eeweb.com/electromechanical>
3. <https://www.electrical4u.com/electrical-drives/>
4. <http://nptel.ac.in/courses/108108077/>
5. <http://nptel.ac.in/courses/108106072/>

Course Objectives:

1. To develop fundamentals of electrical drives and machines
2. Design of speed controls of DC machines
3. Develop of motors and controllers
4. To know about instrumentation.
5. To know deep knowledge about current sensing relays

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	2	2									2			
CO2	3	2	2									2			
CO3	3	2	2									2			
CO4	3	2	2									2			
CO5	3	2	2									2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B. Tech III Semester		
Code: 82501	MINE SURVEYING			L	T	P
Credits: 4				3	1	-

Prerequisite: Basics of Mathematics and Surveying

Course Objectives:

Ability to apply knowledge of mathematics in surveying to calculate areas and volumes for different projects. Ability to identify, formulate and solve problems in the field of advanced surveying. Ability to analyze survey data and design mining engineering projects. Ability to engage in life- long learning with the advances in survey techniques.

MODULE – I: Introduction & Leveling

13 Periods

Overview of Surveying, Objectives, Principles and classifications. Distance and Directions: Distance measurements using conventional methods. Use of chain and compass, meridians, Azimuths and Bearings, declination, computation of angles.

Leveling Instruments – component parts, Temporary and Permanent adjustments – methods of leveling.

MODULE–II:

13 PERIODS

Traversing:

Principles of Traversing, Open and Close traverse using theodolite, Bowditch correction.

Triangulation

Principles of triangulation survey, triangulation using theodolite, basic figures used in triangulation.

MODULE –III: CONTOURING AND THEODOLITE SURVEYING

13 PERIODS

A: Contouring

Characteristics and uses of contours, methods of conducting contour surveys – their plotting. L.S. and C.S. Surveying – their plotting, Calculation of volume from contours.

B: Theodolite Surveying

Theodolite – basic definitions, Temporary and Permanent Adjustments, Measurement of horizontal and vertical angles, Principles of Electronic Theodolite.

Module –IV: Correlation survey

13 Periods

Basics of correlation, verticality of shafts, measurement of depth of shafts, Correlation by Weisbach triangle method, Weisbach quadrilateral method

Setting out curves: types of curves, curve ranging, design and setting out simple curves, surface and underground curves.

MODULE–V: Photogrammetric, Global Positioning System

12 Periods

Principles of photogrammetry, Aerial Photographs, scale of vertical photographs, Terrestrial Photogrammetry. Introduction to Global Positioning System, Application of GPS in mining, Remote Sensing –basic Principles, Application of Remote Sensing. EDM and modern instruments slope and open pit surveys, statutory requirements for mine plans, open pit benches.

TEXT BOOKS:

1. Surveying (Vol-1,2& 3) by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain- Laxmi Publications (P) Ltd., NewDelhi.
2. Surveying and leveling (Vol 1 & 2) – Kanitkar, A.V.G. Prakash
3. Surveying (Vol – 1,2 & 3), by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) Ltd., NewDelhi.
4. Surveying (Vol 1,2& 3), Duggal S.K. Tata Mc.Graw Hill Publishing Co.Ltd. New Delhi,

2004

REFERENCES:

1. Elements of Plane Surveying, Arthur R. Benton and Philip J Taetly, McGrawHill-2000
2. Surveying Vol 1 & 2 & 3, Arora K R Standard Book House, Delhi,2004.
3. Plane Surveying, Chandra A M, New age International Pvt. Ltd., Publishers, New Delhi, 2002.
4. Apply Principles of triangulation survey. Text book of surveying by C. Venkataramaiah, UniversitiesPress.
5. Higher Surveying, Chandra A M. ,New age International Pvt. Ltd. Publisher, New Delhi,2002
6. Surveying and leveling by R. Subramanian, Oxford University Press, NewDelhi

E RESOURCES:

1. <http://www.ism-minesurveying.org/mine-surveying.html>
2. <http://www.minesurveyor.net/>
3. <http://www.pobonline.com/articles/84226-underground-surveying>
4. <http://www.ism-minesurveying.org/mine-surveying.html>
5. <http://www.springer.com/gp/book/9781504123679>

Course Outcomes:

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

- 1:Understand basics and historical methods of survey.
- 2:Understand application Leveling as a part of surveying.
- 3:Understand traversing methods using various survey instruments.
- 4:Understand the fundamentals of triangulation survey.
- 5:Understand contours and using contours for calculations.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	2				1					3	2	2	2
CO2	3	2	2				2		1			2	3	2	1
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2		2	1	2		2			1	3	2	2
CO5	3	2	2				1		1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech III Semester		
Code: 82502	MINING GEOLOGY	L	T	P
Credits: 3		3	-	-

Prerequisite: Under graduate Physics and Chemistry

Course Objectives:

To introduce fundamentals of mining geology to the student emphasizing the importance of properties of rocks, soils and minerals. Course is also aimed at explanation of geology of tunnels, geology of bore hole drilling and excavation.

MODULE-I: Land forms and Mineralogy

10 Periods

Origin or mode of development, characteristic features and engineering considerations of land forms developed by rivers, wind, oceans and volcanoes

Mineralogy: physical and chemical properties, classification of minerals and properties of common silicate minerals, oxides and sulphides.

MODULE-II: Petrology**10 Periods**

Igneous rocks: Magma and lava, extrusive and intrusive forms, classification and description of some common igneous rocks.

Sedimentary rocks: Sedimentation process, classification and description of some common sedimentary rocks

Metamorphic rocks: Process of metamorphism, textures and structures of metamorphic rocks, classification and description of some metamorphic rocks

MODULE-III: Structural Geology and Stratigraphy**A: Structural Geology****10 Periods**

Strike and dip, fundamental type, characteristic features and mechanics of folds, faults, joints and unconformities.

B: Stratigraphy

Principles of stratigraphy, geological time scale.

MODULE-IV: Genesis of Mineral deposits**09 Periods**

Definition of ore, gangue, tenor and grade of ore, processes and formation of ore deposits including coal and petroleum

Mineral Resources of India: Major and minor mineral resources of India, origin and distribution

MODULE-V: Mineral Exploration**09 Periods**

Geological, geophysical and geochemical exploration of mineral deposits, Estimation and determination of mineral reserves by different methods

TEXT BOOKS:

1. Mining Geology by Arogya Swamy, Oxford & IBH Publishing Company ,(1996)
2. Mining Geology by Mc Kinstry, Prentice-Hall

REFERENCES:

1. Mineral Resources of India by Krishna Swamy, Oxford & IBH, 2nd edition (1984)
2. Engineering Geology & Geotechnics by Krynine and Hudd/McGraw-Hill.
3. Economic Mineral Deposits Alan M. Bateman (Author), M.L. Jensen (Editor), John Wiley & Sons Inc; 3rd edition (1979).

E RESOURCES:

1. <http://dmg.kerala.gov.in/>
2. <http://www.mininggeology.ausimm.com.au/>

Course Outcomes:

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

- 1: Know different types of land forms formed by rivers, wind, oceans and volcanoes.
- 2: Know igneous rocks, Sedimentary rocks, and metamorphic rocks.
- 3: Know Structural Geology and Stratigraphy.
- 4: Know Genesis of Mineral deposits and Mineral Resources of India.
- 5: Know Geological, geophysical and geochemical exploration of mineral deposits.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	2				2		1			2	3	2	1
CO3	3	2	2		2		1					2	3	3	2
CO4	3	1	2		2	1	2		2			1	3	2	2
CO5	3	2	2		2				1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech III Semester		
Code: 82503	DEVELOPMENT OF MINERAL DEPOSITS	L	T	P
Credits: 3		3	-	-

Prerequisite: Under graduate Physics, Chemistry and Math's.

Course Objectives:

To demonstrate the importance of mining in national economy, understand the terminology associated with the discipline and be familiar with the available regulatory mechanism to enable safe & sustainable mining operations. To know the history of mining and describe the correlation between the development of mining and cultural progress. To introduce the field of mining and provide basic input about mining unit operations. To learn the various modes of access and study the methods of designing the access.

MODULE-I: Introduction to mining engineering and Opening up of deposits

10 Periods

Significance of mining industry in national economy and infrastructure building, basic mining terminologies, stages in mine life cycle, Economical, Social, Environmental and Health impacts of Mining. Mineral Exploration and Reporting. Geo-technical investigations, Resource estimation. Classification of mining methods and their selection criteria. Opening up of deposits: Types, size and location of entries into underground coal and other minerals.

MODULE-II: Shaft sinking operation

10 Periods

Preliminary geo-technical investigations for a shaft sinking, surface arrangements for sinking shafts and equipment. Methods of sinking shaft in water-logged, pressurized strata in loose and running soils. Mechanized shaft sinking, shaft borers and drop raise method. Need for widening and deepening of operating shafts. Different methods for widening and deepening shafts. Design of shaft insets, pit bottom excavation.

MODULE-III: Development of workings

10 Periods

A: Drivage of cross cuts, drifts, inclines and raises by conventional and mechanized methods. Calculation of OMS.

B: Arrangements for ventilations, supports, lightings, transportations and drainages. Drilling patterns for underground coal mines and hard rock mines.

MODULE-IV: Mine Supports

09 Periods

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

MODULE-V: Tunneling methods

09 Periods

Conventional methods: drilling, types of drill patterns, blasting and transportation of muck.

Mechanized methods: construction and working principle of tunnel boring machine, applicability, advantages and limitations of tunnel boring machine.

Shield tunneling method: construction and working principle, applicability, advantages and limitations.

TEXT BOOKS:

1. Introductory mining engineering-, Howard L.Hartman, Jan M.Mutmansky/ wiley India (P) Ltd
2. Elements of mining technology Vol-I - D.J. Deshmukh /Denett& Company

REFERENCES:

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

E RESOURCES:

1. <https://www.nap.edu/read/10318/chapter/5#23>
2. <http://www.alta.eu/commodities/mining-technology/surface-mining/long-distance-beltconveyors/>
3. Indian Mining Journal

Course Outcomes:

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

- 1: Know the status and significance of mining Industry.
- 2: Apply different methods of Shaft sinking according to the ground conditions.
- 3: Know about Development of workings.
- 4: Know about different types of supports, their advantages and disadvantages.
- 5: Know about different tunnelling methods.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		1			1				3	2	2	2
CO2	3	2	2				2		1			2	2	2	1
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2	2	1		2		2			1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80319	FLUID MECHANICS AND HYDRAULIC MACHINES LAB [Common to EEE and Min.E]	L	T	P
Credits:1		-	-	2

Course Objectives:

To provide practical knowledge of fluid flow properties, flow losses, performance testing of hydraulic turbines and hydraulic pumps.

List of Experiments

1. Performance test on impact of jet on Vanes.
2. Performance test on Pelton Wheel.
3. Performance test on Francis Turbine.
4. Performance test on Kaplan Turbine.
5. Performance test on Single Stage Centrifugal Pump.
6. Performance test on Multi Stage Centrifugal Pump.
7. Performance test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of minor losses (sudden contraction, expansion, pipe bend and union) for a given pipeline.
12. Validation of Bernoulli's Theorem.

Course Outcomes:

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

1. Analyze the performance of turbines.
2. Analyze the performance of centrifugal and reciprocating pump.
3. Analyze the performance of venturimeter and orifice meter.
4. Determine the minor losses in given pipe system.
5. Demonstrate the Bernoulli's equation in Bernoulli's apparatus.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1		3	2	1			3			3	3		
CO2	3	1		3	2	1			3			3	3		
CO3	3	1		3	2	1			3			3	3		
CO4	3	1		3	2	1			3			3	3		
CO5	3	1		3	2	1			3			3	3		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE	B. Tech		
	(Autonomous)	III Semester		
Code:82504	MINING GEOLOGY LAB	L	T	P
Credits: 1.5		-	-	3

Objectives:

To identify minerals, rocks, ores and geological structures. To learn geological mapping, remote sensing techniques and geophysical methods

LIST OF EXPERIMENTS:

1. Identification and physical properties of important rock-forming minerals.
2. Identification and physical properties of ore-forming minerals.
3. Identification and distinguish characteristics of important igneous.
4. Identification and of sedimentary and metamorphic rocks.
5. Determination of strike and dip of planar features by clinometer compass.
6. Study of models pertaining to folds, faults and unconformities.
7. Study and interpretation of Topographic Maps.
8. Study of Geological Maps of Andhra Pradesh & India.
9. Study of Geomorphologic Map of India and Tectonic Map of India.
10. Study of Seismotectonic Atlas of India.
11. Vertical Electrical sounding Survey to determine depth to water table & bed rock.
12. Determination of unconfined compressive strength of important rock

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

- 1:** Identify the properties of rock forming and ore forming minerals.
- 2:** Determine the strike and dip planar features by clinometer compass. Mine Surveying
- 3:** Identify the folds, faults and unconformities.
- 4:** Knowledge of geology mapping.
- 5:** Determine the unconfined compressive strength of important rocks.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	2				2		1			2	3	2	1
CO3	3	2	2		1		1					2	2	3	2
CO4	3	1	2		2	2	2		2			1	3	2	2
CO5	3	2	2			3			2			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech III Semester		
Code: 82505	MINE SURVEYING LAB-I	L	T	P
Credits: 1.5		-	-	3

Coursr Objectives:

To familiarize with the various surveying instruments and methods.

LIST OF EXPERIMENTS:

Ranging a line, measuring the distance between two points, pacing.

1. Chain triangulation, booking, calculation of areas and plotting.
2. Traversing with compass.
3. Introduction to levels.
4. Fly leveling.
5. Profile leveling and plotting the section.
6. Contouring
7. Measurement of horizontal angle.
8. Measurement of vertical angle.
9. Theodolite Traversing
10. Finding distance between two in-accessible points.
11. Plane table surveying.
12. Determination of elevation of various points with dumpy level by collimation plane method and rise & fall method.

Course Outcomes

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

- 1: Do the Range and to measure the distance between two points.
- 2: Conduct the chain triangulation survey.
- 3: Determine the area by using different methods.
- 4: Determine the elevation of a given point.
- 5: Use the instruments used in the surveying.

COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		3			1				3	2	2	2
CO2	3	2	2			1	2		1			2	3	2	1
CO3	3	2	2		2		1					1	2	3	2
CO4	3	1	2			2	2		2			1	3	3	2
CO5	3	2	2			1			1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech III Semester		
Code: 80M01	ENVIRONMENTAL SCIENCES (Common for CE, ME and Min.E)		L	T	P
Credits: Nil			2	-	-

Pre-requisite: Nil

Course Objectives:

An interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences, including geo systems, biology, chemistry, economics, political science and

international processes. The ability to work effectively as a member of an interdisciplinary team on complex problem of environment.

Module I: Ecosystems:

5 Periods

Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structure and Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy.

Activity: Plantation.

Module II: Natural resources, Biodiversity and Biotic resources

5 Periods

Natural Resources:

Classification of Resources: Living and Non-Living resources, Renewable and non-renewable resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources–case studies. Energy resources: growing energy needs, introduction to renewable and non renewable energy sources.

Biodiversity and Biotic resources:

4 Periods

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Threats to Biodiversity (habitat loss, poaching of wildlife, man-wild life conflicts). Conservation of Biodiversity (In-situ and Ex-situ conservation),

Activity: case studies.

Module III: ENVIRONMENTAL POLLUTION AND CONTROL:

07 Periods

A) Classification of pollution and pollutants, Causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards.

B) Soil Pollution, Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of hazardous waste, Coastal pollution due to sewage and marine disposal of industrial effluents. E-waste and its management.

Activity: Field visit.

Module IV: Global Environmental Problems and Global effects:

06 Periods

Green house effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions/Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

Activity: Poster Making.

Module V: Towards sustainable future:

05 Periods

Concept of Sustainable Development, Threats to Sustainability, Population and its explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development, Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable

Cities and Sustainable Communities, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism(CDM).

Text Books:

1. R.Rajagopalan,“**Environmental Studies from crisis to cure**”, Oxford University Press 2nd Edition, 2005.
2. Anubha Kaushik, C.P.Kaushik, “**Environmental studies**” New age International Publishers,4th Edition,2012

REFERENCES:

1. Erach Bharucha,“**Environmental studies**” University Grants Commission, and University Press,I Edition, 2005.
2. M. Anji Reddy “**Text book of Environmental Science and Technology**” 3rd Edition, 2007
3. Richard T.Wright,“**Environmental Science: towards a sustainable future**” PHL Learning, Private Ltd. New Delhi, 2nd Edition., 2008
4. Gilbert McMasters and Wendell P.Ela,“**Environmental Engineering and science**”, 3rd Edition, PHI Learning Pvt. Ltd.,2008.

E-Resources:

- (1)<http://www.gdrc.org/uem/ait-terms.html> (Glossary of Environmental terms).
- (2) <http://www.environmentalscience.org/> (Environmental sciences Lectures series).
- (3) Journal of earth science and climatic change (OMICS International Journal).
- (4) Journal of pollution effects & control (OMICS International Journal).
- (5)nptel.ac.in/courses/120108004/ (Principles of Environment Management Lectures).
- (6)<http://www.nptelvideos.in/2012/12/fundamentals-of-environmental-pollution.html>(NPTEL online video courses IIT lectures).

Course Outcomes:

After completion of the course, students will be able to:

1. To enable the students to realize the importance of ecosystem, its structure, services. To make the students aware of Different natural functions of ecosystem, which helps to sustain the life on the earth.
2. To use natural resources more efficiently.
3. To make the students aware of the impacts of human actions on the environment, its effects and minimizing measures to mitigate them.
4. To educate the students regarding environmental issues and problems at local, national and international level.
5. To know more sustainable way of living

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3		1		1	2	1								
C02	2	3	2	3	1	3		2							
C03	3	3	2	3	2	2		1							
C04	3	2	2	1	2	1									
C05	2	1	1			1	3	3							

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80B09	PROBABILITY AND STATISTICS (Common for CE, ME & Min.E)	L	T	P
Credits: 3		3	-	-

Pre-requisite: Basic Probability

Course Objectives:

This course is meant to provide a grounding in Statistics and foundational concepts that can be applied in modeling processes and decision making. These would come in handy for the prospective engineers in most branches.

Module - I: Probability

9 Periods

Introduction to Probability, events, sample space, mutually exclusive events, Exhaustive events, Addition theorem for 2 & n events and their related problems. Dependent and Independent events, conditional probability, multiplication theorem, Baye's Theorem, Statement of Weak law of large numbers

Module - II: Random Variables and Probability Distributions **10 Periods**

Random variables – Discrete Probability distributions. Bernoulli, Binomial, poisson, mean, variance, moment generating function–related problems. Geometric distributions.

Continuous probability distribution, Normal distribution, Exponential Distribution, mean, variance, moment generating function–related problems. Gamma distributions (Only mean and Variance)
Central Limit Theorem

Module - III: Sampling Distributions & Testing of Hypothesis **11 Periods**

A: Sampling Distributions: Definitions of population-sampling-statistic, parameter. Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance. Parameter estimations – likelihood estimate, point estimation and interval estimation.

B: Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, and Level of significance. One tailed test, two tailed test.

Large sample tests:

1. Testing of significance for single proportion.
2. Testing of significance for difference of proportion.
3. Testing of significance for single mean.
4. Testing of significance for difference of means.

Module IV: Small sample tests **09 Periods**

Student t-distribution, its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples, Paired t-test, Snedecor's F-distribution and its properties. Test of equality of two population variances, Chi-square distribution, its properties, Chi-square test of goodness of fit and independence of attributes.

Module V: Correlation, Regression: **09 Periods**

Correlation & Regression: Correlation, Coefficient of correlation, the rank correlation. Regression, Regression Coefficient, The lines of regression: simple regression.

TEXT BOOKS:

1. Walpole, Probability & Statistics, for Engineers & Scientists, 8th Edition, Pearson Education.
2. Paul A Maeyer Introductory Probability and Statistical Applications, John Wiley Publicaitons.

- Monte Gomery, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley Publications.

REFERENCES:

- Sheldon M Ross, Introduction to Probability & Statistics, for Engineers & Scientists, 5th Edition, Academic Press.
- Miller & Freund's , Probability & Statistics, for Engineers & Scientists, 6th Edition, Pearson Education.
- Murray R Spiegel, Probability & Statistics, Schaum's Outlines, 2nd Edition, Tata Mc. Graw Hill Publications.
- S Palaniammal, Probability & Queuing Theory, 1st Edition, Printice Hall.

E Resources:

- <http://www.csie.ntu.edu.tw/~sdlin/download/Probability%20&%20Statistics.pdf>
- (Probability & Statistics for Engineers & Scientists text book)
- http://www.stat.pitt.edu/stoffer/tsa4/intro_prob.pdf (Random variables and its distributions)
- <http://users.wfu.edu/cottrell/ecn215/sampling.pdf> (Notes on Sampling and hypothesis testing)
- <http://nptel.ac.in/courses/117105085/9> (Mean and variance of random variables)
- <http://nptel.ac.in/courses/111105041/33> (Testing of hypothesis)
- <http://nptel.ac.in/courses/110106064/5> (Measures of Dispersion)

Course Outcomes:

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

- The students will understand central tendency and variability for the given data.
- Students would be able to find the Probability in certain realistic situation.
- Students would be able to identify distribution in certain realistic situation. It is mainly useful for circuit as well as non-circuit branches of engineering. Also able to differentiate among many random variables Involved in the probability models. It is quite useful for all branches of engineering.
- The student would be able to calculate mean and proportions (large sample) and to make important decisions from few samples which are taken out of unmanageably huge populations.
- The student would be able to calculate mean and proportions (small sample) and to make important decisions from few samples which are taken out of unmanageably huge populations.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	4		3					3	1			
CO2	3	3	2		3			2	1		2				
CO3	3	2	1		3					2	3				
CO4	3	3	2		2		1		1			1			
CO5	3	2	2												

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80306	MECHANICS OF SOLIDS	L	T	P
Credits: 3		3	-	-

Prerequisites: Physics of Materials and Engineering Mechanics

Course Objectives:

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

MODULE I: Simple Stresses & Strains

10 Periods

Elasticity and plasticity – Types of stresses & strains – Hooke’s law – stress–strain diagram for ductile and brittle material–Working stress–Factor of safety–Lateral strain, Poisson’s ratio & volumetric strain.

Elastic Module & the relationship between them–Bars of varying section–composite bars– Temperature stresses. Strain energy – Resilience–Gradual, sudden, impact and shock loadings

MODULE II: Shear Force and Bending Moment

10 Periods

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

MODULE III: Bending Stresses & Shear Stresses

10 Periods

A: Bending Stresses: Theory of simple bending– Assumptions– Neutral axis – Derivation of bending equation: $M/I=f/y=E/R$ –Determination bending stresses– section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections–Design of simple beam sections.

B: Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections – rectangular, circular, triangular, I, T and angle sections.

MODULE IV: Deflection of Beams & Torsion

09 Periods

Deflection of Beams: Bending into a circular arc–slope, deflection and radius of curvature – Differential equation for the elastic line of a beam– Double integration and Macaulay’s methods– Determination of slope and deflection for cantilever and simply supported beams subjected to point loads- UDL – uniformly varying load.

Torsion: Theory of pure torsion – Assumptions – Derivation of torsion equation, polar section modulus – power transmitted by shafts – combined bending and torsion.

MODULE V: Analysis of Pin Jointed Plane Frames & Thin Cylinders

09 Periods

Analysis of Pin- Jointed Plane Frames: Determination of forces in the members of various types of cantilever & simply supported trusses using (i) Method of Joints (ii) Method of Sections.

Thin Cylinders: Thin seamless cylindrical shells–Derivation of formula for longitudinal and circumferential stresses– hoop, longitudinal and volumetric strains– changes in diameter and volume of thin cylinde

TEXT BOOKS

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

REFERENCES

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

E - RESOURCES

1. nptel.ac.in/courses/112107147
2. [nptel.ac.in/courses/Web course- contents/.../strength%20of%20materials/homepage.htm](http://nptel.ac.in/courses/Web%20course-contents/.../strength%20of%20materials/homepage.htm)
3. www.springer.com > Home > Materials > Characterization & Evaluation of Materials
4. [discovermagazine.com/tags/strength of materials](http://discovermagazine.com/tags/strength%20of%20materials)
5. nptel.ac.in/courses/105105108/
6. nptel.ac.in/courses/105105108/30

Course Outcomes:

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

1. Describe the fundamentals about the simple stresses, strains and deformation in components due to external loads.
2. Draw the shear force and bending moment diagrams for various beams.
3. Understand bending stress and shear stress.
4. Determine the deflection of beams and torsion.
5. Solve pin joint, thin cylinder problems.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	3		3						3	3		
CO2	3	3	1	3		3						3	3		
CO3	3	3	1	3		3						3	3		
CO4	3	3	1	3		3						3	3		
CO5	3	3	1	3		3						3	3		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80311	MACHINE DRAWING	L	T	P
Credits: 2		1	-	2

Prerequisites: Engineering Graphics

Course Objectives:

To understand projections of simple machine elements and understand assembly drawings of typical machine parts such as Connecting rod, Eccentric, Cross head, Screw jack, Plummer block.

Machine Drawing Conventions:

Need for drawing conventions - introduction to IS conventions

- a) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features
- b) Types of sections - selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
- c) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs, springs.
- d) Title boxes, their size, location and details - common abbreviations & their liberal usage
- e) Assembly drawings - working drawings of machine parts.

I. Drawing of Machine Elements and simple parts:

Selection of Views, additional views for the following machine elements and parts with every drawing proportion.

- a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- b) Keys, cotter joints and knuckle joint, bolted joint.
- c) Riveted joints for plates
- d) Shaft coupling, flange coupling and universal coupling, socket and spigot joint.

II. Assembly Drawings:

- a) Engine parts - Stuffing boxes, Cross heads, Eccentrics, Petrol Engine connecting rod, Piston assembly.
- b) Other machine parts - Screws jack, Milling machine tail stock, Plummer block, single tool post, Clapper block

TEXT BOOKS

1. K.L.Narayana, P.Kannaiah “**Machine Drawing**”, New Age Publishers, 5th edition, 2016.
2. RK Dhawan “**Machine Drawing**”, S.Chand Publications, Revised edition, 2014.
3. N.D.Bhatt “**Machine Drawing**”, Charotar Publishing House pvt ltd, 48th edition, 2013.

REFERENCES

1. P.S.Gill “**Machine Drawing**”, S.K. Kataria & Sons Publisher, 17th edition, 2009.
2. Rajput “**Machine Drawing**”, Lakshmi Publications
3. K.C.JOHN “**Machine Drawing**”, PHI Learning Pvt Ltd, 2009
4. N.D. Junnarkar “**Machine Drawing**”, Pearson Education India, 2007.

E – RESOURCES

1. <http://nptel.ac.in/courses/105108069/>
2. <http://www.me.metu.edu.tr/courses/me114/Lectures/assembly.htm>
3. <http://www.nature.com/nature/journal/v58/n1510/abs/058543c0.html>

Course Outcomes:

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

1. Know the basic conventional representation of materials which is fundamental to the subject.
2. Know the nomenclature of threads, bolts, nuts, set screws and taps.
3. Know the importance of joints like cotter joints, knuckle joint and also come to know how the power being transmitted from one shaft to other.
4. Draw the Journal bearings, collar and foot step bearings.
5. Draw the assembly drawings of machine parts.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		1					1		3		3	3		
CO2	2		1					1		3		3	3		
CO3	2		1					1		3		3	3		
CO4	2		1					1		3		3	3		
CO5	2		1					1		3		3	3		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. IV Semester		
Code: 82506	MINE ENVIRONMENTAL ENGINEERING - I		L	T	P
Credits: 3			3	-	-

Prerequisite: Fundamentals of Fluid Mechanics

Course Objectives:

Students should be aware of the principles of ventilation and basic ventilation systems.

MODULE-I: Mine gases**10 Periods**

Atmospheric air – its composition, mine air – its general composition, origin, physical and chemical

properties of mine gases, physiological effects of breathing mine gases and its detection, sampling and analysis of mine air, methane drainage.

MODULE-II: Heat, Humidity and Air flow

10 Periods

Sources of heat in mines, effects of heat and humidity, kata thermometer and hygrometer. Laws governing the airflow in mines, resistance of airways, Equivalent orifice, Natural ventilation, determination of NVP, direction of natural ventilation

MODULE-III: Mechanical ventilation

10 Periods

A:Principal types of mine fans, fan characteristic curves, mine characteristic curves, operating point, reversal of mine fans, Evasee and its importance.

B: Series and parallel operation of mine fans, booster fans, Face Ventilation.

MODULE-IV: Standards of ventilation and Air distribution

09Periods

Standards of ventilation including permissible air velocities, Ascensional, Descensional, Homotropical, Antitropical ventilation, Distribution of air, ventilation stoppings, Air crossings, Measurement of air velocities and pressure.

MODULE-V: Ventilation Planning

09 Periods

Quantity and pressure requirement. Ventilation layout for coal mining and metal mining. Calculation of air quantity and total mine head required for ventilating a mine. Introduction to Network analysis: Hardy-Cross method, Ventilation survey.

TEXT BOOKS:

1. Mine Environment and Ventilation – G.B. Misra, Oxford University Press
2. Mine Ventilation and Air Condition – HL Hearlman, Wiley India (p) ltd

REFERENCES:

1. Environmental Engineering in Mines, Vatukuri V.S. & Lama R.D, Cambridge University Press.
2. Mining and Environment, Dhar B.B, APH Publishing.

E RESOURCES:

1. <http://technology.infomine.com/reviews/ventilation/welcome.asp?view=full>
2. <https://link.springer.com/article/10.1134/S1062739116041178>

Course Outcomes:

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

- 1:**Understand origin, physical and chemical properties of mine gases and their physiological effects
- 2:**Understand Heat, Humidity and Air flow in mines
- 3:**Understand Principal types of mine fans, Series and parallel operation of mine fans

4: Understand Standards of ventilation and Air distribution

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)											B. Tech IV Semester			
Code: 82507	DRILLING AND BLASTING <small>CO-PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</small>											L	T	P	
Credits: 3												3		-	
COS	Programme Outcomes(POs)											PSOS			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2				1					2	2	2	2
CO2	3	2	2				2		2			2	3	2	2
CO3	3	2	2				2					2	3	3	2
CO4	3	1	2		1		2		2			1	3	1	2
CO5	3	1	2				1		1			2	3	1	2

5: Understand Ventilation Planning and Network analysis.

