ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2018-19 onwards

Department of Civil Engineering (CE)

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), Re accrediated by NAAC with 'A' Grade (II – Cycle)

Maisammaguda, Dhulapally (Post Via Kompally), Secunderabad, Telangana, India -500100
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

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

Striving to be the centre of excellence in civil engineering education. To provide students the latest learning techniques and complete knowledge base for sustainable development of society.

DEPARTMENT MISSION

Provide value based technical education and empower the students to become competent professionals

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To provide students with a solid foundation in Mathematical, Scientific, software skills and Engineering fundamentals required to solve engineering problems and also to pursue higher studies.

PEO2: To train students with good scientific and engineering breadth so as to comprehend, analyze, design and create novel products and solutions for the real life problems.

PEO3: To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach and ability to relate engineering issues to broader social context.

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)

The graduates in Civil Engineering will be able to

PSO 1 : Analyze Design, Construct, Maintain and Operate infrastructural projects.

PSO 2 : Assess the environmental impact of various projects and take required measures to curb environmental deterioration.

PSO 3 : Able to use latest softwares pertaining to various streams of Civil Engineering.

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 $\geq$ 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 undergraduate 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.	11	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.	20.5	24
4	PCC	Core Courses	Professional core Courses are relevant to the chosen specialization/branch; [May be split into Hard (no choice) and Soft (with choice)], if required.	65.5	48
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**

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 ± 3credits 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%(>= 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)	• 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)	• 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)	• 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)	• 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)	• 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)	• 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)	• 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 to7.5.

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 Examination				
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

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.

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.

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

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 ≥ 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

$\text{SGPA} = \left\{\sum_{i=1}^{N} C_i G_i\right\} / \left\{\sum_{i=1}^{N} C_i\right\}$ … 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.

$\text{CGPA} = \{\sum_{j=1}^{M} C_j G_j\} / \{\sum_{j=1}^{M} C_j\}$… 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

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 X6 = 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

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 Inspite 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 …

% of Marks = (final CGPA – 0.5) x 10

11 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 undergraduate 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 form of material relevant to that course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the student has 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	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	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

	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	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.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	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.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all 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 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. CIVIL ENGINEERING
(MR 18 Regulations - Effective from Academic Year 2018-19 onwards)

I SEMESTER							
S.No	Category	Course Code	Name of the course	Contact hours/week			Credits
				L	T	P	
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	80302	Engineering Graphics Lab	-	-	2	1
10	ESC	80305	Engineering Mechanics Lab	-	-	2	1
11	MC	80A01	NSS/SPORTS/YOGA	-	-	3	-
Total				**13**	**2**	**13**	**20**
Total Contact Hours				**28**			

II SEMESTER							
S.No	Category	Course Code	Name of the course	Contact hours/week			Credits
				L	T	P	
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
5	HSMC	80H02	English Language Lab	-	-	2	1
6	BSC	80B08	Engineering Physics Lab	-	-	2	1
7	ESC	80502	Programming for Problem Solving Lab	-	-	2	1
8	ESC	80303	Engineering Workshop	-	-	2	1
Total				**12**	**2**	**8**	**18**
Total Contact Hours				**22**			

III SEMESTER							
S.No	**Category**	**Course Code**	**Name of the course**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1	ESC	80101	Engineering Geology	2	-	-	2
2	PCC	80102	Strength of Materials-I	3	1	-	4
3	PCC	80103	Fluid Mechanics	3	1	-	4
4	PCC	80104	Surveying & Geomatics	3	-	-	3
5	PCC	80105	Building Materials Construction & Planning	3	-	-	3
6	ESC	80106	Engineering Geology Lab	-	-	2	1
7	PCC	80107	Strength of Materials Lab	-	-	3	1.5
8	PCC	80108	Surveying Lab	-	-	3	1.5
9	MC	80M01	Environmental Sciences	2	-	-	-
10	AC	80A02	Internship – I	-	-	-	-
			Total	**16**	**2**	**8**	**20**
			Total Contact Hours	**26**			

IV SEMESTER							
S.No	**Category**	**Course Code**	**Name of the course**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1	BSC	80B09	Probability and Statistics	3	-	-	3
2	PCC	80109	Strength of Materials-II	3	-	-	3
3	PCC	80110	Structural Analysis	3	1	-	4
4	PCC	80111	Hydraulics & Hydraulic Machinery	3	-	-	3
5	PCC	80112	Water Resources Engineering	3	-	-	3
6	ESC	80113	Computer-Aided Drafting of Buildings Lab	-	-	3	1.5
7	PCC	80114	Mechanics of Fluids & Hydraulic Machinery Lab	-	-	3	1.5
8	PCC	80115	Structural Analysis Lab	-	-	2	1
9	MC	80M02	Gender Sensitization	-	2	-	-
			Total	**15**	**3**	**8**	**20**
			Total Contact Hours	**26**			

V SEMESTER							
S.No	**Category**	**Course Code**	**Name of the course**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1	HSMC	80H04	Engineering Economics and Accountancy	3	-	-	3
2	PCC	80116	Advanced Structural Analysis	3	-	-	3
3	PCC	80117	Structural Engineering-I (RCC)	3	1	-	4
4	PCC	80118	Geotechnical Engineering	3	-	-	3
5	PEC-I	80119	Concrete Technology	3	-	-	3
		80120	Surface Hydrology				
		80121	River Engineering				
6	HSMC	80H03	English Communication and Presentation Skills Lab	-	-	2	1
7	PCC	80122	Geotechnical Engineering Lab	-	-	3	1.5
8	PCC	80123	Concrete Technology & Highway Materials Lab	-		3	1.5
9	MC	80M03	Essence of Indian Traditional Knowledge	2	-	-	-
10	AC	80A03	Internship - II	-	-	-	-
Total				**17**	**1**	**8**	**20**
Total Contact Hours				**26**			

VI SEMESTER							
S.No	**Category**	**Course Code**	**Name of the course**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1	HSMC	80H06	Industrial Management	3	-	-	3
2	PCC	80124	Environmental Engineering	3	-	-	3
3	PCC	80125	Transportation Engineering	3	-	-	3
4	PEC-II	80126	Foundation Engineering	3	-	-	3
		80127	Ground Improvement Techniques				
		80128	Soil Structure Interaction				
5	PEC-III	80129	Rehabilitation and Retrofitting of Structures	3	-	-	3
		80130	Pre Stressed Concrete Structures				
		80131	Plastic Analysis & Design				
6	OEC-I			3	-	-	3
7	PCC	80132	Environmental Engineering Lab	-	-	2	1
8	PCC	80133	CADD Lab	-	-	2	1
9	MC	80M04	Indian Constitution	2	-	-	-
Total				**20**	**-**	**4**	**20**
Total Contact Hours				**24**			

VII SEMESTER							
S.No	**Category**	**Course Code**	**Name of the course**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1	PCC	80134	Structural Engineering-II**(Steel)**	3	-	-	3
2	PCC	80135	Estimating Costing & Construction Management	3	-	-	3
3	PEC-IV	80136	Traffic Engineering and Management	3	-	-	3
		80137	Pavement Design				
		80138	Public Transportation				
4	PEC-V	80139	Environmental Impact Assessment and Life Cycle Analyses	3	-	-	3
		80140	Solid and Hazardous Waste Management				
		80141	Rural Water Supply and Onsite Sanitation Systems				
5	OEC-II			3	-	-	3
6	PCC	80142	Remote Sensing & Geographical Information System	2	-	-	2
7	PCC	80143	Remote Sensing & Geographical Information System Lab	-	-	2	1
8	PROJ	80P01	Internship – III / Mini Project	-	-	4	2
9	PROJ	80P02	Project Stage - I	-	-	4	2
Total				**17**	**-**	**10**	**22**
Total Contact Hours				**27**			

VIII SEMESTER							
S.No	**Category**	**Course Code**	**Name of the course**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1	PCC	80144	Irrigation Structures and Water Power Engineering	3	-	-	3
2	PEC-VI	80145	Advanced Reinforced Concrete Design	3	-	-	3
		80146	Principles of Bridge Engineering				
		80147	Finite Element Methods				
3	OEC-III			3	-	-	3
4	PROJ	80P03	Seminar	-	-	2	1
5	PROJ	80P04	Project Stage -II	-	-	20	10
Total				**9**	**-**	**22**	**20**
Total Contact Hours				**31**			

LIST OF OPEN ELECTIVES

S.No	Branch	Course Code	Name Of The Course	No.of Credits
1	CIVIL	80139	Environmental Impact Assessment And Life Cycle Analyses	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 Design	3
13	CSE	80512	Database Management Systems	3
14		80521	Big Data Analytics	3
15		80535	Cloud Computing	3
16	IT	80605	Android Application Development	3
17		80606	Python Programming	3
18		80617	Artificial Intelligence	3
19	MINING	82507	Drilling And Blasting	3
20		82537	Material Handling	3
21		82542	Tunneling Engineering	3
22	ENGLISH	80H07	English Language Skills	3
23		80H08	Interpretation Skills And Analytical Writing	3
24		80H09	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 Materials	3
32		80B18	Nano Chemistry	3
33		80B19	Polymer Chemistry	3

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

Pre-requisite: Basics of Matrices and Calculus

Course Objectives:

To learn types of matrices and their properties, rank of the matrix and to know the consistency and solving the system of linear equations. To find Eigen values, eigenvectors and to reduce the quadratic form to canonical form. To understand the concept of sequence and series, geometrical approach to the mean value theorems.

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.

TEST 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:

After learning the contents of this paper the student must 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, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
COS	**Programme Outcomes(POs)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
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	-

Pre-requisite: 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.

TEST 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.

REFERENCE BOOKS:

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. Volhardt 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:

After completion 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)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
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 (Common for CE, ME and Min.E.)	L	T	P
Credits: 3		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.

TEST 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"**, 3 rd 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:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	**3**	**3**	**3**									**3**			
CO 2	**3**	**3**	**3**									**3**			
CO 3	**3**	**3**	**3**									**3**			
CO 4	**3**	**3**	**3**									**3**			
CO 5	**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 Involutes.

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.

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

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3		1							3		3	2		
CO2	3		1							3		3	2		
CO3	3		1							3		3	2		
CO4	3		1							3		3	2		
CO5	3		1							3		3	2		

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 [10 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 [10 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 [10 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 [09 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 [09 Periods]

Work, Power and Energy: Introduction, work-energy equation - motion of connected bodies - work done by a spring - general plane motion.

Mechanical Vibrations: Definitions, concepts - simple harmonic motion - free vibrations - Simple and compound pendulums.

TEST BOOKS

1. S. Timoshenko, D.H. Young, J.V. Rao and Sukumar Pati**, “Engineering**

Mechanics", Tata McGraw-Hill Education, 5th Edition, 2013.

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,PSO 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:

After completion 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)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1								
CO2	2	1	2									
CO3	2	2		1								
CO4	2	2	1									
CO5	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 (Common for CE, ME and Min.E.)	L	T	P
Credits: 2		-	-	4

Course Objectives: 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 Characterstics of various diodes
4. Design Different Rectifier Circuits
5. Differentiate the Transistors and their Operations

CO-PO Mapping:

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	Programme Outcomes(POs)														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3					3			3			
CO 2	3	3	3	3					3			3			
CO 3	3	3	3	3					3			3			
CO 4	3	3	3	3					3			3			
CO 5	3	3	3	3					3			3			

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

Course Objective:

To develop 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	2		
CO2	3		1		3				2	3		2	2		
CO3	3		1		3				2	3		2	2		
CO4	3		1		3				2	3		2	2		
CO5	3		1		3				2	3		2	2		

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

COS	Programme Outcomes(POs)												PSOS		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
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: 80H01	ENGLISH (Common for CE, ME and Min.E.)	L	T	P
Credits: 3		3	-	-

Course Objective:
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.

Prescribed Textbook: Reddy, Surendranatha et al., ed. *Effective English*: *A Text book to rediscover self***,** Maruthi Publications, 2017.

MODULE – I:
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:
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:
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:
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:
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.

REFERENCE BOOKS:

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:
After completion 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**
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	-

Pre-requisite: Basic 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:

After learning the contents of this paper the student must 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												
CO S	**Programme Outcomes(POs)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
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 (Common for CE, ME and Min.E.)**	**L**	**T**	**P**
Credits: 4		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

[12periods] 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 [12periods]

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 [14Periods]

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: [14periods]

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 [12Periods]

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.

TEST 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, 3rd Edition, 2008.
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, student 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
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
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**.**

TEXT BOOKS:

1. PradipDey, Manas Ghosh, **"Programmingin 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 university press.ac.in/eBooks/ Programming in C.
2. https://www.journals.elsevier.com/science-of-computer-programming
3. http://www.ejournalofsciences.org
4. http://onlinecourses.nptel.ac.in/iiitk_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**	**PO 10**	**PO 11**	**PO 12**	**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 (Common for CE, ME and Min.E.)	L	T	P
Credits: 1		-	-	2

Course Objective:
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.

English Language Communication Skills Lab shall have two parts:
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):

REFERENCE BOOKS:

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/CommSkll/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

Course Outcomes:

After completion 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												
CO S	**Programme Outcomes(POs)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO 1		1				1		1	2	2		1
CO 2										1		1
CO 3							1		1	2		2
CO 4								1	1	2		2
CO 5										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 **LASER**
To verify the frequency of AC Power Supply

6 **Michelson interferometer (Demonstration only)**
To observe the Optical interference pattern.

Course Outcomes:

On Completion of this course, students are 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												
CO S	**Programme Outcomes(POs)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO 1	3	1	1									
CO 2	3	1	1									
CO 3	3											
CO 4	3											
CO 5	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. 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.

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. Comparethe 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)**												**PSOS**		
	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 (Common for CE, ME and Min.E.)	L	T	P
Credits: 1		-	-	2

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,PSO 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	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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: 80101	ENGINEERING GEOLOGY	L	T	P
Credits: 2		2	-	-

Pre Requisites: NIL

Course Objective: Ability to analyze representations of key concepts from geology (earth science), policy and values as they appear in geophysics, geochemistry and other natural sciences & technological sciences. To make clear key points of a complex article or research work in concrete technology, material sciences in building construction and management & conservation of natural building materials. Also, to understand the naturally occurring potable (surface and subsurface) water its origin, accumulation, migration and management of water resources.

MODULE I: Introduction [06 Periods]

Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology. Weathering of rocks **:** Its effect over the properties of rocks, importance of weathering with reference to dams, reservoirs and tunnels. Weathering of common rock like ―Granite.

MODULE II: Mineralogy and Petrology [07 Periods]

Mineralogy: Definition of mineral, importance of study of minerals, different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldsper, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chromite, Galena, Pyrolusite, Graphite, Magnesite and Bauxite.

Petrology: Definition of rock. Geological classification of rocks into igneous, sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary & metamorphic rocks and their distinguishing features, Megascopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate. Rock excavation, stone aggregates.

MODULE III: Structural Geology and Geophysical Studies [06 Periods]

A: Structural Geology: Indian stratigraphy and Geological Time Scale**.** Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities and joints their important types.

B: Geophysical Studies: Importance of Geophysical studies. Principles of Geophysical study by Gravity methods, Magnetic methods, Electrical methods, Seismic methods, Radiometric methods and Geothermal method. Special importance of Electrical resistivity methods and seismic refraction methods. Improvement of competence of sites by grouting, etc. Fundamental aspects of Rock Mechanics and Environmental Geology.

MODULE IV: Geology of Dams and Reservoirs and Tunnels [07 Periods]

Geology of Dams and Reservoirs: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors contributing to the success of a reservoir. Geological factors influencing water tightness and life of reservoirs, Geo-hazards, ground subsidence.

Tunnels: Purposes of tunneling, Effects of Tunneling on the ground. Role of Geological Considerations (Lithological, structural and ground water) in tunneling, over break and lining in tunnels, Tunnels in rock, subsidence over old mines, mining subsidence.

MODULE V: Ground Water [06 Periods]

Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration. Earthquakes: their causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides: landslides hazards, water in landslides, their causes and effects, measures to be taken to prevent their occurrence. Importance of study of ground water, earthquake and landslides.

TEST BOOKS:

1. N.Chennakesavulu **—A Text book of Engineering Geology**, Mac-Millan Publishers India Ltd. 2nd Edition, 2013.
2. Parbin Singh **—Engineering Geology and general geology,** S. K. Kataria & Sons, 8thEdition, New Delhi, 2013.

REFERENCES:

1. F.G. Bell, "**Fundamental of Engineering Geology"** Butterworths Publications, New Delhi, 2016.
2. Krynine & Judd, "**Principles of Engineering Geology & Geotechnics"**, CBS Publishers & Distribution, 2005.
3. Tony Waltham "**Foundations of Engineering Geology"** Spon press/ Cry press Taylor & Francis, 2009.

E RESOURCES:

1. www.springer.com › Home › Earth Sciences & Geography › Geology.
2. https://en.wikipedia.org/wiki/Tunnels_(novel).
3. www.icevirtuallibrary.com › Journals.
4. www.groundwater.org/get-informed/basics/groundwater.html.
5. www.soest.hawaii.edu/martel/Courses/GG303.

Course Outcomes

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

1. Demonstrate an advanced knowledge of how geological principles can be applied to engineering practice.

2. Assess data collected in the field and the laboratory and recognize their geological importance.
3. Understand the structure and composition of earth.
4. Understand how precious earth natural resources in the management of construction industry and mineral based industries.
5. Understand how human activities in construction of major projects such as dams, tunnels, highways and reservoirs and its impact on earth environment & its economics.

CO- PO,PSO 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	1	3	3	1		2	1	2		3	
CO2	3	3	3	3	3	2	2		2	3		3		3	
CO3	3	2	3	3	1	2	3		3	3		3		3	
CO4	3	3	3	3	2	2	3	2	3	3	3	3		3	
CO5	3	3	3	3	3	3	3	2	3	3	3	3		3	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80102	STRENGTH OF MATERIALS	L	T	P
Credits: 4		3	1	-

Prerequisite: Engineering Mechanics

Course Objective: To provide basic knowledge by understanding the fundamental concepts of mechanics of deformable solids; including simple stresses and strains, principal stresses and strains, strain energy, shear force, bending moments and geometry of deformation.

MODULE I: Simple Stresses and Strains, Strain Energy [12 Periods]

Simple Stresses and Strains: Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Poisson's ratio and volumetric strain – relationship between Elastic constants – Bars of varying section – composite bars – Temperature stresses – Self weight.

Strain Energy: Resilience – Gradual, sudden and impact loadings – simple applications

MODULE II: Shear Force and Bending Moment (Determinant Beams) [12 Periods]

Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading.

MODULE III: Theory of Simple Bending and Shear Stresses [14 Periods]

A Theory of Simple Bending: Assumptions – Derivation - Neutral axis – Determination of bending stresses and section modulus of rectangular, circular sections (Solid and Hollow), I,T, Angle and Channel sections.