Prerequisite: fundamental activates for extraction of mineral.

Course Objectives:

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

MODULE-I: Principles of Drilling and Drill bits

10 Periods

Principles of drilling: Principles of rock drilling, drillability, factors affecting the drillability,

selection of drills.

Drill Bits: Various types of drill bits, study of bit life, factors affecting bit life, Thrust and rotation

MODULE-II: Explosives

10 Periods

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

MODULE-III: Firing of Explosives and blasting methods

10 Periods

A: Firing of Explosives: Safety fuse, detonating cord and accessories, detonators, Exploders, Electric firing and non-electric firing, electronic detonators, NONEL blasting.

B: Blasting methods: Preparation of charge, stemming and shot firing, choice and economical use of explosives, misfires, blown out shots, incomplete detonation, their causes, prevention and remedies.

MODULE-IV: Handling of Explosives

09 Periods

Surface and underground transport of explosives, storage and handling of explosives, magazines, accidents due to explosives, precautions and safety measures during transportation.

MODULE-V: Mechanics of blasting and effects of blasting

09 Periods

Mechanics of blasting: Factors affecting rock breakage using explosives, theory of shaped charge, detonation pressure, coupling, shock waves impedance, critical diameter.

Effects of blasting: Vibrations due to blasting and damage criteria, fly rocks, dust, fumes, water pollution and controlled blasting.

TEXT BOOKS:

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

REFERENCES:

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

E RESOURCES:

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

Course Outcomes:

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

- 1:** Understand Principles of drilling and various types of drill bits.
- 2:** Understand different types of Explosives.

3:Apply different methods of Blasting according to the conditions.

4:Deal with the Explosives.

5:Understand Mechanics of blasting and effects of blasting

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				2	2	2	2
CO2	3	2	2				2		1			2	3	2	2
CO3	3	2	2				1					2	3	3	2
CO4	3	1	2				2		2			1	3	1	2
CO5	3	1	2						1			2	3	1	2

2017-18 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)					B. Tech IV Semester		
Code: 82508	MINING MACHINERY-I					L	T	P
Credits: 3						3	-	-

Prerequisite: Engineering Mechanics, Mechanical Technology,

Course Objectives:

To understand the electrical layouts and power distribution in mine. To study the rope haulage layouts, technical details and applications. To study the various modes of transport means and electrical circuits. To study the types of pumps, installations and design calculations.

MODULE-I: Introduction

10 Periods

Different types of motive power used in mines – their field of application, relative merits and demerits; transmission and distribution of compressed air in mines, compressed air in mines, compressed air drills. Elements of the transport system, classification and techno-economic indices. Wire ropes – classification, construction, fields of application, rope capping and splicing; deterioration of rope in use and its prevention; testing of ropes, selection and maintenance, rope calculations.

MODULE-II: Rope haulage

10 Periods

Construction of the wire ropes, rope haulages–gravity, direct, balanced direct, main & tail, endless, reversible endless. Suitability of these haulages and their limitations. Dimension of ropes, drums and pulleys, care and maintenance of ropes, changing of haulage ropes, rope

splicing, safety appliances in haulage road, and signaling, statutory requirements of haulages.

MODULE-III:Other transport systems

10 Periods

A:Locomotives – diesel, trolley-wire, battery locomotives, constructional features and safety devices and comparison of different types; underground and surface battery charging stations and safety measures, locomotive calculations;

B:Shuttle cars, underground trucks, load-haul- dumpers, SDL, aerial rope ways, gravity transport, principles of hydraulic& pneumatic transportation and their fields of application, electric layouts, man-riding systems.

MODULE-IV:Pumping & Conveying

09 Periods

Different types of drives, installation and maintenance of pumps and pipes in shafts and roadways, electrical layouts, various sources of water in mines, design of sumps.

Face haulage and conveyors – Various types of conveyors, Scraper chain conveyors, AFCs, belt conveyors, cable belt conveyor, shaking and vibrating conveyors, armoured flexible conveyors, high angle conveying, electrical layouts. Numerical problems in conveyors.

MODULE-V:Mine electrical engineering

09 Periods

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

TEXT BOOKS:

1. Elements of Mining Technology Vol. III, D.J. Deshmukh, Denett & Company,
2. Mine Transport – N.T. Karelin, Orient Longmans,

REFERENCES:

1. Mining and Transport – S. C. Walker, Elsevier
2. Introduction to Mining Engineers – Hartman. H.L, John Wiley & Sons.

E RESOURCES:

1. <http://www.westrac.com.au/Industries/Pages/Mining.aspx>
2. <http://www.springer.com/in/book/9783319477909>

Course Outcomes:

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

- 1:Understand Different types of motive power used in mines and different types of wire ropes and their applications
- 2:Understand different types of rope haulages
- 3:Understand diesel, trolley-wire, battery locomotives and machinery used in underground

workings

4: Understand different types of pumps and belt conveyor

5: Understand how electricity will be supplied in mines.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	2				2		1			2	3	2	2
CO3	3	2	2				1					2	3	3	2
CO4	3	1	2				2		2			1	3	1	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)					B.Tech. IV Semester				
Code: 80352	MECHANICS OF SOLIDS LAB					L	T	P		
Credits: 1.5						-	-	3		

Course Objectives:

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

LIST OF EXPERIMENTS:

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

Course Outcomes:

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

1. Find out the hardness of different engineering materials.

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

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2				1					3	2	2	2
CO2	3	2	2				2		1			2	3	2	2
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2				2		2			1	3	1	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80312	MACHINE DRAWING LAB	L	T	P
Credits: 1	(Common for ME & Min.E)	-	-	2

Prerequisites: Engineering Graphics

Course Objectives:

To draft the simple machine elements and assembly drawings of typical machine parts such as, Couplings, Screw jack, Plummer block etc. by drafting and modeling software.

Demonstration & Exposure

Practice dimensioning conventions, its components & drafting objects to scale, different machine elements and finishing symbols

Any 12 Exercises out of fourteen by using drafting/modeling software.

1. Drafting of section elements, machine part and conversional representation of machine elements
2. Drafting of screw heads & bolts nut
3. Drafting of screw stud bolts, tap holes and set screws
4. Drafting of cotter joint
5. Drafting of knuckle Joint
6. Drafting of shaft coupling
7. Drafting of flange coupling

8. Drafting of universal coupling
9. Drafting of screw jack, socket and spigot
10. Modeling and assembly of stuffing box
11. Modeling and assembly of cross head
12. Modeling and assembly of eccentric joint
13. Modeling and assembly of milling machine tail stock
14. Modeling and assembly of milling machine clapper block

Course Outcomes:

After completing the course the students will be able to

- a. Draft machine elements and dimension various components using drafting software
- b. Complete the machine components like screw heads, studs bolts set screws in drafting software
- c. Able to draft machine parts like cotter joints and riveted joints with standard bolted joints using drafting software
- d. Understand and draw the assembly drawing like stuffing box and cross heads using by modeling software
- e. Draw the assembly drawing like tail stock and clapper block using by modeling software

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		1		3			1	2	3		2	3		
CO2	2		1		3			1	2	3		2	3		
CO3	2		1		3			1	2	3		2	3		
CO4	2		1		3			1	2	3		2	3		
CO5	2		1		3			1	2	3		2	3		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech IV Semester		
Code:82509	MINE SURVEYING LAB-II	L	T	P
Credits: 1.5		-	-	3

Course Objectives:

To familiarize with the various surveying instruments and methods.

LIST OF EXPERIMENTS:

1. Correlation by two shafts by total station.
2. Correlation by single shaft by total station.
3. Correlation by single shaft weiss quadrilateral by total station.
4. Curve ranging offsets from long chord
5. Curve ranging Ranking methods
6. Curve Tacheometric methods
7. Curve ranging total station method.
8. Reading mine plans
9. Determination of K and C in Tacheometric Survey
10. Finding Horizontal & Vertical distance by Tacheometer
11. Study of opencast map.
12. Study of underground map.

Course Outcomes:

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

- 1:**Conduct the correlation by two shaft co-planar method.
- 2:**Conduct the correlation by shaft weisbatch methods and shaft Weiss quadrilateral methods.
- 3:**Set a curve by ranging offsets from long chord and ranging ranking method.
- 4:**Set a curve by Tacheometric and ranging Tacheometric methods.
- 5:** Conduct the weisbatch method

CO- PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	2				2		1			2	3	2	2
CO3	3	2	2		1		1					2	3	3	1
CO4	3	1	2				2		2			1	3	1	1
CO5	3	2	2		2				1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B. Tech. IV Semester		
Code: 80M02	GENDER SENSITIZATION (Common for CE, ME and Min.E)			L	T	P
Credits: Nil				2	-	-

Prerequisite: Nil

Course Objectives:

To develop students' sensibility with regard to issues of gender in contemporary India. To provide a critical perspective on the socialization of men and women. To introduce students to information about some key biological aspects of genders. To expose the students to debates on the politics and economics of work. To help students reflect critically on gender violence. To expose students to more egalitarian interactions between men and women.

MODULE -I:- UNDERSTANDING GENDER

06 Periods

Gender: Why Should We Study It? (*Towards a World of Equals: Unit -1*)
 Socialization: Making Women, Making Men (*Towards a World of Equals: Unit -2*)
 Introduction. Preparing for Womanhood. Growing up Male. First Lessons in Caste. Different Masculinities.
 Just Relationships: Being Together as Equals (*Towards a World of Equals: Unit -2*)
 Mary iKorn and Onler. Love and Acid just do not Mix. Love Letters. Mothers aniJ Fathers. Further Reading: Rosa Parks-The Brave Heart.

MODULE -II:- GENDER AND BIOLOGY

06 Periods

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals: Unit -4*)
 Declining Sex Ratio. Demographic Consequences.
 Gender Spectrum: Beyond the Binary (*Towards a World of Equals: Unit -10*)
 Two or Many? Struggles with Discrimination.
 Additional Reading: Our Bodies, Our Health (*Towards a World of Equals: Unit -13*)

MODULE -III:- GENDER AND LABOUR

07 Periods

A: Housework: the Invisible Labour (*Towards a World of Equals: Unit -3*)
 "My Mother doesn't Work." "Share the I.oa.d."

B: Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

MODULE -IV:- ISSUES OF VIOLENCE

07 Periods

Sexual Harassment: Say Nol (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading:

"*Chdpulum*. Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -5)

Is Home a Safe Place? When Women Unite (Film) Rebuilding Lives. Further Reading: New Forums for Justice. Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim-1 Fought for my Life...." - Further Reading: The Caste Face of Violence.

MODULE -V:- GENDER STUDIES

06 Periods

Knowledge: Through the Lens of Gender (*Towards a World of Equals*: Unit -5)

Point of View. Gender and the Structure of Knowledge. Further Reading: Unacknowledged Women Artists of Telangana.

Whose History? Questions for Historians and Others (*Towards a World of Equals*: Unit -9)

Reclaiming a Past. Writing other Histories. Further Reading: Missing Pages from Modern Telangana History.

Essential Reading: All the Units In the Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender*" written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Mina Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Thant

Note: Since it Is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field.

TEXT BOOKS:-

1. Towards a World of Equals: A bilingual Textbook on Gender , A Suneetha -etall

REFERENCES:-

1. Sen, Amartya. "More than One Million Women are Missing.' New York Review of Books 37.20 (20 December 1990). Print. *We Were Making History...'* Life Stories of Women in the *Telangana People's Struggle*. New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." *Women's Studies Journal* (14 November 2012) Available online at: <http://blogs.visj.com/India-real-time/2012/11/14/by-the-numbers-where-Indian-women-work>
3. K. Satyanarayana and Susie Thant (Ed.) *Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada* <http://haroreollins.co.in/BookDetail.asp?FlookCndet,3732>
4. Vimata. "Vantillu (The Kitchen)". *Women Writing in India: 600 BC to the Present. Volume II: The 20th Century*. Ed. Susie Thant and K. Lalita. Delhi: Oxford University Press 1995. 599-601.
5. Shatrughna, Veena et al. *Women's Work and its Impact on Child Health and Nutrition*, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6. Stree Shakti Sanghatana. 'We Were Making History' *Life Stories of Women in the Telangana People's Struggle*. New Delhi: Kali for Women, 1989.

E - Resources:

- http://www.actforyouth.net/resources/rf/rf_gender1_1213.cfm(UNDERSTANDING GENDER)
- <https://www.simplypsychology.org/gender-biology.html>(GENDER AND BIOLOGY)
- <http://www.yourarticlelibrary.com/essay/essay-on-gender-issues-in-labour-market-in-india/40442/> (GENDER AND LABOUR)

Journals/Magazines links:-

- <http://journals.sagepub.com/doi/abs/10.1177/1077801200006007004> (ISSUES OF VIOLENCE)
- <http://www.nordiclabourjournal.org/emner/likestilling> (GENDER AND BIOLOGY)

Course Outcomes:

After completion of the course, students will be able to:

1. Develop a better understanding of important issues related to gender in contemporary India.
2. Sensitize about the basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Acquire insight into the gendered division of labour and its relation to politics and economics.
5. Develop a sense of appreciation of women in all walks of life.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						3		3	3		2	3			
CO2						3		3	3		2	3			
CO3						3		3	3		2	3			
CO4						3		3	3		2	3			
CO5						3		3	3		2	3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 82510	MINE ENVIRONMENTAL ENGINEERING - II	L	T	P
Credits: 3		3	-	-

Prerequisite: Mine Environmental Engineering-II

Course Objectives:

This course introduces spontaneous coal heating, control measures, various methods adopted to combat fires, firefighting techniques, mine inundation, mine illumination, rescue and recovery work, principle of management.

MODULE-I: Spontaneous Combustion 10 Periods

Various theories, factors affecting the liability of coal seams to spontaneous heating, Experimental methods to determine relative tendencies of coal seams to spontaneous combustion, prevention of coal seam fires.

Mine Fires:

Various methods adopted to combat fires and their advantages and disadvantages.

MODULE-II: Fire Fighting and Reopening of sealed-off areas 10 Periods

Advances in firefighting techniques, different inert gases used for firefighting, their advantages and disadvantages, different types of fire extinguishers.

Reopening of sealed-off areas

Factors to be considered, methods, precautions to be taken to reopen the sealed off areas. Causes of fires in surface coal stocks, precautions against fire in coal stocks on surface, fighting the surface coal stock fires.

MODULE-III: Mine Explosions 10 Periods

A: Different inflammable gases in underground coal mines and explosive triangles. Causes of fire damp explosions, different sources of ignition of fire damp, prevention of fire damp explosions, Characteristics of fire damp explosions.

B: Causes of coal dust explosion, factors affecting the coal dust explosion and preventive measures against coal dust explosion. Comparison of Coal dust explosions with the Fire damp explosions.

MODULE-IV: Mine Inundation and Noise 09 Periods

Surface causes and underground causes of mine inundation, precautions against mine inundation, approaching of water logged areas, dewatering of water logged areas.

Noise: Causes and measurement of noise levels. Precautions, prevention and reduction of noise levels.

MODULE-V: Mine illumination and Rescue 09 Periods

Illumination standard, common types of flame safety lamps, their use and limitations, cap lamp, and organization. Illumination arrangement of opencast and underground working. Rescue and recovery work, Rescue apparatus, Rescue stations, principles of risk management. Introduction to disaster management plan.

TEXT BOOKS:

1. Mine Fires, Explosion , Rescue, Recovery and Inundation – M.A. Ramulu, Mukharjee Publishers
2. Mine Environment & Ventilation – G.B. Misra, Oxford University Press.

REFERENCES:

1. Fires in Coal Mines – L.C.Kaku, Oriental Publishers.
2. Mine Environment Engineering-M.Sengupta

E RESOURCES:

1. <https://sites.google.com/site/mineventilationitkgp/mine-hazards-and-rescue>
2. <http://www.edumine.com/courses/online-courses/mine-safety-and-rescue-2-underground-fire-hazards/>

Course Outcomes:

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

- 1: Understand Various theories, factors affecting the liability of coal seams to spontaneous heating
- 2: Understand Advances in firefighting techniques and Reopening of sealed-off areas
- 3: Understand fire damp explosions and coal dust explosions
- 4: Understand Mine Inundation and Noise
- 5: Understand Mine illumination.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	2				2		1			2	3	2	1
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2				2		2			1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech V Semester
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(MR-18)				
Code: 82511	UNDERGROUND COAL MINING	L	T	P
Credits: 3		3	-	-

Prerequisite: Mining Geology, Surface mining Technology.

Course Objectives:

To understand the details of development of a mine for exploitation of mineral deposits. To Analyze design requirements of Underground Coal and metal mining methods. To apply different support systems including backfilling techniques for underground mines for stability of workings.

MODULE-I: Introduction to Mine Planning **10 Periods**

Size of mining property, reserves and production capacity. Opening of Deposits; Development of mine for in-seam mining and horizon mining (including shaft pillar and their comparison, advantages and disadvantages), division into levels and districts.

MODULE-II: Development **10 Periods**

General principle of Bord & Pillar Development, their choice, suitability, advantages and disadvantages, layout of Bord & Pillar panel, size of panel, statutory provisions, manual and mechanized system of development: conditions suitable for application of mechanized loader and continuous miners; factor affecting the selection of equipment.

MODULE-III: Pillar Extraction **10 Periods**

A: Preparatory arrangement for depillaring operation, statutory provision for depillaring, principle and designing of pillar extraction, size of a district.

B: Factor, affecting choice of pillar extraction, depillaring with caving, stowing, mechanized depillaring operation, organization and safety.

Layout for required outputs, types of machines, personnel and working of thick seams and blasting gallery method.

MODULE-IV: Long wall mining **09 Periods**

Longwall methods of working, their choice, suitability, advantages and disadvantages. Layout of the workings for the required output, length and orientation of longwall faces, Shape & size of development roadways and gate roads and their maintenance. Mechanized longwall face organization.

MODULE-V: Special methods of working **09 Periods**

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

TEXT BOOKS:

1. Principles and Practices & Modern Coal Mining, R.D. Singh, New Age International Publication.
2. Underground Mining & Coal, Singh, T.N. Singh – Oxford Publication.

REFERENCES:

1. Longwall mining, Peng S.S., Chiang H/S. – John Willey Publication.
2. Mine Planning for Coal, Mathur S.P. – M.J Consultant Publications.

E RESOURCES:

1. <https://www.nap.edu/read/18766/chapter/5>
2. <http://www.canoseco.com/general-description/technologies-and-practices/modern-underground-coal-mining-technologies.html>
3. <https://link.springer.com/article/10.1007/s40789-014-0043-0>

Course Outcomes:

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

- 1: Understand Various theories, factors affecting the liability of coal seams to spontaneous heating
- 2: Understand Advances in firefighting techniques and Reopening of sealed-off areas
- 3: Understand fire damp explosions and coal dust explosions
- 4: Understand Mine Inundation and Noise
- 5: Understand Mine illumination.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	2				2		1	2		2	3	2	1
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2				2		2		1	1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B. Tech V Semester		
Code: 82512	ROCK MECHANICS			L	T	P
Credits: 3				3	-	-

Prerequisite: Underground Coal Mining

Course Objectives:

To study about application of Rock Mechanics in mining and allied engineering. To study Physico-Mechanical properties of rocks, non-destructive testing methods, time dependent properties of rock. To study the theories of failure and approaches used for open pit and underground designs.

MODULE-I: Introduction

10 Periods

Definition of some important terms used in rock mechanics, application of rock mechanics in mining, introduction to stress analysis, stresses in two and three dimensions, Mohr's circle.

MODULE-II: Physical properties of rocks and rock indices

10 Periods

Physical properties of rocks — density, porosity, moisture content, permeability, water absorption various indices of rocks like swell index, slake durability index, impact strength index, protodynakov index, etc., thermal conductivity, hardness, durability, rock mass classification.

MODULE-III: Mechanical properties of rocks

10 Periods

A: Preparation of test specimens, laboratory determination of mechanical properties of rocks - compressive strength, tensile strength, flexural strength, shear and triaxial strength,

B: Modulus of elasticity, Poisson's ratio, Mohr's envelope, effect of various parameters on the strength of rocks, in-situ strength, post failure behavior of rocks.

MODULE-IV: Non-destructive testing methods and time dependent properties of rocks
09 Periods

Dynamic wave velocities, dynamic elastic constants, their determination in the laboratory, application in mining, time dependent properties of rocks, creep, mechanism of creep of rocks — different stages, rheological models.

MODULE-V: Theories of failure of rocks & Design of underground workings

09 Periods

Different theories of failure of rocks, modes of failure - Griffith, Coulomb-Navier, Mohr's, Hoek-Brown, empirical criteria, etc. and their field of applications. Stress distribution in underground workings

TEXT BOOKS:

1. Vutukuri, V.S., and Lama, R.D., Handbook on Mechanical Properties of Rocks, Vol. I, II, III and IV, Transtech Publication, Berlin, 1974/78.
2. Peng, S.S., Ground Control, Wiley Interscience, New York, 1987.

REFERENCES:

1. Obert, L. and Duvall, W.I., Rock Mechanics and Design of Structure in Rock John Wiley and Sons Inc., New York, 1967.
2. Brady, B.H.G. and Brown, S.T., Rock Mechanics, Wiley Interscience, 1985.
3. Hoek, E., and Brown, S.T., Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980.

E RESOURCES:

1. <https://rocscience.com/documents/hoek/references/H1966a.pdf>
2. <http://www.brighthubengineering.com/geotechnical-engineering/96483-rock-mechanics-defined/>

Course Outcome:

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

- 1: Understand important terms used in rock mechanics, application of rock mechanics in mining, introduction to stress analysis
- 2: Understand Physical properties of rocks and rock indices.
- 3: Understand Mechanical properties of rocks
- 4: Understand Non-destructive testing methods and time dependent properties of rocks
- 5: Understand Theories of failure of rocks & Design of underground workings.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	2				2		1			3	3	2	1
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2				2		2			3	3	2	2
CO5	3	2	2						1			1	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)					B. Tech V Semester		
Code: 82513	MINING MACHINERY-II					L	T	P
Credits: 3						3	-	-

Prerequisite: Mining Machinery -I

Course Objectives:

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

MODULE – I: Winding engines

10 Periods

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

MODULE – II: Winding accessories and layouts

10 Periods

Head gear and their design, head sheave, cages and skips, suspension gear, shaft fittings and appliances – guides, keps, etc., signalling systems, winding calculations relating to rope size & numbers, capacity & power requirement for cages, skips, drum and Koepe winding systems. Surface and Pit-bottom layouts - Mine car circuits at the surface and pit bottom, creepers, skip winding – loading and discharge arrangements. Case studies, railway sidings and layouts.

MODULE – III: Coal face machinery

10 Periods

A: Construction, salient mechanical and electrical features and operations of coal drills and their control panels, different types of mechanical loaders, coal ploughs, and continuous miners.

B: Development road headers in face mechanization, longwall mining equipment, electrical and hydraulic layouts; condition monitoring of mining machinery for underground and opencast mines and ore handling plants, modern concepts in underground mine mechanization.

MODULE – IV: Excavation and loading machinery in surface mines

09 Periods

Classification. Hydraulic system diagram. Under carriage. Design and Constructional details of Front end loaders, Hydraulic excavators and Electric Rope shovel, Backhoe, Dragline, and Bucket Wheel Excavator. Bucket Chain Excavator and Surface Miners.

MODULE – V: Other machinery in surface mines

09 Periods

Classification of transport equipments; Construction and technical specifications of Dumpers of different types including multi-axial dumpers,, Tractors, trailers, dump trucks, Rippers (types), Motor Graders, Bull Dozers, Rock breakers, Road Compactors, Water Tankers..

TEXT BOOKS:

1. Elements of Mining Technology Vol. I & II, Deshmukh D.J., Denett & Company
2. Pumps Focus Compressors Walkar, winding & Transport, Cherkasky B.M.

REFERENCES:

1. Mine Mechanisation and Automation, Alemgren G, U.Kumar.

2. Coal Mining Series, Ernest Mason, London, 1952.

E RESOURCES:

1. <https://www.generalkinematics.com/blog/a-brief-history-of-mining-and-the-advancement-of-mining-technology/>
2. <http://advanced-mining.com/artikel.php?id=241>

Course Outcomes:

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

- 1: Know about Winding engines
- 2: Know Winding accessories and layouts
- 3: Know coal drills, coal ploughs, cutter loaders and continuous miners and modern concepts in underground mine mechanization
- 4: Select the Excavation and loading machinery in surface mines
- 5: Know Classification of transport equipment's, dumpers, Tractors, trailers, dump trucks, Rippers (types), Motor Graders, Bull Dozers, Rock breakers, Road Compactors, Water Tankers.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	2				1					3	2	2	2
CO2	3	2	2				2		1			2	3	2	1
CO3	3	2	3		1		1					2	3	3	2
CO4	3	1	2		3		2		2			1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE					B. Tech V Semester					
	(Autonomous)										
Code: 82514	SURFACE MINING TECHNOLOGY					L	T	P			
Credits: 3						3	-	-			

Prerequisite: Mining Geology, Mine environmental engineering, Mine surveying.

Course Objectives:

The objective of this course is to provide students in mining engineering with the necessary knowledge to design safe, efficient and environmentally responsible surface mining operations.

MODULE-I: Introduction

10 Periods

Status of surface mining, types of surface mines, applicability and limitations, concept of stripping ratio, stripping economics, concept of ultimate pit limits, design of haul roads, elements of surface

mine planning – selection of site for box cut, selection of operating parameters like bench height, width, slope, etc.

MODULE-II: Layout and design of surface mine

10 Periods

Slopes in surface mines – Highwall and waste dumps; Working pit slope and ultimate pit slope, common modes of slope failure, factors influencing stability of slopes, development of open cast mine layouts for various shapes of deposits. Conversion of underground mine to opencast mine vis-a-vis open cast mine to underground mine related problems and probable solutions.

MODULE-III: Ground preparation methods

10 Periods

A: Preparation of the site – ripping, drilling and blasting; types, operation, selection, applications and limitations of ground preparation equipment's-ripper, dozer,

B: Blast hole drills and rock breakers, determining number of drilling machines, dozers and rippers for planned production. Concept of ripability, blasting in open cast mines over developed galleries.

MODULE-IV: Excavation system in surface mines

09 Periods

Selection criteria for equipments used in surface mines. Classification, application and limitations of different types of equipments used in surface mining projects; Cycle time and productivity calculation for excavating and loading equipments. Drag line - calculation of required bucket capacity for a given handling requirement, method and cycle of operations of drag lines, front end loaders, scrapers, bucket wheel and bucket chain excavators, surface miners. Determining the capacity and number of shovels and dumpers for planned production.

MODULE-V: Transport and waste dumps

09 Periods

Scope and application of different modes of transport system in surface mine-trucks, synchronization of shovel and dumper capacity for required production; locomotives; conveyers, mode of operations, applicability and limitations, scope and application of in-pit crusher in surface mines. Illumination in surface mines.

Types of waste dump- internal and external; dump formation methods and corresponding equipment; dump stability and stabilisation measures.

TEXT BOOKS:

1. Surface Mining Technology Samir Kumar Das, Lovely Prakashan.
2. Surface Mining – GB Misra, Dhanbad Publishers

REFERENCES:

1. Principles and Practices & Modern Coal Mining, Singh R.D, New Age International.
2. Mine Planning For Coal, Mathur S.P., M.G. Consultants
3. Introductory Mining Technology – H L Hartman, Wiley India (p) Ltd

E-RESOURCES:

1. <http://www.edumine.com/courses/online-courses/conventional-methods-of-resource-reserve-estimation/>
2. <http://www.springer.com/in/book/9783319477909>

COURSE OUTCOMES:

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

- 1: Understand Status of surface mining, types of surface mines and basics of surface mines.
- 2: Design the surface mines Layouts.
- 3: Understand Ground preparation methods and various equipment related to ground preparation
- 4: Understand Excavation system in surface mines
- 5: Understand different modes of transport system in surface mines and Types of waste dump

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	2				2		1			2	3	2	1
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2			3	2		2			1	3	2	2
CO5	3	2	2						2			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)					B. Tech V Semester		
Code: 82515	ROCK EXCAVATION ENGINEERING (Professional Elective -I)					L	T	P
Credits: 3						3	-	-

Prerequisite: Mining Geology, Drilling and Blasting

Course Objectives:

This course introduces rock excavation engineering, physico-mechanical and geotechnical properties, selection of excavation method. Mechanics of rock drilling and rock fragmentation by explosives, selection of explosives for rock excavation. Advances in blast design for underground excavation, Tunnel boring machines.

MODULE-I: Introduction

10 Periods

Scope and importance, Rock excavation engineering in mining and construction industries; Physico-mechanical and geotechnical properties of rocks Vis-à-vis excavation methods; selection of excavation methods.

MODULE-II: Drilling

10 Periods

Mechanics of rock drilling, design and operating parameters of surface and underground drilling, evaluation of drill performance, mechanism of bit Wear, bit selection, problems of drilling, economics of drilling.

MODULE-III: Blasting**10 Periods**

A: Mechanics of rock fragmentation by explosives; advances in explosives and their selection criteria for rock excavation, blast design for surface excavations and optimization.

B: Advanced blast initiation systems, cast blasting, techno - economic and safety aspects of surface and underground blasting.

MODULE-IV: Design of Blasting**09 Periods**

Advances in blast design for underground excavations, contour blasting, computer aided blast designs, review of tunnel blasting techniques in recent advances.

MODULE-V: Rock Cutting**09 Periods**

Theories of rock tool interaction for surface excavation machinery – rippers, bucket wheel excavators, continuous surface miners; theories of rock tool interaction for underground excavation machinery- Ploughs, Shearers, road headers, continuous miners.

Selection criteria for cutting tools; advanced rock cutting techniques – high pressure water jet assisted cutting.

TEXT BOOKS:

1. Principles of Rock fragmentation, Cark G.B—John Wiley & Sons
2. Rock fragmentation by blasting- Pradeep K.Singh et.al

REFERENCES:

1. Diamond Drilling, Chugh C.P.- Oxford Publication
2. Blasting in ground excavation & mines- B. Singh et.al

E RESOURCES:

1. <http://technology.infomine.com/reviews/Blasting/welcome.asp?view=full>
2. https://link.springer.com/chapter/10.1007/978-981-10-1989-0_16

Course Outcomes:

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

- 1:** Understand Physico-mechanical and geotechnical properties of rocks Vis-à-vis excavation method
- 2:** Understand Mechanics of rock drilling, problems of drilling, economics of drilling.
- 3:** Understand Mechanics of rock fragmentation by explosives and Advanced blast initiation systems
- 4:** Understand Design of Blasting
- 5:** Understand Theories of rock tool interaction for surface excavation machinery.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak		
COS	Programme Outcomes(POs)	PSOS

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	2			2	2		1			2	3	2	1
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2				2		2			1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech V Semester		
Code: 82516	MINERAL EXPLORATION (Professional Elective -I)	L	T	P
Credits: 3		3	-	-

Prerequisite: Mining Geology

Course

Objectives:

To know the mineral resources and prospecting techniques. To understand exploration techniques and strategy. To study the prefeasibility and feasibility reports and its evaluation methods

MODULE-I: Mineral Resources and Prospecting **10 Periods**

Introduction to important mineral resources in India and worldwide, surface and aerial prospecting, reconnaissance, application of geochemical, geophysical and geostatistical methods.

MODULE-II: Exploration **10 Periods**

Preliminary and detailed exploration by boring, exploratory mining by shafts, drifts, cross-cuts, collection and compilation of data for computer processing.

MODULE-III: Exploration Strategy **10 Periods**

A: Exploration. investment-decision, exploration-techniques

B: Strategies and exploration targets: Hydrocarbon provinces of India and exploration strategies–Water Resources and exploration strategies. Soil, Forest & Biomass and Marine resources.

MODULE-IV: Exploration Groups and their Role **09 Periods**

Strategy and structure of the exploration group, government policies, aspects of exploration, role of exploration in the mining company.

MODULE-V: Preparation and Evaluation of Project Reports

09 Periods

Evaluation of exploration and development projects, study of typical pre-feasibility and feasibility reports.

TEXT BOOKS:

1. Deshmukh, R.T., Mineral and Mine Economics, Mira Publications, Nagpur, 1986.
2. Hartman, H. L. (Editor), SME Mining Engineering Handbook, 3rd edition, Vol I & II, Society of Mining Engineers, New York, 2011.

REFERENCES:

1. Bhattacharjee, S., Frontiers in Exploration Geophysics Oxford and IBH Publishing Company, 1992.
2. A.K. Ghosh., Strategies for Exploitation of Mineral Resources in developing countries, Oxford & IBH Publishing Company, 1992.
3. Loan, D.A., Mine Management, Chapman and Hall, London, 1983.
4. Arogyaswamy, R.N.P., Courses in Mining Geology, Oxford and IBH Publishing Company Private Limited, 1994.

E RESOURCES:

1. www.doganaydal.com/.../INTRODUCTION_TO_MINERAL_EXPLORATION.PDF
2. <http://www.sciencedirect.com/science/article/pii/S0360128512>

Course Outcomes:

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

- 1: Understand Mineral Resources and Prospecting
- 2: Understand Preliminary and detailed exploration by different methods
- 3: Understand Exploration Strategy
- 4: Understand Exploration Groups and their Role
- 5: Understand Preparation and Evaluation of Project Reports

COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2				1					3	2	2	2
CO2	3	2	2		3		2		1			2	3	2	1
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2				2		2			1	3	2	2

CO5	3	2	2						1			2	3	1	2
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2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech V Semester		
Code: 82517	SMALL SCALE MINING AND MARINE ENGINEERING (Professional Elective -I)	L	T	P
Credits: 3		3	-	-

Prerequisites: Introduction to Mining Engineering, Metal Mining, Coal Mining

Course Objectives:

To introduce the small scale mining methods with case studies. To introduce the marine geology and its exploitation techniques

MODULE-I: Introduction to Small Scale Mining

10 Periods

Concept of small scale mining, small scale mines – world wide, Indian Policy in small scale mines – practices, policies and perspectives, problems of small scale mines – finance, legislative support, technical expertise, environmental obligations, safety, health and training, environmental impacts and protection.

MODULE-II: Small Scale Mining Methods

10 Periods

Classification and mode of occurrence of granite and other minor minerals, physical, mechanical and chemical properties, geological aspects of mining, granite and dimensional stone mining – manual, semi-mechanised and mechanised mining methods, & novel techniques, recent trends, processing, finishing, quality control, marketing & export of minerals. Case studies of mining of other minerals like sandstone, marble, beach sands, alluvial mining, mica, barytes, diamond and gemstones, etc.

MODULE-III: Introduction to Marine Mining

10 Periods

A: Introduction to marine environment, development & status of ocean resources of mining in India and other parts of the world.

B: Ocean profile, ocean floor topography, economic exclusive zone & fundamentals of law of the sea, coastal zone & its characteristics.

MODULE-IV: Marine Geology and Resources**09 Periods**

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

MODULE-V: Exploitation of Marine Deposits**09 Periods**

Shallow and deep sea bed, oceanographic instruments, mining of manganese nodules, deep sea drilling methods, ocean bottom samplers, drag buckets, grab buckets, coring systems, ocean bathymetry, temperature measurement systems, water samplers, ocean dynamic analysis, beach placer mining, underwater photographs, vehicles and transportation, offshore oil platforms.

TEXT BOOKS:

1. Chatterjee, S.K., An Introduction to Mineral Resources, Wiley Eastern Ltd., 1983.
2. Ghose, A.K., (Ed). Small Scale Mining – A Global Overview, Oxford - IBH Publishers, 1991

REFERENCES:

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

E RESOURCES:

1. <http://www.sanfoundry.com/best-reference-books-small-scale-marine-mining/>
2. <http://ibm.nic.in/index.php?c=pages&m=index&id=73&mid=18282>

Course Outcomes:

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

1. Understand Concept of small scale mining, small scale mines
2. Understand Small Scale Mining Methods
3. Understand Marine Mining and related concepts
4. Understand Marine Geology and Resources
5. Understand Exploitation of Marine Deposits

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO1	3	2	2					1				3	2	2	2
CO2	3	2	2				2		1			2	3	2	1
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2				2		2			1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. V Semester		
Code: 80H03	ENGLISH COMMUNICATION AND PRESENTATION SKILLS LAB (Common for CE, ME and Min.E)	L	T	P
Credits: 1		-	-	2

Course Course Objectives:

The learners need to be aware of the characteristics of technical communication in their workplaces; as a result, they are exposed to different channels of technical communication. Hence the acquired skills make the learners effective communicators using persuasive language. Besides the above said, one of the major objectives is to maintain objectivity in writing documents and to produce professional quality documents using different components of the language.

Methodology: Facilitator's role: Since classroom learning augments thinking process, helping them to develop written, spoken and non verbal communication, the facilitator / Faculty would briefly discuss the topics with the students and later on guide them while the students involved in activities, writing work and while making presentations. The facilitator is required to design a lot of practical/industry oriented project works for the students

*Students are required to participate, perform, write and submit the work in the form of written documents or Power Point Presentations to hone their spoken written and non verbal communication skills. Students are to take up field work and submit the project work.

Module – I: Oral Presentations

Mechanics of Presentations – Methodology of Presentation, Importance of Non-verbal communication during presentations– Nuances of Presentation.

*This particular module is for internal evaluation purpose(s).

Module – II: E - Correspondence and Social Media Etiquette

Common web mail services, yahoo, gmail etc, fields to pay attention- To:, Cc:, Bcc:, Reply All, Subject, Salutation, Body, Signature, Font, Caps Lock , Highlight, The 'KISS' strategy (Keep It Simple and Short,)Points to remember while signing off, Introduction to Technical Vocabulary, Cultural Differences

- This Module is purely for internal assessment/evaluation

Module – III: Group Discussion

Initiators- Contributor-Informer-Team Leader-Motivator-Creative Contributor , Importance of , Non verbal communication -eye contact, voice characters, posture, gestures, do's and don'ts, Role play and Simulation- Learners assuming the roles of characters and participating in Group discussion, analysis, or prediction with strictly defined goals.

Module – IV: Interview Skills & Office Etiquette

Preparing for the interview, types of interviews, interview session, importance of non verbal communication during the interview, do's and don'ts of interview, follow up and thanking letter. FAQ's. Formal Conversation, office attire- do's and don'ts, greetings and meetings, speaking to seniors and handshakes, offering and taking visiting cards, Asking questions and Seeking Clarifications.

Module – V: Career Progression

Job Hunt Process-SWOT analysis, correspondence and browsing the internet to search for a suitable job(s), job application-cover letter drafting, drafting a winning resume', types of resume's - electronic, video and printed resume's

- Instruction: Students are required to prepare their video resume which will be assessed by the faculty member.

REFERENCES:

1. Chrissie: **Handbook of Practical Communication Skills**: Jaico Publishing house, 1999.
2. Daniels, Aubrey: **Bringing Out the Best in People**: Tata McGraw-Hill: New York, 2003.
3. Wright, Goulstone, Mark: **Just Listen: Discover the Secret to getting through to absolutely anything** : American Management Association, 2010.
4. Leslie. T. Giblin: **Skill with people** Publication details not known
5. Lewis, Norman: **Word Power Made Easy**: Goyal Publications: New Delhi, 2009.
6. Murthy, A.G, Krishna,: **Ten Much** : Tata McGraw-Hill :New Delhi, 2010.

E-Resources:

1. http://www.mindtools.com/pages/article/newTMC_05.htm
2. <http://www.kent.ac.uk/careers/intervw.htm>
3. <http://www.wikihow.com/Write-a-Report>

Outcomes:

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

1. Give Oral Presentations Confidently.
2. Draft appropriate Resume in accordance with the context.
3. Participate and present their view and ideas logically and confidently.
4. Understand the importance of communication in various settings.
5. Utilize the technology for career advancement.

CO- PO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01										2		1			
C02						1			2		1	2			
C03		2		1											
C04											1	2			
C05											1	3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech V Semester		
Code: 82518	MINING MACHINERY LAB	L	T	P
Credits: 2		-	-	4

Course Objectives:: To study the various machineries, ropes, conveyors and different types of loading machines.

1. Study of jack Hammer, lubricator and air leg.
2. Study of construction of different types of wire ropes.
3. Study of safety hooks used in winding.
4. Study of different types of haulage systems and attachment of tubs to the rope.
5. Study of tensioning arrangement in endless haulage and different types of haulage clips.
6. Study of haulage track, curves, diamond crossing.
7. Study of construction of mine tubs and cars along with their couplings.
8. Study of safety devices provided of haulage roads
9. Study of submersible pumps.
10. Study of Electrical and hydraulic layouts for longwall faces
11. Study of aerial rope ways.
12. Study of various types of head gear-fleet angle, Study of shaft fittings-signal systems, guides, safety dogs and protective roofing, study of guides– methods of support and tensioning arrangements.

Course Outcomes:

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

- 1: Understand the safety and efficiency of various haulage layouts and devices
- 2: Understand the safety and efficiency of various Winding arrangements and devices
- 3: Understand the safety and efficiency of various Pit top layouts and devices
- 4: Understand the safety and efficiency of various Pit bottom layouts and devices
- 5: Understand the safety and efficiency of various machineries used at coal faces.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	2				2		1			2	3	2	1
CO3	3	2	2		1		1					3	3	3	2
CO4	3	1	2				2		2			1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80M03	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (Common for CE, ME and Min.E)	L	T	P
Credits: Nil		2	-	-

Pre requisites: Nil

Course Course Objectives: To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

MODULE- I Introduction to traditional knowledge 7 Periods

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge *vis-à-vis* formal knowledge

MODULE-II Protection of traditional knowledge 6 Periods

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

MODULE-III Legal frame work and TK 6 Periods

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);
B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

MODULE-IV Traditional knowledge and intellectual property 6 Periods

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

MODULE-V Traditional knowledge in different sectors 7 Periods

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

REFERENCES:

1. Traditional Knowledge System in India, by Amit Jha, 2009.

2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
4. "Knowledge Traditions and Practices of India" Kapil Kapoor¹, Michel Danino²

E- RESOURCES:

1. <https://www.youtube.com/watch?v=LZP1StpYEPM>
2. <http://nptel.ac.in/courses/121106003/>

Course outcomes:

At the end of the course students will be able to

1. Understand the concept of Traditional knowledge and its importance
2. Know the need and importance of protecting traditional knowledge.
3. Know the various enactments related to the protection of traditional knowledge.
4. Understand the concepts of Intellectual property to protect the traditional knowledge.
5. Know the various streams of Indian traditional knowledge.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						2		2				2			
CO2						2		2				2			
CO3						2		2				2			
CO4						2		2				2			
CO5						2		2				2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code:80H06	INDUSTRIAL MANAGEMENT	L	T	P

Credits: 3	(Common for CE, ME & Min.E)	3	-	-
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Prerequisites: Nil

Course Objectives:

Through reading the text, references and discussion of cases students should be able to understand the fundamentals underlying the management of an organization and Industrial Management.

MODULE – I Introduction to Management

10 Periods

- A. Introduction to Management:** Entrepreneurship and organization, Concepts of Management, nature, importance and Functions of Management, Taylor’s Scientific Management Theory, Systems Approach to Management, Fayol’s Principles of Management, Mayo’s Hawthorne Experiments.
- B. Management Theories:** Maslow’s Theory of Human Needs, Douglas McGregor’s Theory X and Theory Y, Herzberg’s Two-Factor Theory of Motivation, Leadership Styles, Corporate Social responsibility.

MODULE – II Organizational Structures and Types

09 Periods

- A. Organizational Structures:** Basic concepts related to Organization - Departmentation and Decentralization, Types of mechanistic and organic structures of organization
- B. Types of Organizations:** Line organization, Line and staff organization, functional organization, committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat Organization structure.

MODULE – III Operations Management

10 Periods

- A. Operations Management:** Objectives- product design process- Process selection-Types of production system (Job, batch and Mass Production), Plant location-factors- Urban-Rural sites comparison.
- B. Plant layout:** Types of Plant Layouts- Design of product layout- Line balancing (RPW method) Value analysis-Definition-types of values- Objectives- Phases of value analysis- Fast diagram

MODULE – IV Work Study and Statistical Quality Control

09 Periods

- A. Work Study:** Introduction, definition, objectives, steps in work study, Method study, definition, objectives, and steps of method study. Work Measurement, purpose, types of study, stop watch methods, steps, key rating, allowances, standard time calculations, work sampling.
- B. Statistical Quality Control:** variables-attributes, Shewart control charts for variables- chart, R chart, – Attributes-Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), acceptance Sampling- Single sampling- Double sampling plans-OC curves, Deming’s contribution to quality.

MODULE – V Project Management and contemporary practices 10 Periods

- A. Project Management (PERT/CPM):** Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems)
- B. Contemporary Management Practices:** Basic concepts of ERP, Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma, Capability Maturity Model (CMM), Benchmarking, Balanced Score card.

TEXT BOOKS:

1. Aryasri: **Management Science**, 4th edition, TMH, 2004.(UNITS I,II,III,IV,V)
2. Stoner, Freeman, Gilbert, **Management**, 6th Ed, Pearson Education, New Delhi, 2004. (UNITS I,II)

REFERENCES:

1. Kotler Philip & Keller Kevin Lane, **Marketing Management**, PHI, 12th edition, 2005
2. Koontz & Weihrich, **Essentials of Management**, TMH, 6th edition, 2005.
3. Panneerselvam **Production and Operations Management** PHI,2012.
4. Memoria & S.V. Gauker, **Personnel Management**, Himalaya, 25th edition, 2005
5. Samuel C. Certo, **Modern Management**, PHI, 9th edition, 2005.

E- Resources:

- 1.<http://www.learnerstv.com/Free-Management-Video-lectures-ltv656-age1.htm>
- 2.<http://www.learnerstv.com/Free-Management-Video-lectures-ltv728-age1.htm>
- 3.<http://freevidelectures.com/Course/2371/Project-and-Production-management>

At the end of the course students will be able to

1. Understand the various concepts, principles and theories of management.
2. Design the structure of an organization through understanding various structures of organizations.
3. Understand the basic concepts and processes of operations management.
4. Understand the concept of work study and Statistical Quality Control
5. Understand the basics of project management and also learns various contemporary management practices.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									2	3	1				
CO2		3							2		1				
CO3		3								2	1				
CO4		3		2	1										

CO5				2			3				1			
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2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VI Semester		
Code: 82519	MINE ECONOMICS	L	T	P
Credits: 3		3	-	-

Prerequisites: Basic mining operations.

Objectives: Student should be aware of methods to access economic value of minerals.

MODULE-I: The Mineral Industry

10 Periods

Economic characteristics of the mineral industry in India and world, the place of minerals in the national and international Economy.

MODULE-II: Mineral resources

10 Periods

Brief survey of India's mineral resources in the world setting with special reference to its need and deficiencies.

MODULE-III: Mining companies and mine Accounts

10 Periods

A:Structure, formation and capitalization, principles of book keeping as applied to the mining industry

B: Presentation of accounts, balance sheets and profit and loss accounts, Depreciation DCF, IRR.

Module –IV: Mine Valuation

09 Periods

Mineral reserves, mining reserve and profit examination and report on mines.

MODULE-V: Mine project planning

09 Periods

Mineral property planning valuation of mines, Mine properties, mine investments. Project planning and project evaluation.

TEXT BOOKS:

1. Deshmukh RT —Mineral Economics, Meera Publishers, Nagpur.
2. Mineral Economics, GB Misra.

REFERENCES:

1. Rubawsky —Mineral Economics, Elsevier Science pub.
2. Sharma N.L. —Mineral Economics.

E RESOURCES:

1. <http://www.dmr.gov.za/publications/mineral-economics.html>
2. <http://ibm.nic.in/index.php?c=pages&m=index&id=73&mid=18282>

Course Outcomes:

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

- 1:Understand Economic characteristics of the mineral industry in India and world
- 2:Understand Brief survey of India's mineral resources in the world
- 3:Understand Mining companies and mine Accounts
- 4:Understand Mineral reserves, mining reserve and profit examination and report on mines
- 5:Understand Mine project planning

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2				1					3	2	2	2
CO2	3	2	2				2		1			2	3	2	1

CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2				2		2			1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VI Semester		
Code: 82520	COMPUTER APPLICATIONS IN MINING	L	T	P
Credits: 2		2	-	-

Prerequisite: Machine Drawing and Computer Aided Graphics, Rock slope Engineering.

Objectives: This course introduces algorithms, flow charts, programs, design of open pit, underground minedesign, operational simulations, simulation of mining aspects, machine repairs, GPSS, SLAM, mining problems.

MODULE- I

07 PERIODS

INTRODUCTION TO STRUCTURE TERMINOLOGY AND PERIPHERALS, ALGORITHMS, FLOW CHARTS, PROGRAMS, DEDICATED SYSTEMS. APPLICATION IN MINING, EXPLORATION, ROCK TOPOGRAPHIC MODELS, BORE HOLE COMPOSITING, ORE RESERVE CALCULATION, INTERPOLATION AND GEOSTATICAL MODELS.

MODULE-II

07 PERIODS

Open pit design, Ultimate pit design, introductory process control, underground mine design, production scheduling.

MODULE-III

06 PERIODS

A: OPERATIONAL SIMULATION, INTRODUCTION, SIMULATION OVERVIEW, OBJECTIVE, UNDERSTAND THE ROLE OF MODELING, UNDERSTANDING THE BASIC CONCEPT IN SIMULATION. .

B: EXAMPLE OF SIMULATION IN MINING ASPECTS, SIMULATION OF MACHINE REPAIR PROBLEMS, CONCEPTS OF VARIABILITY AND PREDICTION, EXAMPLE WITH DUMPING TIME PROBLEM, FITTING DISTRIBUTION WITH CHI-SQUARE TEST.

MODULE-IV**06 Periods**

Random number generation, properties of random number, pseudorandom number, random variates generation, Methods of random variates generation, inverse transformed method, acceptance rejection method, composition method, empirical method and rectangular approximation.

MODULE-V

06 PERIODS

Simulation languages, GPSS and SLAM, Logical flow diagram of different mining activities. Coding with GPSS and SLAM of different mining problems, Computer control, Remote Control, automatic Control, application and limitations of control.

TEXT BOOKS:

1. Digital Computer Fundamentals, T.C. Bartee, Mc Graw Hill, 4thEd.,1984
2. Digital Principles and applications, P. Malvino and D.P. Leach, Mc Graw Hill, 5thEd., 1994

REFERENCES:

1. Application of Computer Methods in the Mineral Industry, R.V.Ramani.
2. Ram, R. V. et. al. Computers in mineral Industry, Oxford & IBH, 1994 Husterilid, Open pit mine planning and design, Bulkema, 1995.

E- RESOURCES:

1. https://www.shaalaa.com/question-papers/gujarat-technological-university-bachelor-be-computer-application-mining-be-mining-engineering-semester-6-te-third-year-2010_9958
2. <https://www.scribd.com/document/288352821/Computer-Applications-in-Mining-Industry>

COURSE OUTCOMES:

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

1. Understand structure terminology and peripherals, algorithms, flow charts, programs, dedicated systems
2. Understand Open pit design, Ultimate pit design, introductory process control, underground mine design, productionscheduling
3. Understand basic concepts in simulation

4. Understand Random number generation
5. Understand Simulation languages, GPSS and SLAM, Logical flow diagram of different mining activities

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	3				2		1			2	3	2	1
CO3	3	2	1		1		1					2	3	3	2
CO4	3	1	2				3		2			1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VI Semester		
Code: 82521	UNDERGROUND METAL MINING	L	T	P
Credits: 3		3	-	-

Prerequisite: Underground coal mining Technology.

Objectives:

To understand the details of development of a mine for exploitation of mineral deposits. To analyze design requirements of Underground Coal and metal Mining Methods. To apply different support systems including backfilling techniques for underground mines for stability of workings.

MODULE-I:Development

10 Periods

Mine development for working veins, lodes and tabular deposits, shape, size and position of the development working in relation to the ore body, Layout of the drifts, cross-cut, raises and winze in ore body.

MODULE-II: Raising methods

10 Periods

Different types of raising methods and their merits and demerits. Classification of stoping methods, factors influencing the choice of stoping method.

MODULE-III: Stopping Methods

10 Periods

A:Room and Pillar, Sublevel Open Stopping, Shrinkage method of Stopping and Cut & Fill method

of Stopping

B: Sublevel Caving, Block Caving, Special methods of working of thin deposits

MODULE-IV: Mine development

09 Periods

Applicability of methods, stope layout, stope development, ground breaking, mucking, ventilation, support, haulage and dumping.

MODULE-V: Leaching methods

09 Periods

Productivity and cost of mining of ores. Principles of in-situ leaching, scope and limitation of in-situ leaching.

TEXT BOOKS:

1. Mining Engineers handbook Vol.I & II, Peele , John Wiley & sons,
2. Working of Mineral deposits, Georgi Popov, International Law & Taxation Publishers.

REFERENCES:

1. Underground Mining Methods handbook.
2. Underground Mining Methods and Technology – Elsevier Science publication.
3. Mine working Vol. I & II, Karmakar H. – Lovely Prakasan, Dhanbad.

E RESOURCES:

1. <http://wikianswers.indianservers.com/under-ground-metal-mining-technology/>
2. <https://www.princeton.edu/~ota/disk3/1981/8103/810313.PDF>

Course Outcomes:

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

- 1:** Understand Mine development for working veins, lodes and tabular deposits
- 2:** Understand Different types of raising methods and their merits and demerits
- 3:** Understand different types of Stopping Methods
- 4:** Understand stope layout, stope development and related concepts
- 5:** Understand different types of Leaching methods.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2			1		1				3	2	2	2
CO2	3	2	2				3		1			2	3	2	1

CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2		2		2		2			1	3	2	2
CO5	3	2	2			1			1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VI Semester		
Code: 82522	MINE GROUND CONTROL (Professional Elective - II)	L	T	P
Credits: 3		3	-	-

Prerequisite: Underground Coal Mining Technology

Objectives:

To Identify and understand the factors contributing to strata control problems in mines, Analyze & design requirement of support system in different workings of mine, To Apply different instruments for evaluation of strata condition and organization of strata control in mines

MODULE-I: Pit slope stability & subsidence

10 Periods

Approach to slope stability, slope parameters, different types of slope failures, factors affecting slope stability, introduction to methods of failure, analysis, determination of factor of safety,. Introduction to different rock slope stabilization techniques.

Theories of subsidence, factors affecting subsidence, subsidence surveys, subsidence prediction techniques, subsidence control – surface and underground measures, pseudo- mining damage.

MODULE-II: Pillar design and rock burst

10 Periods

Strength of pillars, barrier and shaft pillar design – load estimation, factor of safety, various formulae, rock burst and bumps — phenomena, causes, prediction, monitoring and control, gas outbursts

MODULE-III: Underground supports

10 Periods

A: Various methods of roof examination, objectives and limitations of supports, ground forces and in situ stresses, pressure arch theory, evolution of supports, conventional supports — timber and steel supports, arches, yielding supports.

B: Rock and cable bolting, shotcreting, roof stitching, support of shaft bottoms, galleries, junctions and places of roof falls, freshly exposed roof supports, design of supports, longwall powered supports. Design of systematic support rules for B & P and longwall - development, depillaring, etc.

MODULE-IV: Instrumentation

09 Periods

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

MODULE-V: Stowing / filling

09 Periods

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

TEXT BOOKS:

1. Strata Control in Mineral Engineering, T. Bieniawski Ziti, John Wiley & Sons.

REFERENCES:

1. Underground winning of Coal, T.N. Singh, Oxford and IBH New Delhi.
2. Engineering Rock Mass Classifications, Bieniawski Z.T. 1989, Wiley, New York
3. Longwall mining, Peng S S and Chiang HS, Wiley, New York, 708p.

E RESOURCES:

1. http://www.undergroundcoal.com.au/fundamentals/15_general.aspx
2. <http://www.icevirtuallibrary.com/doi/abs/10.1680/ijoti.1939.14545>

Course Outcomes:

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

- 1: Understand Pit slope stability & subsidence
- 2: Understand Pillar design and rock burst
- 3: Understand various types of Underground supports
- 4: Understand different types of Instruments used for strata monitoring
- 5: Understand Stowing / filling

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	2					1				3	2	2	2

CO2	3	2	2		2		3		2			2	3	2	1
CO3	2018-19	2	MALLA REDDY ENGINEERING COLLEGE									2	3	3	2
CO4	Onwards	1	2		1		2		2			2	3	2	2
CO5	(MR-18)	1	2						1			2	3	1	2
Code:82523		LONGWALL MINING										L	T	P	
Credits: 3		(Professional Elective -II)										3	-	-	

Prerequisite: Introduction to mining Engineering

Objectives:

To pioneer the history of longwall mining and its development stages. To understand the extraction, support and transport on a longwall face. To learn ventilation methods and strata monitoring instruments

MODULE-I: Planning

10 Periods

History of longwall mining and its development, techno-economic consideration of the modified longwall retreat panels, longwall advance panels with caving method and stowing method, design of gate roadways and their size disposition, layout of panels, production and manpower planning, sublevel caving systems for thick seams, caving system in thin seams, multi-slice longwall mining, application of longwall mining for steep seams, longwall caving in metal mines.

MODULE-II: Supports

10 Periods

Types of supports used in longwall mining in the past and present, design of powered supports for different situations, longwall face end problems, supports in longwall gate roadways during drivage and extraction, pressure distribution around a moving longwall face, caving of thick seams and thin seams. Main roof fall, local fall and induced roof wall, floor heaving, precautions during main fall and surface subsidence.

MODULE-III: Extraction and Transportation on a Longwall Face

10 Periods

PART A: Methods of mining coal on longwall faces, machines – shearers, ploughs etc., methods of cutting and face advancement, stables and Sumping, gate road pillar extension.

PART B: Mode of transporting coal or ore in longwall face and machinery used. Shortwall Mining – a modified longwall mining. Remotely operated longwall faces. Shifting of longwall equipment.

MODULE-IV: Development and Working of Longwall Faces**09 Periods**

Methods of driving gate roadways, choice of selection of machinery, road headers and dinters, special problems associated with working of longwall faces - faults, roof caving, face spalling, overburden movement, subsidence control, hydraulic stowing, dealing with spontaneous heating while working thick seams in coal.

MODULE-V: Environment and Ancillary**09 Periods**

Methods of ventilating longwall faces and gate roadways. Methane control, dust control and noise control, monitoring at longwall faces. Assessment of cost of ventilation. Electric and hydraulic circuits. Surface and ground water effects. Strata monitoring with instruments

TEXT BOOKS:

1. Peng , S.S., Longwall Mining, 2rd Edition, John Willey and Sons, New York, 2006
2. Singh, R.D., Principles and Practices of Modern Coal Mining, New Age International, 1997.

REFERENCES:

1. Mathur, S.P., Mining Planning for Coal, M.G. Consultants, Bilaspur, 1999
2. Singh T.N., Dhar, B.B. Thick Seam Mining, problems and Issues, Oxford & IBH Publishers, 1992.
3. Das S.K., Modern Coal Mining Technology, Lovely Prakashan, Dhanbad, 1994. 4 Longwall Mining in Company Seminar – Proceedings – The Singareni Collieries Co. Ltd., 1990.

E RESOURCES:

1. www.coaleducation.org/technology/Underground/Longwall_Mining.htm
2. www.undergroundcoal.com.au/pdf/longwall_mitchell.pdf
3. webapp1.dlib.indiana.edu/virtual_disk_library/index.cgi/.../pdf/coal.../tr0588.pdf
4. www.miningmagazine.com/tag/longwall/

Course Outcomes:

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

- 1:Understand Planning of Long wall Mining
- 2:Understand design of powered supports for different situations
- 3:Understand Extraction and Transportation on a Longwall Face
- 4:Understand Development and Working of Longwall Faces
- 5:Understand Methods of ventilating longwall faces and gate roadways.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2				1					3	2	2	2
CO2	3	2	2				2		1			2	3	2	1
CO3	3	2	2		1		1					2	3	3	2

CO4	3	1	2				2		2			1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VI Semester		
Code: 82524	MINE SYSTEMS ENGINEERING (Professional Elective -II)	L	T	P
Credits: 3		3	-	-

Prerequisite: Mathematics

Coursr Objectives:

The objective of this subject is to provide knowledge of solving the models for their optimal solutions.

MODULE-I: Introduction

10 Periods

Introduction to optimization techniques, Introduction to linear programming, problem formulations, graphical solutions, unboundedness, infusibility, unique solution, multiple solutions. Mining examples

MODULE-II:

10 Periods

Simplex method with different combinations of constraints, Big M method, Duality of linear programming, importance of dual problems, interpretations of solutions of primal from dual

MODULE-III: Transportation Problem

10 Periods

A: Formulation–Optimal solution, unbalanced transportation problem–Degeneracy, variants in assignment problems, mining examples.