B Shear Stresses: Derivation– Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections

MODULE IV: Deflection of Beams (Determinant Beams) [12 Periods]

Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam: Double Integration method, Macaulay's method, Area Moment method, Conjugate beam method.

MODULE V: Principal Stresses and Strains, Theories of failures [14 Periods]

Principal Stresses and Strains: Introduction–Stresses on an inclined section of a uni-axial loading–compound stresses–Normal and tangential stresses on an inclined plane for biaxial stresses Two perpendicular normal stresses accompanied by a state of simple shear–Mohr's circle of stresses–Principalstressesandstrains–Analyticalandgraphicalsolutions.

Theories of Failures: Introduction Various Theories of failures like Maximum Principal stress theory–Maximum Principal strain theory–Maximum shear stress theory – Maximum strain energy theory –Maximum shear strain energy theory (Von Mises Theory).

TEST BOOKS:

1. R.K.Bansal, **"Introduction to Strength of materials"** Laxmi publications Pvt. Ltd., 6th Edition-2015, New Delhi.
2. R. Subramanian **"Strength of materials",** Oxford university press, 2nd Edition 2010 New Delhi

REFERENCES:

1. S. Ramakrishna and R.Narayan, **"Strength of Materials"**, Dhanpat Rai publications 1st Edition - 2007.
2. R.K.Rajput, **"Strength of materials"** by, S.Chand & Co, 6th Edition 2017 New Delhi.
3. **"Strength of materials"** by W A Nash, 4th Edition, 2007, Tata McGraw-Hill Education.
4. **"Mechanics of materials"** by Dr. B.C.Punmia, 2002, Lakxmi Publications.

E RESOURCES:

1. http://www.aboutcivil.org/solid-mechanics.html
2. https://link.springer.com/journal/11223
3. https://www.journals.elsevier.com/mechanics-of-materials
4. http://nptel.ac.in/courses/105105108/
5. http://nptel.ac.in/downloads/112106141/

Course Outcomes:

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

1. Understand the concepts of simple stresses and strains and estimation of stresses for Bars of varying sections, composite bars and Temperature stresses.
2. Examine the variation of bending moment and shear force at any section and identify the position and the magnitude of maximum and minimum values for all practical loading cases
3. Examine the variation of flexural/shear stresses across the section and identify the position and magnitude of maximum and minimum values in various sections.
4. Compute the deflections and rotations by various methods.
5. Analyze the principal stresses and strains by recognize the orientation of principal planes and develops an understanding of various theories of failures.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:80103	FLUID MECHANICS	L	T	P
Credits: 4		3	1	-

Pre Requisites: NIL

Course Objective: To give fundamental knowledge of fluid, its properties and behavior under various conditions. To develop and understanding of fluid kinematics and classification of flows. To apply the working concepts of various devices used to measure the velocity and discharge of fluid. To apply interrelationship of various properties of fluid in practical problems and how these are used in Civil engineering.

MODULE I: Introduction and Hydrostatic Forces [12 Periods]

Introduction: Dimensions and units – Physical properties of fluids specific gravity, viscosity, surface tension, vapour pressure and their influences on fluid motion, Pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure, Pressure gauges, Manometers: differential and Micro Manometers.

Hydrostatic Forces: Hydrostatic forces on submerged plane, Horizontal, Vertical, Inclined and Curved surfaces – Center of pressure, Derivations and problems.

MODULE II: Fluid Kinematics and Classification of Flows [12 Periods]

Fluid Kinematics: Description of fluid flow, 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, two, three dimensional flows – stream and velocity potential functions, flownet analysis.

MODULE III: Fluid Dynamics and Applications of Momentum Principle [14 Periods]

A: Fluid Dynamics Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow.

B: Applications of Momentum Principle Navier – Stokes equations (Explanationary), Momentum equation and its application – forces on pipe bend.

MODULE IV: Boundary Layer Theory and Laminar and Turbulent Flow [12 Periods]

Boundary Layer Theory: Approximate Solutions of Navier Stoke's Equations – Boundary layer – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers, BL in transition, separation of BL, control of BL, flow around submerged objects-Drag and Lift- Magnus effect.

Laminar and Turbulent Flow: Reynold's experiment – Characteristics of Laminar & Turbulent flows, Flow between parallel plates, Flow through long tubes, Flow through inclined tubes.

MODULE V: Closed Conduit Flow and Measurement of Flow [14 Periods]

Closed Conduit Flow: Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, Pipe network problems, variation of friction factor with Reynold's number – Moody's Chart.

Measurement of Flow: Pitot tube, Venturi meter and orifice meter – classification of orifices, flow over rectangular, triangular, trapezoidal and Stepped notches –Broad crested weirs.

TEST BOOKS:

1. Modi and Seth "**Fluid Mechanics**", Standard book house.20th Edition, 2015.
2. S.K.Som & G.Biswas "**Introduction to Fluid Machines**" (Tata Mc.Grawhill publishers Pvt. Ltd.) 3rd Edition, 2011.
3. Edward J. Shaughnessy, Jr, Ira M. Katz and James P. Schaffer "**Introduction to Fluid Machines**",Oxford University Press, New Delhi, 1st Edition, 2004.

REFERENCES:

1. J.F.Douglas, J.M. Gaserek and J.A.Swaffirld, "**Fluid Mechanics**" Prentice Hall 4th Edition, 2000.
2. A.K. Mohanty, "**Fluid Mechanics**", Prentice Hall of India Pvt. Ltd., New Delhi, 2nd Edition 2004.
3. Subramanya "**Fluid Mechanics**", Tata McGraw-Hill Education, 2nd Edition, 2011
4. R.K.Rajput "**Fluid Mechanics**" S. Chand, 2nd Edition, 2008.

E RESOURCES:

1. http://nptel.ac.in/courses.php?disciplineId=105.
2. http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv078-Page1.htm.
3. http://nptel.ac.in/courses/105101082/.

Course Outcomes:

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

1. Gain knowledge about the physical properties of the fluid and their influence on fluid motion and measurement of pressure by various manometers and the hydrostatic forces acting on the submerged bodies.
2. Recognize fluid kinematics through stream line, path line and streak line and understand the classification of flows and continuity equation for one, two & three dimensional flows.

3. Understand fluid dynamics using Euler's and Bernoulli's equation for three dimensional flows and application of Momentum equation.
4. Gain the knowledge of boundary layer theory by Navier stoke's equation and Vonkarmen momentum integral equation and gain the knowledge in Laminar & Turbulent flows using Reynold's experiment.
5. Understand various frictional losses in pipes and measurement of flow using notches & weirs.

CO- PO,PSO 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	
CO2	3	3	3	3	1								2	2	
CO3	3	2	3	3									3	2	
CO4	3	3	3	2									2	2	
CO5	3	2	2										3	2	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80104	SURVEYING & GEOMATICS	L	T	P
Credits: 3		3	-	-

Pre Requisites: NIL

Course Objective: Student will be able to learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, the field applications and concepts of leveling survey

MODULE-I: **[09 Periods]**

INTRODUCTION BASIC CONCEPTS: Introduction, Objectives, classifications and Principles of surveying, Scales, Shrinkage of maps, conventional symbols and code of signals, Surveying Accessories, phases of surveying.

MEASUREMENT OF DISTANCES AND DIRECTIONS:

Linear distances: Approximate methods, Direct methods-chains – tapes, ranging-tape corrections, Indirect methods- optical methods –E.D.M methods.

Prismatic Compass: Bearings, Included Angles, Local Attraction, Magnetic Declination and Dip.

MODULE-II: LEVELING AND CONTOURING: **[09 Periods]**

Leveling: Basic definitions, types of levels and leveling staves,Temporary and permanent adjustments- method of leveling. Booking and determination of levels-HI method – Rise and fall method, effect of curvature if earth and refraction

Contouring: Characteristics and Uses of contours, Direct and indirect methods of contour surveying, interpolation and sketching of Contours.

MODULE-III **[10 Periods]**

A. **COMPUTATION OF AREAS AND VOLUMES: Areas:**Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries, Planimeter. **Volumes**:Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.
B. **THEODOLITE SURVEYING:** Types of Theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite. Trigonometrical leveling when the base is accessible and in accessible

MODULE-IV **[10 Periods]**

TRAVERSING: Methods of traversing traverse computation and adjustments , gale's traverse table, omitted measurements

TACHEOMETRIC SURVEYING: Principles of tacheometry, Stadia and tangential methods of Tacheometry.

MODULE-V **[10 Periods]**

CURVES: Types of curves, design and setting out – simple and compound curves.

INTRODUCTION TO MODERN SURVEYING METHODS: Total Station, Global positioning system and Geographic information system (GIS)

GEOMATICS: Basic Concepts of Photogrammetry – Scale, Flying Height.

TEST BOOKS:

1. B.C.Punmia Ashok Kumar Jain and Arun Kumar Jain "**Surveying**" (Vol – 1, 2 & 3), Laxmi Publications (P) ltd., 14th Edition, 2014.
2. Duggal S K, "**Surveying**" (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co. Ltd. 4th Edition, 2004.

REFERENCES:

1. Arora K R "**Surveying Vol 1, 2 & 3"**, Standard Book House, Delhi, 15th Edition, 2015
2. Chandra A M, "**Plane Surveying**", New age International Pvt. Ltd., Publishers, New Delhi, 3rd Edition 2015.
3. Chandra A M, "**Higher Surveying**", New age International Pvt. Ltd., Publishers, New Delhi, 3rd Edition 2015.

E RESOURCES:

1. HYCOS/Surface Waters/Levelling_and_surveying.pdf
2. http://v5.books.elsevier.com/bookscat/samples/9780750669498/9780750669498.PDF
3. http://www.whycos.org/fck_editor/upload/File/Pacific
4. http://nptel.ac.in/courses/105107122/
5. https://www.youtube.com/watch?v=chhuq_t40rY

Course Outcomes:

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

1. Apply basic geometry to detect difference in plane and arc distance over "spherical" earth surface for typical length survey projects.
2. Identify the importance of the compass survey and its practical applications
3. Apply basic methods and applications of plane Table survey
4. Identify the field applications and concepts of leveling survey
5. Identify the different methods of calculation of area, contouring and measurement of volumes.

CO- PO –PSO 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	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	3	3	1	3	3	1		2	1	2		3	
CO 2	3	3	3	3	3	2	2		2	3		3		3	
CO 3	3	2	3	3	1	2	3		3	3		3		3	
CO 4	3	3	3	3	2	2	3	2	3	3	3	3		3	
CO 5	3	3	3	3	3	3	3	2	3	3	3	3		3	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80105	BUILDING MATERIALS CONSTRUCTION & PLANNING	L	T	P
Credits: 3		3	-	-

Prerequisite: NIL

Course Objective: To provide basic knowledge in engineering materials which includes role of materials in civil engineering based on Physical, chemical and Mechanical properties which will be useful for all engineering works and enable the students to develop knowledge of material science and behavior of various building materials used in construction and to identify the construction materials required for the assigned work and to provide procedural Knowledge of the simple testing methods of cement, Lime, concrete etc. and Introduction to techniques of construction planning and green buildings.

MODULE I: Building Stones, Bricks and Tiles [09 Periods]

Stone- Building stones, classification of building stones, quarrying procedures, dressing, and tools for dressing of stones. Bricks-Composition of brick earth, manufacturing of brick & Tests on brick. Tiles - Types of tiles, manufacturing of tiles.

MODULE II: Cement & Admixtures [09 Periods]

Ingredients of cement – manufacture – field & lab tests, Admixtures – mineral & chemical admixtures – uses.

MODULE III: Building Components and Building Services [10 Periods]

A. Building Components: Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed ;foundations – types ; Damp Proof Course; Joinery – doors – windows – materials – types.

B. Building Services: Plumbing services, water distribution, sanitary lines and fittings, ventilators, functional requirements, systems of ventilators, air conditioning essentials and types, acoustics, Fire protection & fire hazards.

MODULE IV: Masonry and Finishing Form Work [10 Periods]

Masonry And Finishing: Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick. Finishers: Plastering, Pointing, Painting.

Form Work: Requirements, Standards, Scaffolding, Shoring, Underpinning.

MODULE V: Green Building and Building Planning: **[10 Periods]**

Introduction to green buildings, Green materials, Green Globes- Building Planning, Principles of Building Planning, Classification of buildings and Building by- laws

TEST BOOKS:

1. SK Duggal, **"Building Materials"**, New Age Publications 4th Edition, April, 2014.
2. BC Punmia, Ashok Kumar Jain and Arun Kumar Jain, **"Building Construction"**, Laxmi Publications (P) Ltd., New Delhi, 10th Edition, 2013.

REFERENCES:

1. Roy Chudley **"Construction Technology"** Vol. – 1 & 2, 2nd Edition, Longman, UK, 1987.
2. PC Varghese, **"Building Construction"**, Prentice Hall of India Private Ltd., New Delhi, 2nd Edition, 2007.

E RESOURCES:

1. http://www.dewa.gov.ae/images/greenbuilding_eng.pdf
2. http://Building materials and construction planning.pdf
3. http://www.wikipedia.org/wiki/Construction

Course Outcomes

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

1. To identify various building materials and select suitable type of building material for given situation and to be aware of various traditional building materials and also the emerging materials in the field of Civil Engineering construction.
2. List the grades of cement, the types of cement and the types of different admixtures.
3. To select suitable type of foundation and gain complete knowledge on plumbing works.
4. Visualization of different types of masonry construction and design suitable type of formwork
5. Create awareness about green building practice and apply the principles of planning and by-laws used for building planning.

CO- PO–PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	1				1	1	2				2	3	1	2	
CO 2	1				2	2	3					3	1	2	
CO 3	1				2	3	2	2			2	3		3	
CO 4	1					3	3					3	2		
CO 5	1				2	3	3	3			3	3	2	3	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80106	ENGINEERING GEOLOGY LAB	L	T	P
Credits: 1		-	-	2

Prerequisite: NIL
Course Objective: This course deals with the experiments conducted to determine engineering properties of rocks and minerals.

List of Experiments:

1. Study of physical properties and identification of minerals referred under theory.
2. Megascopic and microscopic description and identification of rocks referred under theory.
3. Megascopic and microscopic identification of rocks & minerals.
4. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
5. Simple Structural Geology problems.

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

1. Learn geology and its types, various features like fault, fissures, weathering etc., minerals, rocks, and rock formations in relation to civil engineering structures.
2. Understand various techniques to determine engineering properties of rocks etc.
3. Understand various techniques to analyze and to made possible solutions for various Geological Engineering problems.

CO- PO–PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	3	3	3	3		3			3	3		3		3	
CO 2	3	3		3	2	2	2	3	3	3		3		3	
CO 3	1	1	2	2	2	3	3	3	3	3		3		2	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80107	STRENGTH OF MATERIALS LAB	L	T	P
Credits: 1.5		-	-	3

Prerequisite: Engineering Mechanics, Strength of Materials.

Course Objective: To determine the mechanical properties of different engineering materials under Tension, Compression, Shear Impact, Hardness, Torsion, and elastic constants of beams and springs.

List of Experiments:

1. Tension test on Mild steel
2. Compression test on wood or concrete
3. Shear test
4. Brinell hardness & Rock well hardness test
5. Impact test (Charpy & Izod)
6. Torsion test
7. Spring test
8. Deflection test on (Steel / Wood) Cantilever beam.
9. Deflection test on simple support beam.
10. Deflection test. Continuous beam
11. Verification of Maxwell's Reciprocal theorem on beams.
12. Use of electrical resistance strain gauges.

Course Outcomes

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

1. Demonstrate the basic knowledge of the mechanical properties of materials
2. Estimate compressive strength of wood, concrete, brick materials and decide their suitability for the construction purpose
3. Determine the impact resistance of steel used in construction works
4. Estimate young's modulus of wood/steel materials
5. Estimate rigidity modulus for a given spring

CO- PO–PSO 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	3	-	3	1	-	-	-	-	1	-	2	1	-
CO2	2	3	1	-	2	1	-	-	-	-	-	-	3	1	-
CO3	2	1	2	-	3	1	-	1	-	-	-	-	2	1	-
CO4	2	1	2	-	2	1	-	1	-	-	-	-	2	1	-
CO5	3	2	1	-	1	1	-	-	-	-	2	-	2	1	-

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80108	SURVEYING LAB	L	T	P
Credits: 1.5		-	-	3

Prerequisite: NIL

Course Objective: To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.

List of Experiments:

1. Survey of an area by chain survey (closed traverse) & Plotting
2. Surveying of a given area by prismatic compass (closed traverse) and plotting after adjustment.
3. Radiation method, intersection methods by plane Table survey
4. Fly leveling (differential leveling)
5. An exercise of L.S and C.S and plotting
6. Two exercises on contouring.
7. Measurement of horizontal angles by method of repetition and reiteration.
8. Heights and distance using Principles of tacheometric surveying (Two Exercises)
9. State-out using total station
10. Determine of area using total station
11. Determination of remote height using total station
12. Distance, gradient, Diff, height between to inaccessible points using total stations.

Course Outcomes

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

1. Discuss the relative precision expected from pacing, taping, and electronic distance measurement techniques
2. Calculate the errors, standard deviations, standard errors of the mean, accuracy ratio or relative precision of a set of measurements in terms used by the surveyor
3. Determine the earth's curvature effect, by comparing the difference between a horizontal plane and a level (curved) surface on the earth
4. Distinguish between plan view, profile view and cross-sections as used in route surveying and demonstrate understanding of cross-sectioning to attain earthwork data.
5. Determine latitudes and departures for all segments of a closed loop traverse check for closure error, and express the results in the form of the standard accuracy ratio, i.e. accuracy ratio.

CO- PO–PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	3	3	1	2				2	2		2	3		
CO 2	3	3	3	1	2				2	2		2	3		
CO 3	3	3	3	2	2				2	2		2	3		
CO 4	3	3	3	3	2				2	2		2	3		
CO 5	3	3	3	3	2				2	2		2	3		

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:

A) Natural Resources: [5 Periods]

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.

B) **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&control: [7 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: [6 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: [5 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).

TEST 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

REFERENCE BOOKS:

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												
CO S	**Programme Outcomes(POs)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO 1	3		1		1	2	1					
CO 2	2	3	2	3	1	3		2				
CO 3	3	3	2	3	2	2		1				
CO 4	3	2	2	1	2	1						
CO 5	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 & MINING)	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 [9 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 it's 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: [9 Periods]

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

TEST BOOKS:

1. Walpole, Probability & Statistics, for Engineers & Scientists, 8th Edition, Pearson Education.
2. Paul A Maeyer Introductory Probability and Statistical Applications, John Wiley Publicaitons.
3. Monte Gomery, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley Publications.

REFERENCE BOOKS:

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

E RESOURCES:

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

Course Outcomes:

1. The students will understand central tendency and variability for the given data.
2. Students would be able to find the Probability in certain realistic situation.
3. 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.
4. 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.
5. 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)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
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: 80109	STRENGTH OF MATERIALS -II	L	T	P
Credits: 3		3	-	-

Prerequisite: Strength of Materials

Course Objective: To provide the basic concepts of Columns and Struts and calculation of stresses and deformations under Direct, Bending Stresses and in beams subjected to unsymmetrical bending so that to apply the knowledge of solids on engineering applications and design problems.

MODULE I: Torsion, Shafts & Springs, Beams Curved in Plan [10 Periods]

Torsion, Shafts & Spring: Torsion of circular and hollow shafts, Elastic Theory of torsion, Stresses and Deflection in circular solid and hollow shafts. Combined bending moment and torsion of shafts – Strain energy due to torsion- Modulus of Rupture – Power transmitted to shaft- shaft in series and parallel- Closed and open coiled helical springs- Leaf springs- Springs in series and parallel- Design of buffer springs.

Beams Curved in Plan: Introduction–circular beams loaded uniformly and supported on symmetrically placed columns –Semi-circular beam simply-supported on three equally spaced supports.

MODULE II: Direct and Bending Stresses [09 Periods]

Stresses under the combined action of direct loading and bending moment, core of a section –determination of stresses in the case of chimneys, retaining walls and dams–conditions for stability–stresses due to direct loading and bending moment about both axis.

MODULE III: Thin Cylinders & Thick Cylinders [10 Periods]

A: Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells.

B: Thick Cylinders: Introduction Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders –Necessary difference of radii for shrinkage – Thick spherical shells.

MODULE IV: Columns and Struts [09 Periods]

Introduction–Types of columns–Short, medium and long columns–Axially loaded compression members–Crushing load–Euler's theorem-assumptions-derivation of Euler's critical load formulae for various end conditions–Equivalent length of a

column–slenderness ratio–Euler's critical stress–Limitations of Euler's theory–Rankine–Gordon formula–Long columns subjected to eccentric loading–Secant formula–Empirical formulae–Straight line formula–Prof.Perry's formula.

MODULE V: Unsymmetrical Bending and Shear Centre [10 Periods]

Unsymmetrical Bending: Introduction–Centroidal principal axes of section–Graphical method for locating principal axes–Moments of inertia referred to any set of rectangular axes–Stresses in beams subjected to unsymmetrical bending– Principal axes–Resolution of bending moment into two rectangular axe through the centroid–Location of neutral axis-Deflection of beams under unsymmetrical bending.

Shear Centre: Introduction-shear centre for symmetrical and unsymmetrical (Channel, I, T & L) Sections

TEXTBOOKS:

1. R.K.Bansal "**Strength of materials**" Laxmi Publications(P)ltd., 6th Edition 2015.
2. Basavarajaiah and Mahadevappa "**Strength of materials**" University press 3rd Edition, 2011

REFERENCES:

1. Ferdinandp Beer "**Mechanics of Solid**", TataMc.Grawhill Publications 1stEdition 2000.
2. S.Ramakrishna and R.Narayan "**Strength of Materials**" Dhanpat Rai publications., 1stEdition 2015.
3. A.R.Basu,NaiSarah "**Strength of Materials**" DhanpatRai&Co., 2nd Edition , 2011.
4. L.S.Srinath "**Strength of Materials**" Macmillan IndiaLtd.,1st edition, 2014.

E RESOURCES:

1. http://www.aboutcivil.org/solid-mechanics.html
2. https://archive.org/details/atextbookoncivi01schogoog
3. https://link.springer.com/journal/11223
4. https://www.journals.elsevier.com/mechanics-of-materials
5. http://nptel.ac.in/courses/105105108/
6. http://nptel.ac.in/downloads/112106141/

Course Outcomes

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

1. Know the theory behind the Shafts and springs and their types.
2. Assess the resultant stresses in the case of chimneys, retaining walls and dams and checking their stability. Evaluate bulking loads of a given column when ends are either held in position or are restrained fully and their combinations

3. Calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels and Design the thickness of the thin and thick cylinders subjected to internal pressure
4. Analyze slender, long columns subjected to axial loads.
5. Apply the different methods of unsymmetrical bending analysis. Design simple bars, beams, and circular shafts for allowable stresses and loads/demonstrate the significance and concept of shear centre

CO- PO-PSO 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	3	-	3	1	-	-	-	-	1	-	2	1	-
CO2	2	3	1	-	2	1	-	-	-	-	-	-	3	1	-
CO3	2	1	2	-	3	1	-	1	-	-	-	-	2	1	-
CO4	2	1	2	-	2	1	-	1	-	-	-	-	2	1	-
CO5	3	2	1	-	1	1	-	-	-	-	2	-	2	1	-

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80110	STRUCTURAL ANALYSIS	L	T	P
Credits: 4		3	1	-

Prerequisites: Engineering Mechanics, Strength of Materials.

Course Objective: To provide a good knowledge in the analysis of beams and frames. The members of a structure are subjected to internal forces like axial forces, shearing forces, ending and torsional moments while transferring the loads acting on it. Structural analysis deals with analyzing these internal forces in the members of the structures.

MODULE I: Analysis of Frames and Energy Theorems [14 Periods]

Analysis of Frames Types of frames- Perfect and Imperfect pin jointed frames. Analysis of determinate pin jointed frames using method of joints and method of sections for vertical, horizontal and inclined loads.

Energy Theorems Introduction-Strain energy in linear elastic system, expression of strain energy due axial load, bending moment and shear forces- castigliano's first theorem - Unit Load Method. Deflections of simple beams and pin jointed plane trusses.

MODULE II: Fixed and Continuous Beams [12 Periods]

Propped cantilever and fixed beams-fixed end moments for propped cantilever and fixed beams subjected to concentrated loads and uniformly distributed load, triangular load –Clapeyron theorem of three moments – analysis of continuous beams – shear forceand bending moment diagrams for continuous beams.

MODULE III: Three Hinged Arch and Two Hinged Arch [14 Periods]

A: Three Hinged Arch Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three Hinged- parabolic and circular arches – Settlement and temperature effects.

B: Two Hinged Arch Analysis of parabolic arches- effect of yielding of supports- effect of shortening of rib- effect of temperature change.

MODULE IV: Slope Deflection Method [12 Periods]

Continuous beams and rigid frames (with and without sway) – Symmetry and antisymmetry – Simplification for hinged end – Support displacements.

MODULE V: Moment Distribution Method [12 Periods]

Distribution and carry over of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway.

TEST BOOKS:

1. Vaidyanadhan, R and Perumal, P**, "Comprehensive Structural Analysis – Vol.1&Vol. 2",** Laxmi Publications, New Delhi, 3rd Edition, 2014.
2. BhaviKatti, S.S, "**Structural Analysis – Vol. 1 & Vol. 2**", Vikas Publishing Pvt Ltd., New Delhi, 4th Edition, 2014.

REFERENCES:

1. S.B. Junnarkar "**Mechanics of structures**", charotar publishing house.31st edition (2014).
2. Pandit & Gupta "**Theory of structures**", Tata Mc. Graw –Hill Publishing co. Ltd., New Delhi.
   1st edition 1999.
3. B.C Punmia, Khanna "**Strength of materials**", Laxmi Publications, New Delhi.10th edition 2015.

E RESOURCES:

1. https://www.youtube.com/watch?v=s4CN6aVKhPo
2. http://ascelibrary.org/journal/jsendh
3. http://www.springer.com/engineering/civil+engineering/journal/40091
4. http://seekdl.org/journal_details.php?jourid=130
5. http://www.nptel.ac.in/downloads/105101085/

Course Outcomes:

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

1. Find the member forces on frames and to have a good idea on Energy theorems
2. Solve fixed beams, continuous beams and propped cantilever beams.
3. Analyze the three hinged and two hinged arches.
4. Draw the SFD and BMD for beams and trusses using slope deflection method.
5. Draw the SFD and BMD for beams and trusses using Moment distribution method.

CO- PO-PSO 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				2	2		2	3		
CO2	3	3	3	1	2				2	2		2	3		
CO3	3	3	3	2	2				2	2		2	3		
CO4	3	3	3	3	2				2	2		2	3		
CO5	3	3	3	3	2				2	2		2	3		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80111	HYDRAULICS AND HYDRAULIC MACHINERY	L	T	P
Credits: 3		3	-	-

Prerequisite: Fluid Mechanics

Course Objective: To introduce the importance of study of open channel flow, fundamentals of flow in open channels and hydraulic design principles of channels. To get knowledge about hydraulic similitude using dimensional analysis of a prototype and model. To understand the application of momentum principle in impacts of jets on plane and curved surfaces. To impart the knowledge on pumps and turbines, their working principles, efficiencies, work done, specific speed and performance characteristics.

MODULE I: Open Channel Flow [09 periods]

Types of flows- Type of channels– Velocity distribution– Energy and momentum correction factors, Chezy's, Manning's and Bazin formulae for uniform flow– Most Economical sections, Specific energy,Criticalflow-criticaldepth– computationofcriticaldepth–critical,sub critical and super critical flows, Non uniform flow-Dynamic equation for G.V.F, Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- Rapidly varied flow-hydraulic jump - energy dissipation.

MODULE II: Hydraulic Similitude [09 periods]

Dimensional analysis- Rayleigh's method and Buckingham's pi theorem -study of Hydraulic models– Geometric, kinematic and dynamic similarities- Dimensionless numbers–model and prototype relations.

MODULE III: Basics of Turbo Machinery and Turbo Machinery [10 periods]

A. Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat vertical, inclined and curved vanes, jet striking centrally and at tip.

B: Turbo Machinery: Velocity triangles at inlet and outlet, expressions for work done and efficiency- Angular momentum principle, Applications to radial flow turbines.

MODULE IV: Hydraulic Turbines [10 periods]

Layout of a typical Hydropower installation – Heads and efficiencies- Classification of turbines-Pelton wheel- Francis turbine- Kaplan turbine– working principle, velocity diagram, work done and efficiency, hydraulic design, Governing of turbines, Differences between types of turbines, Draft tube– theory and function, efficiency, surge tanks, Specific speed of turbines- unit speed- unit quantity- unit power- performance characteristics- geometric similarity- cavitations. Run way speed.

MODULE V: Centrifugal-Pump and Hydropower Engineering [10 periods]

Centrifugal-Pump: Pump installation details- classification- work done- Manometric head- minimum starting speed- losses and efficiencies- specific speed multistage pumps- pumps in parallel- performance of pumps- characteristic curves- NPSH- cavitations.

Hydropower Engineering: Classification of Hydropower plants– Definition of terms– load factor, utilization factor, capacity factor, estimation of hydro power potential.

TEST BOOKS:

1. Modi&Seth"**Fluid Mechanics, Hydraulic and Hydraulic Machines**", Standard book house. 20th Edition, 2015.
2. K,Subramanyam"**Open Channel flow**", Tata Mc.Grawhill Publishers,3rd Edition, 2009.
3. Narayanapillai "**Fluid Mechanics &Fluid machines**", Universities press, 3rd Edition, 2009.

REFERENCES:

1. R.K.Bansal "**A text of Fluid Mechanics and Hydraulic Machines**" Laxmi Publications (P)ltd., New Delhi, 9th Edition, 2010.
2. RangaRaju, "**Elements of Open channel flow**" Tata Mc.GrawHill, Publications, 2nd Edition, 2001.

E-RESOURCES:

1. http:// nptel.ac.in/courses/105103096/
2. http:// nptel.ac.in/courses/105103082/

Course Outcomes

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

1. Apply the knowledge in addressing problems regarding open channels and possess skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
2. Know the importance of studies of hydraulic similitude and build highly representative models for various real time prototypes by considering Geometric, kinematic and dynamic similarities.
3. Gain knowledge on impact of jets on the vanes and application of this knowledge in representing velocity triangles at inlet and outlets and radial flow turbines.
4. Learn about different types of turbines, their working and various engineering characteristics.
5. Learn about different types of pumps, their working and various engineering characteristics along with the basic concepts related to hydropower plant.

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	3	3	2	1	1	-	-	-	-	-	-	-	2	2	
CO 2	3	3	3	1	1	-	-	-	-	-	-	-	2	2	
CO 3	3	3	2	1	1	-	-	-	-	-	-	-	3	2	
CO 4	3	3	1	1	1	-	-	-	-	-	-	-	2	2	
CO 5	3	3	1	1	1	-	-	-	-	-	-	-	3	2	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80112	WATER RESOURCES ENGINEERING	L	T	P
Credits: 3		3	-	-

Prerequisites: Fluid mechanics, Hydraulics & Hydraulic machinery, Engineering Geology

Course Objective: To impart basic knowledge of hydrology, various components of hydrology and their applications and importance of surface and ground water resources and application of these principles to solve hydrologic problems and its significance in design of canals and mechanisms and pathways of water storage, transport and transformation in the landscape.

MODULE I: Surface Water Hydrology [10 Periods]

A. Surface Water Hydrology Water Resources in India, Hydrology in water Resource Planning – Hydrological cycle -Precipitation– Types, Measurement of rainfall, Average depth of rainfall over an area, Mean annual rainfall, consistency of rainfall record – Double mass curve, Infiltration: Definition Factors affecting and its determination, Evaporation and Evapo – Transpiration: Definition Factors affecting and its determination .

B. Runoff Factors affecting runoff, methods of determination of runoff, stream gauging, Hydrograph analysis: Base flow separation, unit hydrograph – Hydrograph of different durations, Applications of unit hydrograph: S-hydrograph, Flood Forecasting Techniques.

MODULE II: Ground Water Hydrology [10 Periods]

Ground water hydrology: Definitions, sub surface distribution of water, ground water movement, Darcy's law–permeability.

Well hydraulics: Steady flow in different types of aquifers and wells – determination of hydraulic properties of aquifer, well losses, specific capacity of well, well efficiency, pumping test and recovery test methods for determination of well yield.

MODULE III: Irrigation [10 Periods]

Irrigation Definition, Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils.

Soil-water-plant relationship Vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, Duty and delta, factors affecting duty, Determination of canal capacities for cropping patterns consumptive use, Methods of improving soil fertility –Crop Rotation, preparation of land for Irrigation, standards of quality for Irrigation water, Irrigational efficiencies.

MODULE IV: Canal Systems [09 Periods]

Classification of irrigation canals – canal alignment, Design of unlined canals, Regime theories – Kennedy's and Lacey's theories, Design problems.

MODULE V: Reservoir Planning: [09 Periods]

Definition, Types of reservoir investigations for reservoir planning, selection of site for a reservoir, zones of storage in a reservoir, purpose of reservoir, reservoir yield, mass curve and demand curve, Determination of reservoir capacity, yield from a reservoir of given capacity, Reservoir sedimentation, control of reservoir sedimentation, Life of reservoir..

TEST BOOKS:

1. P. Jayarami Reddy, "**A Text book of Hydrology"**, Laxmi Publication, Delhi, 14th Edition 2009.
2. B.C. Punmia and Pande B.B.Lal, "**Irrigation and Water Power Engineering"**., Laxmi Publications Pvt. Ltd., New Delhi, 18thEdition, 2009.

REFERENCES:

1.S.K. Garg, "**Irrigation Engineering and Hydrology Structures"**, Khanna Publishers, Delhi, 23rd Edition 2009
2. K. Subramanya, "**Engineering Hydrology"**, Tata-Mc Graw Hill Publishing, Delhi, 4th Edition,2013.
3. P.N.Modi, "**Irrigation, Water Resources and Water Power Engineering"**. Standard Book House, Delhi, 6th Edition, 2004.

E –RESOURCES

1. http://textofvideo.nptel.iitm.ac.in/1028/lec40.pdf
2. http://nptel.ac.in/courses/Webcourse
3. Contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m4l06.pdf

Course Outcomes:

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

1. Gain knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation and apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing.
2. Know the basics of ground water and hydraulics of subsurface flows.
3. Gain knowledge on irrigation and different methods of irrigation and understand the concept of soil-water-plant relationship and apply it to schedule irrigation.
4. Gain knowledge and skills on planning and design of canal systems.
5. Gain knowledge on zones of storage in a reservoir, steps for planning reservoir, reservoir sedimentation and its control.

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	2	3	3	3	1	2	2	2	1	-	-	-	3	3	1
CO 2	3	3	3	3	1	2	2	2	1	-	-	-	3	3	-
CO 3	3	3	3	2	1	2	2	1	-	-	1	2	3	2	1
CO 4	3	3	3	2	1	3	2	1	-	-	1	1	3	3	-
CO 5	3	3	3	3	1	2	2	2	1	-	2	-	3	2	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80113	COMPUTER-AIDED DRAFTING OF BUILDINGS LAB	L	T	P
Credits: 1.5		-	-	3

Prerequisites: BMCP

Course Objective: To introduce the students to draft the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements. To introduce the students to analysis and design the structural members using computer softwares.

List of Exercises:

1. Introduction to computer aided drafting software
2. Drawing of Single storeyed buildings plans of using CAD
3. Drawing of Multi storeyed buildings plans of using CAD
4. Developing sections and elevations for Single storyed buildings
5. Developing sections and elevations for Multi storyed buildings
6. Detailing of building components like Doors using CAD software‘s
7. Detailing of building components like Windows using CAD software‘s
8. Detailing of building components like Roof Trusses etc. using CAD software‘s

Course Outcomes:

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

1. The students will be able to draft the plan, elevation and sectional views of the buildings, Industrial structures, and framed buildings.
2. The students will be able to analyze and design the simple structural members using computer software’s.

CO- PO-PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1			1		2					2			3		
CO 2	2	3	3										3		3
CO 3															
CO 4															
CO 5															

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:80114	MECHANICS OF FLUIDS & HYDRAULIC MACHINERY LAB	L	T	P
Credits: 1.5		-	-	3

Prerequisite: NIL

Course Objective: Understand the standard measurement techniques of fluid mechanics and their applications. Illustrate with the components and working principles of the different types of Turbines and Pumps.

List of Experiments:

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice / mouthpiece by constant head method.
3. Calibration of contracted Rectangular Notch and / Triangular Notch
4. Determination of Friction factor of a pipe.
5. Determination of Coefficient for minor losses.
6. Verification of Bernoulli's equation.
7. Impact of jet on Vanes
8. Study of Hydraulic jump.
9. Performance test on Pelton wheel turbine
10. Performance test on Francis turbine.
11. Performance characteristics of a Single stage/ multi-stage centrifugal pump.
12. Performance characteristics of a Reciprocating pump.

Course Outcomes

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

1. Calibrate various flow measuring devices in pipe and open channel flow.
2. Determine various losses and velocity in pipe flow in field.
3. Calibrate the performance characteristics of pumps and turbines.

CO- PO-PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1			1		2					2			3		
CO 2	2	3	3										3		3
CO 3															
CO 4															
CO 5															

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80115	STRUCTURAL ANALYSIS LAB	L	T	P
Credits: 1		-	-	2

Prerequisites: Structural Analysis-I & II

Course Objective: To impart knowledge on testing of beams, columns, trusses and frames.