B: Assignment problem – Formulation – Optimal solution - Mining examples

MODULE-IV: Inventory and Waiting line

09 Periods

Importance of Inventory, Introduction to inventory, basic assumptions in EOQ model, EOQ (Economic Order Quantity).

Introduction to waiting line theory, basic assumptions in waiting line, determination of waiting time in quee, waiting time in system, Single channel quee systems – arrivals Poisson distributed, service time exponential distribution

MODULE-V:

09 Periods

Introduction to CPM, Importance of CPM, Determination of Early start times, Early finish times, Latest finish times, Critical path, Project duration, Crashing of a network, Importance of PERT, Probability of project completion time, Assumptions in PERT

TEXT BOOKS:

1. Introduction to O.R /Taha/PHI Publishers
2. Operations Research / S.D.Sharma/Kedarnath Publisher

REFERENCES:

1. Operations Research /A.M.Natarajan, P.Balasubramani,A. Tamilarasi/Pearson Education.
2. Operations Research: Methods & Problems / Maurice Saseini, ArhurYaspan& Lawrence Friedman/ Literary Licensing
3. Operations Research / R.Pannerselvam,PHI Publications.

E RESOURCES:

1. https://en.wikipedia.org/wiki/Systems_engineering
2. https://web.stanford.edu/class/archive/ee/ee392m/ee392m.1056/Lecture9_ModelSim.pdf

Course Outcomes:

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

- 1:Understand optimization techniques, linear programming, graphical solutions
- 2:Understand Simplex method, Big M method, Duality of linear programming
- 3:Understand basics of Transportation Problem
- 4:Understand Inventory and Waiting line problems
- 5:Understand basic concepts of PERT and CPM

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PSO 2	PS O3
CO1	3	2	2				1					3	2	2	2
CO2	3	2	2				2		1		3	2	3	2	1
CO3	3	2	2		1		1			2		3	3	3	2
CO4	3	1	2				2		2			1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VI Semester		
Code: 82525	ENVIRONMENTAL IMPACT AND MANAGEMENT (Professional Elective -III)	L	T	P
Credits: 3		3	-	-

Prerequisite: Basic knowledge of Development of Mineral Deposits. Basic study of Environmental science.

Course Objectives: This course introduces influencing factors of environmental.

Module I: Sustainable development: 10 Periods

Ecology, Sustainable activity and Control Measures:

Land environment: Land degradation due to mining; Physical and biological reclamation.

Ecology: Introduction to ecology, ecosystem structures and functions. Sustainable development, environmental carrying capacity - concepts & principles; Base line studies, pre-mining status of environment.

Module II: Water pollution: 10 Periods

Study of surface sources of water. Global hydrological cycle; Self purification mechanism, sources of water pollution, important parameters–pH, turbidity, oil & grease, nitrates, DO, BOD, COD; Eutrophication, deoxygenation, Study of water table. Acid mine drainage and heavy metal pollution–preventive and control measures.

Module III: Air, Noise and Vibration pollution: 10 Periods

A: Air pollution due to dust: Atmospheric composition and meteorology; Sources of air pollution – Pollution due to Drilling and Blasting, HEMM, Air pollution due to mine gases, mine fires, mine explosions, point and non-point pollutions; Emission factors; Control measures – extraction, suppression and consolidation of dust.

B: Noise and vibration: Basic concepts, sources, monitoring and control measures. Vibration – Reduction techniques.

Waste disposal, Fuels, oils and Hazardous materials produced due to mining and dealing them.

Module IV: Environmental administration: 09 Periods

The basis for Environmental laws. Laws related to mining environment; National procedure for accreditation of laboratories and consulting organizations, Different functional area experts, Environmental co-ordinators. Impact assessment. Impact management. Environmental Clearance of Projects procedure for mines and projects.

Module V: Human Angle to the Mine Environment: 09 Periods

Public participation in project approvals. Project effected persons, Socio Economic Study. Corporate Social Responsibility: Concepts and principles.

Mine closure: Concepts and principles. Audit of Mine Closure activities. A case study.

TEXT BOOKS:

1. ENVIRONMENTAL IMPACT ASSESSMENT: A GUIDE TO BEST PROFESSIONAL PRACTICES 2011 BY CHARLES H. ECCLESTON
2. WATER POLLUTION BY AGARWAL S K

REFERENCES:

1. FUNDAMENTALS OF AIR POLLUTION BY DANIEL VALLERO
2. FUNDAMENTALS OF NOISE AND VIBRATION BY FRANK FAHY, JOHN WALKER

E RESOURCES:

1. https://www.researchgate.net/publication/23638230_Handbook_of_Noise_and_Vibration_Control
2. <http://www.nios.ac.in/media/documents/313courseE/L34.pdf>
3. <http://www.dmp.wa.gov.au/Documents/Environment/ENV-MEB-121.pdf>

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	3	2			2		1			2	3	2	1
CO3	3	2	2		1		2					2	3	3	2
CO4	3	1	3			2	2		2			1	3	2	2
CO5	3	2	2			1			1			2	3	1	2

2018-19 Onwards	MALLA REDDY ENGINEERING COLLEGE	B. Tech VI Semester
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(MR-18)	(Autonomous)			
Code: 82526	MINE SUBSIDENCE ENGINEERING (Professional Elective -III)	L	T	P
Credits: 3		3	-	-

Prerequisite: Mining Geology, Mine Mechanization, Surface Mining Technology.

Course Objectives: This course introduces factors influencing convergence in mine working, Subsidence mechanism and different methods of subsidence prediction, Time influence and impact on structures, Control of substance and governing laws and standards.

MODULE-I: Introduction

10 Periods

Strata movement at the mining horizon, convergence in mine working, factors influencing convergence in mine working.

MODULE-II: Subsidence mechanism

10 Periods

Zones of movement in the overlying beds, vertical and horizontal movement, subsidence trough, angle of draw, angle of break, sub-surface subsidence.

MODULE-III: Subsidence prediction

10 Periods

A: Different methods of surface subsidence prediction.

B: Graphical, analytical, profile function empirical and theoretical models.

MODULE-IV: Time influence and impact on structures

09 Periods

Influence of time on subsidence, example from long wall and bord and pillar working. Calculation of ground movement over time.

Types of stress on structures, stress-strain behavior of soils, mining damage to buildings, industrial installations, railway lines, pipes, canals, etc.,

MODULE-V: Subsidence control, governing laws and standards

09 Periods

Measures to reduce mining damage, mining methods to minimize damage. Laws governing mining damage, different standards suggested for mining and building ground in respect of subsidence. Case studies of Mine subsidence

TEXT BOOKS:

1. Subsidence: occurrence prediction and control, B.N Whittaker & D.J Reddish, Elsevier
2. Mine Subsidence Engineering, H. Kratzsch, Springer London

REFERENCES:

1. Mine Subsidence, B. Singh, Parijat Mudranalaya Publications.
2. Surface subsidence Engineering, Syd S. Peng, W. M. Ma, W. L. Zhong, Society for

Mining, Metallurgy & Exploration.

E RESOURCES:

1. <http://www.minesubsidence.com/>
2. https://www.researchgate.net/publication/236394097_Mining_Subsidence_Engineering.

Course Outcomes:

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

- 1: Understand Strata movement, convergence in mine working, factors influencing convergence in mine working
- 2: Understand Subsidence mechanism
- 3: Understand Different methods of surface subsidence prediction
- 4: Understand Time influence and impact on structures
- 5: Understand Subsidence control, governing laws and standards

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	3				1	1				3	2	2	2
CO2	3	2	2				2		1			2	3	2	1
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2				2		2			1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VI Semester		
Code: 82527	ADVANCED COAL MINING AND MECHANIZATION	L	T	P

Credits: 3	(Professional Elective -III)	3	-	-
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Prerequisite: Coal Mining and Mine machinery

Course Objectives:

To introduce the recent trends of level of mechanization for coal face. To understand the various advanced methods of coal mining

MODULE-I: Coal Face Mechanization

10 Periods

Recent Trends, mechanized bord and pillar mining, case studies.

MODULE-II: Mining of Thick Seams

10 Periods

Problems, past experiences in India, current methods, mining of thick, contiguous, and steep seams

MODULE-III: Hydraulic Mining

10 Periods

A: Applicability, operating parameters, equipment, layouts, Indian experience.

B: Computer applications such as remote control and environmental monitoring in hydraulic mining.

MODULE-IV: Longwall Mining

09 Periods

Powered supports, development of powered supports, their types and designs, selection for different conditions, last drivages for longwall panelling, remotely operated powered support and longwall faces, Indian experiments, salvaging in longwall.

MODULE-V: Underground Coal Gasification

09 Periods

Scope, application, methods of gasification, design of gasification plants, coal bed methane. Environmental monitoring techniques and computer applications in coal gasification techniques.

TEXT BOOKS:

1. Das S.K., Modern Coal Mining Technology, Lovely Prakashan, Dhanbad, 1994
2. Singh, T.N., and Dhar, B.B. Thick Seam Mining, Problems and Issues, Oxford & IBH Publishers, 1992

REFERENCES:

1. Mathur, S.P., Mining Planning for Coal, M G Consultants, Bilaspur, 1993
2. Peng S.S. and Chiang, H.S., Longwall Mining, John Willey and Sons, New York, 1992
3. T.N. Singh, Underground Winning of Coal, Oxford IBH Publishers, 1999 6. R.D. Singh, Principles and Practices of Modern Coal Mining, New Age International, 1997

E RESOURCES:

1. <http://www.nber.org/chapters/c6321.pdf>

2. <http://www.geevor.com/media/teaching%20resources/coal%20mining.pdf>

Course Outcomes:

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

- 1: Understand various advanced coal face mechanization.
- 2: Understand various advanced methods of coal mining.
- 3: Understand Hydraulic Mining.
- 4: Understand Underground Coal Gasification
- 5: Understand mining methods.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1				3	2	2	2
CO2	3	2	2				2		1			2	3	2	1
CO3	3	2	2		1		3					2	3	3	2
CO4	3	1	2				2		2			1	3	2	2
CO5	3	2	2				1		1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech VI Semester		
Code: 82528	MINE ENVIRONMENTAL ENGINEERING LAB	L	T	P
Credits: 1.5		-	-	3

Objectives:

To determine the psychrometric properties, gas percentage in atmosphere. To study the principles and characteristics governing mine fans. To understand lamp design and perform underground

illumination surveys. To understand the temporary and permanent stoppings, preventive measures for mine explosions and rescue apparatus.

LIST OF EXPERIMENTS:

1. Detection of mine gases.
2. Measurement of relative humidity by hygrometer and Kata thermometer.
3. Study of Constructional features and Characteristic curves of centrifugal and axial flow fans.
4. Measurement of air quantity by anemometer, velometer, smoke tube
5. Study and analysis ventilation network circuit.
6. Study of mine air-conditioning plant.
7. Constructional features of a flame safety lamp and cap lamp.
8. Fire extinguishers used in mines.
9. Study of cowards Diagram.
10. Study of stone dust barrier.
11. Oxygen self-rescuer
12. Self-contained breathing apparatus..

Course Outcomes:

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

- 1:Determine the psychrometric properties, gas percentage in atmosphere.
- 2:Determine the relative humidity by hygrometer.
- 3:Knowledge of principles and characteristics governing mine fans.
- 4:Analyses ventilation network circuit.
- 5:Knowledge of mine air-conditions plant.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		1					2			2	1	2
CO2	3	2	2										2	3	3
CO3	3	2	2				2		3				1	2	2
CO4	2	3	2		2			2	1		2		3	3	2
CO5	2	1	2					1					2	3	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VI Semester		
Code: 82529	ROCK MECHANICS LAB	L	T	P
Credits: 1.5		-	-	3

Course Objectives:

To study the various of methods to determine the properties of rocks. To study the operation of various instruments and equipment.

LIST OF EXPERIMENTS:

1. Determination of RQD of rocks.
2. Determination of Protodyaknov index of a given rock sample

3. Determination of point load index strength of a given rock sample
4. Determination of porosity of rocks.
5. Determination of hardness of rocks
6. Determination of uniaxial compressive strength of a given rock sample
7. Determination of tensile strength of a given rock sample using Brazilian method
8. Determination of shear strength of rocks
9. Determination of modulus of elasticity of given rock sample using strain gauge.
10. Determination of triaxial strength of rock and drawing of Mohr's envelope
11. Study of different types of supports used in mines
12. Study of design of mine pillars.

Course Outcomes:

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

- 1: Determine the properties of rocks
- 2: Knowledge of various instruments and equipment.
- 3: Design the supports for mine openings.
- 4: Design mine pillars.
- 5: Knowledge of various equipments.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2				2					2	2	1	3
CO2	3	2	2						2				2	1	2
CO3	3	2	3			2							1	3	2
CO4	2	1	3				1		2				1	2	1
CO5	2	1	2				2						3	2	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code:80M04	INDIAN CONSTITUTION (Common for CE, ME and Min.E)	L	T	P
Credits: -		2	-	-

Prerequisites: NIL

Course Objectives:

To understand the importance of Indian constitution, Administration, Concept and Development of Human Rights, Election Commission.

MODULE-I

06 Periods

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution- Sources and constitutional history, Features- Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

MODULE-II

07 Periods

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions; **State Government and its Administration** Governor: Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

MODULE-III

06 Periods

A.Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation,
B.Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

MODULE-IV

07 Periods

Concept and Development of Human Rights: Meaning Scope and Development of Human Rights, United Nations and Human Rights – UNHCR, UDHR 1948, ICCPR 1996 and ICESCR 1966, **Human Rights in India:** Protection of Human Rights Act, 1993 (NHRC and SHRC), First, Second and Third Generation Human Rights, Judicial Activism and Human Rights.

MODULE-V

06 Periods

Election Commission: Election Commission- Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012
10. **E-Resources:**
 1. nptel.ac.in/courses/109104074/8
 2. nptel.ac.in/courses/109104045/
 3. nptel.ac.in/courses/101104065/
 4. www.hss.iitb.ac.in/en/lecture-details
 5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Course outcome:

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

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

C01						1	2	3							
C02						1	2	3							
C03						1	2	3							
C04						1	2	3							
C05						1	2	3							

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VII Semester		
Code:82530	MINE LEGISLATION	L	T	P
Credits: 2		2	-	-

Prerequisite: Industrial Management

Course Objectives: This course introduces laws and legislation of mines, electricity rules of India, training required, safety measures to be followed by workers, types of accidents, statistics, causes and prevention of accidents, labor rules, welfare organizations etc.

MODULE-I: Introduction

06 Periods

Introduction to mining laws and legislation, development of mining legislation of India. Workmen compensation Act, Maternity benefit Act, Crèche rules, Payment of wages Act.

MODULE-II:

07 Periods

Mines Acts: Definitions, Appointment & powers of inspectors, management & operation of mines, Hours and limitation of employment, provisions related to H&S

Mines Rules: Definition of rules and bye laws, Appointment duties of welfare officer; Periodical medical standards & medical examinations, canteens, Rest shelters, pit safety commitment. Workman inspector.

MODULE-III: Rules and Regulations

07 Periods

A: Vocational Training rules, Explosives act, Rescue Rules, Environmental protection Act.

B: Pit head bath rules, Mines and Minerals Development and Regulation Act, Mineral concession rules.

MODULE-IV:

06 Periods

Coal Mines Regulations and Metalliferous Mine Regulations.

MODULE-V: Accidents and Health

06 Periods

Causes and prevention of accidents. Accidents rate in Indian mines. Accident enquiries and reports, health of workmen. Occupational diseases in mining.

TEXT BOOKS:

1. Principle Acts & Rules CMR and MMR

REFERENCES:

1. Intent and Content of Mine Legislation – Prasad.

E RESOURCES:

1. <https://blog.ipleaders.in/mining-laws-in-india/>
2. <http://www.dmr.gov.za/legislation.html>

Course**outcomes:**

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

- 1: Understand development of mining legislation of India
- 2: Understand Mines Act, Mine Rules
- 3: Understand Vocational Training rules, Explosives act, Rescue Rules, Environmental protection Act and Mines and Minerals Development and Regulation Act
- 4: Understand Coal Mines Regulations and Metalliferous Mine Regulations.
- 5: Understand Causes and prevention of accidents in mines.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2										1	2	3
CO2	3	3	2				2			2		2	3	2	2
CO3	2	2	3			2		2					3	3	1
CO4	2	1	1										2	3	1
CO5	3	1	1										2	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VII Semester		
Code: 82531	MINERAL PROCESSING	L	T	P
Credits: 2		2	-	-

Prerequisite: Development of Mineral Deposits

Course Objectives: This course introduces Objectives of mineral processing, characteristics of minerals and coal, crushing methods, separation methods, methods of concentration, fields of application and limitations.

MODULE-I: Introduction

07 Periods

Scope, objectives and limitations of mineral processing, liberation and beneficiation.

Combinations:

Theory and practices of crushing and grinding; different types of crushing and grinding equipment's – their applications and limitations.

MODULE-II: Size Separation

06

Periods

Laboratory size analysis and interpretation; settling of solids in fluids; industrial screens, mechanical classifiers and hydro cyclones.

Gravity Concentration Methods:

Jigging, Heavy media separation, flowing film concentrators–theory, applications and limitations.

MODULE-III: Froth Flotation

07 Periods

A: Physico-chemical principles, reagents.

B: Machines, flotation of sulphides, oxides and coal.

MODULE-IV: Applications and Limitations of concentrating technique **06 Periods**

Applications and limitations of magnetic concentration, high tension concentration, Ore sorters

Dewatering: Thickeners, filters, thermal drying.

MODULE-V: Flow Sheets

06 Periods

Simplified flow sheets for coal, zinc, iron, and manganese ores.

Magnetic methods of concentration Principles, Fields of Application and Limitation.

TEXT BOOKS:

1. Introduction to Mineral Processing – V. Malleswar Rao, Indian Academy of Geoscience
2. Mineral Processing – Barry AWills, Elsevier.

REFERENCES:

1. Mineral Processing – S.K. Jain, CBS Publishers & Distributors
2. Mineral beneficiation a concise basic course by D.V. Subba rao

E RESOURCES:

1. <https://www.britannica.com/technology/mineral-processing>
2. <http://www.sciencedirect.com/science/journal/03017516>

Course Outcomes:

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

1. Understand Scope, objectives and limitations of mineral processing and theory of Comminution
2. Understand basic concepts of Size Separation
3. Understand basic concepts Froth Floatation
4. Understand Applications and Limitations of Concentrating techniques
5. Understand various Flow Sheets

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		1								2	2	2
CO2	3	2	2			2	2					2	2	2	3
CO3	3	2	2		1					2			3	3	1
CO4	3	2	2			2							1	1	2
CO5	3	2	2						2				2	2	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VII Semester		
Code: 82532	DISASTER MANAGEMENT (Professional Elective -IV)	L	T	P
Credits: 3		3	-	-

Prerequisite: Mine Environmental engineering I & II

Course Objectives: To provide students an exposure to disasters, their significance and types. To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction. To gain a preliminary understanding of approaches of Disaster Risk Reduction in mines. To enhance awareness of Legislation on Mine Disaster dealing and conduct of rescue recovery.

MODULE I: Introduction to Disasters

10 Periods

Definition: Vulnerability, Hazard, Resilience, and Risks – Disasters: Types of disasters – Classification, Causes, Impacts- - urban disasters, Climate change - Dos and Don'ts during various types of Disasters.

MODULE II: Approaches to Disaster Risk Reduction

10 Periods Disaster

cycle - Phases, Culture of safety, prevention, mitigation and preparedness. Risk Assessment, How legislation helps in reducing risks in mines, Concept of factor of Safety, Concept of Early Warning Systems in all activities in mines. Flow of information in the disaster management framework, Stakeholders, Rescue recovery setup in mines.

MODULE III: Preparations and Equipment In Mines

10 Periods

A: Rescue preparedness in mines. Rescue trained persons. Roles of different responsible persons. Response and Recovery Phases of Disaster. Disaster Management Plans (Emergency Plan) for mines, Standard procedures for rescue and recovery in various situations in mines.
B: Rescue Equipment: Two hour self contained breathing apparatus, short duration self contained breathing apparatus, Self Rescuers, Resuscitating Apparatus, first aid and immediate Medical treatments required.

MODULE IV: Conduct Of Rescue And Recovery In Mines:

09 Periods Leadership

in the event of Disaster, Response time, Response logistics, Recovery, Post Disaster Damage Assessment, Public Participation, Courts of Enquiries, Rescue by Drilling large dia hole.

MODULE V: Case Studies

09 Periods

Case Studies of Jitpur Methane explosion, Dhori Coal Dust Explosion Disasters, Bumps Disaster in Kolar Gold Fields at Great depth, Chasnulla inundation disaster. How these Disasters effected the legislation in Indian mines.

TEXTBOOK:

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Mines Disasters in India Vol – I and Vol II

REFERENCES:

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

E RESOURCES:

1. https://www.researchgate.net/publication/318339409_Mining_Disasters_-_What_lessons_can_be_learned
2. https://www.researchgate.net/...Disaster...Management/.../279804770_Disaster_Prevention

Course Outcomes:

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

- 1: Know various aspects of Disasters.
- 2: Know the concept of Risk Reduction.
- 3: Know the preparations and Equipment requirement in mines
- 4: Know various aspects involved in Rescue And Recovery In Mines:
- 5: What went right or wrong in past case studies and how this helped mining industry.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2				2						2	3	2
CO2	3	3	3									2	3	3	1
CO3	3	2	2				2						1	2	3
CO4	2	1	3			2					2		3	1	3
CO5	2	1	1										2	2	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VII Semester		
Code: 82533	ROCK SLOPE ENGINEERING (Professional Elective -IV)	L	T	P
Credits: 3		3	-	-

Prerequisite: Surface mining technology

Course objectives:

To introduce the basic mechanics of rock slope failure to learn the types of rock failure and its influencing parameters

MODULE-I: Basic mechanics of rock slope failure **10** **Periods**

Rock slope economics, slope parameters, effect of water pressure, factor of safety of slopes, slope height vs. slope angle, design of slopes.

MODULE-II: Geological and strength properties **10** **Periods**

Geological parameters affecting slope stability; physico-mechanical properties affecting slope stability, shearing on incline plane, determination of shear strength of rock and rock discontinuities; Ground water flow in rock masses; field measurement of permeability; measurement of water pressure.

MODULE-III: Plane failure **10** **Periods**

A: Plane failure analysis; graphical analysis of stability; influence of ground water on stability
B: Influence of tension crack; rock reinforcement; analysis of failure on a rough plane; case studies.

MODULE-IV: Wedge failure **9** **Periods**

Analysis of wedge failure; wedge analysis including cohesion and water pressure; case studies.

MODULE-V: Circular and toppling failure **9** **Periods**

Conditions for circular failure; derivation of circular failure analysis; effect of ground water; Types of toppling failure; analysis of toppling failure; Influence of slope curvature on stability; slope depressurization: protection of slopes: control of rock falls.

TEXT BOOKS:

- 1) Hoek, E and Bray, J.W., Rock Slope Engineering, Institution of Mining and Metallurgy, 1991.
- 2) Goodman, R.E., Rock Mechanics, John Wiley and Sons, 1989

REFERENCES:

- 1) Singh, R.N. and Ghose, A.K., Engineered Rock Structures in Mining and Civil Construction, A.A. Balkema, Netherlands, 2006.

2) Rock Slope Engineering: Civil and Mining by Duncan C. Wyllie

E RESOURCES:

1. [Technology.infomine.com/reviews/rock slope stability/](http://Technology.infomine.com/reviews/rock%20slope%20stability/)

Course

Outcomes:

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

1. Understand Basic mechanics of rock slope failure
2. Understand Geological parameters and physico-mechanical properties affecting slope stability
3. Understand basics of Plane failure
4. Understand basics of Wedge failure
5. Understand basics of Circular and toppling failure.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2									2	2	2	3
CO2	2	2	2				2		2				2	3	2
CO3	3	3	1				1		3			2	3	2	1
CO4	1	2	2				1		2		2	2	1	1	3
CO5	3	3	1			2			1				2	2	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE					B. Tech VII Semester		
	(Autonomous)							
Code: 82534	MINE PLANNING AND DESIGN					L	T	P
Credits: 3	(Professional Elective-IV)					3	-	-

Prerequisite: Underground and Open cast Mining Methods

Course Objectives: To understand the planning of opencast & underground mines and equipment utilization. To study project implementation and monitoring

MODULE-I: Introduction

10 Periods

Technical factors in mine planning, methodology of mine planning, short range & long range, Optimization Techniques in Mine Planning; mine plan preparation; Choice between surface and underground mining

MODULE-II: Opencast Mining

10 Periods

A. Development of Ultimate Pit Configuration (open pit limits) and its determination – hand method, floating cone technique, Lerchs-Grossmann algorithm and computer assisted hand method; Selection of initial mine cuts and geometrical considerations; location of surface structures, division of mining area into blocks, mine design, Impact of various parameters like depth, dip, stripping ratio, geology and strength of mineral and overburden on mine planning.

B. Selection of Mining Systems; Determination of optimum mine size and sequencing by nested pits; Lanes algorithm for estimation of optimum mill grade and production planning; calendar plan, production scheduling, economic productivity indices. Quality Control-Ore Blending; Planning for mine closure.

MODULE-III: Underground Mining

10 Periods

A: Design of mine entries – shafts, inclines, design of stopes – size, level interval, etc. design of coal mining district, mine boundaries; design of shaft pillars and protective pillars, planning of production capacity, optimization of mine size – mine production capacity, layout of development drives / raises / winzes etc, length of faces, etc,

B: Planning of support systems, ventilation, layout of drainage system; Production planning & Production scheduling, selection of depillaring / stoping method, manpower management economic/ productivity indices, Productivity and quality control; Techno- economic analysis, Planning for mine closure.

MODULE-VI: Equipment Planning

09 Periods

Latest technological developments in increase in both types and capacities of equipment used in mining operations. Planning and selection of equipment, their capacities and population for different mining conditions.

Maintenance planning and scheduling including spare management; Equipment information – performance monitoring and expert systems.

MODULE-V: Project Implementation and Monitoring

09 Periods

Pre-project activities – feasibility report, environmental clearance, detailed project report, sources of funds, import of technology, selection of contracts and contract administration, time management, cost control material management system, project quality assurance, social responsibility,

government orders and guidelines. Environmental impact assessment and preparation of environmental management plan.

TEXT BOOKS:

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

REFERENCES:

1. Ehrenburger, V and Fajkos, A., Mining Modelling, Elsevier, 1995.
2. Bawden, W.F., and Archibald., J.F., Innovative Mine Design for the 21st Century
3. Elsevier, 1993. Christopher J. Bise, Mining Engineering Analysis, 2nd Edition, Society for Mining, Metallurgy, and Exploration, 2003.
4. Pazdziora, J., Design of Underground Hard Coal Mines, Elsevier, 1988.

E RESOURCES:

1. www.core-mining.com/services/details/Mine-Planning-and-Design
2. www.tetrattech.com/en/docs/mc14-028-en-mine-planning-and-design
3. www.empr.gov.bc.ca/Mining/Geoscience/Coal/CoalBC/.../Volume3-MinePlanning
4. <https://journals.agh.edu.pl/mining/article/view/460>

Course Outcomes:

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

1. Understand Technical factors in mine planning, methodology of mine planning, Optimization Techniques in Mine Planning.
2. Understand different design concepts related to Opencast Mining
3. Understand different design concepts related to Underground Mining
4. Understand Equipment Planning
5. Understand Project Implementation and Monitoring.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		1			1				3	2	3	2
CO2	3	2	2		2	2	1		1			2	3	1	1
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2				2		2			1	3	2	2
CO5	3	2	2						1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B. Tech VII Semester		
Code: 82535	ADVANCED SURFACE MINING (Professional Elective -V)			L	T	P
Credits: 3				3	-	-

Prerequisite: Surface Mining Technology

Course Objectives: To introduce the various techniques for mine planning, geotechnical investigation and equipment management. To appreciate the modern trends in opencast mines, safety and environment

MODULE-I: Pit Planning

10 Periods

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

MODULE-II: Geotechnical Parameters

10 Periods

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

MODULE-III: Production and Equipment Planning

10 Periods

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

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

MODULE-IV: Health, Safety and Environmental Management

09 Periods

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

MODULE-V: Modern Trends in Opencast Mines

09 Periods

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

TEXT BOOKS:

1. Hartman, H. L. (Editor), SME Mining Engineering Handbook, 3rd edition, Vol I & II, Society of Mining Engineers, New York, 2011.
2. Hustrulid, W. and Kuchta, M., (eds)., Fundamentals of Open Pit Mine Planning & Design, Elsevier, 1995

REFERENCES:

1. Proceedings of National Seminar on Surface Mining, IME Publications/ Calcutta, 1995
2. Das, S.K., Surface Mining Technology, Lovely Prakashan, Dhanbad, 1994
3. Das, S.K., Modern Coal Mining Technology, Lovely Prakashan, Dhanbad, 1994
4. Kennedy, B.A., Surface Mining – 2nd Edition, SME, New York, 1990

E RESOURCES:

1. www.eolss.net/sample-chapters/c05/e6-37-06-01.
2. <https://link.springer.com/book/10.10>

Course Outcomes:

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

1. Understand Pit Planning and related concepts
2. Understand Influence of pit slope on mine economics and related concepts
3. Understand Production and Equipment Planning
4. Understand Health, Safety and Environmental Management
5. Understand Modern Trends in Opencast Mines.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					1	2			3	2	2	2
CO2	3	2	2				2		2			2	3	2	1
CO3	3	2	2		1		1					2	3	3	2
CO4	3	1	2				2	1	2			1	3	2	2
CO5	3	2	2				2		1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VII Semester		
Code: 82536	ADVANCED METAL MINING AND MECHANIZATION (Professional Elective -V)	L	T	P
Credits: 3		3	-	-

Prerequisite: Nil

Course Objectives: To introduce the recent advancement of metal mine development. To understand the various advanced methods of metal mining

MODULE-I: Advanced Mine Development 10 Periods

Recent advances in raising, winzings, development of drives, tunnels, cross-cuts, drifts, stope preparations, opening up of mineral deposit, enlargement of drives and raises, recent trends in shaft sinking. Techno economic aspects.

MODULE-II: Advanced Metal Mining and Stopping Practices 10 Periods

Recent advances in stopping practices, VCR mining, deep mining, stopping practices in rock burst prone mines, back-filling, recent developments in metal mining in India.