List of Experiments:

1. Determination of Flexural Rigidity (EI) of a given beam.
2. Verification of Maxwell-Betti's Law.
3. Experiment on three hinged arch.
4. Experiment on two hinged arch.
5. Verification of moment area theorem for slope and deflection of a given beam.
6. Deflection of a statically determinate pin jointed truss.
7. Forces in members of redundant frames.
8. To find deflection of curved members.
9. Unsymmetrical bending of a cantilever beam.
10. Deflection of fixed beam and influence line for reactions.
11. Deflection studies for a continuous beam and influence line for reactions.
12. Study of behavior of columns and struts with different end conditions.

Course Outcomes:

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

1. Understand the concept of Maxwell Theorem and its application.
2. Analyse two hinged and three hinged arches.
3. Analyse trusses and beams curved in plan.
4. Calculate the deflection of fixed and continuous beams due to various types of loading.
5. Study the behaviour of columns and struts.

CO- PO-PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3		2		2		2	2		2	3		
CO 2	3	3	3	1	2				2	2		2	3		
CO 3	3	3	3	2	2				2	2		2	3		
CO 4	3	3	3	3	2				2	2		2	3		
CO 5	3	3	3		2				2	2		2	3		

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	-	-

Course Objective:
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 [6 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 [6 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 [7 Periods]
A: Housework: the Invisible Labour *(Towards a World* of *Equals:* Unit -3)
"My Mother doesn't Work." "Share the I.oad."
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 [7 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 [6 Periods]
Knowledge: Through the Lens of Gender *(Towards a Work/ 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.

TEST BOOKS:-

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

REFERENCE BOOKS:-

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 ToIrmgana People's Struggle.* New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." Women's Studios Journal (14 November 2012) Available online at: http:// blogs.visj.com/ India real time/2012/11/14/by -the-numbers-where-Indan-womenworkP
3. K. Satyanarayana and Susie Thant (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada htto://harooreollins.co.in/BookDetailasp?Flook Cndet,3732
4. Vimata. "Vantillu (The Kitchen)". Women Writing in India: 600 BC to the Present. Volume II: The 20th Century. Ed. Susie Thaw and K. Lalita. Delhi: Oxford University Press 1995. 599-601.
5. Shatrughna, Veena et al. Women's Work and its Impact on Child Health end Nutrition, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6. Stree Shakti Sanghatana. 'We Were Making I listory ....' 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(GENDERAND BIOLOGY)
- http://www.yourarticlelibrary.com/essay/essay-on-gender-issues-in-labour-market-in-india/40442/ (GENDER AND LABOUR)
- 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-PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1						3		3	3		2	3			
CO 2						3		3	3		2	3			
CO 3						3		3	3		2	3			
CO 4						3		3	3		2	3			
CO 5						3		3	3		2	3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80H04	ENGINEERING ECONOMICS & ACCOUNTANCY (Common for CE, ME)	L	T	P
Credits: 3		3	-	-

Pre-requisites: NIL

Course Objective: EEA is a think beyond program which will make the student to examine the application of microeconomics theory as applied to the manager's responsibilities in an organization. To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making. This course should emphasize the quantitative and qualitative applications of economic principle to business analysis

MODULE-I Business Environment and Managerial Economics [10 Periods]

A. **Business Environment**: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Latest trends in Business Environment (Entrepreneurship).
B. **Managerial Economics:** Definition, Nature and Scope of Managerial Economics–Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand, Types, Significance of Elasticity of Demand, Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

MODULE – II Theory of Production and Cost Analysis [10 Periods]

A. **Theory of Production:** Production Function – ISOquants and ISOcosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.
B. **Cost Analysis:** Cost concepts, Opportunity cost, fixed vs. Variable costs, explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEA.

MODULE – III Market structures and Pricing Policies [9 Periods]

A. **Introduction to Markets & Market structures:** Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.
B. **Pricing Policies & Methods:** Cost plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, PLC based pricing methods.

MODULE – IV Capital and Capital Budgeting [9 Periods]

A. **Capital:** Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance.
B. **Capital Budgeting** : Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method,

Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

MODULE – V Financial Accounting and Ratios [10 Periods]

A. **Financial Accounting:** Introduction, Accounting principles, Accounting Cycle, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).
B. **Financial Analysis Through Ratios:** Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

Course outcomes:

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

1. Understand the concepts of managerial economics and their application in evaluating the demand.
2. Evaluate the production function and identifies the least cost combination to control the costs of production.
3. Understand the structures of various market types and their pricing policies.
4. Understand the types of business forms and also be able to evaluate the investments using capital budgeting techniques.
5. Understand the basic concepts of financial accounting and evaluation of company performance using ratio analysis.

TEST BOOKS:

1. Aryasri, **"Managerial Economics and Financial Analysis"**, TMH, 2nd edition, 2005.(UNITS I,II,III,IV,V).
2. Varshney & Maheswari, **"Managerial Economics"**, 5th edition Sultan Chand, 2003.(UNITS, I,II,III).

REFERENCE BOOKS:

1. H. Craig Peterson & W. Cris Lewis, **"Managerial Economics"**, PHI, 4 Ed.
2. Domnick Salvatore, **"Managerial Economics In a Global Economy"**, Thomson, 4th Edition.
3. Raghunatha Reddy & Narasimhachary, **"Managerial Economics& Financial Analysis"**, 4TH edition Scitech.
4. S.N.Maheswari & S.K. Maheswari, **"Financial Accounting"**, 6th edition Vikas.
5. Dwivedi, **"Managerial Economics"**, Vikas, 6th Edition.

E-RESOURCES:

1. http://www.learnerstv.com/Free-Economics-video-lecture-courses.htm
2. http://nptel.ac.in/courses/110105067/
3. http://nptel.ac.in/courses/110107073/
4. http://nptel.ac.in/courses/110101005/
5. http://nptel.ac.in/courses/109104073/

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1		2							1		3				
CO 2	3			2	1										
CO 3		1			2						3				
CO 4	2	1			3										
CO 5		1			2						3				

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80116	ADVANCED STRUCTURAL ANALYSIS	L	T	P
Credits: 3		3	-	-

Prerequisites: Engineering Mechanics, Strength of Materials, Structural Analysis.

Course Objective: This course is in continuation of Structural Analysis. Here in advanced method of analysis like Matrix method and Plastic Analysis are covered to identify, formulate and solve problems in structural analysis.

MODULE I: Kani's Method [09 Periods]

Analysis of continuous beams including settlement of supports. Analysis of frame including side sway. Shear force and Bending moment diagrams.

MODULE II: Moving Loads and Influence Lines [09 Periods]

Influence lines for reactions, Shear force and bending moment for statically determinate beams – influence lines for members' forces in pin-jointed frames.

MODULE III: Approximate Method of Analysis [10 Periods]

A: Application to multi storey frames by Portal frame method

B: Application to multi storey frames by Cantilever method

MODULE IV: Flexibility Method [10 Periods]

Equilibrium and compatibility – Determinate vs Indeterminate structures – Indeterminacy -Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames [with redundancy restricted to two]

MODULE V: Stiffness Matrix Method [10 Periods]

Introduction, Stiffnes matrix, Analysis of continuous beam and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach.

TEST BOOKS:

1. Vaidyanadhan, R and Perumal, P**, "Comprehensive Structural Analysis – Vol.1&Vol. 2",** Laxmi Publications, New Delhi, 3rd Edition, 2014.
2. BhaviKatti, S.S, "**Structural Analysis – Vol. 1 & Vol. 2**", Vikas Publishing Pvt Ltd., New Delhi, 4th Edition, 2014.

REFERENCES:

1. S.B. Junnarkar "**Mechanics of structures**", charotar publishing house.31st edition (2014).

2. Pandit & Gupta "**Theory of structures**", Tata Mc. Graw –Hill Publishing co. Ltd., New Delhi.
   1st edition 1999.
3. B.C Punmia, Khanna "**Strength of materials**", Laxmi Publications, New Delhi.10th edition 2015.

E RESOURCES:

1. http://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf
2. http://web.iitd.ac.in/~sbhalla/cel717.pdf
3. https://link.springer.com/journal/40091
4. http://journals.azad.ac.ir/ijase/
5. http://textofvideo.nptel.iitm.ac.in/105101086/lec4.pdf

Course Outcomes:

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

1. Draw the SFD and BMD using Kani's method of analysis.
2. Get good knowledge on Moving loads and Influence lines.
3. Solve the structure using approximate method of analysis.
4. Analyze the structure using Flexibility method.
5. Analyze the structure using Stiffness method.

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	3	3	3	1	2				2	2		2	3		
CO 2	3	3	3	1	2				2	2		2	3		
CO 3	3	3	3	2	2				2	2		2	3		
CO 4	3	3	3	3	2				2	2		2	3		
CO 5	3	3	3	3	2				2	2		2	3		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80117	STRUCTURAL ENGINEERING - I (RCC)	L	T	P
Credits: 4		3	1	-

Prerequisite: Strength of Materials

Course Objective: To give procedural knowledge to design a system, component or process as per needs and specifications of R C elements such as beams, slabs, columns and footings subjected to various load combinations with different boundary conditions and also the show the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to wrong design, use of poor quality of materials and faulty construction methods.

MODULE I: Concepts of RCC Design & Beams [14 Periods]

Design Philosophies

Design philosophies-Working Stress Method (WSM), Ultimate Load Method(ULM), and Limit State Method(LSM) – Material- Stress- Strain Curves – Safety factors – characteristic values. Stress Block parameters (generalized, rectangular, parabolic) – IS-456-2000 codal provisions

Limit State of Collapse (Flexure):

Limit state design of singly reinforced, doubly reinforced, Flanged sections--T and L beam sections.

MODULE II: Limit State of Collapse in Shear, Torsion and Bond [14 Periods]

Shear Torsion and Bond:

Limit state design of section for shear and torsion. Concept of bond, anchorage and development length, I.S. code provisions

Limit State Design for Serviceability

Limit State Design for Serviceability for deflection, cracking and codal provision. Design examples in simply supported and continuous beams.

MODULE III: Slabs [14 Periods]

A: Types of slabs-one way, two way - simply supported rectangular slabs subjected to only uniformly distributed loads. IS Code Method.

B: Continuous rectangular slabs subjected to only uniformly distributed loads. IS Code Method, Detailing of reinforcement in slabs.

MODULE IV: Columns [12 Periods]

Design of axially loaded circular, square and rectangular columns; Uniaxial and biaxial bending of columns - interaction diagrams. Design of columns subjected to axial load and bending.

MODULE V: Stairs and Footings [12 Periods]

Stairs: Design and detailing of dog legged stairs

Analysis and Design of Footings

Design of Isolated Square, rectangular and Circular footings as per IS code

TEST BOOKS:

1. P.C.Varghese **—Limit state designed of reinforced concrete** Prentice Hall of India, New Delhi, 2nd Edition, 2008.
2. N. Krishna Raju and R.N. Pranesh **—Reinforced concrete design**, New age International Publishers, New Delhi, 3rd Edition, 2009.

REFERENCES:

1. M.L. Gambhir **—Fundamentals of Reinforced concrete design**, Printice Hall of India Private Ltd., New Delhi, 3rd Edition, 2006.
2. P. Purushotham **—Reinforced concrete structural elements–behaviour, Analysis and design**, Tata Mc. Graw-Hill, 3rdEdition, 2014.
3. B.C.Punmia, Ashok Kumar Jain and Arun Kumar **—Reinforced concrete structures**, Vol.1, Laxmi publications Pvt. Ltd., 3rd Edition, 2011.
4. S.Unnikrishna Pillai & Devdas Menon, **—Reinforced concrete design** Tata Mc. Graw Hill, New Delhi, 3rd Edition, 2009.

E RESOURCES:

1. https://en.wikipedia.org/wiki/Reinforced_concrete
2. http://www.bd.gov.hk/english/documents/code/CoP_SUC2013e.pdf
3. http://www.sturdystructural.com/reinforced-concrete.html
4. http://engineeringvideolectures.com/course/294
5. http://www.nptel.ac.in/courses/105105105/
6. http://www.nptel.ac.in/courses/105105104/

Course Outcomes:

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

1. Know the needs and mode of the design philosophies like Working Stress Method (WSM), Ultimate Load Method (ULM), Limit State Method(LSM).
2. Have an idea on flexure, shear, torsion, Bond, anchorage length and to check the Design for Serviceability.
3. To inculcate the design methodology for various slabs using IS Codal Provisions and Detailing of Reinforcement for torsion.
4. To know about compression members like columns and design procedure for various types of columns using IS Code -456-2000.
5. To familiarize about Foundations and their Design.

CO- PO-PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	-	-	2	-	-	3	2	1	1	-	2		1	1	-
CO 2	1	3	2	-	3	1	-	1	-	-	1	-	3	2	1
CO 3	1	1	2	-	3	-	-	1	-	-	1	-	3	1	1
CO 4	1	1	2	-	3	-	-	1	-	-	1	-	3	1	1
CO 5	1	1	1	-	2	-	-	1	-	-	1	-	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80118	GEOTECHNICAL ENGINEERING	L	T	P
Credits: 3		3	-	-

Prerequisite: NIL

Course Objective: To understand the formation of soils, their classification. To analyze the in-situ soil and stresses developed due to loads or surcharge in the soil at any depth and its practical significance. Also to predict the bearing capacities and possible settlements of structures founded on various soils.

MODULE I: Introduction and Index Properties of Soils [09 Periods]

Introduction Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship – Relative density.

Index Properties of Soils Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils and unified soil classification

MODULE II: Permeability and Effective Stress & Seepage through Soils [10 Periods]

Permeability Soil water – capillary rise – flow of water through soils – Darcy's law-permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered soils – Insitu permeability tests (Pumping in & Pumping out test).

Effective Stress & Seepage through Soils Total, neutral and effective stress – principle of effective stress - quick sand condition – Seepage through soils – 2-D flow and Laplace's Equation -Flownets: Characteristics and Uses.

MODULE III: Stress Distribution in Soil and Compaction [10 Periods]

A: Stress Distribution in Soil Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.

B: Compaction Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

MODULE IV: Consolidation [09 Periods]

Consolidation Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation **-** stress history of clay; e-p and e-log p curves – normally consolidated soil, over consolidated soil and under consolidated soil - preconsolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods.

MODULE V: Shear Strength of Soils [10 Periods]

Importance of shear strength **–** Mohr's– Coulomb Failure theories – Types of

laboratory strength tests – strength tests based on drainage conditions – Shear strength of sands - dilatancy – Critical Void Ratio – Liquefaction- shear strength of clays.

TEST BOOKS:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt. Ltd, New Delhi. 6th Edition,2014
2. Principals of Geotechnical Engineering by Braja M.Das, Cengag e Learning Publishers, 7th Edition,2014
3. Geotechnical Engineering: Principles and practices of soil mechanics and foundation Engineering by VNS Murthy, Taylor & Francis Group**,**13th Edition ,2015

REFERENCES:

1. Geotechnical Engineering by C. Venkataramiah, New age International Pvt .Ltd, 7th Edition, 2013.
2. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi, 12th Edition,2013.
3. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi., 12th Edition,2012
4. Soil Mechanics and Foundation by by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi,13th Edition ,2015

E RESOURCES

1. http://geotech.fce.vutbr.cz/studium/mech_zemin/soil_mechanics.pdf
2. http://www.alljntuworld.in/wp-content/uploads/2015/12/GTE-Lecture-Notes.pdf
3. http://geotech.fce.vutbr.cz/studium/mech_zemin/soil_mechanics.pdf
4. http://www.nptel.ac.in/courses/105105105/
5. http://www.nptel.ac.in/courses/105105104/

Course Outcomes:

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

1. Gain a general understanding on the nature of soil and the classification and evaluation of engineering properties of soil.
2. Recognize the Permeability characteristics of soils and Seepage through Soils
3. Compute the vertical stress at any depth by deferent methods and also understands the compaction characters.
4. Understand the stress distribution and settlement characteristics of soil when it is subjected to the application of external loads.
5. Evaluate the shear strength characteristics of soil.

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	3	2	3	3	2	3			3				2	1	1
CO 2	3	3	2	3	2	3							2		
CO 3	3	3	3	3	2	2							2	1	
CO 4	3	3	3	2	2	3							2		
CO 5	3	3	3	3	3	3							2	1	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80119	CONCRETE TECHNOLOGY (PROFESSIONAL ELECTIVE –I)	L	T	P
Credits: 3		3	-	-

Prerequisites: Building Materials, Construction & Planning

Course Objective: To provide the basic knowledge of science and engineering of concrete properties related to civil engineering problems. Going through the course one would develop adequate understanding on concrete production process and properties and uses of concrete as a modern material of construction. The courses will enable one to make appropriate decision regarding ingredient selection and use of concrete.

MODULE I: Cement & Admixtures [10 Periods]

Cement: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement –Tests on cement– Different grades of cement.

Admixtures: Types of admixtures – mineral and chemical admixtures – properties – dosages – effects – usage

MODULE II: Aggregates [09 Periods]

Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

MODULE III: Fresh& Hardened Concrete [10 Periods]

A: Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

B: Hardened Concrete: Water / Cement ratio – Abram‘s Law – Gelspaoe ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength.

MODULE IV: Testing Of Hardened Concrete & Elasticity, Creep & Shrinkage [09 Periods]

Testing Of Hardened Concrete: Compression tests – Tension tests: Flexure tests – Splitting tests – Pull-out test, Nondestructive testing methods – codal provisions for NDT

Elasticity, Creep & Shrinkage: Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

MODULE V: Mix Design & Special Concretes [10 Periods]

Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design with Admixtures as per IS:10262-2009

Special Concretes: Light weight aggregates – Light weight aggregate concrete – Cellular concrete – High density concrete – Fiber reinforced concrete – Polymer concrete – Types of Polymer concrete – High performance concrete – Self compacting concrete-Self Curing Concrete.

TEST BOOKS:

1. M.S.Shetty "**Concrete Technology**" S.Chand & Co. Revised Edition; 2006
2. M.L. Gambhir. "**Concrete Technology**" 5th Edition 2013 – Tata Mc. Graw Hill Publishers, New Delhi

REFERENCES:

1. A.M.Neville "**Properties of Concrete**" Low priced Edition – 5th Edition 2012
2. M.L. Gambhir. "**Concrete Technology**" 5th Edition 2013 – Tata Mc. Graw Hill Publishers,New Delhi
3. A.R. Santha Kumar "**Concrete Technology**", Oxford university Press 2006, New Delhi
4. P.K.Mehta and J.M.Monteiro, "**Concrete: Micro structure, Properties and Materials**" –5th Edition 2014 Mc-Graw Hill Publishers.

E RESOURCES:

1. http://www.indianconcreteinstitute.org/
2. http://www.ncbindia.com/
3. www.icijournals.com
4. http://nptel.ac.in/courses/105102012/
5. http://nptel.ac.in/courses/105105104/

Course Outcomes

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

1. To understand various chemical and physical properties of ordinary Portland cement and admixture
2. Acquire knowledge on physical, chemical, thermal and mechanical properties of aggregates
3. Gain knowledge on properties of both fresh and hardened concrete
4. Acquire knowledge on various tests conducted on hardened concrete like tension and compression etc and also effect and factors influencing of elasticity,

creep and shrinkage.