MODULE-III: Mechanization, Support Systems in Metal Mines 10 Periods

A: Mechanization in metal mines – LHD declines, hydraulic transport, trackless mining.

B: Modern support system used in metal mines, recent developments in winding and transport

MODULE-IV: Special Mining Techniques 09 Periods

Marine mining methods – sea water, marine beaches, continental shelves, sea-bed sediments and polymetallic nodules, solution mining, ore leaching, in situ leaching techniques.

MODULE-V: Special Problems of Ore Mining 09 Periods

Special problems of deep mines – rock pressure, heat, humidity, rock burst, noise and dust pollution, deep winding and transport, etc.

TEXT BOOKS:

1. Peng, S.S, Ground Control, Wiley Interscience, New York, 1985
2. Underground Mining Methods Handbook, AMIE Publication, 1992
3. Karmakar, H., Mine Working, Vol. I and II, Lovely Prakashan, Dhanbad, 1995
6. Underground Mining Methods and Technology, Elsevier Science Publishers, 1990

REFERENCES:

1. Cummings, A.B. and Given, I.V., SME Mining Engg. Vol.I and II, Society of Mining Engineers of American Institute of Mining, Metallurgical Petroleum Engineers, Inc., New

York, 1994.

- Hartman, H.L., Mine Ventilation and Air Conditioning, Wiley Inter Science Publication, New York, 1986

E RESOURCES:

- https://books.google.co.in/books?hl=en&lr=&id=N9Xpi6a5304C&oi=fnd&pg=PR9&dq=metal+mining+methods&ots=AHCAPfLjSa&sig=eGLu0GdMqhLizg2v_2FrDEC4pxk#v=onepage&q=metal%20mining%20methods&f=false
- https://www.informationvine.com/index?qsrc=999&qo=semQuery&ad=semD&o=36175&l=sem&askid=356432ce-a9aa-456b-b08f-01504e7884c8-0-iv_gsb&q=mining%20metal&dqi=&am=broad&an=google_s

Course Outcomes:

- The student will have thorough knowledge of about the various advanced methods of metal mining.
- The student will have thorough knowledge of special mining techniques to overcome the field issues.
- The student will have knowledge Metal Mining and Stopping Practices Advanced Metal Mining and Stopping Practices.
- The students will have good knowledge Mechanization, Support Systems in Metal Mines.
- The student will have good knowledge of Special Problems of Ore Mining.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2			1		1				3	2	2	2
CO2	3	2	2				2		1			2	3	2	1
CO3	3	2	2		2		1					2	3	3	2
CO4	3	1	2		2		2		2			1	3	2	2
CO5	3	2	2			1			1			2	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B. Tech VII Semester		
Code: 82537	MATERIAL HANDLING (Professional Elective -V)			L	T	P
Credits: 3				3	-	-

Prerequisite: Engineering Mechanics and strength of Materials

Course Objectives:

To introduce the basic principles in material handling and its equipment. To study the conveyor system and its advancement

MODULE-I: Bulk Handling Systems

10 Periods

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

MODULE-II: Short Conveyors and Haulage Systems

10 Periods

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

MODULE-III: Belt Conveyor System

10 Periods

A: Design, capacity, calculations with respect to the size, speed, troughing, power requirement, tension requirement, belt selection, factor of safety.

B: Developments in the design, of various components of belt conveyor systems such as; structures, rollers, gear boxes and motors, drums and pulleys, belting, ancillary components and safety gadgets.

MODULE-IV: New Types of Belt Conveyor Systems

09 Periods

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

MODULE-V: Material Handling in Mines, Plants and Workshops

09 Periods

Mobile cranes, derrick cranes, pillar cranes, tower cranes, radial cranes, bridge cranes, fork lifters, overhead gantry material handling in workshops. Mineral handling in dimensional stone quarries, Mineral handling plants(coal, etc.,) Locomotives, rail tracks, rail cars, railways wagons; Aerial ropeways, gravity ropeways; Containers and shipping; Rope haulage - different types.

TEXT BOOKS:

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

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

REFERENCES:

- Kennedy, B.A., Surface Mining – 2nd Edition, SME, New York, 1990.
- Deshmukh, D.J., Elements of Mining Technology, Vol.I, II and III, EMDEE Publishers, Nagpur, 1979.
- Peng, S.S., and Chiang, H.S., Longwall Mining, John Wiley and Sons, New York, 1984.
- Hartman, H.L., (Ed.), SME Mining Engg. Handbook Vol.I and II, Society for Mining,
- Metallurgy, and Exploration, Inc., Colorado, 1992.

E RESOURCES:

- www.bmt.org > Overview
- www.canadianminingjournal.com/tag/material-handling/

Course Outcomes:

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

- Understand Basic principles in material handling exclusive to mining industry and its benefits
- Understand Short Conveyors and Haulage Systems
- Understand Belt Conveyor System
- Understand New Types of Belt Conveyor Systems
- Understand Material Handling in Mines, Plants and Workshops

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		1					2			2	1	2
CO2	3	2	2										2	3	3
CO3	3	2	2				2		3				1	2	2
CO4	2	3	2		2						2		3	3	2
CO5	2	1	2										2	3	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B. Tech VII Semester		
	Code:	OPEN ELECTIVE-1			L	T
Credits: 3				3	-	-

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VII Semester		
Code: 82538	MINERAL PROCESSING LAB	L	T	P
Credits: 1.5		-	-	3

COURSR OBJECTIVES:

To study various mineral processing technique to enrich minerals.

LIST OF EXPERIMENTS:

1. Different sample division techniques like coning and quartering, riffle sampling techniques, etc.
2. Determination of crushing characteristics of a given mineral sample using jaw crusher
3. Determination of the grinding characteristics of a given mineral sample using ball mill.
4. Sieve analysis of a given sample and to calculate (a) percentage sample retained on screens (b) to plot sizing curves.
5. Concentration of a given mineral sample using mineral jig.
6. Concentration of a given mineral using Wilfely table.
7. Concentration of a given mineral using froth flotation cell
8. Study of wash ability characteristic of a coal sample using float and sink test.
9. Study of sedimentation characteristics of a given sample.
10. Estimation moisture content by Drying of mineral sample.
11. Determining the average size of samples
12. Collection of sample by riffle sample technique.

Course Outcomes:

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

1. Know different sample division techniques.
2. Determine the grinding and crushing characteristics of a given mineral sample.
3. Know the wash ability characteristic of a coal sample.
4. Determine the moisture content by Drying of mineral sample.
5. Determine the average size of samples.

CO- PO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		1					2			2	1	2
CO2	3	2	2										2	3	3
CO3	3	2	2				2		3				1	2	2
CO4	2	3	2		2						2		3	3	2
CO5	2	1	2										2	3	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VII Semester		
Code: 82539	COMPUTER APPLICATION IN MINING LAB	L	T	P
Credits: 1.5		-	-	3

Course Objectives: To design the mining equipment's, Blast design, Fragmentation Analysis and Mine ventilation network analysis.

LIST OF EXPERIMENTS:

1. Prediction of surface subsidence over underground coal mining workings.
2. Stress analysis in stability of pillar in coal mines
3. Study of strata and support behavior in underground mine
4. Behavior of shield supports in long wall mining.
5. Slope stability analysis
6. Performance of explosive impact on mine production.

7. Identification of most influencing blast design parameters using IBM SPSS.
8. Regression analysis in excel.
9. Prediction of subsidence in underground metal mining.
10. Optimization of ventilation system.
11. Design of new pollution systems in mines.
12. Study of blast parameters using XLSTAT.

Course Outcomes:

1. At the end of the course, students will be able to
2. Design the Mining Equipment's
3. Design the Blast design
4. Analysis the fragmentation
5. Analysis of mine ventilation network analysis

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		1					2			2	1	2
CO2	3	2	2										2	3	3
CO3	3	2	2				2		3				1	2	2
CO4	2	3	2		2						2		3	3	2
CO5	2	1	2										2	3	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B. Tech VIII Semester		
Code: 82540	NUMERICAL MODELLING IN MINING			L	T	P
Credits: 3	(Professional Elective -VI)			3	-	-

Prerequisite: Nil

Course Objectives: To study the finite element methods, finite difference methods and boundary element methods. To understand the practical applications of numerical methods in mining field

MODULE-I: Introduction to Elastic and Plastic Models

10 Periods

Fundamentals, elastic, plastic, homogeneous and isotropic, non-linear elastic and elasto- plastic models.

MODULE-II: Finite Difference Methods

09 Periods

Concept, formation of mesh element, finite difference patterns, solutions, application to mining.

MODULE-III:Finite Element Methods**10 Periods**

A: Concept, discretization, element configuration, element stiffness, assemblage and solutions, two and three dimensional solutions.

B: Linear and non-linear analysis, applications in geomechanics; simulation of joints in strata.

MODULE-IV:Boundary Element Method**09 Periods**

Concept, discretization, different methods of solution for isotropic and infinite media.

MODULE-V: Practical Applications in Mining and Rock Mechanics **10 Periods**

Practical Applications in stress analysis, slope stability, subsidence prediction, and pillar design, rock burst, etc.

TEXT BOOKS:

1. Desai, C.S. and Abel, J.F., Introduction to the finite Element Method, Van Nostrand Riehokl Co., New York, 1983.
2. Zienkiewicz, O.C., The Finite Element Method in Engineering Science, Tata McGraw Hill 1972

REFERENCES:

1. Segerlind, L.J., Applied Finite Element Analysis, John Wiley and Sons, New York, 1987.
2. Mukhopadyay, M., Matrix Finite Element – Computer and Structural Analysis, Oxford and IBH Publishing co., 1984
3. Brown, E.T., (Ed) Analytical and Computational Methods in Engineering and Rock Mechanics, Allen and Unwin, London, 1987

E RESOURCES:

1. <https://doaj.org/toc/2251-6565>
2. <http://www.citefactor.org/journal/index/13692/journal-of-analytical-and-numerical-methods-in-mining-engineering#.WYdJWBWGPIU>

Course Outcomes:

1. At the end of the course, students will be able to
2. Understand fundamentals of Elastic and Plastic Models.
3. Understand Finite Difference Methods
4. Understand Finite Element Methods
5. Understand Boundary Element Method
6. Understand Practical Applications in Mining and Rock Mechanics

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

C01	3	2	2		1					2			2	1	2
C02	3	2	2										2	3	3
C03	3	2	2				2		3				1	2	2
C04	2	3	2		2						2		3	3	2
C05	2	1	2										2	3	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VIII Semester		
Code: 82541	GEO-STATISTICS (Professional Elective -VI)	L	T	P
Credits: 3		3	-	-

Prerequisite: Basics of statistics, mining geology

Objectives: To make the students familiar with the basics of geostatistics

MODULE-I: Introduction to Geostatistics 10 Periods

Definition, schools of geostatistics, estimation models for mine evaluation- average method, polygonal or triangular method, deterministic mathematical model, independent random model, trend with random noise, correlated random model and trend with correlated random residuals.

MODULE-II: Semi-variogram and Co-variogram 09Periods

Definitions, characteristics and computation in one, two, and three dimensions, mathematical models, associated difficulties i.e. anisotropy, non-stationaries, regularization, presence of nugget effect.

MODULE-III: Extension variance and estimation variance 10 Periods

A:Calculation of estimation variance, the nugget effect and estimation variance, examples, auxiliary

function.

B: Kriging: kriging and optimal valuation, kriging equations in general cases.

MODULE-IV: The Integrated geological-geostatistical system **09** **Periods**
 Statistical analysis, comparative statistical analysis, geostatistical structural analysis, trend analysis, point kriging, cross validation, block kriging, mineral inventory, tonnage relations.

MODULE-V: Geostatistical applications **10** **Periods**
 Optimization of exploration drilling, calculation of mineral inventory, establishment of grade-tonnage relations, misclassified tonnage, grade control plan

TEXT BOOKS:

1. An Introduction to Applied Geostatistics, Issacks and Srivastava Oxford, JBH, 1990

REFERENCES:

1. An Introduction to Geostatistical methods of Mineral Exploration, Rendu J.M John Wiley and Sons, 1981
2. Geostatistical Ore Reserve Estimation, David, Michel, Mc Graw Hill, 1977

E RESOURCES:

1. <http://www.springer.com/in/book/9781402093791>
2. https://link.springer.com/chapter/10.1007%2F978-3-319-39264-6_17

CourseOutcomes:

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

1. Understand schools of geostatistics, estimation models for mine evaluation
2. Understand Semi-variogram and Co-variogram
3. Understand Extension variance and estimation variance
4. Understand The Integrated geological-geostatistical system
5. Understand Geostatistical applications

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		1					2			2	1	2
CO2	3	2	2										2	3	3
CO3	3	2	2				2		3				1	2	2
CO4	2	3	2		2						2		3	3	2
CO5	2	1	2										2	3	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VIII Semester		
Code: 82542	COAL BED METHANE AND COAL GASSIFICATION (Professional Elective -VI)	L	T	P
Credits: 3		3	-	-

Prerequisite: Study of Development of Mineral Deposits and Mining Geology.

Course Objectives: To make the students familiar about extraction of methane and its importance.

Module I: Formation of Methane:

10 Periods

Coalification process and coal grades.
Methane generation and storage in coal beds.

Module II: Exploration CBM:

10 Periods

Geological control in Coal Bed Methane (CBM) exploration;
Methane adsorption, desorption in coal.
Coal as CBM reservoir:

Module III: Exploitation of CBM:

10 Periods

A:In-place methane estimation; Transport of methane in coal-bed.
Drilling & Completion of a CBM hole/well.
Identification and characterization of coal beds by hole/well logs.
B:Hydraulic fracturing in coal beds. Production performance of a CBM hole/well;
Water drainage & gas-water separation.

Module IV: Measurement & Transportation of Methane:**09 Periods**

Gas volume measurement.

Compression & transport; Liquefaction and utilization.

Enhanced recovery by CO₂ and N₂ adsorption methods.

Module V: Underground Coal Gasification (UCG) Concept:**09 Periods**

Conditions suitable for UCG, Principles of UCG. UCG Process Component factors: Technology of UCG, opening up of coal seam for UCG. Underground Coal Gasification at Great Depth, Merits and Demerits of Underground coal gasification.

TEXT BOOKS:

1. Coal Bed Methane - 1st Edition - Elsevier
2. A guide to Coal bed methane reservoir engineering". Society of Petroleum engineers , published by Gas research institute, Chicago, Illinois.
3. Fundamentals of Coal bed Methane Reservoir Engineering, John Seidle, PennWell Books (15 September 2011)
4. Principles and Practices of Modern Coal Mining – R.D. Singh, New Age International

REFERENCES:

1. Underground Coal Mining Methods – J.G. Singh, Braj-Kalpa Publishers.
2. Winning and Working Coal in India Vol.II- R.T. Deshmukh and D.J.Deshmukh., Dhanbad Publishers

E- RESOURCES:

1. <http://www.gasification-syngas.org/technology/underground-coal-gasification>
2. <http://www.sciencedirect.com/science/article/pii/S0360128512000573>
3. <https://www.sciencedirect.com/science/article/pii/S2213397613000165>
4. <http://www.dghindia.org/index.php/page?pageId=38>

Course Outcomes:

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

1. Understand Basic concept of Coal Bed Methane.
2. Understand Basic concept of methods of exploration and exploitation of CBM.
3. Understand Basic concept of Underground Coal Gasification(UCG)
4. Know Mining methods of UCG
5. Understand Merits and Demerits of Underground coal gasification.

CO- PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOS		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		1					2			2	1	2
CO2	3	2	2										2	3	3
CO3	3	2	2				2		3				1	2	2
CO4	2	3	2		2						2		3	3	2
CO5	2	1	2										2	3	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B. Tech VIII Semester		
Code:	OPEN ELECTIVE-II			L	T	P
Credits: 3				3	-	-

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B. Tech VIII Semester		
Code:	OPEN ELECTIVE-III			L	T	P
Credits: 3				3	-	-

OPEN ELECTIVES

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.
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Code: 80139	ENVIRONMENTAL IMPACT ASSESSMENT AND LIFE CYCLE ANALYSIS <i>(Open Elective)</i>	L	T	P
Credits: 3		3	-	-

Prerequisite: Environmental Sciences

Course Objectives:

The main objective of this course is to provide in-depth knowledge about various methodologies in assessing the environmental impact of various developmental projects. It also provides the knowledge to design a more publicly acceptable project which helps in achieving sustainable development.

MODULE I:

10 periods

Concept of EIA: Significance of EIA, Factors affecting EIA, Classification of Environmental Parameters, Elements of EIA: Initial Environmental Examination, Preparation of Environmental Base map, Impact Evaluation and Analysis, Environmental Impact Statement (EIS) and Environmental Management Plan (EMP), List of Projects which require EIA.

EIA Methodologies: General methodology of EIA with flow chart, EIA Methods: Ad-hoc methods, Matrix methods, Network methods, Environmental Media Quality Index method, Overlay methods, Cost/Benefit Analysis.

MODULE II:

10 Periods

EIA of Soil: Methodology for the assessment of developmental activities on Soil: Delineation of study area, Identification of impacts, Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures, Environmental impacts of Deforestation: Causes, Effects and Mitigation measures.

EIA of Ground water: Ground water quantity and quality impacts, Systematic method for evaluation of various developmental activities on Ground water environment.

EIA of Surface water: Introduction, Projects which create concerns, Methodology for the assessment of Impacts on surface water environment.

MODULE III:

10 Periods

A: EIA of Air and Noise environment:

Air Pollution sources, Generalized approach for assessment of air pollution impact, Effects of Noise on people and their physiological responses, systematic methodology for assessing environmental impacts of noise

B: EIA of Biological Environment

Introduction to Biodiversity and Systematic approach for evaluating Biological impacts. Assessment of impacts of developmental activities on Vegetation and Wild life.

MODULE IV:

09 Periods

Environmental Legislation: Legislation policies, Environmental Protection Act, Water Act, Water Cess Act, The Air (Prevention & Control of pollution) Act, Motor Act, Wild life Act.

Environmental Audit: Objectives, Advantages, Types of environmental Audit, Audit protocol, Stages of Environmental Audit: Pre-audit activities, Onsite activities and Post audit activities.

MODULE V:

09 Periods

Life Cycle Assessment: Definition, Scope, Methodology, its applications and drawbacks. **Case studies:** Preparation of EIA for developmental activities: Industrial projects, Land clearing projects,

River valley projects, Construction projects, Highways and Road projects.

TEXT BOOKS:

1. Y. Anjaneyulu, “**Environmental Impact Assessment Methodologies**”, BS Publications, CRC Press, 2nd edition, 2011.
2. R.R. Barthwal “**Environmental Impact Assessment**”, New Age International Publishers, 2nd edition, 2012.

REFERENCES:

1. M. Anji Reddy, “**Environmental Impact Assessment: Theory and Practice**”, BS Publications 1st edition, 2016.
2. Canter, “**Environmental Impact Assessment**”, India edition, 1st edition, 2015.
3. N. S. Raman, A.R. Gajbhiye, S.R. Khandeshwar “**Environmental Impact Assessment**”, I.K. International Publishing House, Kindle edition, 2014.

E - RESOURCES

1. https://en.wikipedia.org/wiki/Environmental_audit
2. <https://fenix.tecnico.ulisboa.pt/downloadFile/3779577342892/5.%20EIA%20methodologias.pdf>
3. <https://www.dlsweb.rmit.edu.au/conenv/envi1128/Reading-CSTI.pdf>

Course Outcomes:

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

1. Understand the significance of EIA and the methodologies used for assessing the environmental impacts of developmental projects.
2. Identify, predict and assess the impacts of projects on soil, ground water and surface water environment.
3. Identify a systematic methodology for assessing environmental impacts of projects on air, noise and biological environment.
4. Gain knowledge on various Environmental legislations, policies and Acts.
5. Acquire knowledge on environmental audit, procedure and preparation of audit report.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	3		3	3	3	2	2					
CO2			2	3		2	1	3	3	2					
CO3			3	2	3	2	2	1	3	2					
CO4							3	2	3	3					
CO5							3	3	2	3					

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)					B.Tech.					
Code: 80148	GREEN BUILDINGS (Open Elective)					L	T	P			
Credits: 3						3	-	-			

Prerequisite: NIL

Course Objectives:

The purpose of the course is provide an overview of emerging delivery systems for high performance green buildings and the basis on which their sustainability can be evaluated.

MODULE I

[09 Periods]

Introduction to green buildings, green materials, sources of green materials, high-performance green buildings Impacts of building construction, operation, and disposal Methods and tools for building assessment, Green Globes

MODULE II

[10 Periods]

The green building process, Design and construction relationships, benefits of green building quality, healthy and safe environments , Site and landscape strategies.

MODULE III

[10 Periods]

A: Building energy system strategies, Water cycle strategies, Materials selection strategies, Indoor Environmental Quality [IEQ]

B: Analysis and strategies, Construction, team responsibilities and controls, Building commissioning strategies

MODULE IV

[09 Periods]

Economic issues and analysis, Use of the Green Strategies cost estimating tool, Future directions in green, high performance building technologies

MODULE V

[10 Periods]

Carbon accounting Green Building Specification, Case Study on green buildings, Net Zero Energy Buildings, Sustainable Constructions in civil Engineering.

TEXT BOOKS

1. Abe Kruger and Carl,"**Green Building, Principles and Practices in Residential Construction**", In 2012, Seville Publication.
2. Ross Spiegel, Dru Meadows, "**Green Building Materials: A Guide to Product Selection and Specification**", 3rd Edition,October 2010

REFERENCES

1. Charles J. Kibert,"**Sustainable Construction: Green Building Design and Delivery Hardcover – Import**", 16 Nov 2012

E-RESOURCES

1. <http://www.ncrec.gov/Pdfs/bicar/GreenBuilding.pdf>

Course Outcomes:

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

1. Identify green Building Materials and their Sources.
2. Understand the construction process of green buildings and their benefits quality, healthy and safe environments
3. Learn the strategies to construct green buildings.
4. Identify the issues a raised due to construction of green buildings

5. Gain knowledge on the case studies of green buildings.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	2	1	2		3	2	1	1	1	1			
CO2		1	2			2	3			1		1			
CO3	1	1	1				2					1			
CO4				2			2			1	2	1			
CO5			1			1	1		1	2	1	1			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80149	DISASTER MANAGEMENT & MITIGATION (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisite: NIL

Course Objectives:

This course provides the knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts and public health consequences along with International Strategy for Disaster Reduction. It also has the potential to make the student design and implement disaster mitigation measures.

MODULE I: Concept of Hazards and Disasters [10 Periods]

Environmental Hazards & Disasters Concept of Environmental Hazards, Environmental Stress & Environmental Disasters. Different Approaches & relation with human Ecology – Landscape, Ecosystem and Perception Approach - Human Ecology & its application in geographical researches.

Types of Environmental Hazards & Disasters Natural hazards and Disasters – Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra-Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards.

MODULE II: Classification of Hazards [10 Periods]

Endogenous Hazards Volcanoes: Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes – Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions. Earthquake Hazards/ Disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of earthquakes - Earthquake Hazards in India - Human adjustment, perception & mitigation of earthquake. Landslides: causes and impacts. Avalanches -causes and impacts.

Exogenous Hazards Infrequent events: Cyclones – Lightning – Hailstorms, Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes , distribution human adjustment, perception & mitigation), Cumulative atmospheric hazards/ disasters : Floods- Droughts- Cold waves- Heat waves Floods:- Causes of floods- Flood hazards in India- Flood control measures [Human adjustment, perception & mitigation], Droughts: Impacts of droughts- Drought hazards in India- Drought control measures, Extra Planetary Hazards/ Disasters-Man induced Hazards /Disasters- Physical hazards/ Disasters-Soil Erosion Soil Erosion: Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion. Chemical hazards/ disasters: Release of toxic chemicals, nuclear explosion- Sedimentation processes, Sedimentation processes: Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation, Biological hazards/ disasters: Population Explosion.

MODULE III: Approaches and Measures in Disaster Management [10 Periods]

A: Emerging Approaches Three Stages: Pre-disaster stage (preparedness), Emergency Stage, Post Disaster stage (Rehabilitation).

B: Natural Disaster Reduction & Management Provision of Immediate relief measures to disaster affected people, Prediction of Hazards & Disasters, Measures of adjustment to natural hazards

MODULE IV: Disaster Management [09 Periods]

An integrated approach for disaster preparedness, mitigation & awareness. Mitigation- Institutions- discuss the work of following Institution.

- a. Meteorological Observatory
- b. Seismological Observatory
- c. Volcanological Institution
- d. Hydrology Laboratory
- e. Industrial Safety Inspectorate
- f. Institution of Urban & Regional Planners
- g. Chambers of Architects
- h. Engineering Council
- i. National Standards Committee

Integrated Planning- Contingency Management Preparedness –

- a] Education on disasters

- b) Community involvement
 - c) The adjustment of Human Population to Natural Hazards & Disasters Role of Media
- Monitoring Management- Discuss the programme of disaster research & mitigation of disaster of following organizations.**

- a) International Council for Scientific Unions [ICSU]- Scientific Committee on Problems of the Environment [SCOPE], International Geosphere- Biosphere programme [IGBP]
- b) World Federation of Engineering Organizations [WFED]
- c) National Academy of Sciences
- d) World Meteorological Organizations [WMO]
- e) Geographical Information System [GIS]
- f) International Association of Seismology & Physics of Earth's Interior [IASPEI]
- g) Various U.N agencies like UNCRD, IDNDR, WHO, UNESCO, UNICEF, UNEP.

MODULE V: Disaster Management in India [09 Periods]

A regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India

Ecological planning for sustainability & sustainable development in India- Sustainable rural development: A Remedy to Disasters-Role of Panchayats in Disaster mitigations **C:** Environmental policies & programmes in India- Institutions & National Centers for Natural Disaster reduction, Environmental Legislations in India, Awareness, Conservation Movement, Education & Training.

TEXT BOOKS:

1. Jagbir Singh, "Disaster Management–Future Challenges and Opportunities", I.K.International Publishing House, 1st Edition, 2005.
2. Coppala P Damon, "Introduction to International Disaster Management", ABD Publishers, 2007.

REFERENCES BOOKS:

1. R.B.Singh [Ed], "Environmental Geography", Heritage Publishers, New Delhi, 1st Edition,1990.
2. Kates,B.I & White. G.F, "The Environment as Hazards", oxford publishers, 5th Edition, New York, 1978.
3. R.B. Singh [Ed] - Disaster Management, Rawat Publication, New Delhi, 1st Edition, 2000.

E RESOURCES:

1. <http://www.wcpt.org/disaster-management/what-is-disaster-management>.
2. <http://study.com/academy/lesson/what-are-cyclones-types-causes-effects.html>.

Course Outcomes:

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

1. Analyze, evaluate and manage the environmental, social, cultural, economical, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
2. Assess the different public health aspects at local and global levels as a result of Disaster and can plan well to mitigate them.
3. Gain knowledge in various emerging approaches and measure in disaster management.
4. Understand the role of disaster management through Meteorological Observatory, Seismological Observatory, Volcanological Institution, etc.,
5. Acquire the information about Disaster Management, Ecological planning and sustainable development and Environmental policies, Disaster Reduction programs in India.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2				2	3	2	3	2	2				
CO2	3	2				2	3	2	3	2	2				
CO3	3	2				2	3	2	3	2	2				
CO4	3	2				2	3	2	3	2	2				
CO5	3	2				2	3	2	3	2	2				

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)					B.Tech.		
Code: 80234	ELECTRICAL ENERGY CONSERVATION AND AUDITING (Open Elective)					L	T	P
Credits: 3						3	-	-

Prerequisites: Nil

Course Objectives: This course deals about the concept of energy conservation, energy management and different approaches of energy conservation in industries, economic aspects of energy conservation project and energy audit in commercial and industrial sector.

MODULE I: Basic Principles of Energy Audit [9 Periods]

Energy audit - definitions, concept , types of audit, energy index, cost index , pie charts, Sankey diagrams, load profiles, Energy conservation schemes - Energy audit of industries - Energy saving potential, energy audit of process industry, thermal power station, building energy audit.

MODULE II: Energy Management [9 Periods]

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting, Energy manger, Qualities and functions, language, Questionnaire - check list for top management.

MODULE III : Energy Efficient Motors [10 Periods]

A: Energy efficient motors, factors affecting efficiency, loss distribution, constructional details. **B:** Characteristics - Variable speed, variable duty cycle systems, RMS hp - Voltage variation -Voltage unbalance - Over motoring - Motor energy audit.

MODULE IV: Power Factor Improvement, Lighting & Energy Instrument

[10 Periods]

Power Factor Improvement, Lighting: Power factor – Methods of improvement, location of capacitors, Pf with non linear loads, effect of harmonics on power factor. Power factor motor controllers - Good lighting system design and practice, lighting control, lighting energy audit.

Energy Instruments: Watt meter, data loggers, thermocouples, pyrometers, lux meters, tongue testers , application of PLC's.

MODULE V: Economic Aspects and Analysis

[10 Periods]

Economics Analysis - Depreciation Methods, time value of money, rate of return, present worth method , replacement analysis, life cycle costing analysis - Energy efficient motors, Calculation of simple payback method, net present worth method - Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

TEXT BOOKS

1. W.R. Murphy and G. Mckay, “**Energy Management**”, Butter Worth Publications.
2. John. C. Andreas, “**Energy Efficient Electric Motors**”, Marcel Dekker Inc Ltd, 2nd Edition, 1995.

REFERENCES

1. Paul O' Callaghan, “**Energy Management**”, Mc-Graw Hill Book Company, 1st Edition, 1998.
W.C.Turner, “**Energy Management Hand Book**”, A John Wiley and Sons.S. C. Tripathy, “**Utilization of Electrical Energy**”, Tata McGraw Hill, 1993.
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online).
3. L.C. Witte, P.S. Schmidt and D.R.Brown, “**Industrial Energy Management and Utilization**”, Hemisphere Publication, Washington, 1998.