5. Design a concrete mix which fulfills the required properties of concrete by using BIS method and development of special concretes and different materials used in them.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	**3**	**2**		**2**	**1**		**2**							2	2
CO 2	**3**	**2**		**2**	**2**	**1**	**2**							2	2
CO 3	**3**	**3**	**3**	**3**	**3**		**1**							3	2
CO 4	**3**	**3**		**3**	**2**		**3**			**2**				2	2
CO 5	**3**	**2**	**3**	**3**	**3**		**2**			**3**				3	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80120	SURFACE HYDROLOGY (Professional Elective –I)	L	T	P
Credits: 3		3	-	-

Prerequisites: Water resources engineering.

Course Objective: To study occurrence movement and distribution of water that is a prime resource for development of a civilization and methods of collecting the hydrological information, which is essential, to understand surface water hydrology. .

MODULE I Introduction [09 Periods]

Hydrologic cycle, Climate and water availability, Water balances, Precipitation, Forms, Classification, Variability, Measurement, Data analysis, Evaporation and its measurement, Evapotranspiration and its measurement, Penman Monteith method. Infiltration: Factors affection infiltration, Horton's equation and Green Ampt method.

MODULE II Reservoirs, Hyetograph and Hydrograph Analysis [09 Periods]

Reservoir: Types, Investigations, Site selection, Zones of storage, Safe yield, Reservoir capacity, Reservoir sedimentation and control. Hyetograph, Runoff: drainage basin characteristics, Hydrograph concepts assumptions and limitations of unit hydrograph, Derivation of unit hydrograph S hydrograph, Flow duration curve.

MODULE III Flood Management [10 Periods]

PART A - Indian rivers and floods, Causes of flooding, Alleviation, Leeves and floodwalls Floodways, Channel improvement, Flood damage analysis.

PART B - Hydrologic Analysis and Design: Design flood, Flood estimation, Frequency analysis, Flood routing through reservoirs and open channels, Storm drainage design.

MODULE IV Drought Management and Water Harvesting [10 Periods]

Definition of drought, Causes of drought, measures for water conservation an augmentation, drought contingency planning. Water harvesting: rainwater collection, small dams, runoff enhancement, runoff collection, ponds, tanks, natural and artificial ground water recharge methods.

MODULE V Hydroelectric Power and Water Resources Planning and Development [10 Periods]

Introduction & Components of Hydroelectric Power Plant, Levels in planning, Functional requirements of water resources projects, steps in water resources planning, Environmental aspects in water resources planning.

TEST BOOKS:

1. Garg S.K., Hydrology and Water Resources Engineering
2. Subramanya, K., Engineering Hydrology, Tata McGraw Hill, New Delhi.

REFERENCE BOOKS:

1. Modi, P.N., Irrigation Water Resources and Water Power Engineering, Standard Book House, New Delhi.

2. Todd, D.K., Groundwater Hydrology, 1993 John Wiley & Sons..
3. Raghunath, H.M., Hydrology – Principles, Analysis and Design, 1986, Wiley
4. Dr. P.Jaya Rami Reddy, A Textbook of Hydrology, University Science Press.

E RESOURCES:

1. http://nptel.iitm.ac.in
2. http://www.uiowa.edu
3. http://www.ngwa.org

Course Outcomes

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

1. Gain knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation and apply the various methods of field measurements.
2. Gain knowledge on reservoirs, hyetograph and hydrograph analysis
3. To understand empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing.
4. Gain knowledge and skills on drought management and rain water harvesting.
5. Gain knowledge on Hydroelectric Power and Water Resources Planning and Development.

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

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	2	-	-	-	-	-	-	-	-	2	2	-
CO 2	3	3	2	2	-	-	-	-	-	-	-	-	2	2	-
CO 3	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CO 4	3	3	2	2	-	2	2	-	-	-	1	-	2	2	-
CO 5	3	3	2	2	-	2	2	-	-	-	1	-	3	2	-

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80121	RIVER ENGINEERING (Professional Elective –I)	L	T	P
Credits: 3		3	-	-

Prerequisites: Hydraulics & Hydraulic machinery, Engineering Geology, Water resources engineering.

Course Objective: To understand theoretical concepts of complex behavior of water and sediment movements in rivers. Knowledge on hydraulics of river and to understand the modeling of river hydraulics and river management skills.

MODULE I: River Functions [09 Periods]
Introduction to River Functions: Primary function of a river – River uses and measures – Water and Sediment loads of river – Rivers in India, Himalaya and Peninsular.

MODULE II: [10 Periods]
River Hydraulics A: Steady Flow in Rivers
Introduction to River hydraulics, Types of flows, Physical Properties and Equations: Steady flow in rivers, uniform and non uniform, Turbulence and velocity profiles, resistance coefficients, Boundary conditions and back waters, Transitions – Rating Curve.
B: Unsteady Flow in Rivers
Propagative of surface waves – Characteristics, flood waves – kinematic and diffusion analogy – velocity of propagation of flood waves – Maximum Flood wave.

MODULE III: River Mechanics and River Dynamics [10 Periods]
A: River Mechanics: River Equilibrium: Stability of Channel, regime relations, river bend equilibrium – hydraulic geometry of downstream, Bars and meandering
B: River Dynamics: Degradation and aggradations of river bed, Confluences and branches, River Data base.

MODULE IV: **River Surveys and Model [10 Periods]**
Mapping, Stage and Discharge Measurements, Sediments, Bed and suspended load Physical hydraulic Similitude, Rigid and mobile bed, Mathematical, Finite one dimensional, multi – dimensional ,Water Quality and ecological model.

MODULE V: **River Management [09 Periods]**
River training works and river regulation works, Flood plain management, waves and tides in Estuaries, Interlinking of rivers, River Stabilization.

TEST BOOKS:

1. Janson PL.Ph., Lvan BendegamJvanden Berg, Mdevries A. Zanen [Eds], "**Principles of River Engineering – The non tidal alluvial rivers"** Pitman, 1st Edition, 1994.

2. P. Jaya Rami Reddy, "**Hydrology**", Laximi Publications, New Delhi, 12th Edition, 2004.

REFERENCES:

1. Warren Viessman, et al., "**Introduction to hydrology**", Thomas Y.Crowell, New York, 5th Edition, 2002.
2. Ven Te chow [eds], "**Handbook of applied hydrology**", McGraw Hill Book company, 1st Edition, 1964.
3. Subramanya K., "**Hydrology**", Tata McGraw Hill Co., New Delhi, 1st Edition, 1994.
4. Patra.K.C, "**Hydrology and Water Resources Engineering**", Narosa Publications, 2nd Edition, New Delhi 2008.

E RESOURCES:

1. http://www.iihr.uiowa.edu/riverflow2016/.
2. http://www.rivergauges.com/.

Course Outcomes:

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

1. Recognize the complex behavior of rivers.
2. Gain the skills to take up research activities in river engineering.
3. Gain knowledge in river mechanics and dynamics.
4. Understand the significance of River survey and model
5. Develop skill of River management.

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

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	-	-	-	-	-	-	-	-	-	-	3	3	
CO 2	3	3	2	3	-	-	-	-	-	-	-	-	3	2	
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	3	2	
CO 4	3	3	2	2	1	-	-	-	-	-	-	-	3	2	
CO 5	3	3	2	2	1	1	3	-	-	-	1	-	3	2	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. V Semester		
Code: 80H03	English Communication and Presentation Skills Lab	L	T	P
Credits: 1	(Common for CE, ME and Min.E.)	-	-	2

Course Objective:

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.

REFERENCE BOOKS:

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

Course Outcomes:

After completion 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		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1					1					2		2		3	3
CO 2										1		2		3	2
CO 3		1		1						2		2		3	2
CO 4					1	1			1	2		2		3	2
CO 5				1	1				1	2		2		3	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80122	GEOTECHNICAL ENGINEERING LAB	L	T	P
Credits: 1.5		-	-	3

Prerequisite: NIL

Course Objective: Student will gain familiarity with laboratory procedures for assessing the index and engineering properties of soil by conducting appropriate tests and interpretation of experimental results.

List of Experiments:

1. Specific gravity, G
2. Atterberg's Limits (LL & PL)
3. Field density-core cutter and sand replacement method
4. Grain size analysis (Sieve and Hydrometer analysis)
5. Permeability of soil, constant and variable head test
6. Compaction test
7. CBR Test
8. Consolidation test
9. Unconfined compression test
10. Tri-axial Compression test
11. Direct shear test.
12. Vane shear test

Course Outcomes:

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

1. Determine the specific gravity of soil fraction by density bottle and pycnometer.
2. Determine the in-situ density of soil by the core cutter and sand replacement method.
3. Obtain knowledge to determine the grain size distribution of coarse grained soil by dry sieve analysis.
4. Gain knowledge to classify the given fine grained soil based on its plasticity characteristics.
5. Determine the coefficient of permeability of soil and also evaluate the shear parameters of soil by various methods.

CO- PO-PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1			1			1							3		
CO 2	2	3	3			1							3		
CO 3	3		1			1							3		
CO 4	3		1			1							3		
CO 5	3		1			1							3		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80123	CONCRETE TECHNOLOGY AND HIGHWAY MATERIALS LAB	L	T	P
Credits: 1.5		-	-	3

Prerequisite: NIL

Course Objective: Enable to carry various experiments regarding compressive strength of concrete, tensile strength of concrete, workability test, design mix, modulus of rupture of concrete. All these experiments intended to determine the quality of concrete.

List of Exercise:

A) Tests on cement and concrete

1. Normal Consistency and setting time of cement.
2. Fineness, Specific gravity and Soundness of cement
3. Compressive strength of cement.
4. Workability test on concrete by compaction factor, slump and Vee-bee.
5. Young's modulus and compressive strength of concrete.
6. Bulking of sand.
7. Non-Destructive testing on concrete [for demonstration].

B) Tests on Highway Materials

1. Aggregate Crushing value and Impact Test
2. Specific Gravity and Water Absorption.
3. Attrition and Abrasion Test
4. Shape tests
5. Penetration and Softening Point Test on Bitumen.
6. Ductility Test.
7. Flash and fire point tests.

Course Outcomes:

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

1. Find the properties of cement.
2. Calculate the workability of fresh concrete.
3. Find out the strength of hardened concrete.
4. Do the concrete mix design.
5. Get good idea about the water cement ratio.

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

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2		3	2				2				3	3	
CO 2	3	3		3	3	2	1		3				3	2	
CO 3	3	3		3	3				2				3	2	
CO 4	3	3	3	3			1		3				3	2	
CO 5	3	3		3	2	2	1		2				3	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 objective: 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 **[07 Periods]**

Introduction to traditional knowledge: 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 **[06 Periods]**

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

MODULE-III **[06 Periods]**

Legal frame work and TK:

A: The Scheduled Tribes and Other Traditional Forest **A:**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 **[06 Periods]**

Traditional knowledge and intellectual property: 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 **[07 Periods]**

Traditional knowledge in different sectors: 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.

REFERENCE BOOKS:

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 Kapoor[1], Michel Danino[2]

E- RESOURCES:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/

Course outcomes:

Upon completion of the course, the students are expected 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 (Common for CE, ME and Min.E.)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objective:
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), Bench marking, Balanced Score card.

Course Outcomes:

They should 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.

TEST 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)

REFERENCE BOOKS*:*

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://freevideolectures.com/Course/2371/Project-and-Production-management

b) Concerned Journals/Magazines links

Journals : Journal of Management, Asia Pacific Journal of research in Business management Journal of Management Development, Journal of Management And Organization.

1. http://nptel.ac.in/courses/110106044/

2. https://www.youtube.com/watch?v=obzp6biyAN0

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1									2	3	1				
CO 2		3							2		1				
CO 3		3								2	1				
CO 4		3		2	1										
CO 5				2			3				1				

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80124	ENVIRONMENTAL ENGINEERING	L	T	P
Credits: 3		3	-	-

Prerequisite: Environmental Sciences

Course Objective: To create awareness in Water supply engineering, providing knowledge about the importance of potable water, treatment methods and the mode of distribution to the public. Explain about sewerage system, its appurtenances, treatment methods and disposal techniques with designs aspects.

MODULE I: Introduction and Sources of Water [10 Periods]

Introduction: Waterborne diseases, Need for protected water supply, Population forecasting methods, design period, Water demand: Types of demand – factors affecting – fluctuations – fire demand in detail – storage capacity, water quality and testing, drinking water standards.

Sources of Water: Sources of water and comparison between quality and quantity and other considerations, Types of Intake, Infiltration galleries, Jack wells, springs, confined and unconfined aquifers and wells.

MODULE II: Sedimentation and Filtration& Disinfection [10 Periods]

Sedimentation: Sedimentation: Types of sedimentation, principles, uniform settling velocity, design of sedimentation tank, Coagulation- flocculation Definition and principles, Types of coagulants, feeding arrangements. Optimum dosage of coagulant-Jar test

Filtration& Disinfection: Filtration theory/ Principles, Construction and working of slow and rapid gravity filters, multimedia filters, design of filters, troubles in operation, comparison of filters, Disinfection – Types of disinfection - Theory of chlorination - chlorine demand, Residual chlorine test.

MODULE III: Distribution Systems and Joints and Valves [10 Periods]

A. Distribution Systems: Distribution systems, Requirements, methods and Types of layouts, Design aspects of distribution systems, Equivalent pipe methods and Hardy Cross method, Service reservoirs.

B. Joints and Valves: Types of Joints, Types of Valves such as sluice valves, air valves, scour valves and check valves, water meters, laying and testing of pipe lines.

MODULE IV: **Conservancy and Water Carriage System [09 Periods]**

Definition of sewage, characteristics of sewage, Decomposition of sewage, cycles of decay examination of sewage – B.O.D, – C.O.D equations. Sewage and storm water estimation – time of concentration – storm water overflows, combined flow, Sewers shapes and materials, Design of Sewer, Sewer appurtenances: Manholes – Inverted siphon – Catch basins – Flushing tanks – Ejectors, pumps and pump houses, house drainage – components requirements, sanitary fittings-traps, one pipe and two pipe systems of plumbing.

MODULE V: **Waste Water Effluent Treatment methods and disposal**

[09 Periods]

Lay out of Waste Water Effluent Treatment plant, Primary treatment: Types and classification of screens, grit chambers, skimming tanks, sedimentation tanks, principles and design of biological treatment: Trickling filters, standard, high rate Trickling filter and Activated sludge process. Ultimate disposal of sewage, sewage farming dilution, Sludge digestion tanks – factors affecting – design of Digestion tank – Sludge disposal by drying – septic tanks, working principles and design, soak pits, design of oxidation ponds.

TEST BOOKS:

1. G.S. Birdi "**Water supply and sanitary Engineeringy"**, Dhanpat Rai & Sons Publishers 2010.
2. Dr. **B.C.Punmia, Ashok Jain** & **Arun** Kumar **Jain**, "**Water Supply Engineering**", Vol. I "**Waste water Engineering**", Vol. II, Laxmi Publications Pvt.Ltd, New Delhi 2nd **Edition** 2016.
3. **S.K. Garg, "Water Supply Engineering: Environmental Engineering"** Vol.I Khanna Publications, 2010, New Delhi.

REFERENCES:

1. **"Water and Waste Water Technology"** by Steel. 2. Metcalf and Eddy 2004.
2. Mark **J.** Hammer**,** Sr**.** Mark **J.** Hammer **"Water and Wastewater Technology**", 6th Edition**,** HDR Engineering**,** Inc. ©2008;
3. S.C.Rangwala**,** revised by **K.S.**Rangwala & P.S**.**Rangwala "**Water Supply** and **Sanitary Engineering**" 14th edition, 2014.

E RESOURCES:

1. http://www.nptel.ac.in/courses/105105105/.
2. http://www.nptel.ac.in/courses/105105104/.
3. http://bloggerfromtashkent.eklablog.com/water-supply-engineering-by-s-k-garg-pdf-a1288.

Course Outcomes

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

1. Recognize the importance of protected water supply, water demand and water quality.
2. Acquire knowledge about different treatment methods.
3. Identify a source of water for water supply to a town or city with respect to quality and quantity of water through distribution system.
4. Understand the sources of sewerage, Estimation and design of sewers and its appurtenances.
5. Identify the techniques of disposal methods of waste water and sludge.

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	2	3	3	2	1	2	3	1	-	-	2	2	2	3	1
CO 2	2	3	3	2	2	2	2	1	-	-	2	1	3	3	1
CO 3	2	2	2	1	2	2	2	1	-	-	-	-	2	2	1
CO 4	2	3	3	3	1	3	2	2	1	-	2	1	2	2	-
CO 5	2	3	3	2	1	2	2	2	1	-	1	1	3	2	-

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80125	TRANSPORTATION ENGINEERING	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objective: To provide the students with basic knowledge of history of roads and planning stages for highways and cross section elements along with the geometric features of highways and drainage problems and remedial measures for construction of safe, durable pavements and traffic signs, signals, markings to control the traffic and for safe flow of vehicles without accidents.

MODULE I: Highway Development and Planning and [10 Periods]

Highway Development and Planning: Highway development in India – Necessity for Highway Planning- Different Road Development Plans.

Highway Planning: Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports, Road Projects initiation need based planning.

MODULE II: Highway Geometic Design [10 Periods]

Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical alignment-Gradients- Vertical curves. Typical cross sections for different types of roads.

MODULE III: Highway Materials and Testing [10 Periods]

A: Highway Materials and Testing

Desirable properties and testing of highway materials: road aggregates, bituminous materials and subgrade soil.

B: Highway Construction & Maintenance

Construction of earth roads, WBM roads, stabilized roads, bituminous pavements, cement concrete roads and joints in cement concrete roads – Maintenance of flexible & rigid pavements - Types and causes of distress. Concept of BOT and BOOT.

MODULE IV: Railway Engineering and Geometric Design of Railway Track [09 Periods]

Introduction to Railway Engineering Permanent way components – Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Ageing of Sleepers- Sleeper density.

Geometric Design of Railway Track

Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – Crossings and Turn outs.

MODULE V: Traffic Engineering [09 Periods]

Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies-

Data Collection and Presentation-speed studies- Data Collection and Presentation-Parking Studies and Parking characteristics- Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams.Traffic, infrastructural and safety audits.

TEST BOOKS:

1. S.K.Khanna, C.E.G.Justo, A.Veeraragavan. –**Highway Engineering**, Nem Chand and Brothers,Roorkee, 10th Edition, 2015.
2. Dr.L.R.Kadyali, –**Traffic Engineering & Transportation Planning** – Khanna publications – 6th Edition 1997

REFERENCES:

1. Partha Chakraborty and Animesh das, –**Principles of Transportation Engineering**, Prentice Hall, India– 6th Edition 1997
2. Flaherty, C.A.O. –**Highway Engineering**, Edward Arnold,London, – 6th Edition,1986
3. Mannering, –**Principles of Highway Engineering & Traffic Analysis**, Wiley Publishers, New Delhi. , 5th Edition, 1998.
4. Sharma, S.K. –**Principles, Practice& Design of Highway Engineering**, S. Chand & Company Ltd., New Delhi, 5th Edition, 1985.

E RESOURCES

1. http://teacher.buet.ac.bd/cfc/CE353/Lec1_Intro_web.pdf
2. https://drive.google.com/file/d/0B-IbNSAhk4D2LXpSc2w2cFh1TGM/view
3. http://www.sciencedirect.com/science/journal/20957564
4. http://www.civilenggforall.com/2016/12/highway-engineering-by-s.k.khanna-and-c.e.g.justo-free-download-pdf-civilenggforall.com.html
5. http://nptel.ac.in/downloads/105101087/
6. http://nptel.ac.in/courses/105105107/

Course Outcomes:

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

1. Understand different modes of transportation and planning stages for highways
2. Design various highway geometric elements using the knowledge of mechanics and applying the principles of equilibrium conditions.
3. Characterize highway materials and understand the various types of highway construction
4. Design various geometric elements of railway track
5. Carryout various traffic engineering studies for traffic data collection

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	3	2	3	3	2	3			3				2	1	1
CO 2	3	3	2	3	2	3							2		
CO 3	3	3	3	3	2	2							2	1	
CO 4	3	3	3	2	2	3							2		
CO 5	3	3	3	3	3	3							2	1	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80126	FOUNDATION ENGINEERING [Professional Elective-II]	L	T	P
Credits: 3		3	-	-

Prerequisite: Geotechnical Engineering

Course Objective: To understand the significance of investigation of soil in the field. To design retaining walls, analyze and predict the possible instability of slopes. Design of shallow foundations and deep foundations.

MODULE I: Soil Exploration and Retaining Walls [10 Periods]
Soil Exploration Need – Methods of soil exploration – Boring and Sampling methods – Penetration Tests – Plate load test – Pressure meter – Planning of Programme and preparation of soil investigation report.
Retaining Walls Types of retaining walls – stability of retaining walls against overturning, sliding, bearing capacity and drainage from backfill.

MODULE II: Slope Stability and Earth Pressure Theories [10 Periods]
Slope Stability Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method – Taylor's Stability Number- Stability of slopes of earth dams under different conditions.
Earth Pressure Theories Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Culmann's graphical method.

MODULE III: [10 Periods]
A: Shallow Foundations - Bearing Capacity Criteria Types - choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi, Meyerhof, Skempton and IS Methods
B: Shallow Foundations - Settlement Criteria Safe bearing pressure based on N-value – allowable bearing pressure; safe bearing capacity - plate load test – allowable settlements of structures.

MODULE IV: Pile Foundation [09 Periods]
Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests - Load carrying capacity of pile groups in sands and clays – Settlement of pile groups.

MODULE V: Well Foundations [09 Periods]
Types – Different shapes of wells – Components of wells – functions and Design Criteria – Sinking of wells – Tilts and shifts.

TEST BOOKS:
1. Gopal Ranjan & ASR Rao. "**Basic and Applied Soil Mechanics**" by New Age International Pvt. Ltd, revised 2nd edition, 2006.

2. VNS Murthy. "**Geotechnical Engineering: Principles and practices of soil mechanics and foundation Engineering"**- 7th Edition, 2007.

REFERENCES:

1. Swami Saran, "**Analysis and Design of Substructures**" –Oxford and IBH Publishing company Pvt Ltd, 1st Edition, 1998.
2. S. K.Gulhati & Manoj Datta "**Geotechnical Engineering**" Tata Mc.Graw Hill Publishing company New Delhi, 1st Edition, 2005.
3. K.R. Arora, "**Soil Mechanics and Foundation Engineering**", Standard Publishers and Distributors, Delhi. 1st Edition, 2000.
4. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, "**Soil Mechanics and Foundation**" Laxmi publications Pvt. Ltd., New Delhi, 1st Edition, 2000.
5. Das, B.M. **Principles of Foundation Engineering** –6th Edition [Indian edition]-2007

E RESOURCES

1. https://drive.google.com/file/d/0B5_-VqecjfqpdnN5c2huVk1JN1k/view
2. https://www.researchgate.net/journal/00380741_Soil_Mechanics_and_Foundation_ Engineering
3. http://www.nptel.ac.in/courses/105105105/
4. http://www.nptel.ac.in/courses/105105104/

Course Outcomes:

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

1. Identify the methods of soil exploration, perform various field tests and also check the stability of retaining wall.
2. Analyze the stability of finite and infinite slopes and evaluate lateral earth pressure using different methods.
3. Compute the bearing capacity and settlement of shallow foundations.
4. Evaluate the load carrying capacity of pile foundation and settlement of pile groups.
5. Recognize different types of well foundations and understand the design criteria.

CO- PO-PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	3	3			3				3	1	
CO 2	3	3	3	3	3	3							3		
CO 3	3	3	3	3	3	3							3		
CO 4	3	3	3	3	3	3							3	1	
CO 5	3	3	3	3	3	3							3		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80127	GROUND IMPROVEMENT TECHNIQUES [Professional Elective-II]	L	T	P
Credits: 3		3	-	-

Prerequisite: Geotechnical Engineering and Foundation Engineering

Course Objective: Student is expected to identify basic deficiencies of various soil deposits. Student will be in a position to decide various ways and means of improving the soil and implementing techniques of improvement.

MODULE I: Dewatering and Grouting [10 Periods]

Dewatering Methods of de-watering- sumps and interceptor ditches- single, multi stage well points - vacuum well points- Horizontal wells-foundation drains-blanket drains- criteria for selection of fill material around drains –Electro-osmosis.

Grouting Objectives of grouting- grouts and their properties- grouting methods ascending, descending and stage grouting- hydraulic fracturing in soils and rocks post, grout test.

MODULE II: [10 Periods]

In – Situ Densification Methods in Granular Soils Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth.

In – Situ Densification Methods in Cohesive Soils Preloading or dewatering, Vertical drains – Sand Drains, Sand wick geodrains – Stone and lime columns – thermal methods.

MODULE III: Geosynthetics and Geoenvironmental Application [10 Periods]

A: Geosynthetics Description, properties, functions and applications of geosynthetics

B: Geoenvironmental Application of Geosynthetics Geomembranes for landfills and ponds, Geosynthetic clay liner, Designing with GCL;s, Filtration, Erosion control, slope protection.

MODULE IV: Reinforced Earth Principles [09 Periods]

Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls.

MODULE V: Stabilization [09 Periods]

Methods of stabilization-mechanical-cement- lime-bituminous chemical stabilization with calcium chloride, sodium silicate and gypsum. Expansive soils: Problems of expansive soils – tests for identification – methods of determination of swell pressure. Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles.

TEST BOOKS:

1. Purushotham Raj. "**Ground Improvement Techniques**", Laxmi Publications, New Delhi, 2nd Edition , 2016.

2. Nihar Ranjan Patra."**Ground Improvement Techniques**", Vikas Publications 1st Edition, 2012.

REFERENCES:

1. Moseley M.P, "Ground Improvement", Blackie Academic and Professional, Boca Taton, Florida, USA. 1st Edition, 1993.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A "Ground Control and Improvement", John Wiley and Sons, New York, USA. 1st Edition, 1993.
3. Robert M. Koerner, "Designing with Geosynthetics", Prentice Hall New Jercy, USA, 1st Edition, 1993.
4. Hausmann M.R., "Engineering Principles of Ground Modification", McGraw-Hill International, 1st Edition, 1990

E RESOURCES

1. https://www.slideshare.net/SravanMuguda/ground-improvement-techniques
2. http://www.powershow.com/view/43702bZmRmZ/Ground_Improvement_Techniques_For_Highways_powerpoint_ppt_presentation
3. https://www.smartzworld.com/downloads/download/gd-complete-chapter-pdf-notes/
4. https://forumfreak4.files.wordpress.com/2013/06/ground-improvement-techniques-by-purushothama-raj.pdf
5. http://nptel.ac.in/courses/105104034/lecture_pdf/lec1.pdf

Course Outcomes:

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

1. Understand various methods of dewatering and grouting.
2. Recognize and classify different In – Situ densification methods in granular and Cohesive Soils.
3. Apply geoenvironmental application of geosynthetics.
4. Understand the design principals of reinforced earth.
5. Classify the methods of stabilization and apply them to different types of soils.

CO- PO-PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	3	3			3				3	1	
CO 2	3	3	3	3	3	3							3		
CO 3	3	3	3	3	3	3							3		
CO 4	3	3	3	3	3	3							3	1	
CO 5	3	3	3	3	3	3							3		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80128	SOIL STRUCTURE INTERACTION [Professional Elective-II]	L	T	P
Credits: 3		3	-	-

Prerequisites: Geotechnical Engineering

Course Objective: Focus is on idealization of soil response to closely represent continuum behavior and interaction analysis between the soil-structure with reference to relative stiffness of beams, slabs and piles under different loading conditions.

MODULE I Soil Response Models of Interaction Analysis [09 Periods]
Introduction to soil – Foundation interaction problems, Soil behavior, Foundation behavior, Interface behavior, soil-foundation interaction analysis, soil response models, Elastic continuum, Winkler, Two parameter elastic models, Elastic – plastic behavior, Time dependent behavior.

MODULE II Infinite and Finite Beams on Elastic Foundations [09 Periods]
Infinite beam, General solution of the elastic line – concentrated and distributed loads on beams – Idealization of semi-infinite and finite beams. Classification of finite beams, different end conditions and loads – solutions by general method, finite difference and application packages.

MODULE III Plate on Elastic Medium [10 Periods]
PART A -Infinite plate, elastic continuum, Winkler, Two parameters, Thin and thick plates, Analysis of finite plates, rectangular and circular plates, simple solution, ACI method.
PART B- Numerical analysis of finite plates, Analysis of highway and airfield pavements – Application packages.

MODULE IV Analysis of Pile and Pile Groups [10 Periods]
Elastic analysis of single pile – Methods of analysis for settlement of pile – Solutions for settlement and load distribution in pile – Pile tip load – settlement of pile groups – Analysis – Interaction between piles – end bearing and floating piles – Effect of pile cap – Piled raft – Application packages.

MODULE V Laterally Loaded Pile [10 Periods]
Load - deflection prediction for laterally loaded piles, subgrade reaction and elastic analysis, Interaction analysis, pile raft system, solutions through influence charts and Application packages.

TEST BOOKS:

1. Salgado,R., **"The Engineering of Foundations",** Tata McGraw Hill Education Private Limited, New Delhi, 2011.
2. Murthy, V.N.S., **"Advanced Foundation Engineering",** CBS Publishers, New Delhi, 2007. 3. Saran, S, **"Analysis and Design of Substructures",** Taylor & Francis Publishers, 2006

REFERENCE BOOKS:

1. McCarthy, D.F. **"Essentials of Soil Mechanics and Foundations",** Basic Geotechnics, Sixth Edition, Prenticce Hall, 2002.
2. Hemsley, J.A, **"Elastic Analysis of Raft Foundations",** Thomas Telford, 1998.
3. Selvadurai, A.P.S., **"Elastic Analysis of Soil Foundation Interaction",** Elsevier 1979.
4. Kurien, N.P., **"Design of Foundation Systems: Principles and Practices**" Narosa Publishing House, New Delhi, 1999.

E RESOURCES

1. https://nptel.ac.in/courses/105101004/6
2. https://nptel.ac.in/courses/105104136/Module%204/Lecture%2022.pdf
3. https://nptel.ac.in/courses/114106025/31

Course Outcomes:

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

1. Gain a general understanding on the nature of soil and the classification and evaluation of engineering properties of soil.
2. Recognize the Permeability characteristics of soils and seepage through soils
3. Compute the vertical stress at any depth by deferent methods and also understands the compaction characters.
4. Understand the stress distribution and settlement characteristics of soil when it is subjected to the application of external loads.
5. Evaluate the shear strength characteristics of soil.

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

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3		1		1	2	1						3	3	
CO 2	2	3	2	3	1	3	3	2	3	2			3	2	
CO 3	3	3	2	3	2	2	3	1	3	3			3	2	
CO 4	3	2	2	1	2	1	3		2	2			3	2	
CO 5	2	1	1			1	3	3	2	2			3	2	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80129	REHABILITATION AND RETROFITTING OF STRUCTURES	L	T	P
Credits: 3	[Professional Elective-III]	3	-	-

Prerequisites: Concrete Technology

Course Objective: To get the knowledge on causes of deterioration, assessment of distressed structures, repairing of structure and provides knowledge of Development of other advanced structural materials and technologies for execution for providing durable repairs and strengthening is the need of the day.

MODULE I: Deterioration & Damage of Structures [09 Periods]
Introduction– Deterioration of Structures – Distress in Structures – Causes and Prevention-Mechanism of Damage – Types of Damage.

MODULE II: Corrosion of Steel Reinforcement [09 Periods]
Corrosion of Steel Reinforcement– Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomena of Desiccation - Case Studies.

MODULE III: Inspection and Testing & Damage Assessment [10 Periods]
A: Inspection: Symptoms and Diagnosis of Distress
B: Testing & Damage assessment: Evaluation Models –Damage Testing Methods – NDT – Core Samples.

MODULE IV: Rehabilitation Methods and Repair of Structure [10 Periods]
Rehabilitation Methods – Grouting – Detailing – Imbalance of Structural Stability – Case Studies
Repair of Structure – Common Types of Repairs – Repair in Concrete Structures – Repairs in Under Water Structures – Guniting – ShotCrete – Underpinning – Epoxy - Cement Mortar Injection- Crack Ceiling.

MODULE V: Strengthening of Structures [10 Periods]
Strengthening of Structures– Strengthening Methods – Retrofitting – Jacketing - Health Monitoring of Structures – Use of Sensors – Building Instrumentation – Bridge Repairs – Seismic Strengthening.

TEST BOOKS:
1. W. H. Ranso, —"**Concrete Repair and Maintenance Illustrated"**, RS Means Company Inc 1st Edition,1981.
2. B.L. Gupta and Amit Gupta, —"**Maintenance and Repair of Civil Structures"**, Standard Publications New Delhi, 2nd Edition, 2007.

REFERENCES:
1. A.R. Shantakumar, —"**Concrete Technology**", Oxford University press, 2nd Edition, 2006.

2. Bungey, —"**Non-Destructive Evaluation of Concrete Structures**", 2nd edition, 2003
3. Bt. A. Richardson —"**Building Failures: Diagnosis and Avoidance**", EF & N Spon, London, 3rd Ediion, 1991.

E RESOURCES:

1. http://cpwd.gov.in/Units/handbook.pdf
2. https://www.smartzworld.com/notes/rehabilitation-retrofitting-structures-notes-pdf-rrs/
3. http://www.smrcorissa.org/
4. http://getreport.in/idea/rehabilitation-and-retrofitting-of-structures-nptel
5. http://getreport.in/idea/rehabilitation-and-retrofitting-of-structures-notes-nptel
6. https://www.youtube.com/watch?v=fikRPFpbgVo

Course Outcomes:

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

1. Understand the causes and prevention of deterioration in structures, interpret the types of damages and understand their mechanisms.
2. Categorize the causes and prevention mechanisms of corrosion in steel reinforcement and fire induced damages
3. Able to Examine to inspect and assess the structures using techniques of visual inspection and NDT
4. Estimate the structural damage and recommend suitable repair and strengthening methods.
5. Make use of the latest health monitoring and building instrumentation methods

CO- PO-PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1		1	3		2	3	2	1	2		2		2	2	
CO 2	1		2	2		2	2		1	1	2		2	1	
CO 3	2	2	1	2	3			1	2		2	1	1		1
CO 4			3		2	2	1	1	2			1	1	1	
CO 5					3	2		1		2	3	2	1	1	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80130	PRESTRESSED CONCRETE STRUCTURES	L	T	P
Credits: 3	[Professional Elective-III]	3	-	-

Prerequisites: Concrete Technology, DRCS

Course Objective: To understand types, systems and loss of prestressing. Design the flexural members for shear, bond and torsion and design the end blocks. Using the concept of linear transformation and cable profile. Analysis of composite section and their application in design of prestressed concrete bridges. To understand short term and long term deflections and their determination.

MODULE I: Introduction [09 Periods]

Historic development – General principles of prestressing pre tensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel and their characteristics.

MODULE II: Methods and Systems of Prestressing [10 Periods]

Methods and Systems of Prestressing: Pre tensioning and post tensioning methods and systems of pre stressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System, Lee McCall system,

Loss of Prestress: Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

MODULE III: Flexure and Shear [10 Periods]

A: Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons. Stress diagrams - Elastic design of simple PSC slabs and beams of rectangular and I-sections-kern line-cable profile and cable layout

B: Shear: General considerations- principal tension and compression- improving shear resistance of concerete by horizontal and vertical pre stressing and by using inclined or parabolic cables- Analysis of rectangular and I-beams for shear- Design of shear reinforcement- I.S.Code Provisions.

MODULE IV: Transfer of Prestress in Pre Tensioned Members [12 Periods]

Tansmission of pre stressing force by bond-transmission length- flexural bond stresses- IS code provisions- Anchorage zone stresses in post tensioned members-stress distribution in end block- Analysis by Guyon's, Magnel, Zienlinski and Rowe's methods-Anchorage zone reinforcement- I.S.Code provisions.

MODULE V: Composite Beams and Deflections [10 Periods]

Composite Beams: Different types- propped and unpropped – stress distribution-Differential shrinkage – Analysis of composite beams-General designs considerations.

Deflections: Importance of control of deflections – factors influencing deflections – short term deflections of uncracked members prediction of long term deflections-I.S.Code provisions.

TEST BOOKS:

1. Prestressed Concrete by Krishna Raju, - Tata Mc.Graw Hill Publications, 5th Edition, 2012
2. Prestressed Concrete by N.Rajasekharan, Narosa publications, 3rd Edition, 2009

REFERENCES:

1. Prestressed Concrete by Ramamrutham, Dhanpatrai Publications, 4th Edition 2013.
2. Design of Prestressed concrete structures by T.Y. Lin & Ned 3rd Edition, 2010.

REFERENCE CODES:

1. BIS code on prestressed concrete, IS 1343-2012

E RESOURCES:

1. https://en.wikipedia.org/wiki/Prestressed_concrete
2. https://www.pci.org/
3. http://nptel.ac.in/courses/105105105/
4. http://nptel.ac.in/courses/105106118/
5. http://www.nptel.ac.in/courses/105106117/

Course Outcomes:

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

1. Understand the materials used in pre stressed concrete & general principles of prestressing pre tensioning and post tensioning.
2. Behavior of pre tensioned and post-tensioned in pre stressed concrete structures & losses of pre stress in pre tensioned and post-tensioned members due to various causes.
3. Analysis and Design of section for the flexural and shear beams of pre tensioned and post- tensioned of pre stressed concrete.
4. Transfer of pre stress in pre tensioned member and post tensioned member and stress distribution in end block by various method.
5. Analysis and Design of composite beams and computation of short term & long term deflection in pre stressed concrete member.