E - RESOURCES

1. <http://industrialelectricalco.com/wp-content/uploads/2014/01/Understanding-Energy-Efficient-Motors-EASA.pdf>
2. <https://beeindia.gov.in/>
3. <https://beeindia.gov.in/sites/default/files/3Ch10.pdf>

Course Outcomes:

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

1. Examine the principles of Energy audit and its process in thermal power station, industries.
2. Analyze the different aspects of energy management.
3. Describe the characteristics of energy efficient motors.
4. Illustrate the power factor improvement, good lighting system practice and the types of energy instruments
5. Analyze the economic aspects of Energy Management.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3								3			
CO2	3	3	3	3								3			
CO3	3	3	3	3								3			
CO4	3	3	3	3								3			
CO5	3	3	3	3								3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)					B.Tech.					
Code: 80240	ELECTRICAL SAFETY AND ENERGY MANAGEMENT (Open Elective)					L	T	P			
Credits: 3						3	-	-			

Pre-Requisite: Nil

Course Objectives:

This course deals with the general safety requirements during the electrical installations. The course emphasis on the various objectives of energy management and auditing.

MODULE I: RULES & REGULATIONS [10 Periods]

Power sector organization and their roles – significance of IE rules & IE acts – general safety requirements: Span conductor configuration, spacing and clearing, sag, erection, hazards of electricity.

MODULE II: INSTALLATION AND EARTHING OF EQUIPMENTS 10 Periods]

Classification of electrical installation - earthing of equipment bodies – electrical layout of switching devices and SC protection – safety in use of domestic appliances – safety documentation and work permit system – flash hazard calculations – tools and test equipments.

MODULE III: SAFETY MANAGEMENT AND FIRST AID [09 Periods]

A:Safety aspects during commissioning – safety clearance notice before energizing – safety during maintenance – maintenance schedule – special tools – security grand– check list for plant security – effects of electric and electromagnetic fields in HV lines and substations.

B:Safety policy in management & organizations – economic aspects – safety program structure – elements of good training program – first aid – basic principles – action taken after electrical shock – artificial respiration and methods – choking – poisoning.

MODULE IV: FIRE EXTINGUISHERS

[10 Periods]

Fundamentals of fire – initiation of fires – types – extinguishing – techniques – prevention of fire – types of fire extinguishers- fire detection and alarm system – CO₂ and Halogen gas schemes, foam schemes.

MODULE V: ENERGY MANAGEMENT & ENERGY AUDITING [09 Periods]

Objectives of energy management – energy efficient electrical systems – energy conservation and energy policy – renewable source of energy – energy auditing – types and tips for improvement in industry.

TEXT BOOKS

1. John Codick, “**Electrical safety hand book**”, McGraw Hill Inc, New Delhi, 2000.
2. V. Manoilov, “**Fundamentals of electrical safety**”, Mir Publishers, MOSCOW, 1975.

REFERENCES

1. C.S. Raju, “**A Practical Book on domestic safety**”, Sri Sai Publisher, Chennai, 2003.
2. **Power Engineering Hand book**, TNEB Engineers officers, Chennai, 2002.
3. S. Rao, R.C. Khanna, “**Electrical safety, Fire safety engineering and safety management**”, Khanna Publisher, Delhi, 1998.
4. The Indian electricity rules, 1956, authority regulations, 1979, Commercial Law Publication, Delhi, 1999.
5. W.F.Cooper, “**Electrical safety Engineering**”, Newnes-Butterworth company, 1978.

E- Resources

1. <http://nptel.ac.in/courses/103106071/5>
2. <https://beeindia.gov.in/>
3. <https://www.electrical4u.com/equipment-earthing/>
4. <https://www.electricaltechnology.org/2015/05/earthing-and-electrical-grounding-types-of-earthing.html>

Course Outcomes:

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

1. Gain basic knowledge on Indian Power sector organization and their roles.
2. Understand the concepts of earthing and its standards.
3. Acquire the basic knowledge on First aid and safety during electrical installation..
4. Distinguish various fire extinguishers and their classification.
5. Understand the basic concepts of energy auditing.

CO- PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3								3			
CO2	3	3	3	3								3			
CO3	3	3	3	3								3			
CO4	3	3	3	3								3			
CO5	3	3	3	3								3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80241	ENERGY STORAGE SYSTEMS (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objectives:

This course deals with the need for electrical energy storage, different electrical storage technologies, types and features of energy storage systems and the applications of electrical energy storage.

MODULE I: ELECTRICAL ENERGY STORAGE TECHNOLOGIES [13 Periods]

Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, Long distance between generation and consumption, Congestion in power grids, Transmission by cable.

MODULE II: NEEDS FOR ELECTRICAL ENERGY STORAGE [10 Periods]

Emerging needs for EES, More renewable energy, less fossil fuel, Smart Grid uses. The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

MODULE III: FEATURES OF ENERGY STORAGE SYSTEMS [10 Periods]

A: Classification of EES systems, Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES).

B: Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H₂), Synthetic natural gas (SNG).

MODULE IV: TYPES OF ELECTRICAL ENERGY STORAGE SYSTEMS

[09

Periods]

Electrical storage systems, Double-layer capacitors (DLC), Superconducting magnetic energy storage (SMES), Thermal storage systems, Standards for EES, Technical comparison of EES technologies.

MODULE V: APPLICATIONS

[09 Periods]

Present status of applications, Utility use (conventional power generation, grid operation & service) , Consumer use (uninterruptable power supply for large consumers), New trends in applications ,Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles, Management and control hierarchy of storage systems, Internal configuration of battery storage systems, External connection of EES systems , Aggregating EES systems and distributed generation (Virtual Power Plant), Battery SCADA– aggregation of many dispersed batteries.

TEXT BOOKS

1. James M. Eyer, Joseph J. Iannucci and Garth P. Corey, “Energy Storage Benefits and Market Analysis”.
2. “The Electrical Energy Storage” by IEC Market Strategy Board.

REFERENCES

- 1.Jim Eyer, Garth Corey, “Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report”, Sandia National Laboratories, Feb 2010.

E - RESOURCES

- 1.<http://nptel.ac.in/courses/108105058/>
- 2.<http://www.nptel.ac.in/courses/108103009/pdf/lec33.pdf>

Course Outcomes:

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

- 1.Understand the different types of electrical energy storage technologies.
- 2.Learn about the need for electrical energy storage.
- 3.Comprehend the various features energy storage systems.
- 4.Understand the various types of electrical energy storage systems.
- 5.Emphasize the various applications of electrical energy storage.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3								3			
CO2	3	3	3	3								3			
CO3	3	3	3	3								3			
CO4	3	3	3	3								3			
CO5	3	3	3	3								3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80352	TOTAL QUALITY MANAGEMENT (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objectives:

To give the students an overview of quality and TQM and explaining the salient contributions of Quality Gurus like Deming, Juran and Crosby and general barriers in implementing TQM and also get basic knowledge about ISO.

MODULE I: Introduction 10 Periods

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, and Customer retention - Costs of quality.

MODULE II: TQM Principles 10 Periods

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

MODULE III: Statistical Process Control (SPC) 10 Periods

A: Statistical fundamentals – Measures of central Tendency and Dispersion - Population and Sample.

B: Control Charts for variables and attributes, Industrial Examples. Process capability. Concept of six sigma – New seven Management tools.

MODULE IV: TQM Tools 09 Periods

Bench marking -Reason to bench mark, Bench marking process - FMEA - Stages, Types. Quality Function Deployment (QFD) - House of Quality - Taguchi quality loss

function - TPM - Concepts, improvement needs - Performance measures

MODULE V: Quality Systems

09 Periods

Need for ISO 9000 and Other Quality Systems - ISO 9000-2008 Quality System - Elements, Implementation of Quality System Documentation, Quality Auditing - QS 9000 - ISO 14000 - ISO 18000, ISO 20000, ISO 22000 TS 16949, ISO 14000, AS9100– Concept, Requirements and benefits – case studies.

TEXT BOOKS

1. Dale H. Besterfield, "Total Quality Management", 3rd, Pearson Education Asia, Indian Reprint, 2010.
2. Subburaj Ramasamy "Total Quality Management" Tata McGraw - Hill publishers, 2012.

REFERENCES

1. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2011.
2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, Cengage Learning, 2012.
3. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
4. Dr S. Kumar, "Total Quality Management", Laxmi Publications Ltd., New Delhi 2015.
5. P. N. Muherjee, "Total Quality Management", Prentice Hall of India, New Delhi, 2006.
6. Poornima M. Charantimath "Total Quality Management" Pearson publications, 2011.

E - RESOURCES

1. https://src.alionscience.com/pdf/RAC-1ST/SOAR7_1st_Chapter.pdf
2. https://onlinecourses.nptel.ac.in/noc17_mg18
3. nptel.ac.in/courses/122106032/Pdf/4_2.pdf
4. www.thecqi.org
5. www.emeraldinsight.com/journal/tqm

Course outcomes

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

1. Gain basic knowledge in total quality management relevant to both manufacturing and service industry.
2. Implement the basic principles of TQM in manufacturing and service based organization.
3. Apply various SPC tools in real time manufacturing and service industry.
4. Implement various TQM tools like FMEA & QFD.
5. Apply various ISO Standards for real time applications.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1				3	2			3		3	3	2		3
CO2	1				3	2			3		3	3	2		3
CO3	1				3	2			3		3	3	2		3
CO4	1				3	2			3		3	3	2		3
CO5	1				3	2			3		3	3	2		3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80356	INDUSTRIAL SAFETY (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objectives:

The purpose of this course is to teach the concept of Industrial Safety & provide useful practical knowledge for workplace safety which helps identification, evaluation and control of all the hazards and potential hazards to prevent or mitigate harm or damage to people, property or the environment.

MODULE I Introduction

10 Periods

Definition-Development before industrial revolution-Milestones in industrial safety movement
Development of accident prevention programs-3 E's of safety- Development of Safety organizations-Safety and health movement- Managing emergency in industries.

MODULE II: Accident Prevention

10 Periods

Safety and productivity-Fallacies about safety-Industrial psychology in accident prevention
Basic philosophy of accident prevention-Unsafe condition, Unsafe act, Injury, Fault of persons
Cost of accidents- Safety education.

MODULE III: Safety Organization & Industrial Hygiene and Hazards

10 Periods

A: Purpose of a safety organization-Safety policy- Safety committee- types- Role of safety coordinator- Responsibilities, Interferences and Sufferings of safety supervisor-Safety publicity-Accident reporting-Accident investigation-Accident statistics-Safety audits.

B: OSHA and industrial hygiene-work site analysis-recognizing and controlling hazards
Occupational diseases prevention-Employee welfare-Statutory welfare schemes, Non statutory schemes-Health hazards-Control strategies- Fire hazards and prevention, Electrical hazard prevention and safety.

MODULE IV: Industrial Process Safety

9 Periods

Overview-Safety performance by industry sector-Incident pyramid-Process hazard and risk.
Failure of defenses - Process safety management-Scope, Functions, Features and Characteristics. Role of organizational levels in Process safety Management-Assessing organizations safety effectiveness.

MODULE V Human Side of Safety

9 Periods

Management of change-Process and equipment integrity-Human behavior aspects and modes-The Swiss cheese model of industrial accidents-Active and Latent failures-examples - Safety lessons Human Factors influencing the likelihood of failure-Organizational culture, Demographic effects.

TEXT BOOKS

1. Krishnan N.V., “**Safety in Industry**”, Jaico Publisher House, 2005.
2. Singh, U.K. and Dewan, J.M., “**Safety, Security and risk management**”, APH Publishing Company, New Delhi, 2005.

REFERENCES

- 1 C. Ray Asfahl, David W. Rieske “ **Industrial Safety and health management**”, Prentice Hall,2009.
- 2 R.K. Mishra, “**Safety Management**”, AITBS publishers, 2012.
- 3 Krishnan N.V., “**Safety in Industry**”, Jaico Publisher House, 2005
- 4 Singh, U.K. and Dewan, J.M., “**Safety, Security and risk management**”, APH Publishing Company, New Delhi, 2005.
- 5 C. Ray Asfahl, David W. Rieske, “ **Industrial Safety and health management**”, Prentice Hall,2009.

E - RESOURCES

- 1 https://issuu.com/stmjournalspublication/docs/journal_of_industrial_safety_engine
- 2 http://www.nsc.org.in/index.php?option=com_content&view=article&id=15&Itemid=99
- 3 <http://www.mdpi.com/journal/safety>
- 4 <http://www.sciencedirect.com/science/journal/09219110?sdc=1>

Course outcomes

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

1. Identify the evaluation of industrial safety and health standards.
2. Analyze the philosophies behind industrial accidents.
3. Apply the hierarchical levels in a safety organization and apply the types of industrial hazards and preventive measures.
4. Implement the concept of industrial process safety.
5. Apply the safety procedures for human.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1		2			3	3			2		3			
CO2	1		2			3	3			2		3			
CO3	1		2			3	3			2		3			
CO4	1		2			3	3			2		3			
CO5	1		2			3	3			2		3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80357	RENEWABLE ENERGY SOURCES (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objectives:

The objective of this subject is to provide knowledge about different non-conventional energy sources.

MODULE I: Principles of Solar Radiation 10 Periods

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

MODULE II: Solar Energy 10 Periods

Solar Collectors: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

Solar Energy Storage and Applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

MODULE III: Wind Energy & Bio-Mass 10 Periods

A: Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

B: Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

MODULE IV: Geothermal Energy & Ocean Energy 09 Periods

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India. Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants and their economics.

MODULE V: Direct Energy Conversion 09 Periods

Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, merit, materials, applications. MHD generators - principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems. Electron gas dynamic conversion - economic aspects. Fuel cells - Principles of Faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS

1. G.D. Rai, “**Non-Conventional Energy Sources**”, Khanna publishers, 2011.
2. Tiwari and Ghosal, “**Renewable Energy Resources**”, Narosa Publishing House, 2007.

REFERENCES

1. Twidell & Weir, “**Renewable Energy Sources**”, Taylor and Francis Group Publishers, 2015.
2. Sukhatme, “**Solar Energy**”, McGraw-Hill-third edition, 2008.
3. B.S Magal Frank Kreith& J.F Kreith “**Solar Power Engineering**”, McGraw-Hill Publications, 2010.
4. Frank Krieth & John F Kreider, “**Principles of Solar Energy**”, McGraw-Hill, 1981.
5. Ashok V Desai, “**Non-Conventional Energy**”, New International (P) Limited, 2003.

E - RESOURCES

1. nptel.ac.in/courses/112105051/
2. https://www.vssut.ac.in/lecture_notes/lecture1428910296.pdf
3. faculty.itu.edu.tr/onbasioglu/DosyaGetir/62002
4. <https://www.journals.elsevier.com/renewable-energy/>
5. www.ijrer.org

Course Outcomes

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

1. Understand the principles of solar radiation
2. Recognize solar collectors, Solar energy storage and its applications
3. Classify the harvesting of wind energy & bio-mass energy.
4. Understand the harvesting of geothermal energy & ocean energy.
5. Apply the direct energy conversion methods

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1					3	3					3			
CO2	1					3	3					3			
CO3	1					3	3					3			
CO4	1					3	3					3			
CO5	1					3	3					3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80435	EMBEDDED SYSTEM DESIGN (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre requisites: Microprocessors and Microcontrollers.

Course Objectives: This course introduces the difference between Embedded Systems and General purpose systems. This course familiarizes to compare different approaches in optimizing General purpose processors. This course provides the design tradeoffs made by different models of embedded systems.

Module - I: Introduction to Embedded Systems [08 Periods]

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Module - II: Typical Embedded System [12 Periods]

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Module - III: Embedded Firmware [10 Periods]

A: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer
B: Embedded Firmware Design Approaches and Development Languages.

Module - IV: RTOS Based Embedded System Design [09 Periods]

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Module - V: Task Communication [09 Periods]

Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

TEXT BOOKS:

1. Shibu K. V, “**Introduction to Embedded Systems**”, McGraw Hill, 2013.
2. Raj Kamal, “**Embedded Systems**”, TMH.

REFERENCES:

1. Frank Vahid, Tony Givargis, John Wiley, “**Embedded System Design**”.
2. Lyla, “**Embedded Systems**”, Pearson, 2013.
3. David E. Simon, “**An Embedded Software Primer**”, Pearson Education.

E-Resources:

1. <https://searchworks.stanford.edu/view/10473232>
2. https://www.researchgate.net/.../228619090_Resource_Management_for_Embedded_Sy...
3. <https://electronicsforu.com> › Resources › Learning Corner
4. <https://nptel.ac.in/courses/108102045/>
5. nptel.ac.in/courses/.../IIT%20Kharagpur/Embedded%20systems/New_index1.html

Course Outcomes:

At the end of the course students are able to:

1. Understand the basics of an embedded system.
2. Design, implement and test an embedded system.
3. Understand the design tradeoffs made by different models of embedded systems.
4. Know types of operating systems
5. Learn how to Choose an RTOS

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1			1									
CO2	2		2	1		1	1					1			
CO3	2		3	1	1	2	1				1	1			
CO4	1		3	1	1	2	1					1			
CO5	1		2	1	1	1						1			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)					B.Tech.				
Code: 80446	PRINCIPLES OF COMMUNICATION ENGINEERING					L	T	P		
Credits: 3	<i>(Open Elective)</i>					3	-	-		

Prerequisites: NIL

Course Objectives:

To study different modulation techniques used in analog communications and digital communications. To also introduce basics of satellite and optical communications.

MODULE I: Fundamentals of Analog Communication [10 Periods]

Principles of amplitude modulation, AM envelope, frequency spectrum and bandwidth, modulation index and percent modulation, AM Voltage distribution, AM power distribution, Angle modulation - FM and PM waveforms, phase deviation and modulation index, frequency deviation and percent modulation, Frequency analysis of angle modulated waves. Bandwidth requirements for Angle modulated waves.

MODULE II: Band-pass Modulation Techniques [10 Periods]

Introduction, Shannon limit for information capacity, digital amplitude modulation, frequency shift keying, FSK bit rate and baud, FSK transmitter, BW consideration of FSK, FSK receiver, phase shift keying – binary phase shift keying – QPSK, Quadrature Amplitude modulation, bandwidth efficiency, carrier recovery – squaring loop, Costasloop, DPSK.

MODULE III: Base Band Transmission Techniques [10 Periods]

A: Introduction, Pulse modulation, PCM – PCM sampling, sampling rate, signal to quantization noise rate, companding – analog and digital – percentage error,

B: delta modulation, adaptive delta modulation, differential pulse code modulation, pulse transmission – Intersymbol interference, eye patterns.

MODULE IV: Spread Spectrum and Multiple Access Techniques [09 Periods]

Introduction, Pseudo-noise sequence, DS spread spectrum with coherent binary PSK, processing gain, FH spread spectrum, multiple access techniques – wireless communication, TDMA and CDMA in wireless communication systems, source coding of speech for wireless communications.

MODULE V: Satellite and Optical Communication [09 Periods]

Satellite Communication Systems-Keplers Law,LEO and GEO Orbits, footprint, Link model Optical Communication Systems-Elements of Optical Fiber Transmission link, Types, Losses,Sources and Detectors.

TEXT BOOKS

1. Wayne Tomasi, —Advanced Electronic Communication Systems, 6th Edition, Pearson Education, 2007.
2. Simon Haykin, —Communication Systems, 4th Edition, John Wiley & Sons, 2001.

REFERENCES

1. H.Taub,DL Schilling,G Saha,—Principles of Communication, 3rd Edition,2007.
- 2.B.P.Lathi,—Modern Analog And Digital Communication systems, Oxford University Press, 3rd Edition,2007.
3. Blake, —Electronic Communication Systems, Thomson Delmar Publications,2002.
4. Martin S.Roden, —Analog and Digital Communication System, PHI,3rd Edition, 2002.

5. B. Sklar, —Digital Communication Fundamentals and Applications, Pearson Education, 2nd Edition, 2007.

E-RESOURCES

1. Communication Systems - <https://courses.engr.illinois.edu/ece458/comms2.pdf>
2. Notes on Modulation Techniques <http://www.ece.lehigh.edu/~jingli/teach/F2005CT/notes/AnalogCommunication.pdf>
3. <http://nptel.ac.in/courses/117105131/>

Course Outcomes:

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

1. Understand fundamentals of analog communications
2. Understand different band-pass modulation schemes
3. Understand different base-band modulation schemes
4. Understand spread spectrum techniques and multiple access mechanisms
5. Get basic knowledge on satellite and optical communications

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	2		2	1	1	1	3			
CO2	3	3	3	3	2	2		2	1	1	1	3			
CO3	3	2	2	2	2	1		1	1	1		2			
CO4	3	3	3	3	3	2			1		1	2			
CO5	3	2	2	2	2	2	2	2	1	1	1	2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)						B.Tech.		
Code: 80447	BASICS of VLSI DESIGN (Open Elective)						L	T	P
Credits: 3							3	-	-

Prerequisites: Basic Electrical and Electronics Engineering

Course Objectives:

The course aims to enable the student to visualize IC Fabrication steps and various IC technologies and to understand electrical properties of MOS, CMOS and Bi CMOS circuits. The focus of the course is also on training the student to draw integrated circuit layouts following design rules. The course also helps the student to understand basic architectures of Data path subsystems, Application Specific Integrated Circuits, of CPLDs and FPGAs.

MODULE-I: IC Technologies & IC Fabrication [10 Periods]

IC Technologies – Review of Enhancement and Depletion MOS transistors, NMOS, PMOS & CMOS fabrications, Comparison of NMOS, CMOS & BiCMOS technologies.

IC Fabrication: Steps in Fabrication-Oxidation, Lithography, Diffusion, Ion implantation, Encapsulation Metallization.

MODULE-II: Basic Electrical Parameters [10 Periods]

I_{ds} - V_{ds} relationships, MOS transistor threshold Voltage (V_t), transconductance (g_m), output conductance (g_{ds}) & figure of merit. Pass transistor, NMOS Inverter, Determination of pull-up to pull-down ratios, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters, Latch-up in CMOS circuits.

MODULE-III: VLSI Circuit Design Processes [10 Periods]

A:VLSI Design Flow, MOS Layers, Stick Diagrams, Lambda based Design Rules and Layout, 2 μ m CMOS Design rules for wires, Contacts and Transistors

B:Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits- Scaling models, Scaling function for device parameters, Limitations of Scaling.

MODULE-IV: Data Path Subsystems [10 Periods]

Data Path Subsystems: Subsystem Design – Barrel Shifter, Carry Select and Carry look Ahead Adder, Serial-Parallel and Braun Array Multiplier.

MODULE-V: ASIC's and PLD's [8 Periods]

Application Specific Integrated Circuits – Channel gate array, Channel less gate array and structured gate array.

Programmable Logic Devices - Architectures of CPLDs and FPGAs.

TEXT BOOKS:

1. Kamran Eshraghian, Douglas A. Pucknell, “**Essentials of VLSI circuits and systems**”, PHI, 1st Edition, 2005.
2. K. Lal Kishore, VSV. Prabhakar, “**VLSI Design**”, I. K international Publishing House Private Ltd, 2009.

REFERENCES:

1. Neil H. E Weste, David Harris, Ayan Banerjee, “**CMOS VLSI Design - A circuits and systems perspective**”, Pearson Education, 3rd Edition, 2009.

E-RESOURCES:

1. <https://www.ece.uic.edu/~dutt/courses/ece565/lect-notes.html>
2. <http://www.egr.msu.edu/classes/ece410/mason/files/Ch2.pdf>
3. <http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=92>
4. <https://www.journals.elsevier.com/integration-the-vlsi-journal/>
5. <http://nptel.ac.in/courses/117106093/>

6. <http://nptel.ac.in/courses/117101058/>

Course Outcomes:

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

1. Understand the Enhancement and Depletion mode transistors and describe the steps involved in IC fabrication.
2. Understand the electrical properties of MOS and able to describe problem due to CMOS Latch up and the remedies for that.
3. Illustrate circuit diagrams, stick diagrams and layouts for NMOS, CMOS and BiCMOS circuits and the effects of Scaling.
4. Understand Basic architectures of Data path subsystems.
5. Understand Basic architectures of Application Specific Integrated Circuits, of CPLDs and FPGAs.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	2		1					2			
CO2	2	2	2	2	1										
CO3	2	1	2	2	1						2	2			
CO4	2	1	2	2	2		1				2	2			
CO5	2	1	2	2	3		2				3	3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80512	DATABASE MANAGEMENT SYSTEMS (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL

Course Objectives:

This course enables the students to learn the basic concepts and the applications of Data Base Systems and conceptualize and depict a Data Base System using ER diagram, masterin constructing queries using SQL. Using this course student can understand relational database principles, become

familiar with the basic issues of transaction processing and concurrency control and Data Base storage structures and access techniques.

MODULE I: Introduction

[10 Periods]

Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.

Introduction to Data base design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

MODULE II: Relational Algebra and Calculus

[9 Periods]

Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Data bases, Designing Active Databases.

MODULE III: Schema Refinement and Normal Forms

[10 Periods]

A:Schema Refinement - Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs,

B:Normal Forms- Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

MODULE IV: Transaction Management and Concurrency Control

[10 Periods]

Transaction Management:-Transactions, Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity Transaction Isolation Levels, Implementation of Isolation Levels.

Concurrency Control: Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes.

Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems..

MODULE V: Storage and Indexing

[09 Periods]

Storage - Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations.

Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash Based Indexing: Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXTBOOKS

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Education (India) Private Limited, 3rd Edition.
2. Data base System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill Education(India) Private Limited 1, 6th edition

REFERENCES:

1. Database Systems, 6th edition, R Elmasri, ShamkantB.Navathe, Pearson Education.
2. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning.
3. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition.
4. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
5. Introduction to Database Systems, C. J. Date, Pearson Education.

E-RESOURCES

1. <https://kakeboksen.td.org.uit.no/Database%20System%20Concepts%206th%20edition.pdf>
2. <http://agce.sets.edu.in/cse/ebook/DBMS%20BY%20RAGHU%20RAMAKRISHNAN.pdf>
3. <http://aircse.org/journal/ijdms/ijdms.html>
4. <http://www.springer.com/computer/database+management+%26+information+retrieval?SGWID=0-153-12-114576-0>
5. <http://textofvideo.nptel.iitm.ac.in/video.php?courseId=106106093>
6. <http://www.nptelvideos.in/2012/11/database-management-system.html>

Course Outcomes:

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

1. Identify the basic elements of a relational database management system and the data models for relevant problems.
2. Write SQL Queries by designing entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
3. Analyze various functional dependencies and apply normalization for designing a robust data base in the development of application software.
4. Implement transactions, concurrency control, recovery and Query optimization techniques.
5. Compare various indexing and hashing techniques.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2			3				2		3			
CO2	3	3	3			3				3		3			

CO3	3	3	3			2				3		2			
CO4	3	2	1			1				1		1			
CO5	3	1	1			1						1			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80521	BIG DATA ANALYTICS (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisites: Databases, Programming fundamentals

Course Objectives:

This course enables the students to learn and understand Big data, data analytics, R language, developing map reduce programs, discuss about concepts of big data, make use of Hadoop concepts for designing applications, develop applications using Hadoop I/O and analyze big data using programming tools such as Pig and Hive

MODULE I: Big data overview, data analytics, and R Language [09 Periods]

Big Data Overview : Data Structures, Analyst Perspective on Data Repositories , State of the Practice in Analytics, BI Versus Data Science, Current Analytical Architecture , Drivers of Big Data , Emerging Big Data Ecosystem and a New Approach to Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics. Data Analytics Lifecycle , Model Building and Basic Data Analytic Methods Using R Data Analytics Lifecycle Overview, Key Roles for a

Successful Analytics Project, Background and Overview of Data Analytics Lifecycle - Discovery , Data Preparation, Learning the Business Domain , Model Planning , Model building, Communicate Results, Operationalize and case study example Global Innovation Network and Analysis (GINA)
R Introduction: Introduction to R, Exploratory Data Analysis, Statistical Methods for Evaluation, Hypothesis Testing, Difference of Means, Rank-Sum Test, Errors, Sample Size data

MODULE II: Working with Big Data [09 Periods]

Hadoop - Google File System, Hadoop Distributed File System (HDFS)– Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker).

Configuring of Hadoop Cluster - Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

MODULE III: Hadoop API and Map Reduce Programs [09 Periods]

A: Hadoop API - Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New)

B: MapReduce Programs with classes - Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner.

MODULE IV: Hadoop I/O and Implementation [09 Periods]

Hadoop I/O - The Writable Interface, Writable Comparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, BytesWritable, NullWritable, ObjectWritable and GenericWritable, Writable collections.

Implementation - Implementing a Custom Writable: Implementing a RawComparator for speed, Custom comparators.

MODULE V: PIG and HIVE HADOOP TOOL [12 Periods]

PIG - HADOOP TOOL - Hadoop Programming Made Easier - Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

HIVE – HADOOP TOOL - Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

TEXTBOOKS

1. Data Science & Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data EMC Education Services, Wiley Publishers, 2015.
2. Cay Horstmann, Wiley John Wiley & Sons, “**Big Java**”, 4th Edition, INC
3. Tom White, “**Hadoop: The Definitive Guide**” 3rd Edition, O’reilly

REFERENCES

1. Alex Holmes, “**Hadoop in Practice**”, MANNING Publ.
2. Srinath Perera, Thilina Gunarathne, “**Hadoop MapReduce**” Cookbook.

E-RESOURCES

1. http://newton.uam.mx/xgeorge/uea/Lab_Prog_O_O/materiales_auxiliares/Big_Java_4th_Ed.pdf
2. <http://www.isical.ac.in/~acmsc/WBDA2015/slides/hg/Oreilly.Hadoop.The.Definitive.Guide.3rd.Edition.Jan.2012.pdf>
3. <https://static.googleusercontent.com/media/research.google.com/en//archive/mapreduce-osdi04.pdf>
4. <http://www.comp.nus.edu.sg/~ooibc/mapreduce-survey.pdf>
5. <http://freevideolectures.com/Course/3613/Big-Data-and-Hadoop/18>
6. <http://freevideolectures.com/Course/3613/Big-Data-and-Hadoop/40>

Course Outcomes:

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

1. Develop simple applications using R language
2. Analyze file systems such as GFS and HDFS.
3. Design applications by applying Map reduce concepts.
4. Build up programs by making use of I/O.
5. Explore and inspect the big data using programming tools like Pig and Hive.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1		1	3	2	1	3			
CO2	3	2	3	3	3						2	1			
CO3	3	3	3	3	3							3			
CO4	3	3	3	3	3						1	3			
CO5	2	3	3	3	3						1	3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80535	CLOUD COMPUTING (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisites: Computer Networks

Course Objectives:

This course provides the students to gain knowledge in the cloud computing environment, security architecture and development of cloud services. Students will also examine the collaboration of real time cloud services and analyze the case studies from various cloud development tools.