CO- PO-PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1		1	3		2	3	2	1	2		2		2	2	
CO 2	1		2	2		2	2		1	1	2		2	1	
CO 3	2	2	1	2	3			1	2		2	1	1		1
CO 4			3		2	2	1	1	2			1	1	1	
CO 5					3	2		1		2	3	2	1	1	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80131	PLASTIC ANALYSIS AND DESIGN [Professional Elective-III]	L	T	P
Credits: 3		3	-	-

Prerequisites: Structural Analysis, DSS

Course Objective: To know the static and kinematic methods of plastic analysis and Analyze the continuous beams of uniform & different c/s. Analyze the single span frames and gable frames and to find out the deflections at working load & ultimate load.

MODULE I: Analysis of Structures for Ultimate Load [10 Periods]

Fundamental Principles–statical method of Analysis–Mechanism method of analysis – Method of analysis, Moment check – Carry over factor – Moment Balancing Method.

MODULE II: Design of Continuous Beams [09 Periods]

Continuous Beams of uniform section throughout–Continuous Beams with different cross-sections.

MODULE III: Secondary Design Problems [10 Periods]

A: Introduction–Influence of Axial force on the plastic moment–influence of shear force – local buckling of flanges and webs

B: lateral buckling – column stability.

MODULE IV: Design of Connections [09 Periods]

Introduction–requirement for connections–straight corner connections – Haunched connection – Interior Beam-Column connections.

MODULE V: Design of Steel Frames [10 Periods]

Introduction –Single span frames–simplified procedures for Single span frames – Design of Gable frames with Haunched Connection. Ultimate Deflections: Introduction – Deflection at ultimate load – Deflection at working load – Deflections of Beams and Single span frames.

TEST BOOKS:

1. L.S.Beedle, “Plastic Design of Steel Frames”
2. B.G.Neal, “Plastic Analysis”

REFERENCES:

1. Horve,“Plastic Analysis**”**

E RESOURCES:

1. http://www.aboutcivil.org/plastic-analysis-definition-principles.html
2. https://2cl405uvd.wordpress.com/2014/07/23/plastic-analysis-and-design-lecture-video-from-nptel/
3. http://www.steel-insdag.org/TeachingMaterial/chapter35.pdf
4. http://nptel.ac.in/courses/105106112/
5. https://www.youtube.com/watch?v=1y4RXCJOkTI

Course Outcomes:

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

1. Outline the different methods of plastic analysis of structures
2. Summarize the basic theorems of plastic analysis
3. Demonstrate the concept of deflection at collapse
4. Apply the techniques to the plastic analysis of beams and Frames
5. Outline the plastic analysis techniques useful for the design of various structural elements

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	2	3	3	-	3	1	-	-	-	-	1	-	2	1	-
CO 2	2	3	1	-	2	1	-	-	-	-	-	-	3	1	-
CO 3	2	1	2	-	3	1	-	1	-	-	-	-	2	1	-
CO 4	2	1	2	-	2	1	-	1	-	-	-	-	2	1	-
CO 5	3	2	1	-	1	1	-	-	-	-	2	-	2	1	-

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code:	OPEN ELECTIVE-I	L	T	P
Credits: 3		-	-	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80132	ENVIRONMENTAL ENGINEERING LAB	L	T	P
Credits: 1		-	-	2

Prerequisite: NIL

Course Objective: This course deals with the experiments conducted for characterization of water and municipal sewage.

LIST OF EXPERIMENTS:

1. Determination of pH and Turbidity
2. Determination of Conductivity and Total dissolved solids (Organic and Inorganic)
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides and Fluoride
5. Determination of Iron and Nitrates
6. Determination of Dissolved Oxygen.
7. Determination of Total Hardness and sulphates
8. Determination of B.O.D
9. Determination of C.O.D
10. Determination of Optimum coagulant dose.
11. Determination of Chlorine demand.
12. Presumptive Coli form test.

Course Outcomes:

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

1. Develop an understanding of the procedure for quantifying quality parameters pH, turbidity and hardness.
2. Learn the procedure for quantifying quality parameter chlorides and importance of chlorides, sulphate, and Total hardness in the field water supply.
3. Understand the procedure for quantifying quality parameter of biochemical oxygen demand and chemical oxygen demand and to infer on the strength of wastewater.

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

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	3	3	2	1	2	3	1	-	-	2	2		3	3
CO2	2	3	3	2	2	2	2	1	-	-	2	1		3	2
CO3	2	2	2	1	2	2	2	1	-	-	-	-		3	2
CO4	2	3	3	3	1	3	2	2	1	-	2	1		3	2
CO5	2	3	3	2	1	2	2	2	1	-	1	1		3	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80133	CADD LAB	L	T	P
Credits: 1		-	-	2

Prerequisite: NIL

Course Objective: Upon completion of this course, the student will be able to Analyse and Design problem solving in civil engineering disciplines using various design software programs such as AutoCAD, SketchUp, and Revit.

LIST OF EXPERIMENTS:

1. Introduction of structural analysis & Design software (STAAD.Pro)
2. Analysis of a Fixed Beam using STAAD
3. Analysis of a Propped cantilever beam using STAAD
4. Analysis of a Continuous beam using STAAD
5. Analysis of a single storied 2D Portal Frame using STAAD
6. Analysis of a Double storied 2D portal Frame using STAAD
7. Analysis of a 2D Trusses
8. Analysis of a 3D Trusses

Structural Detailing drawings of the following

9. Autocad Drawing: Foundation
10. Autocad Drawing: Stairs
11. Autocad Drawing: Lintels And Chejja
12. Autocad Drawing: Rcc Slabs And Beams
13. Autocad Drawing: Residential Building

Course Outcomes:

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

1. The students will be able to draft the plan, elevation and sectional views of the buildings, Industrial structures, and framed buildings.
2. The students will be able to analyze and design the simple structural members using computer software's.

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

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1			1		2					2			3		
CO2	2	3	3										3		3
CO3															
CO4															
CO5															

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: NIL		2	-	-

Prerequisites: NIL

Course Objective:

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

REFERENCE BOOKS:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi

2. SubashKashyap, 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. Raj Indian Government and Politics
7. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
8. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80134	STRUCTURAL ENGINEERING - II (STEEL)	L	T	P
Credits: 3		3	-	-

Prerequisite: Structural Analysis

Course Objective: To provide basic knowledge in the areas of limit state method and the concept of design of structural steel elements. Identify, formulate and solve engineering problems in steel structural elements subjected to tension, compression and flexure loads for steel elements such as beams, tension members, compression members, bolted and welded connections subjected to various load combinations.

MODULE I: Introduction and Connections [10 Periods]

Introduction Materials – Making of iron and steel – types of structural steel – mechanical properties of steel – Concepts of plasticity – yield strength. Loads and load combinations -local buckling behavior of steel. Concepts of limit State Design – Limit States of Strength/collapse – Limit state of Collapse serviceability.

Connections Types of connections- Bolted connections– IS – 800 – 2007 - specifications – Design strengths – efficiency of joint – prying action. Welded connections – Types of welded joints – specifications - Design strengths & requirements.

MODULE II: Tension Members [09 Periods]

Design of tension members– Design strength – Design procedure of splice - lug angle.

MODULE III: Compression Members [10 Periods]

A: Design of compression members – Buckling class – slenderness ratio / design strength – laced – battened columns

B: column splice – column bases.

MODULE IV: Beams [10 Periods]

Design of Beams – Plastic moment – Bending and shear strength / buckling – Built-up sections – laterally supported beams. Design of eccentric connections in both bolted & welded–Design of bolted and welded beam connections– [Framed/un-stiffened / Stiffened seat connection].

MODULE V: Roof Truss [09 Periods]

Design of roof trusses – Types of roof trusses, loads on trusses – Purlin design – Truss design.

TEST BOOKS:

1. S.K. Duggal , **"Limit State Design of steel structures",** Tata McGraw-Hill, 2nd Edition-2010
2. S.S. Bhavikatti , **"Design of steel structures",** IK international Publication House, New Delhi, 2nd Edition-2010.

REFERENCE BOOKS:

1. Edwin H. Gaylord, Jr. Charles N. Gaylord , **"Design of Steel Structures"** 3rd Edition 1991

2. Ramchandra, **"Design of Steel Structures" Vol. 1 & 2** –Standard Publications, 1st Edition1992
3. N. Subramanian, **"Design of steel structures"** –, Oxford University Press – 2nd Edition 2009.

REFERENCE CODES:

1. IS Code 800-2007
2. IS Code 875 Part 1-5
3. IS Code 808- Steel Tables

E RESOURCES:

1. http://elearning.vtu.ac.in/13/ENotes/DSS/MCN%2006CV72%20VTU%20notes.pdf
2. http://www.aboutcivil.org/steel-structure-lectures-class-notes.h
3. https://www.journals.elsevier.com/journal-of-constructional-steel-research
4. http://nptel.ac.in/courses/105106112/
5. http://nptel.ac.in/courses/105106113/

Course Outcomes:

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

1. Apply the basic requirements of the IS: 800-2007 design specifications for steel structural elements.
2. Analyze the behavior of bolted connections and welded connections and design them for both axial and eccentric forces
3. Design of steel members subjected to compression and tension members using simple and built-up sections
4. Design of Beams and Plate Girders subjected to Loadings.
5. Design of Roof Truss and its joints, end bearings.

CO- PO-PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	-	-	2	-	-	3	2	1	1	-	2		1	1	-
CO 2	1	3	2	-	3	1	-	1	-	-	1	-	3	2	1
CO 3	1	1	2	-	3	-	-	1	-	-	1	-	3	1	1
CO 4	1	1	2	-	3	-	-	1	-	-	1	-	3	1	1
CO 5	1	1	1	-	2	-	-	1	-	-	1	-	3	1	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80135	ESTIMATING COSTING AND CONSTRUCTION MANAGEMENT	L	T	P
Credits: 3		3	-	-

Prerequisites: Building materials construction and Planning

Course Objective: To understand that estimates of different items of works and their cost estimates are fundamentals. To know about various types of contracts, tenders, valuations and specifications.

MODULE I: **[10 Periods]**

General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating, Detailed Estimates of RCC Buildings

MODULE II: **[10 Periods]**

A: Reinforcement bar bending and bar requirement schedules of Beams- Lintel cum Sunshade, slabs and Column Footings.

B: Rate Analysis – Working out data for various items of work over head and contingent charges.

MODULE III: **[10 Periods]**

A: Contracts: Types of contracts – Contract Documents – Conditions of contract. Valuation of buildings.

B. Standard specifications: Specifications for different items of building construction. Tender, Tender forms, Tender notice, Tender Documents, E tender, Work order

MODULE IV: Construction Planning And Management **[09 Periods]**

Significance of Construction Management, Objectives and Functions of Construction Management, Types of Construction, Resources for Construction Industry, Various stages in Construction, Construction Management Team & Types of Organization.

MODULE V: Contract Management

A:Contract Management: **[09 Periods]**

Types of Construction Contracts and their advantages and disadvantages, Contract Document and conditions of contract. Estimation and its types. Significance of Safety & Quality in construction work.

B:Bidding

Definition and Process, Various steps in Bidding, M Book- Muster Roll, Earnest money & Security Deposit,

TEST BOOKS:

1. B.N. Dutta, "**Estimating and Costing"** UBS publishers, 28th Edition 2016.
2. G.S. Birdie, "**Estimating and Costing"** Dhanapati rai Publications, Edition 2014
3. P.S. GAHLOT, B.M. DHIR., "**Construction Planning and Management**" Wiley Eastern Limited, 1992.

REFERENCES:

1. M.Chakraborthi "**Estimating and Costing & Specifications**", UBS Publications, Edition 2006.
2. Kohli, D.D and Kohli, R.C., "**A Text book of estimating and costing(CIVIL)**", S.Chand & Company Ltd., Revised Edition.
3. Chitkara, K.K., "**Construction Project Management"**, Tata McGraw Hill Publishing Co, Ltd., New Delhi, 1998.

REFERENCES CODES:

1. Standard Schedule of rates and standard data book by public works department.
2. I.S. 1200 [Parts I to XXV – 1993 method of measurement of building and Civil Engineering works – B.I.S.]
3. National Building codes.

E RESOURCES

1. www.costeng-solutions.com/detailed_estimating.htm
2. study.com/academy/.../contract-law-terms-definitions-contract-types.html
3. http://ascelibrary.org/doi/abs
4. www.bv-solutions.co.uk/building...validation/building-claims-validation
5. http://nptel.ac.in/courses/108105059/
6. http://nptel.ac.in/courses/105103093/14

Course Outcomes:

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

1. Gain knowledge on various Building items, their standard units and principles.
2. Estimate quantity of each item for RCC buildings by different methods of estimation.
3. Evaluate various types of contracts, valuations, tenders and specifications.
4. Understand objectives functions and types of organizations in construction managements.
5. Understand the ypes of contracts and process of bidding.

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

CO S	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	3								3	3	
CO2	3	2	2	1	3				1				3	2	
CO3	3	3	3	3	3	3	2		3	3	3		3	2	
CO4	3	2	2		3								3	2	
CO5	3	3	3	2	3	3				2	3		3	2	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80136	TRAFFIC ENGINEERING AND MANAGEMENT [Professional Elective-IV]	L	T	P
Credits: 3		3	-	-

Prerequisite: Transportation Engineering

Course Objective: To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well.

MODULE I: Traffic Planning and Characteristics [09 Periods]
Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India – Integrated planning of town, country, regional and all urban infrastructure – Towards Sustainable approach. – land use & transport and modal integration.

MODULE II: Traffic Surveys [09 Periods]
Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including non motorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses - Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting

MODULE III: [10 Periods]
A: Traffic flow and Control
Traffic Flow Parameters - Categories of Traffic flow- Analysis of speed, flow and density relationship- Highway capacity and Level of service - Types and factors affecting.
B: Traffic Signs, Road Markings, Design of pretimed traffic signals and Signal Co-ordination, Traffic control Aids and Street Furniture.

MODULE IV: Design of Traffic engineering facilities [10 Periods]
Introduction, Types of intersections, Design considerations, Traffic control devices, Conflict areas at intersections, Types of Intersection controls. Types of interchanges. Design of Rotary - Bus stop location and bus bay design - Street lighting- Planning and design of pedestrian facilities.

MODULE V: Trafic Management and Environnemental Control [10 Periods]
Traffic Management- Transportation System Management (TSM) and Travel Demand Management (TDM), Restrictions on Turning Movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal Flow Operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS). Air & Noise pollution of different transport modes.

TEST BOOKS:

1. Kadiyali.L.R. "**Traffic Engineering and Transport Planning**", Khanna Publishers, Delhi, 7th Edition, 2013.
2. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.

REFERENCES

1. Patha Chakraborty and Animesh Das, Principles of Transportation Engineering, Prentice Hall of India, 2nd Edition, 2005.
2. Roger P.Roess, Elena S.Prassas and William R.Mcshane, Traffic Engineering, 4th Edition, Prentice Hall, 2010.

E RESOURCES

1. http://nptel.ac.in/downloads/105101008/
2. http://www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Transportation%20Engg%20I/TOC.htm
3. http://textofvideo.nptel.iitm.ac.in/1054/lec2.pdf

Course Outcomes:

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

1. Understand the various road user and vehicular characteristics
2. Conduct various traffic surveys for collecting traffic data.
3. Understand the relationship between traffic flow parameters and the principles of signal design.
4. Understand the principles of design of various traffic engineering facilities.
5. Recognize various methods of traffic management and certain aspects of vehicular pollution

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

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3		1		1	2	1					3	3		
CO 2	2	3	2	3	1	3	3	2	3	2		3	2		
CO 3	3	3	2	3	2	2	3	1	3	3		3	2		
CO 4	3	2	2	1	2	1	3		2	2		3	2		
CO 5	2	1	1			1	3	3	2	2		3	2		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80137	PAVEMENT DESIGN [Professional Elective-IV]	L	T	P
Credits: 3		3	-	-

Prerequisite: Transportation Engineering

Course Objective: To develop an understanding of types of pavements, stresses in flexible and rigid pavements and design them.

MODULE I: Factors Affecting Pavement Design [10 Periods]

Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

MODULE II: **[10 Periods]**

Introduction to Stresses In Pavements: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements

Stresses In Flexible Pavements and Rigid Pavements: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts, Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars

MODULE III: Design of Flexible Pavements and Design of Rigid Pavements [10 Periods]

A: Design of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods.

B: Design Of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Pre stressed and Continuously Reinforced Cement Concrete Pavement Design.

MODULE IV: Pavement Material Characterization [09 Periods]

Pavement Material Characterization: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex [Dynamic] Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilization and Use of Geo Synthetics.

MODULE V: **Design of Pavement for Low Volume Roads and Over Lays**

[09 Periods]

Design Of Pavement For Low Volume Roads Pavement design for low volume roads, Rural road designs – code of practices.

Design Of Over Lays Types of Overlays, Suitability, Design of Overlays Benkelmen beam- flexible overlay over a flexible pavement, flexible overlay over a rigid pavement, rigid overlay over a flexible pavement, rigid overlay over a rigid pavement.

TEST BOOKS:

1. L R Kadyali, "Principles and Practices of Highway Engineering, 4th Edition 2004, Khanna Publishers , New Delhi.
2. S.K.Sharma, "Principles, Practice and Design of Highway Engineering" 2nd Edition 2012, S.Chand and Company.

REFERENCES:

1. Yoder.J. & Witzorac Mathew, "Principles of Pavement Design", Wiley India Pvt Ltd; 2nd Edition, 2011
2. Yang H. Huang, "Pavement Analysis & Design**"**, Pearson Education; 2nd Edition 2008.

REFERENCE CODES:

1. IRC: 37-2012. Guidelines for the Design of. Flexible Pavements
2. IRC: 58-2012. Guidelines for the Design of. Rigid Pavements
3. IRC: SP: 62-2004. Guidelines for low volume Rural road designs

E RESOURCES

1. https://www.civil.iitb.ac.in/~kvkrao/uploads/5/9/3/7/59372049/ce742lec_14new.pdf
2. http://gnindia.dronacharya.info/CivilDept/Downloads/question_papers/Vsem/Transportation-Engg-1/Unit-3/Flexible-Rigid-Pavements.pdf
3. https://drive.google.com/file/d/0B6ehKjDUHJiGMzNtNjFxT1U0cm8/view
4. http://nptel.ac.in/downloads/105101087

Course Outcomes:

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

1. Identify various types of pavements and the factors affecting.
2. Analyze the stresses in flexible and rigid pavements.
3. Design flexible and rigid pavements.
4. Characterize the different pavement materials.
5. Design of low volume roads and overlays.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	3		1		1	2	1					2	3		
CO 2	2	3	2	3	1	3	3	2	3	2		3	3		
CO 3	3	3	2	3	2	2	3	1	3	3		2	3		
CO 4	3	2	2	1	2	1	3		2	2		1	3		
CO 5	2	1	1			1	3	3	2	2		1	3		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80138	PUBLIC TRANSPORTATION [Professional Elective-IV]	L	T	P
Credits: 3		3	-	-

Prerequisite: Transportation Engineering

Course Objective: Student will understand and apply basic concepts and methods of urban transportation planning in the India.