MODULE I: Introduction to Cloud Computing [8 Periods]

Cloud Computing in a Nutshell, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

MODULE II: Virtualization [12 Periods]

Virtual Machines and Virtualization of Clusters and Data Centers: Levels of Virtualization, Virtualization Structures//Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation.

Case studies: Xen Virtual machine monitors- Xen API. VMware - VMware products-VMware Features. Microsoft Virtual Server - Features of Microsoft Virtual Server.

MODULE III: Cloud Computing Architecture over Virtualized Data Centers [8 Periods]

Cloud computing architectures over Virtualized Data Centers: Data-Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

MODULE IV: Cloud Security

[8 Periods]

Cloud Security and Trust Management, Data Security in the Cloud : An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, Crypt Db:Onion Encryption layers-DET,RND,OPE,JOIN,SEARCH, HOM, and Homomorphic Encryption, FPE. Trust, Reputation and Security Management.

MODULE V: Cloud Programming and Standards

[12 Periods]

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, parallel and distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

Common Standards in Cloud Computing: The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers, Standards for Messaging. Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

TEXTBOOKS

1. John W. Rittinghouse, "Cloud Computing: Implementation, Management, and Security ". James F. Ransome, CRC Press 2009.
2. Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, "Distributed and Cloud Computing From Parallel Processing to the Internet of Things", Elsevier, 2012.
3. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski," Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing ©2011

REFERENCES

1. Raluca Ada Popa, Catherine M.S. Redfield, Nikolai Zeldovich, and Hari Balakrishnan, "CryptDB: Protecting Confidentiality with encrypted Query Processing"^{23rd} ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
2. Craig Gentry,"A Fully Homomorphic Encryption Scheme", September 2009.
3. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

E-RESOURCES

1. http://www.motc.gov.qa/sites/default/files/cloud_computing_ebook.pdf
2. <https://www.thesisscientist.com/docs/Study%20Notes/8ad50655-64f5-46d4-bc89-0c02feaf132f>
3. http://ndl.iitkgp.ac.in/document/zyMnqgZQXCJME6wgSqrU87VCGcelOw5mZ-5ybmrhKBj79VQPP0_ZQHLqcOopPDoaFWhZybCrPg_joTbBU8ZpGA
4. <http://www.springer.com/computer/communication+networks/journal/13677>
5. <http://nptel.ac.in/courses/106106129/28>

Course Outcomes:

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

1. Understand the cloud enabling technologies and the Cloud service models.
2. Choose the levels of virtualization and tools for resource provisioning.
3. Compare the cloud platform architectures of virtualized data centers and Inter-cloud Resource Management.
4. Analyze the principles of Security and Trust management to protect confidentiality of data in the Cloud.
5. Propose the standards of Parallel and Distributed Programming Paradigms for improving user Access to Cloud Computing.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1				2										
CO2		1		2	2							1			
CO3		1			3							2			
CO4	1											2			
CO5	1			2								1			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80605	ANDROID APPLICATION DEVELOPMENT (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-requisites: Nil

Course Objectives:

This course aims the students to learn the essentials of mobile apps development, aids in developing simple android applications, identify the essentials of android design, file settings, study about user interface design and develop android APIs.

Module I: Mobile and Information Architecture [10 Periods]

Introduction to Mobile: A brief history of Mobile, The Mobile Eco system, Why Mobile?, Types of Mobile Applications.

Mobile Information Architecture: Mobile Design, Mobile 2.0, Mobile Web development, Small Computing Device Requirements.

Module II [10 Periods]

Introduction to Android: History of Mobile Software Development, The Open Handset Alliance-Android platform differences.

Android Installation: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building a Sample Android application.

Module III [10 Periods]

A: Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents.

B: Android File Settings: Android Manifest File and its common settings, Using Intent Filter, Permissions, Managing Application resources in a hierarchy, working with different types of resources.

Module IV [09 Periods]

Android User Interface Design: Essentials User Interface Screen elements, Designing User Interfaces with Layouts.

Animation Techniques: Drawing and Working with Animation- Drawing on the screen –Working with Text-Working with Bitmaps-Working with shapes-Working with animation.

Module V**[09 Periods]**

Android APIs-I: Using Common Android APIs Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers.

Android APIs-II :Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

TEXT BOOKS:

1. James Keogh, “**J2ME: The Complete Reference**”, Tata McGrawHill.
2. Lauren Darcey and Shane Conder, “**Android Wireless Application Development**”, Pearson Education, 2nd ed. (2011).

REFERENCES:

1. Reto Meier, “**Professional Android 2 Application Development**”, Wiley India Pvt Ltd.
2. Mark L Murphy, “**Beginning Android**”, Wiley India Pvt Ltd.
3. Barry Burd, “**Android Application Development All in one**” Edition: I, Wiley India Pvt Ltd.

E - Resources

1. <http://onlinevideolecture.com/ebooks/?subject=Android-Development>
2. <https://developer.android.com/training/basics/firstapp/index.html>
3. IEEE Transactions on Mobile Computing
4. International Journal of Interactive Mobile Technologies
5. <http://nptel.ac.in/courses/106106147/>

Course Outcomes

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

1. Classify different types of Platforms.
2. Appreciate the Mobility landscape.
3. Familiarize with Mobile apps development aspects.
4. Design and develop mobile apps, using Android as development platform, with key focus on user experience design, native data handling and background tasks and notifications.
5. Perform testing, signing, packaging and distribution of mobile apps.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3													
CO2			3		3										
CO3			3		3										
CO4				2			1								
CO5							1		3			3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80606	PYTHON PROGRAMMING (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL

Course Objectives:

This course enables the students to understand the fundamentals of python programming, describe the various operators and control flow statements, analyze various data structures, make use of functions, discuss about MODULEs, packages in python, object oriented concepts, exception handling, illustrate advanced concepts like multithreading, graphics and generate various test cases.

MODULE I: Python Programming-Introduction [09 Periods]

Introduction- History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL (Shell) Running Python Scripts.

Data Types - Variables, Assignment, Keywords, Input-Output, Indentation-Types - Integers, Strings, Booleans.

MODULE II: Operators and Expressions [09 Periods]

Operators - Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators.

Expressions - Expressions and order of evaluations Control Flow- if, if-elseif-else, for, while, break, continue.

MODULE III: Data Structures and Functions [10 Periods]

A: Data Structures - Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences, Comprehensions.

B: Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful, Functions (Function Returning Values) Scope of the Variables in a Function - Global and Local Variables.

MODULE IV: MODULEs, Packages and Exception handling [10 Periods]

MODULEs - Creating MODULE s, import statement, from. Import statement; name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor, Method, Inheritance, Overriding Methods, Data hiding.

Error and Exceptions - Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

MODULE V: Library functions and testing [10 Periods]

Brief Tour of the Standard Library - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics.

Testing - Why testing is required?, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.

TEXTBOOKS

1. Vamsi Kurama, “**Python Programming: A Modern Approach**”, Pearson Publications.
2. Mark Lutz,” **Learning Python**”, Orielly Publishers

REFERENCES

1. Allen Downey, “**Think Python**”, Green Tea Press
2. W. Chun, “**Core Python Programming**”, Pearson.
3. Kenneth A. Lambert, “**Introduction to Python**”, Cengage

E-RESOURCES

1. <http://kvspgts.org/wp-content/uploads/2013/08/Python-Programming-for-the-Absolute-Beginner.pdf> 2
2. [http://www.bogotobogo.com/python/files/pytut/Python%20Essential%20Reference,%20Fourth%20Edition%20\(2009\).pdf](http://www.bogotobogo.com/python/files/pytut/Python%20Essential%20Reference,%20Fourth%20Edition%20(2009).pdf)
3. <https://periodicals.osu.edu/ictjournal/dokumenty/2015-02/ictjournal-2015-2-article-1.pdf>
4. <http://ptgmedia.pearsoncmg.com/images/9780132678209/samplepages/0132678209.pdf>
5. <http://www.learnerstv.com/Free-Computer-Science-Video-lectures-ltv163-Page1.htm>

Course Outcomes

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

1. Understand the basics of python programming languages
2. Illustrate simple programs with control structures
3. Apply advanced concepts like data structures and make use of functions.
4. Develop simple applications by using MODULE s, packages and exception handling mechanisms.
5. Demonstrate projects that make use of libraries and generate test cases for the projects.

CO- PO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1			1	1										
CO2		1	1	3								-			
CO3	1	1	1	1	2							1			
CO4											1	1			
CO5						1						1			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80617	ARTIFICIAL INTELLIGENCE (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL

Course Objectives:

This course enable the students to understand the basic fundamentals of Artificial Intelligence, determine various problem solving strategies, understand the logic concepts, different approaches to represent the knowledge, develop the expert systems in various phases and its applications, apply the fuzzy logic in various problem solving techniques.

MODULE I: Introduction

[10 Periods]

Introduction to artificial intelligence: Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of ai languages, current trends in AI

MODULE II: Problem Solving

[09 Periods]

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening a*, constraint satisfaction Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games

MODULE III: Logic Concepts and Knowledge Representation

[10 Periods]

A: Logic Concepts - Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution refutation in propositional logic, predicate logic

B: Knowledge Representation - Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, cyc theory, case grammars, semantic web.

MODULE IV: Expert System and Applications

[10 Periods]

Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools

MODULE V: Uncertainty Measure

[09 Periods]

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

TEXTBOOKS

1. Saroj Kaushik, “**Artificial Intelligence**”, CENGAGE Learning,
2. Stuart Russel, Peter Norvig, “**Artificial intelligence, A modern Approach**”, 2nd ed, PEA

- Rich, Kevin Knight, Shiv Shankar B Nair, “**Artificial Intelligence**”, 3rd Ed, TMH
- Patterson, “**Introduction to Artificial Intelligence**”, PHI

REFERENCES

- George F Lugar, “**Artificial intelligence, structures and Strategies for Complex problem solving**”, 5th edition, PEA
- Ertel, Wolf Gang, “**Introduction to Artificial Intelligence**”, Springer
- Blay WhitBY “**Artificial Intelligence**” Rosen Publishing.

E-RESOURCES

- <https://i4iam.files.wordpress.com/2013/08/artificial-intelligence-by-rich-and-knight.pdf>
- https://books.google.co.in/books?id=pVR9W5LEZUwC&printsec=frontcover&source=gb_s_ge_summary_r&cad=0#v=onepage&q&f=false
- <https://www.journals.elsevier.com/artificial-intelligence/>
- <http://www.ceser.in/ceserp/index.php/ijai>
- http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgYe1qW9xY7_M07uyea_7zp_zRG3BvdUVy2Tlab45fvPeNjfyNqsAbmBEgDSUqzidwcse6xwotJA
- http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVIXBW-YWRBg_vrHK12-lqOzTVbb5oZ6eQOBjCWDfRvquHJLEOFENjI5AmOqRc9Ar3eJF4CGFrw

Course Outcomes:

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

- Describe the key components of the artificial intelligence (AI) field.
- Classify knowledge representation techniques.
- Interpret various types of reasoning and processing.
- Discover game playing and apply knowledge representation.
- Demonstrate learning and the analyze aspects of leaning.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1			1	1										
CO2		1	1	3								-			
CO3	1	1	1	1	2							1			
CO4											1	1			
CO5						1						1			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech		
Code: 82507	DRILLING AND BLASTING (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisite: Nil

Course Objectives:

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

MODULE-I: Principles of Drilling and Drill bits [10 Periods]

Principles of drilling: Principles of rock drilling, drillability, drillability index, factors affecting the drillability, selection of drills.

Drill Bits: Various types of drill bits, study of bit life, factors affecting bit life, Thrust feed and rotation

MODULE-II: Explosives [10 Periods]

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

MODULE-III: Firing of Explosives and blasting methods [10 Periods]

A: Firing of Explosives: Safety fuse, detonating cord and accessories, detonators, Exploders, Electric firing and non-electric firing, electronic detonators, NONEL blasting.

B: Blasting methods: Preparation of charge, stemming and shot firing, choice and economical use of explosives, misfires, blown out shots, incomplete detonation, their causes, prevention and remedies.

MODULE-IV: Handling of Explosives [09 Periods]

Surface and underground transport of explosives, storage and handling of explosives, magazines, accidents due to explosives, precautions and safety measures during transportation.

MODULE-V: Mechanics of blasting and effects of blasting [09 Periods]

Mechanics of blasting: Factors affecting rock breakage using explosives, theory of shaped charge, detonation pressure, coupling, shock waves impedance, critical diameter.

Effects of blasting: Vibrations due to blasting and damage criteria, fly rocks, dust, fumes, water pollution and controlled blasting.

TEXT BOOKS:

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

REFERENCES:

1. Rock blasting effect and operation, Roy Pijush Pal, A.A. Balkema, 1st ed, 2005
2. Elements of mining technology, Vol-1, D.J. Deshmukh, Central techno, 7th ed, 2001
3. Blasting operations, B.Hemphill Gary, Mc-graw Hill, 1st ed 1981
4. Explosive and blasting practices in mines, S.K.Das, Lovely prakashan, 1st ed, 1993.

E - RESOURCES:

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

Course Outcomes:

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

1. Understand Principles of drilling and Various types of drill bits
2. Understand different types of Explosives
3. Understand Firing of Explosives and Blasting methods
4. Understand Handling of Explosives
5. Understand Mechanics of blasting and effects of blasting

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	1				3						
CO2	2	2	1	1	3				2						
CO3	3	2	3	3	2				1						
CO4	1	3	2	1	2				2						
CO5	1	1	2	2	1				2						

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech		
Code: 82537	MATERIAL HANDLING (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisite: Nil

Course Objectives:

To introduce the basic principles in material handling and its equipment. To study the conveyor system and its advancement

MODULE-I: Bulk Handling Systems**[10 Periods]**

Basic principles in material handling exclusive to mining industry and its benefits. Classification of material handling equipments. Current state of art of bulk handling materials in mining in the world

and Indian scenario; Selection of suitable types of systems for application. Stacking, blending, reclaiming and wagon loading, machinery and systems used at the stack yards; stock piles, silos, bunkers – their design, reclamation from them, various types of weigh bridges. Segregation - size wise and grade wise, Railway sidings.

MODULE-II: Short Conveyors and Haulage Systems [10 Periods]

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

MODULE-III: Belt Conveyor System [09 Periods]

A: Design, capacity, calculations with respect to the size, speed, troughing, power requirement, tension requirement, belt selection, factor of safety.

B: Developments in the design, of various components of belt conveyor systems such as; structures, rollers, gear boxes and motors, drums and pulleys, belting, ancillary components and safety gadgets.

MODULE-IV: New Types of Belt Conveyor Systems [09 Periods]

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

MODULE-V: Material Handling in Mines, Plants and Workshop [10 Periods]

Mobile cranes, derrick cranes, pillar cranes, tower cranes, radial cranes, bridge cranes, fork lifters, overhead gantry material handling in workshops. Mineral handling in dimensional stone quarries, Mineral handling plants(coal, etc.,) Locomotives, rail tracks, rail cars, railways wagons; Aerial ropeways, gravity ropeways; Containers and shipping; Rope haulage - different types.

TEXT BOOKS:

3. Allegri (Sr.), T.H., Material Handling – Principles and Practices, CBS Publishers and Distributors, Delhi, 1987.
4. Hustrulid, W., and Kuchta, M. Open Pit Mine Planning & Design, Vol. 1, Fundamentals, Balkema, Rotterdam, 1998.

REFERENCES:

6. Kennedy, B.A., Surface Mining – 2nd Edition, SME, New York, 1990.
7. Deshmukh, D.J., Elements of Mining Technology, Vol.I, II and III, EMDEE Publishers, Nagpur, 1979.
8. Peng, S.S., and Chiang, H.S., Longwall Mining, John Wiley and Sons, New York, 1984.
9. Hartman, H.L., (Ed.), SME Mining Engg. Handbook Vol.I and II, Society for Mining,
10. Metallurgy, and Exploration, Inc., Colorado, 1992.

E RESOURCES:

3. www.bmt.org
4. www.canadianminingjournal.com/tag/material-handling/

Course Outcomes:

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

6. Understand Basic principles in material handling exclusive to mining industry and its benefits
7. Understand Short Conveyors and Haulage Systems
8. Understand Belt Conveyor System
9. Understand New Types of Belt Conveyor Systems
10. Understand Material Handling in Mines, Plants and Workshops

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	2						1				
CO2	1	1	2	2	1						2				
CO3	1	2	3	3	2						2				
CO4	2	2	1	2	3						3				
CO5	2	2	1	2	3						2				

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B. Tech		
Code: 82542	TUNNELING ENGINEERING (Open Elective)			L	T	P
Credits: 3				3	-	-

Prerequisite: Nil

Course Objectives:

The course enables the students to be familiar with the recent developments in various technologies used in underground spaces includes tunneling and cavern projects across the world.

MODULE-I: Introduction

[10 Periods]

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

MODULE-II: Tunnel Excavations

[10 Periods]

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

MODULE-III: Drilling and Blasting

[10 Periods]

A:Drilling - drilling principles, drilling equipment, drill selection, specific drilling, rock drillability factors; Blasting - explosives, initiators, blasting mechanics

Part B:Types of cuts- fan, wedge and others; blast design, tunnel blast performance - powder factor, parameters influencing, models for prediction; mucking and transportation equipment selection.

MODULE-IV: Mechanization

[09 Periods]

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

MODULE-V: Tunnel Services

[09 Periods]

Supports in Tunnels: Principal types of supports and applicability. Ground Treatment in Tunneling: Adverse ground conditions and its effect on tunneling; Excavation of large and deep tunnels, caverns. Tunnel Services: Ventilation, drainage and pumping; Tunneling hazards.

TEXT BOOKS:

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

REFERENCES:

1. Legget, R.F., Cities and Geology, McGraw-Hill, NewYork, 624 p., 1973.
2. Johansen, John and Mathiesen, C.F., Modern Trends in Tunnelling and Blast Design, AA Balkema, 154p, 2000.
3. Per-Anders Persson, Roger Holmberg, Jaimin Lee, (1993), Rock blasting and explosives Engineering, CRC Press, p.560.
4. Bickel, J.O., Kuesel, T.R. and King, E.H., Tunnel Engineering Handbook, Chapman & Hall Inc., New York and CBS Publishers, New Delhi, 2nd edition, Chapter 6, 544p, 1997.

E RESOURCES:

1. www.cowi.com/.../bridgetunnelandmarinestructures/tunnels/.../021-1700-020e-10b
2. <https://miningandblasting.wordpress.com/list-of-technical-papers>

Course Outcomes:

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

1. Understand art of tunneling, tunnel engineering, future tunneling considerations
2. Understand different types Tunneling Methods
3. Understand drilling principles, drilling equipment, explosives, initiators, blasting mechanics
4. Understand tunneling by different machines
5. Understand Tunnel Services

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	3					2					
CO2	2	3	1	2	3										
CO3	2	3	1	2	3										
CO4	2	3	1	2	3					3					
CO5	2	3	1	2	3										

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B. Tech.		
Code: 80H07	ENGLISH LANGUAGE SKILLS			L	T	P
Credits: 3	(Open Elective)			3	-	-

Prerequisite: Nil

Course Course Objectives:

To build business English vocabulary and grammar through lessons on the latest topics in the business world and to upgrade the learners communication and presentation skills and make the students competent in communication at an advanced level. In addition to the earlier mentioned, this course gives a room to groom the learners' personality and make the students self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills by giving hands-on experience about business presentations and attending team meetings.

Module – I: Communication Skills [10 Periods]

Types of communication-Oral, aural and written, reading-Word Power-Vocabulary-technical vocabulary, Rate of speech- pitch, tone-clarity of voice.

Module – II: Conversation Skills [10 Periods]

Informal and Formal conversation, Verbal and Non - verbal communication. Barriers to effective communication - Kinesics

Module – III: Reading Skills [10 Periods]

A: Types of reading-reading for facts, guessing meaning from context.
B: Strategies of reading- scanning, skimming, inferring meaning, critical reading.

Module – IV: Creative Writing [09 Periods]

Letter-writing-business letters-pro forma culture-format-style-effectiveness, promptness-Analysis of sample letters collected from industry-email, fax, Essay writing-nuances of essay writing, types of essays,

Module - V: Writing Skills [09 Periods]

Characteristics of writing – mechanics of writing – methodology of writing – format & style-structures of writing – circular writing – memo writing – instructions writing, Report Writing, SOP.

REFERENCES:

1. Rajendra Pal S Korlaha ,**Essentials of Business Communication**, Hi: Sultan Chand & Sons, New Delhi.
2. Andrew J. Rutherford , **Basic Communication Skills for Technology**,: Pearson Education Asia, Patparganj, New Delhi-92.
3. V. Prasad, **Advanced Communication skills**, Atma Ram Publications, and New Delhi.
4. Raymond V. Lesikav; John D.Pettit Jr.; **Business Communication: Theory & application**, All India Traveler Bookseller, New Delhi-51
5. R K Madhukar, **Business Cimmunication**, Vikas Publishing House Pvt Ltd

E Resources

1. <https://blog.udemy.com/types-of-communication/> (Communication Skills)
2. <https://www.skillsyouneed.com/ips/conversational-skills.html> (Conversation Skills)
3. <http://lrs.ed.uiuc.edu/students/jblanton/read/readingdef.htm> (Reading Skills)
4. <https://www.thoughtco.com/what-is-composition-english-1689893> (Writing and composition)
5. <http://www.mansfield.edu/fye/upload/Academic-Reading-Skills.pdf> (Reading Skills)

Course Outcomes:

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

1. Understand the importance of various forms of non-verbal communication.
2. Participate confidently in business meetings.
3. Gain an understanding about different types of reading skills and employ the same during competitive exams.
4. Recognize the importance of writing in real time situations.
5. Improve the skills necessary to meet the challenge of using English in the business world.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1										2		1			
CO2						1			2		1	2			
CO3		2		1											
CO4											1	2			
CO5											1	3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech.		
Code: 80H08	INTERPRETATION SKILLS AND ANALYTICAL WRITING (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisite: Nil

Course Objectives:

To determine how well the students can develop a compelling argument in writing for an academic audience. Further helps them to involve in critical thinking and persuasive writing exercises. This course also intends to develop effective writing skills to analyze and evaluate the data and ideas for better comprehension. On the other hand this course encourages students to learn strategies for becoming accurate readers and critical analysts.

Module – I: Interpretation and Types of Reading

[10 Periods]

- Interpretation in different settings
- Understanding the main ideas in the text
- Reading for inference
- Reading for theme
- Reading for interpretation

Module –II: Approaches to Reading

[10 Periods]

- Biographical
- Historical
- Gender
- Sociological

Module – III: Critical Reading

[10 Periods]

- The Theme
- Setting
- Point of View
- Characters
- Plot
- Analysis
- Interpretation

Note: This module should be dealt with reference to *Animal Farm* by George Orwell

Module - IV: Analytical Writing

[09 Periods]

- Argumentation
- Sequencing
- Analyze an ISSUE
- Analyze an Argument
- Verbal Reasoning
- Interpretive Reports

Note: This module should be dealt with reference to Essays written by Somerset Maugham/Russell/Aldous Huxley

Module – V: Creative Writing

[09 Periods]

- Figurative Language
- Imagery
- Writing a short Poem
- Writing a short Story

REFERENCES:

1. GRE by CliffsTestPrep-7th edition
2. GRE Exam- **A Comprehensive Program**
3. M H Abraham **Glossary of English Literary terms**
4. GD Barche **Interpreting Literature- A Myth and a Reality**
5. Wilbur Scott- **Five approaches to literary criticism.**

E Resources:

1. <http://www.brad.ac.uk/staff/pkkornakov/META.htm>(Introduction to Interpretation Skills)
2. <http://literacyonline.tki.org.nz/Literacy-Online/Planning-for-my-students-needs/Effective-Literacy-Practice-Years-1-4/Approaches-to-teaching-reading> (Approaches to Reading)
3. <https://www.csuohio.edu/writing-center/critical-reading-what-critical-reading-and-why-do-i-need-do-it> (Critical Reading)
4. https://www.ets.org/gre/revised_general/about/content/analytical_writing (Analytical Writing)
5. <http://www.writerstreasure.com/creative-writing-101/> (Creative Writing)
6. <http://scholarworks.rit.edu/jcws/aimsandscope.html> (Creative Writing)

Course Outcomes:

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

1. Think critically and help in writing analytically.
2. Get real life experiences through interpretation of literature.
3. Learn strategies for becoming accurate readers and critical analysts
4. Think logically towards social, political, economical, legal and technological issues.
5. Draw their career vision and mission independently.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			1	2				2		1	2				
CO2										2	1				
CO3			1			2	1			1					
CO4						1		2				1			
CO5				1		1						1			

1. Zemach, D. & Rumisek, L. 2005. *Academic Writing: from Paragraph to Essay*, Oxford, Macmillan
2. Swales, J. & Feak, C. 2004. *Academic Writing for Graduate Students: Essential Tasks and Skills*. Ann Arbor, University of Michigan Press.
3. Sword, H. 2012. *Stylish Academic Writing*, Cambridge, MA. Harvard University Press.
4. Williams, J.M. & Bizup, J. 2014. *Style: Lessons in Grace and Clarity*. 11th ed. Boston, Pearson
5. Weissberg, R. & Buker, S. 1990. *Writing up Research: Experimental Research Report Writing for Students of English* Englewood Cliffs, Prentice Hall Regents.
6. Englander, K. 2014. *Writing and Publishing Science Research Papers in English: A global perspective*. Heidelberg. Springer Briefs in Education

E-Resources:

1. <https://writing.wisc.edu/Handbook/index.html>
2. <https://brians.wsu.edu/common-errors/>
3. <http://www.gutenberg.org/ebooks/37134>
4. <http://nptel.ac.in/courses/110105091/2> (**Research writing**)
5. <http://nptel.ac.in/courses/109106094/26> (**Academic Writing and Linking Words**)
6. https://www.researchgate.net/journal/14751585_Journal_of_English_for_Academic_Purposes

Course Outcomes:

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

1. Write effective and appropriate introduction and conclusion
2. Use a wide range of academic words correctly and appropriately.
3. Write a variety of effective sentences that contain appropriate cohesive devices, connectors and transition words.
4. Identify relevant outside source material and integrate it appropriately in writing.
5. Find out results and draw conclusions for research documentation.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			1	2			2			2	2				
CO2										2	1	1			
CO3				1	1					1	2	1			
CO4		1	1								1				
CO5				2		1				2	2				

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.
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Code: 80B11	COMPUTATIONAL MATHEMATICS <i>(Open Elective)</i>	L	T	P
Credits: 3		3	-	-

Pre-requisite: Basic Calculus

Course Objectives:

The objective of this course is to introduce various numerical techniques which are indispensable tools to solve many algebraic and transcendental equations. Various methods are used to reduce the global error involved in approximations. This course fills into this perceived need. The treatment should be informed by the fact that not only conceptual but also (and in some cases) more importantly numerical or computational methods are of essence.

Module – I: Algebraic and Transcendental Equations [09 Periods]

Solution of Algebraic and Transcendental Equations: Introduction - Bisection Method - Method of False Position - Iteration Method – Newton-Raphson Method - Ramanujan’s Method. Jacobi – Gauss Seidel Methods for solving linear systems, Power Method.

Module – II: Interpolation [10 Periods]

Introduction, Errors in Polynomial Interpolation, Finite differences, Forward Differences-Backward differences, Symbolic relations and separation of symbols, Differences of a polynomial-Newton’s formulae for interpolation Central difference interpolation Formulae, Gauss Central Difference Formulae, Interpolation with unevenly spaced points: Lagrange’s Interpolation formula.

Module – III: Curve fitting, Numerical Differentiation & Integration [10 Periods]

A: Curve fitting: Fitting a first degree (linear) and second degree (parabola), exponential, power curves for a data by the Method of least squares.

B: Numerical Differentiation: Evaluation of derivatives, Evaluation of maximum & minimum for a given data. Numerical Integration: Trapezoidal Rule, Simpson’s 1/3rd, 3/8th Rule.

Module – IV: Numerical solution of Ordinary Differential Equations [10 Periods]

Solution by Taylor’s series method - Picard’s Method of successive Approximations - Euler’s Method-Modified Euler’s Method – Runge-Kutta Methods. Predictor-Corrector Methods: Milne’s method - Adams- Bashforth Method.

Module – V: Numerical Solution of Partial Differential Equations [09 Periods]

Classification of second order equations – Finite difference approximations to derivatives - standard 5 point formula – diagonal 5 point formula – solution of Laplace equation. Solution of poisson’s equation. Solution of one dimensional heat, wave equations (by Crank-Nicolson explicit/implicit formula only).

TEXT BOOKS:

1. Atkinson & Han, Elementary Numerical Analysis, 3rd Edition, Wiley Publications.
2. Francis Scheid, Numerical Analysis, Schaum’s Outlines, 2nd Edition, Tata Mc. Graw Hill Publications.

REFERENCES:

1. M K Jain, et.al, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers.
2. James F Epperson, An Introduction to Numerical Methods and Analysis, Revised Edition, Wiley Publications.
3. V Rajaraman, Computer Oriented Numerical Methods, 3rd Edition, Pritice Hall India.
4. M K Jain, SRK Iyyengar, Numerical Methods for Scientific and Engineering Computation, 4th Edition, Newage International Publishers.
5. S S Sastry, Introductory Methods of Numerical Analysis, 5th Edition, Printice Hall India.

E - RESOURCES:

1. http://www.simumath.com/library/book.html?code=Alg_Equations_Examples (Algebraic and transcendental equation text book by YURG BERENGARD)
2. http://jupiter.math.nctu.edu.tw/~smchang/9602/NA_lecture_note.pdf (Interpolation)
3. <http://www.sam.math.ethz.ch/~hiptmair/tmp/NPDE10.pdf> (Numerical Solution of Partial Differential Equations)
4. https://www.jstor.org/stable/27953736?seq=1#page_scan_tab_contents (Algebraic and transcendental equation by William L. Schaaf)
5. <http://www.ijcsi.org/papers/IJCSI-9-6-2-413-419.pdf> (Algebraic and transcendental equation by Md. Golam Moazzam)
6. <http://nptel.ac.in/courses/111107063> (Numerical solution of Ordinary Differential Equations)
7. <http://nptel.ac.in/courses/111105038> (Numerical Solution of Partial Differential Equations)

Course Outcomes:

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

1. Apply numerical methods to solve some algebraic and transcendental equations to the desired level of accuracy.
2. Application of interpolation concept to evaluate missed data in data analysis.
3. Application of least squares method to solve data analysis problems and able to find the differentiation and integration by using numerical techniques.
4. Apply differential equations in engineering oriented problems and to observe patterns by using numerical techniques.
5. To find out the Numerical solution of partial differential equations.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2				3			2			
CO2	3	3	2	3	3				3			2			
CO3	3	3	2	3	2				2			2			
CO4	3	3	2	2	3				3			2			
CO5	3	3	2	3	2				3			2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80B12	APPLIED STATISTICS	L	T	P
Credits: 3	(Open Elective)	3	-	-

Pre-requisite: Basic concepts of statistics

Course Objectives:

Uncertainty is found everywhere. It is therefore essential to understand the techniques for handling and modeling it. This course is meant to provide a grounding in Statistics and foundational concepts that can be applied in modeling processes and decision making. These would come in handy for the prospective engineers in most branches.

Module - I: Analysis of Variance & Analysis of Co-variance [10 Periods]

Analysis of Variance (ANOVA): one-way & two-way ANOVA and multiple comparisons. Design of Experiments: Importance and applications of design of experiments. Principles of experimentation, Analysis of Completely randomized Design (C.R.D), Randomized Block Design (R.B.D)

Module - II: Design of Experiments [10 Periods]

Latin Square Design (L.S.D) including one missing observation, expectation of various sum of squares. Introduction to Factorial design - 2^2 and 2^n Factorial design. Analysis of Co-variance (ANCOVA) (Only one way). Conducting ANCOVA – Two way Comparison of the efficiencies of above designs.

Module - III: Statistical Quality Control [10 Periods]

A:Importance of SQC in industry. Statistical basis of Shewart control charts. Construction of control charts for variables (mean, range and standard deviation) and attributes (p,np,c&d charts with fixed and varying sample sizes).

B:Interpretation of control charts. Natural tolerance limits and specification limits process capability index. Concept of Six sigma and its importance, Single and double sampling plans.

Module - IV: Multiple Regression & Time Series [09 Periods]

Multiple Regression for n- independent variables

Time Series : Fitting a trend line to a time series, Method of least Squares and Method of Moving Averages, Measure of Seasonal Variation.

Module - V: Queuing Theory [09 Periods]

Structure of a queuing system, Operating Characteristics of queuing system, Transient and Steady states, Terminology of Queuing systems, Arrival and service processes, Pure Birth-Death process Deterministic queuing models, (M/M/1):(∞:FIFO) Model, (M/M/1):(N:FIFO) Model .

TEXT BOOKS:

1. Monte Gomery, “**Applied Statistics and Probability for Engineers**”, 6th Edition, Wiley Publications.
2. J K Sharma, “**Operations research Theory and applications**” Macmillan publishers india limited, 4th edition.
3. Paul A Maeyer Introductory Probability and Statistical Applications, John Wiley Publications.

REFERENCES:

1. Willam Feller : “**Introduction to Probability theory and its applications**”.Volume –I ,Wiley 2.
2. Goon AM, Gupta MK, Das Gupta B : “**Fundamentals of Statistics**”, Vol-I, the World Press Pvt.Ltd. , Kolakota.
3. V.K.Kapoor and S.C.Gupta: “**Fundamentals of Mathematical Statistics**”, Sultan Chand & Sons, New Delhi

E- RESOURCES

1. <https://onlinecourses.science.psu.edu/stat502/node/183> (ANCOVA)
2. <http://www.uoguelph.ca/~dsparlin/sqc.htm> (StatisticalQualitycontrol)

3. http://irh.inf.unideb.hu/~jsztrik/education/16/SOR_Main_Angol.pdf (Basic Queueing Theory)
4. <http://www.ijpcsonline.com/files/34-781.pdf> (Design of Experiments)
5. <http://nptel.ac.in/courses/110106064/5> (Introduction to Data Analysis)
6. <http://nptel.ac.in/courses/111104075/> (ANOVA and Design of Experiments)

Course Outcomes:

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

1. Perform analysis of variance, ANCOVA and design of experiments in manufacturing firms.
2. Do advanced design of experiments and their applications.
3. Learn the concept of quality control, Six Sigma and its importance to real life problems.
4. Understand the concept of Multiple regression and Application of Time-series,
5. Find the expected queue length, the ideal time, the traffic intensity and the waiting time.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	1				3			1			
CO2	3	2	2	3	3							1			
CO3	3	2	2	3	2				2			2			
CO4	3	2	2	2	1				3			2			
CO5	3	2	2	3	2				3			2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80B13	OPTIMIZATION TECHNIQUES	L	T	P
Credits: 3	(Open Elective)	3	0	-

Pre-requisite: Basic concepts of Linear Programming

Course Objectives:

This course deals with the extremely important topics under the broad umbrella of optimization. This is synonymous with efficiency which is the underlying prime rationale for all scientific and technological advances and progress.

Module - I: Introduction and Basic Concepts of Optimization [12 Periods]

Historical Development; Engineering applications of Optimization; Art of Modeling - Objective function; Constraints and Constraint surface; Formulation of design problems as mathematical programming problems.

Module - II: Optimization using Calculus [12 Periods]

Classification of optimization problems Optimization techniques – classical and advanced techniques. Stationary points; Functions of single and two variables; Global Optimum - Convexity

and concavity of functions of one and two variables - Optimization of function of one variable and multiple variables; Gradient vectors

Module - III: Linear Programming Applications [12 Periods]

A: Optimization of function of multiple variables subject to equality constraints; Lagrangian function
Optimization of function of multiple variables subject to equality constraints.

B: Hessian matrix formulation; Eigen values Kuhn-Tucker Conditions; Post optimality analysis -
Other algorithms for solving LP problems – Karmarkar’s projective scaling method

Module - IV: Dynamic Programming [12 Periods]

Sequential optimization; Representation of multistage decision process; Types of multistage decision problems; Concept of sub optimization and the principle of optimality - Recursive equations – Forward and backward recursions; Computational procedure in dynamic programming (DP)

Module - V: Applications of Dynamic Programming [12 Periods]

Problem formulation and application in Design of continuous beam and Optimal geometric layout of a truss - Water allocation as a sequential process - Capacity expansion and Reservoir operation.

TEXT BOOKS:

1. S.S. Rao, "Engineering Optimization: Theory and Practice", New Age International (P) Ltd., New Delhi, 2000.
2. G. Hadley, "Linear programming", Narosa Publishing House, New Delhi, 1990.

REFERENCES:

1. H.A. Taha, "Operations Research: An Introduction", 5th Edition, Macmillan, New York, 1992.
2. K. Deb, "Optimization for Engineering Design Algorithms and Examples", Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.
3. K. Srinivasa Raju and D. Nagesh Kumar, "Multicriterion Analysis in Engineering and Management", PHI Learning Pvt. Ltd., New Delhi, India, ISBN 978-81-203-3976-7, pp.288,

E - RESOURCES:

1. <http://www.mhhe.com/engcs/industrial/hillier/etext/PDF/chap03.pdf>
2. <http://ocw.nctu.edu.tw/upload/classbfs121001503719748.pdf>
3. http://shodhganga.inflibnet.ac.in/bitstream/10603/19544/12/7_chapter%201.pdf
4. <http://www.ime.unicamp.br/~andreani/MS515/capitulo12.pdf>

Course Outcomes:

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

1. Understand the historical development of OR and formulate the design problems.
2. Find the Optimum values using Calculus.
3. Apply the linear programming techniques to solve the engineering problems.
4. Know the various concepts of Dynamic Programming
5. Apply the dynamic programming techniques to solve the engineering problems.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO1	3	2	3	3	3		2		2	2		1			
CO2	3	2	2	2	2		2	3	1	2	2	1			
CO3	3	2	2	3	2		2		2	2	2	2			
CO4	3	2	2	2	2		2	3	3	3	2	2			
CO5	3	2	2	2	2		1			2		2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code:80B14	ADVANCED PHYSICS FOR ENGINEERS (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisites: Engineering Physics & Applied Physics

Course Course Objectives:

The objective of this course is to make the students familiar with the recent advanced concepts in physics.

Module I: Special Theory of Relativity:

[9 Periods]

Introduction, Concept of theory of relativity, Frames of reference-Inertial, non-inertial; Galilean transformation equations, Michelson-Morley experiment, Einstein theory of relativity, Lorentz transformation of space and time, Length contraction, Time dilation, Variation of mass with velocity, Relativistic relation between energy and momentum.

Module II: Holography

[9 Periods]

Introduction, Basic principle, Construction and Reconstruction of Hologram, Properties of Hologram, Types of Holograms, Applications- Holographic Interferometry, Acoustic Holography, Holographic Microscopy.

Module III: Thin films Synthesis and Characterization Synthesis

[6 Periods]

A: Introduction, Deposition techniques-Pulsed Laser Deposition (PLD), Spray Pyrolysis; Nucleation and growth of the thin films, properties (Mechanical, Electrical, Magnetic and Optical).

B: Characterization

[6 Periods]

X-Ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-Ray Analysis (EDAX),

Principles and applications of X-Ray Diffraction, Electron Diffraction, Atomic Force Microscopy.

Module IV: Photonic Crystals

[9 Periods]

Important features of photonic crystals, Presence of photonic band gap, anomalous group velocity dispersion, Micro cavity, effects in Photonic Crystals, fabrication of photonic Crystals, Dielectric mirrors and interference filters, PBC based LEDs, Photonic crystal fibers (PCFs), Photonic crystal sensing.

Module V: Solar cell Physics

[9 Periods]

Single, poly and amorphous silicon, GaAs, CdS, Cu₂S, CdTe; Origin of photovoltaic effect, Homo and hetero junction, working principle of solar cell, Evaluation of Solar cell parameters, I-V, C-V and C-f characteristics.

TEXT BOOKS:

1. R K Gaur and SL Gupta, “**Engineering Physics**” Dhanpat Rai Publications, 8th revised Edition, 2006.
2. B K Pandey and S Chaturvedi, “**Engineering Physics**” Cengage Learning India, Revised Edition, 2014.

REFERENCES:

1. R F Bun shah, “**Hand Book of Technologies for Films and coating**”, Noyes publishers, 1st Edition, 1996.
2. B E A Saleh and A C Tech, “**Fundamentals of Photonics**”, John Wiley and Sons, New York, 1st Edition, 1993.
3. K L Chopra and S R Das, “**Thin film Solar Cells**”, Plenum press, 1st Edition 1983.
4. K Vijaya Kumar, T Sreekanth and S Chandralingam, “**Engineering Physics**” S Chand and Co 1st Edition, 2008.

E - RESOURCES:

1. <http://physics.mq.edu.au/~jcresser/Phys378/LectureNotes/SpecialRelativityNotes.pdf>
2. <http://www.kfupm.edu.sa/centers/CENT/AnalyticsReports/KFUPM-TFSC-Dec20.pdf>
3. <https://www.journals.elsevier.com/solar-energy-materials-and-solar-cells>
4. <https://www.journals.elsevier.com/journal-of-alloys-and-compounds/>
5. <http://aip.scitation.org/journal/apl>
6. <http://nptel.ac.in/courses/115101011/>
7. <http://nptel.ac.in/courses/117103066/11>

Course Outcomes:

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

1. be aware of the concepts of special theory of relativity.
2. analyze the basic concepts of Holography and applications.
3. acquire the knowledge on synthesis methods of thin films and their characterization techniques.
4. develop basic knowledge on the photonic crystals
5. apply the basic concepts of solar cell physics.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1												
CO2	3	2	1												
CO3	3	1	1		1	1									
CO4	2	1	1												
CO5	3	2	1		3	2	2								

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)			B.Tech.		
Code: 80B15	NANO MATERIALS (Open Elective)			L	T	P
Credits: 3				3	-	-

Prerequisites: Engineering Physics

Course Course Objectives:

The objective is to provide different methods of synthesis and characterization of nano materials.

Module I: Physical Methods

[9 periods]

Bottom-up approach and Top-down approach, Inert gas condensation, Arc Discharge, lasers ablation, laser pyrolysis, ball milling, molecular beam epitaxial, and electro deposition.

Module II: Chemical methods

[8 periods]

Nanocrystals by chemical reduction, photochemical synthesis, electrochemical synthesis, Nano crystals of semiconductors.

Module III: Thermal Methods & Surface Characterization

[7 periods]

A: Thermal Methods: Thermolysis route – spray pyrolysis and solvated metal atom dispersion, sol-gel method solvothermal and hydrothermal routes, solution combustion synthesis, CVD method.

B: Surface Characterization:

[7 periods]

Scanning electron microscopy (SEM), Transmission electron microscopy (TEM). Photo luminescence Spectroscopy.

Module IV: Compositional and structural Characterization techniques
[9 periods]

X-Ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-Ray Analysis(EDAX), Principles and applications of X-Ray Diffraction, Electron Diffraction, and Electron probe microanalysis(EPMA).

Module V: Properties and Applications of Nanomaterials

[8 periods]

Carbon Nano Tube (CNT) – Single-Wall Carbon Nano Tube (SWCNT), Multi-wall carbon Nano tube (MWCNT), Activated carbon, Fullerene, Graphene, Quantum wire and Quantum dots

TEXT BOOKS:

1. C N R Rao, A Muller and A K Cheetham “**The chemistry of Nanomaterials: Synthesis, Properties and Applications**” John Wiley, First Edition, 2004
2. Hari Singh Nalwa, “**Nanostructured Materials and Nanotechnology**”, Academic Press, First Edition, 2002.

REFERENCES:

1. Charles P Poole Jr “**Introduction to Nanotechnology**”, John Willey & Sons, 1st Edition, 2003
2. C Dupas, P Houdy, M Lahmani, Nanoscience: “**Nanotechnologies and Nanophysics**”, Springer-Verlag Berlin Heidelberg, 1st Edition, 2007
3. T Pradeep, “**NANO: The Essentials: Understanding Nanoscience and Nanotechnology**”. Tata McGraw-Hill Publishing Company Limited, Revised Edition, 2007
4. Z L Wang, “**Characterization of Nanophase Materials**” Wiley-VCH, 1st Edition, 2000.
5. K Vijaya Kumar, T Sreekanth and S Chandralingam, “**Engineering Physics**” S Chand and Co 1st Edition, 2008.

E-RESOURCES:

1. <http://nptel.ac.in/courses/103103033/module9/lecture1.pdf>
2. http://courses.washington.edu/overney/NME498_Material/NME498_Periods/Lecture4-Overney-NP-Synthesis.pdf
3. <http://www.materialstoday.com/nanomaterials/journals/>
4. <https://www.journals.elsevier.com/nanoimpact>
5. <http://www.springer.com/materials/nanotechnology/journal/12274>
6. <http://nptel.ac.in/courses/118104008/>
7. <http://nptel.ac.in/courses/118102003/>

Course Outcomes:

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

1. be aware of different physical methods of synthesis of nano materials.
2. be aware of different chemical methods of synthesis of nano materials.
3. Understand different thermal methods of synthesis of nano materials and to learn different surface characterization techniques.
4. acquire the the different compositional and structural characterization techniques.
5. develop basic knowledge on the properties and applications of few nano

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1													
CO2	2	1													
CO3	2	1													
CO4	3	2	2		2										
CO5	3	2	2		2										
2018-19 Onwards (MR-18)		MALLA REDDY ENGINEERING COLLEGE (Autonomous)										B.Tech.			
Code: 80B16		NDT AND VACUUM TECHNOLOGY (Open Elective)										L	T	P	
Credits: 3												3	-	-	

Prerequisites: Engineering Physics

Course Course Objectives:

The objective is to provide a basic level of understanding on Non-destructive testing and Vacuum technology.

Module I: Introduction to Non destructive testing [6 periods]

Introduction, Objectives of Non destructive testing, Types of defects – Cracking, Spalling, Staining, Construction and Design defects, Honey combing, Dusting, Blistering, Rain damage.

Module II: Methods of Non destructive Testing [9 Periods]

Liquid penetration method, Dye penetration method, Radiographic testing, Ultrasonic Inspection method, Pulse Echo method, Magnetic particle testing, Eddy current Testing.

Module III: Introduction to Vacuum Technology and Flow meters [9 Periods]

A: Introduction to Vacuum Technology: Definition of vacuum, Degrees of vacuum and their ranges; Review of Kinetic theory of gases; Definitions of particle flux, mono layer formation time, pressure; Elementary gas transport phenomena; Knudsen's and Reynolds' numbers; Throughput, mass flow and conductance.

B: Flow meters: [7 Periods]

Molar flow, Mass flow and throughput; Rota meters and chokes; differential pressure techniques.

Module IV: Pressure gauges [8 Periods]

Classification, Direct and indirect gauges, Indirect gauges – Pirani gauge, Thermocouple gauge, Ionization gauge, hot cathode gauge, Penning gauge

Module V: Vacuum Pumps [9 Periods]

Introduction, Pumping speed, Rotary vane pump, Turbo molecular pump, Diffusion pumps

TEXT BOOKS:

1. B K Pandey, S Chaturvedi, “Engineering Physics”, Cengage learning, 1st Edition, 2014
2. John. F. O’Hanlon, “A User’s guide to Vacuum technology”, Wiley, 3rd Edition, 2003

REFERENCES:

1. M R Srinivasan, “Physics for Engineers”, New Age international, 1st reprint, 2007
2. R K Gaur and S L Gupta, “Engineering Physics”, Dhanpat rai, Reprint, 2006
3. Krishna Seshan, “Hand Book of Thin film deposition”, Noyes, 2nd Edition, 2002

E-Resources:

1. <http://www.enfm.net/catalog/catalog/enfm-usa.pdf>
2. <http://web.itu.edu.tr/~arana/ndt.pdf>
3. http://www.issp.ac.ru/ebooks/books/open/Nondestructive_Testing_Methods_and_New_Applications.pdf
4. <https://www.journals.elsevier.com/ndt-and-e-international/>
5. <https://www.journals.elsevier.com/vacuum>
6. <http://nptel.ac.in/courses/114106035/35>
7. <http://nptel.ac.in/courses/112101004/37>

Course Outcomes:

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

1. Aware of the concepts of NDT
2. Understand different methods of NDT.
3. Analyze Vacuum technology and concepts of flow meters.
4. Develop pressure gauges.
5. Understand the concepts of different vacuum pumps

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2													
CO2	3	2													
CO3	3	2			2										
CO4	2	2			2										
CO5	2	2			2										

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80B17	CHEMISTRY OF ENGINEERING MATERIALS (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-requisite: Nil

Course Objectives:

The objective is to make the students know about the concept of phase rule and alloys, phase diagrams of different systems. To give knowledge to the students regarding liquid crystals, abrasives, glass, ceramics, refractories, colloids and adhesives. To make the students for understand the basic concepts of chemistry to develop futuristic materials for high-tech. applications in the area of engineering.

Module-I: Phase Rule and alloys

[10 Periods]

Phase Rule: Definition of terms: Phase, component, degree of freedom, phase rule equation. Phase diagrams-one component system-water system. Two component system Lead-Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization. Introduction to alloys-fabrication of alloys-ferrous alloys-nonferrous alloys-industrial applications.

Module-II: Composites, Abrasives and Adhesives

[10 Periods]

Composites: Basics of composites, composition and characteristics-types of composites –particle and fiber reinforced composites and their applications. Abrasives- natural and artificial abrasives-grinding wheels-abrasive paper and cloth. Adhesives- classification -action of adhesives- factors influencing adhesive action development of adhesive strength.

Module-III: Cement and Concrete

[10 Periods]

A: Introduction-Classification of cement-natural-chemical composition of cement-port land cement-chemical reactions involved in setting and hardening of cement-additives for cement-mortars.

B: concretes-pre stressed concrete-post tensioning-curing-overall scenario of cement industry-Reinforced concrete, constructions-testing and decaying of cement-prevention of cement decay.

Module-IV: Glass, Ceramics and Refractories

[9 Periods]

Structure of glass-properties-Manufacturing of glass-Types of glasses-uses Ceramics-clays-methods for fabrication of ceramic ware plasticity of clays. Ceramic products-glazes. Porcelain and vitreous enamels. Requisites of a good refractory-classification, properties and applications of refractories.

Module-V: Colloids and surfactants

[9 Periods]

Introduction to solution-types of colloids-characteristics of lyophilic and lyophobic solutions-preparation of colloids (Dispersion methods & Aggregation methods)-purification of colloids

(Dialysis, Electrodialysis and Ultrafiltration). Characteristics of colloidal solutions-coagulation of colloids-origin of charge on colloids-protective colloids-emulsions-gels-applications of colloids. Introduction to surfactants-classification of surfactants-CMC (critical micelle concentration)-HLB scale-detergents-cleaning action.

TEXT BOOKS:

1. P.C.Jain and Monica Jain, “A text Book of Engineering Chemistry”, DhanpatRai Publications, New Delhi, 12th Edition 2006.
2. B.Rama Devi, Ch.VenkataRamana Reddy and PrasanthaRath, “Text Book of Engineering chemistry” , Cengage Learning India Pvt.Ltd,2016.
3. J. Goodwin, “Colloids and Interfaces with Surfactants and Polymers” 2nd Edition 2009.

REFERENCES:

1. B.R.Puri, L.R.Sharma and M.S.Pathania,“Principles of Physical Chemistry”, S.Nagin Chand &Co., New Delhi, 23rd Edition, 1993.\
2. M.Thirumala Chary and E.Laxminarayana, “Engineering Chemistry”, SciTech publications (INDIA) PVT Ltd, Third Edition, 2016.

E-RESOURCES:

1. www.istl.org/02-spring/internet.html (Basics on materials)
2. <http://www.zzm.umcs.lublin.pl/Wyklad/FGFAng/7A.F.G.F.%20Colloids.Emuls.pdf> (colloids)
3. Journal of materials science (Springer publishers)
4. Journal of materials science and technology (Elsevier publishers)
5. npTEL.ac.in/courses/105102012/ (Cement concrete technology)

Course Outcomes:

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

1. Interpret the vitality of phase rule in metallurgy and application of phase rule to one and two component systems.
2. Understand the concepts of abrasives, adhesives and liquid.
3. The immense importance of basic constructional material, Portland cement in Civil Engineering works.
4. Acquire the knowledge about properties and applications of glass, ceramics and refractories.
5. Understand the relationships between macroscopic material properties and microscopic structures.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1		1		1										
CO2	2	1	1	1											
CO3	1	3		1	1										
CO4	1	1	1	2											

CO5	1	1		1	1	2	1							
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2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80B18	NANO CHEMISTRY (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-requisite: Nil

Course Objectives:

The objective is to make the learners know about the scope of nanoscale materials and their versatile properties. To give knowledge of various instrumental techniques to the analysis the nanomaterials. To make aware of the learners of different applications of nanomaterials.

Module-I : Nanochemistry-I

[8 Periods]

Introduction -synthesis of nanostructure materials, Bottom-up approach and Top-down approach with examples-sol-gel method-solvothermal and hydrothermal routes, Chemical Vapor Deposition and precipitation methods.

Module-II: Nanochemistry-II

[10 Periods]

Properties of nanomaterials-Electronic properties, Energy bands and gaps in semiconductors, Fermi surfaces-Optical properties- Fluorescence/luminescence, Photoluminescence/fluorescence, Electroluminescence, quantum dot. Magnetic properties-mechanical properties-thermal properties.

Module-III: Instrumental Analysis

[10 Periods]

A: Characterization techniques: Scanning Electron Microscopy(SEM), Electron Dispersion Spectroscopy (EDS).

B: Transmission Electron Microscopy (TEM), Dynamic Light Scattering (DLS) and Atomic Force Microscopy(AFM) -Illustrative examples.

Module-IV: Carbon Nanotubes and Application

[10 Periods]

Carbon Nanostructures, types and preparation of Carbon Nanotubes. Nanostructured crystals. Graphene, Carbon nanofibers- Carbon clusters and Fullerenes- optical and telecommunication applications. Organic NanoSolar cells and its applications.

Module-V: Environmental Nanotechnology

[09 Periods]

Implications of Nanotechnology & Research needs-Nanostructured Catalysts TiO₂ Nanoparticles for Water purification- Nano membranes in drinking water treatment and desalination, Nanomembranes in Sea desalination-Nano particles for treatment of Chlorinated Organic Contaminants.

TEXT BOOKS:

1. Mark A. Ratner, D. Ratner. "Nanotechnology a gentle introduction to the next big idea", Pearson Education Inc., Asia, 2003.
2. Pradeep.T. "Nano: The essentials-understanding nanoscience and nanotechnology". Tata Mc.Graw Hill, New Delhi, 2007.

REFERENCES:

1. A. K. Haghi, Ajesh K. Zachariah, Nandakumar Kalariakkal. “**Nanomaterials: Synthesis, Characterization, and Applications**”. Apple Academic Press, 2013.
2. Brechignac C., Houdy P., Lahmani M. (Eds.) “**Nanomaterials and Nanochemistry**” (Springer,) 748p. ISBN 978-3-540-72993-8, 2007
3. Phanikumar. “**Principles of nanotechnology**”, Scitech Publications 2nd Edition, 2010.
4. Preetijain, Shankar Lal Garg. “**Environmental Nanotechnology**” Lap Lambert Academic publishing, 2015.

E- RESOURCES:

1. www.docbrown.info/page03/nanochem02.htm (Nanochemistry applications)
2. <https://books.google.co.in/books?isbn=352732626X> (concepts of nanochemistry)
3. Journal of nanostructure in chemistry (springer publishers)
4. Nanochemistry (wiley publishers)
5. nptel.ac.in/courses/118104008/6 (Introduction to nanomaterials)
6. nptel.ac.in/courses/118104008/ (Nanostructures and nanomaterials)

Course Outcomes:

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

1. Students will learn the different synthetic methods of the nanomaterials.
2. To know the student Electronic, optical and magnetic properties of nanomaterials.
3. To acquire the knowledge various instrumental methods of analysis (TEM, EDS, SEM, DLS & AFM).
4. The students can come to know the carbon nanotubes, carbon nanofibers, nanostructured catalysts and organic nanosolar cells.
5. Students will learn usage of nanomaterials in the purification of water.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1			1										
CO2	1		2	1											
CO3	1	2		2	1										
CO4	2		2	1											
CO5	1	2			1	2	1								

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code:80B19	POLYMER CHEMISTRY	L	T	P

Credits: 3	<i>(Open Elective)</i>	3	-	-
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Pre-requisite: Nil

Course Objectives:

The subject provides an introduction to polymer science along with the synthesis of macromolecules by step-growth and chain-growth polymerization. Compounding of polymers and different fabrications methods are discussed. Molecular weight determination of polymers is shown using gel permeation chromatography. An overview of biodegradable and conducting polymers is also given.

Module I: Introduction to Polymer Chemistry [10 Periods]

Definitions-Origin, Monomers and its requirements - Broad classification of polymers- types based on structure (homo & copolymers), processing (thermo plastics & thermosetting plastics) and applications. Molecular force and chemical bonding in polymers - tacticity. Determination of molecular weight (MW)-methods for number average- weight average- PDI(poly dispersity index)-effect of polymerization on PDI. Distribution and processing of polymers using Tg& Tm.

Module II: Polymerization mechanism [10 Periods]

Chain growth Polymerization – Addition Polymerization – Reaction Mechanism - Free Radical Reaction – Ionic Reaction – Coordination Polymerization – Ring – Opening Polymerization – Condensation (step) Polymerization – Degree of Polymerization–differences between addition and step growth polymerization. Polymerization techniques -bulk, solution, suspension, emulsion-advantages and disadvantages.

Module III: Compounding of Polymers & fabrication methods [09 Periods]

A: Introduction-compounding of polymers and their functions, selection of additives (by function), improving/modifying the mechanical properties.

B: Fabrication of plastics by compression, injection, transfer, extrusion –moulding, blowing and thermoforming methods.

Module IV: Characterization techniques [10 Periods]

Molecular mass by Gel permeation chromatography, Molecular structure by X-ray diffraction, Morphology of polymer using -Scanning Electron Microscopy, Thermal stability using Thermogravimetric analysis (TGA).

Module V: Biodegradable polymers and conducting polymers [09 Periods]

Biodegradable polymers, types, examples: Polyhydroxy butyrate (PHB), Poly-Hydroxybutyrate-co-β-Hydroxyvalerate (PHBV), Polyglycolic acid (PGA), Polylactic acid (PLA), Poly (ε-caprolactone) (PCL). Applications of biodegradable polymers. Conducting polymers (poly aniline and poly acetylene)-types-properties-doping-applications.

TEXT BOOKS:

1. P.C.Jain and Monica Jain, “A text Book of Engineering Chemistry”, DhanpatRai Publications, New Delhi, 12th Edition 2006.
2. S.S. Dara and S.S. Umare, “A Text Book of Engineering Chemistry”, S Chand Publications, New Delhi, 12th Edition 2010.
3. P. C. Hiemenz and T. P. Lodge. “Polymer Chemistry”, 2nd edition, CRC Press, 2007.
4. F.W. Billmeyer, “Text Book of Polymer Science”, John Wiley & Sons, 4th Edition, 1996.

5. V.R. Gowariker, “**Polymer Science**”, New Age International Publisher, 2nd Edition, 2015.

REFERENCES:

1. B.Rama Devi, Ch.Venkata Ramana Reddy and Prasantha Rath, “**Text Book of Engineering chemistry**”, Cengage Learning India Pvt.Ltd,2016.
2. Prasanth Rath, “**Engineering Chemistry**”, Cengage Learning India Pvt.Ltd, 2015.

E- RESOURCES:

1. [http://hysz.nju.edu.cn/wangxl/download-polymer/Polymer%20Chemistry%20\(Carraher\).pdf](http://hysz.nju.edu.cn/wangxl/download-polymer/Polymer%20Chemistry%20(Carraher).pdf) (polymer chemistry)
2. <file:///C:/Users/Admin/Downloads/polymer-science-and-technology.pdf>(polymer science and technology)
3. European polymer journal (Elsevier publishers)
4. Journal of polymer research (Springer publishers)
5. <http://nptel.ac.in/courses/104105039/> (Polymer chemistry)
6. <http://nptel.ac.in/courses/113105028/> (Polymers)

Course Outcomes:

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

1. Analyse different mechanisms of polymer formation and use this information in the synthesis of different polymers.
2. Evaluate the effect of factors such as polymer structure, molecular weight, branching and diluents on crystallinity.
3. Interpret experimental data and determine the structure of polymers by different techniques.
4. Assess the compounding of polymers & fabrication methods.
5. To know the student importance of biodegradable and conduction polymers.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2		2	1										
CO2	2		1		2										
CO3		2	1	2	1										
CO4	2	1	2												
CO5	2	1		1	2		1								