MODULE I: Introduction [10 Periods]

Role of transportation in the economic development of nations, overview of transport modes, growth trends, National Transport Policy of India – Case studies, transportation planning in the developing world; and comparative international transportation policies; Fundamentals of transportation , Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems; formulation of community goals and objectives, inventory of existing conditions; transportation modeling trip generation, distribution, modal choice, assignment

MODULE II: Data Collection and Inventories [10 Periods]

Collection of data – Organization of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

MODULE III: Travel Demand Issues [10 Periods]

A: Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes.

B: Assumptions in Demand Estimation, Detailed approach on 4 step travel demand estimation; Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

MODULE -IV: Demand Analysis and Supply Analysis Planning [09 Periods]

Planning for sustainable urban mobility, positive and negative externalities in urban transport, congestion pricing, parking policy, demand management , Urban travel and transportation system characteristics - a systems perspective, Data management and use in decision making, Demand analysis, Urban activity analysis, Supply analysis; Plan Preparation And Evaluation: Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis

MODULE -V: Metropolitan Cities [09 Periods]

Design issues in urban mobility, integrating land use and transport planning; , Overview of urbanization process, city structure and urban activity and infrastructure systems, Economic and social significance of urban infrastructure systems; Transport's Role in tackling Social Inclusion, Economic Impacts of Transport Policy.

TEST BOOKS:

1. Dr.L.R.Kadyali, "Traffic Engineering & Transportation Planning" –Khanna Publications – 6th Edition 1997
2. M.J.Bruton" Introduction To Transportation Planning", Hutchinson Of London Ltd, 7th Edition 2000.

REFERENCES:

1. Partha Chakraborty and Animesh das, "Principles of Transportation Engineering", Prentice Hall, India– 6th Edition 1997
2. Flaherty, C.A.O. "Highway Engineering", Edward Arnold, London, – 6th Editions 1986.

E RESOURCES

1. http://tripp.iitd.ernet.in/delhibrts/metro/Metro/public%20trpt%20systm%20%2 review.pdf
2. http://www.vtpi.org/tranben.pdf
3. http://www.ncsl.org/Portals/1/Documents/transportation/P3_State_Statutes.pdf
4. http://nptel.ac.in/courses/105106058/
5. http://nptel.ac.in/courses/105107067/

Course Outcomes:

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

1. Design and conduct surveys to provide the data required for transportation planning. Learn and understand zonal demand generation and attraction regression models.
2. Learn and understand demand distribution models (gravity models) and modal split models for mode choice analysis.
3. Develop and calibrate trip generation rates for specific types of land use developments.
4. Make final decisions among planning alternatives that best integrate multiple objectives such as technical feasibility and cost minimization.
5. Understand land use and planning issues related to metropolitan Cities.

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

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3		3	3	3				3	2			2	3	
CO 2	3	3	3	3	3				2	3			3	3	
CO 3	3	2	2	2	3				3	3			2	3	
CO 4	3	1		2	3					1			3	3	
CO 5	3			1	3				2	3			3	3	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80139	ENVIRONMENTAL IMPACT ASSESSMENT AND LIFE CYCLE ANALYSIS [Professional Elective-V]	L	T	P
Credits: 3		3	-	-

Prerequisite: Environmental Studies

Course Objective: 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.

TEST 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%20methodologies.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**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	2	1	3	3		3	3	3	2	2			2	3	
CO 2			2	3		2	1	3	3	2			3	3	
CO 3			3	2	3	2	2	1	3	2			2	3	
CO 4							3	2	3	3			3	3	
CO 5							3	3	2	3			3	3	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80140	SOLID AND HAZARDOUS WASTE MANAGEMENT [Professional Elective-V]	L	T	P
Credits: 3		3	-	-

Pre-requisites: Environmental Studies

Course Objectives:
The main objective of this course is to provide in-depth knowledge about handling of solid waste from cradle to grave. It also provides the knowledge of designing and constructing the solid waste treatment systems.

MODULE I: Introduction to Municipal Solid Waste [09 periods]
Definition - Sources and Impacts of solid waste on environment, Classification of solid waste- composition and its determinants of Solid waste-factors influencing generation-quantity assessment of solid wastes-methods of sampling and characterization.

MODULE II: Integrated Solid Waste Management [09 periods]
Collection: Collection of Solid waste, equipments, time and frequency of collection, factors affecting collection, analysis of collection system, collection routes.
Transfer and Transport: Need for transfer operation, transfer stations – types – transport means and methods – location of transport stations Transfer stations & design requirements.

MODULE III: Hazardous Waste Management
A: Introduction to Hazardous Waste [10 Periods]
Definition, Identification, Characteristics and Classification, Sources, Collection and Transport.
B: Hazardous waste Treatment [6 Periods]
Physical & chemical Treatment: Solidification and Stabilization, Thermal: Incineration, Pyrolysis, Biological: Aerobic, Anaerobic and Biochemical.

MODULE IV: Waste to Energy options [10 Periods]
Introduction- Five WtE Technologies, Composting, principles of composting, factors affecting composting, vermi composting, Landfill technique, and design and operating procedure of landfill.

MODULE V: Solid & Hazardous Waste Management Legislations [10 Periods]
Solid waste management Hierarchy, waste avoidance /waste prevention, Definition of source Reduction, waste reduction at source using 5R's Technique, Solid and Hazardous waste management rules and regulations.

TEST BOOKS:

1. Jimmy Alexander Faria Albanese, M. Pilar Ruiz, **"Solid Waste as a Renewable Resource: Methodologies"**, Apple Academic Press, 1st edition, 2015.
2. Sunil Kumar, "**Municipal Solid Waste Management in Developing Countries",** CRC Press, 1st edition, 2016.

REFERENCE BOOKS:

1. P. Jayarama Reddy, **"Municipal Solid Waste Management: Processing - Energy Recovery - Global Examples",** CRC Press - BS Publications 1st edition, 2015.
2. Elena Cristina Rada, "**Solid Waste Management: Policy and Planning for a Sustainable Society",** Apple Academic Press, 1st edition, 2016.
3. Syeda Azeem Unnisa, S. Bhupatthi Rav, "**Sustainable Solid Waste Management",** Apple Academic Press, 1st edition, 2012.

E RESOURCES

1. http://www.cyen.org/innovaeditor/assets/Solid%20waste%20management.pdf
2. http://www.slideshare.net/ebchandar/solid-waste-management-5942441
3. http://www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.pdf

Course Outcomes:

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

1. Acquire knowledge in classification of solid waste and quality assessment methods of sampling.
2. Understand the solid waste collection and transport methods, and other design requirements, operational maintenance.
3. Gain knowledge in waste processing techniques and to engage in reduce and recycle, and reuse methods
4. Identify different techniques for waste disposal
5. A broad understanding about solid waste management techniques.

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

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3		1		1	2	1					2	3		
CO 2	2	3	2	3	1	3	3	2	3	2		3	3		
CO 3	3	3	2	3	2	2	3	1	3	3		2	3		
CO 4	3	2	2	1	2	1	3		2	2		3	3		
CO 5	2	1	1			1	3	3	2	2		3	3		

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80141	RURAL WATER SUPPLY AND ONSITE SANITATION SYSTEM [PROFESSIONAL ELECTIVE –V]	L	T	P
Credits: 3		3	-	-

Pre-requisites: Environmental Engineering

Course Objectives:

The main objective of this course is to provide in-depth knowledge about rural water supply and sanitation, the problems associated in rural water supply and treatment. It also provides the knowledge to design more publicly acceptable low cost onsite sanitation systems.

MODULE I **[10 periods]**

Concept of environmental and scope of sanitation in rural areas, Magnitude of problem of water supply and sanitation, Selection and development of preferred sources of water, springs, wells and infiltration galleries, collection of raw water from surface source, National rural drinking water program- rural water quality monitoring and surveillance- operation and maintenance of rural water supplies

MODULE II **[10 periods]**

Drinking water quality, Relationships between diseases and water quality, hygiene and sanitation, Need for water treatment, low cost water treatment: filters, bio-sand filters, disinfection systems for rural areas, chlorination, Solar disinfection systems, and Specific contaminant removal systems: removal of arsenic, fluoride and iron.

MODULE III **[10 periods]**

A: Planning of distribution system in rural areas, Water supply through spot sources, hand pumps, open dug –well, Water supply during fairs, festivals and emergencies.

B: Improvised method and compact system of treatment of surface and ground waters such as MB settlers, slow and sand filter, chlorine diffusion cartridge, Treatment and disposal of wastewater/sewage, various methods of collection and disposal of night soil.

MODULE IV **[09 periods]**

Onsite sanitation system: Advantages and disadvantages, importance of hydrogeology on selection of onsite sanitation systems, Design of Septic tanks, single pit and double pit toilets.

MODULE V **[09 periods]**

Disposal of solids waste: composting, land filling and Biogas plants-Design & operating procedure.

TEST BOOKS:

1. Low cost on site sanitation option, Hoffman & Heijno Occasional Nov.1981
2. Wagner, E.G. and Lanoik, J.N. water supply for rural areas and small communities, Geneva: W.H.O.1959.

3. Manual of water supply and treatment, 3rd edition, CPHEEO, GOI, New delhi.

Course Outcomes:

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

1. Analyze the water samples for various quality parameters
2. Acquire Relationships between diseases and water quality, hygiene and sanitation
3. Explain the concepts Treatment and disposal of wastewater/sewage,
4. Understand the importance of hydrogeology on selection of onsite sanitation systems.
5. Acquire knowledge about Disposal of solids waste

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	2	2	2	3	2	2	3	2	1	-	1	1	2	3	2
CO 2	2	1	1	2	1	3	3	2	1	-	1	2	2	2	1
CO 3	2	1	2	2	1	2	2	1	1	-	1	1	2	3	2
CO 4	2	2	2	2	1	2	2	1	1	-	1	2	3	2	1
CO 5	2	2	2	2	1	2	2	2	1	-	2	1	2	2	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:	OPEN ELECTIVE-II	L	T	P
Credits: 3		3	-	-

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80142	REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEM	L	T	P
Credits: 2		2	-	-

Prerequisite: Surveying

Course Objective: To understand the principles, applications, trends and pertinent issues of geographical information systems and sciences, including remote sensing [RS], photogrammetry, cartography, and global positioning system [GPS] in data and information acquisition, extraction, management and analysis; spatial and statistical modeling; mapping and visualization and apply vector and raster spatial data, particularly with regard to local/ state/national issues, emphasizing lands in and near it.

MODULE I: Basic Concepts of Photogrammetry [07 Periods]

Development and classification of Photogrammetry, Aerial Photogrammetric processes: acquisition of data, classification of photographs, photographic scale, relief displacement, flight planning, stereo Photogrammetry, Stereo model compilation, principal and use of stereoscopic 3D view, Orthorectification, Orientation and triangulation, DEM Generation, Map Vs Mosaic, ground control, parallax measurements for height determinations.

MODULE II: Remote Sensing [06 Periods]

Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite, visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

MODULE III: Geographical Information Systems and Data Representation [06 Periods]

A: Geographical Information Systems Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

B. Types of Data Representation Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS- file management, spatial data- layer based GIS, Feature based mapping.

MODULE IV: GIS Spatial Analysis [06 Periods]

Computational analysis methods [CAM], Visual analysis method, data storage- vector data storage, attribute data storage, overview of data manipulation and analysis, integrated analysis of spatial and attribute data.

MODULE V: Applications of GIS [07 Periods]

Land use/ land cover in water resources, surface water mapping and inventory, Rainfall – Runoff relations and runoff potential indices of watersheds , flood and drought impact assessment and monitoring, watershed management for sustainable development and watershed characteristics, reservoir sedimentation, fluvial

geomorphology, water resources management and monitoring, ground water targeting, identification of sites for artificial recharge structures, drainage morphometry, inland water quality survey and management, water depth estimation and bathymetry.

TEST BOOKS:

1. LRA Narayana., "**Remote sensing and its applications"**, University Press, 1st Editon, 2014.
2. Peter A Burrough and Rachael A. Mc Donnell, "**Principals of Geo physical information systems"** Oxford Publishers, 1st Editon, 2004.

REFERENCES:

1. C.P.Lo Albert, K.W. Yonng, "**Concepts & Techniques of GIS"**, Prentice Hall [India] Publications, 1st Editon, 2002.
2. M. Anji Reddy, "**Remote sensing and GIS"**, B.S.Publications, JNTU Hyderabad 1st Editon, 2001.
3. S.Kumar, "**Basics of Remote sensing and GIS"**, Laxmi publications, 1st Editon, 2005.

E RESOURCES:

1. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/resource/tutor/fundam/pdf/fundamentals_e.pdf.
2. http://www.pasda.psu.edu/tutorials/gisbasics.asp.
3. http://www.crisp.nus.edu.sg/~research/tutorial/intro.htm.

Course Outcomes:

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

1. Analyse the principles and components of photogrammetry and remote sensing, gain skills in image analysis and interpretation in preparing thematic maps.
2. Acquire skills in handling instruments, tools, techniques and modelling while using Remote sensing Technology.
3. Explain the concepts and fundamentals of GIS.
4. Understand the data models and data structures used for spatial data and able to perform geospatial analysis and network analysis.
5. Acquire knowledge about remote sensing and GIS in the different civil engineering applications.

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

CO S	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3		3	3	3				3	2			2	3	
CO 2	3	3	3	3	3				2	3			3	3	
CO 3	3	2	2	2	3				3	3			2	3	
CO 4	3	1		2	3					1			3	3	
CO 5	3			1	3				2	3			3	3	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80143	REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEM LAB	L	T	P
Credits: 1		-	-	2

Prerequisites: NIL

Course Objective: Identify different objects and components present in a remote sensing image using visual image interpretation technique. Classify an image into different classes using supervised and unsupervised classification techniques. Understand the basic concepts and components of GIS. Acquire knowledge on creating maps and the techniques used for storage of spatial data and data compression with GIS.

List of Experiments:

REMOTE SENSING:

1. Arial photograph interpretation
2. Visual interpretation of multispectral and panchromatic image
3. Image classification, supervised and unsupervised classifications

GIS:

1. Analog to Digital Conversion – Scanning methods
2. Introduction to software
3. Digital database creation – Point features, Line features, Polygon features
4. Data Editing-Removal of errors – Overshoot and Undershoot, Snapping
5. Data Collection and Integration, Non-spatial data attachment working with tables
6. Dissolving and Merging
7. Clipping, Intersection and Union
8. Buffering techniques
9. Spatial and Attribute query and Analysis
10. DEM

Course Outcomes:

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

1. Perform remotely sensed image classification and identify different objects and components present in an image using visual image interpretation technique.
2. Create a new digitized map and introduce GIS data structures, data input and data presentation
3. Perform different data management tasks using various GIS MODULEs.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	2	1			1									2	3
CO 2	1		2	1										3	3
CO 3	1	2		2	1									2	3
CO 4	2		2	1										3	3
CO 5	1	2			1	2	1							3	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80P01	INTERNSHIP – III / MINI PROJECT	L	T	P
Credits: 2		-	-	4

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80P02	PROJECT STAGE-I	L	T	P
Credits: 2		-	-	4

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80144	IRRIGATION STRUCTURES AND WATER POWER ENGINEERING	L	T	P
Credits:3		3	-	-

Prerequisites: Foundation Engineering, Hydraulics & Hydraulic machinery, Engineering Geology, Water resources engineering.

Course Objective: Design of multi-purpose water retaining structures, to develop skills in the mathematical modeling of both natural and engineered water resource systems that are used to analyze system components.

MODULE I: Gravity Dams [09 Periods]

Definition of Dam, Types of Dams, Introduction to Gravity Dam, Forces acting on a gravity dam, causes of failure of a gravity dam. Elementary profile and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety - Stability Analysis, Foundation for a Gravity Dam, drainage and inspection galleries.

MODULE II: Earth Dams and Spillways [10 Periods]

Earth Dams: Introduction to Earth dams, Types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam- graphical method, measures for control of seepage

Spillways: Introduction and significance of Spillways, Types of spillways, Design principles of Ogee spillways - Spillway gates. Energy Dissipaters and Stilling Basins - USBR and Indian types of Stilling Basins. Significance of Jump Height Curve and Tail Water Rating Curve.

MODULE III: Diversion Head Works and Weirs on Permeable Foundations [10 Periods]

A: Diversion Head Works: Introduction to Diversion works, Types of Diversion head works- weirs and barrages, layout of diversion head work, Components. Silt Ejectors and Silt Excluders, Causes and failure of Weirs and Barrages on permeable foundations.

B: Weirs on Permeable Foundations: Creep Theories, Bligh‘s, Lane‘s and Khosla‘s theories, Determination of uplift pressure various Correction Factors – Design principles of weirs on permeable foundations using Creep theories - exit gradient, U/s and D/s Sheet Piles - Launching Apron.

MODULE IV: Canal Falls, Cross Drainage Works [10 Periods]

Canal Falls: Definition of canal fall/drop, Types of falls and their location, Design principles of Notch Fall and Sarda type fall. Canal regulation works, design principles of distributory and head regulators, Canal Cross Regulators, canal outlets, types of canal MODULEs, proportionality, sensitivity and flexibility.

Cross Drainage Works: Introduction and significance of cross drainage works, Types, selection of site, Design principles of aqueduct, siphon aqueduct and super passage. Design of Type II Aqueduct (Under Tunnel)

MODULE V: **Water Power Engineering [09 Periods]**

Development of hydro power in India, assessment of available power, Utilization factor, load factor, diversity factor, storage and pondage, types of hydro power schemes, Components of hydel schemes – fore bay, intake structure, trash racks,

water hammer, surge tanks, substructure and super structure of power house .

TEST BOOKS:

1. S.K. Garg, "**Irrigation Engineering and Hydrology Structures**", Khanna Publishers, Delhi, 23rd Edition, 2009.
2. K.R.Arora, "**Irrigation, Water Power and Water Resources Engineering**" 3rd Edition, Standard Publishers Distributors, 2010.

REFERENCES:

1. P.N.Modi, "**Irrigation, Water Resources and Water Power Engineering**", Standard Book House, Delhi-6, 6th Edition 2004.
2. B.C. Punmia and Pande B.B.Lal "**Irrigation and Water Power Engineering**", Laxmi Publications Pvt. Ltd., New Delhi, 18th Edition, 2006.
3. R.S.Varshney, S.C. Gupta, and R.L. Gupta, "**Theory & Design of Irrigation Structures**" Vol.II, Nem Chand & Bros., Roorkee, 6th Edition, 1993.
4. ***S. K. Garg, "****Water Supply Engineering*****: "Environmental Engineering"*** Vol.I Khanna Publications, 2010, New Delhi.

E RESOURCES:

1. http://nptel.tvm.ernet.in/Syllabus.php?syl=Civil_Eng/WaterResEngg.php&sub=civil&semSemester%207.
2. http://ww.slb.com›...›WaterServices›WaterResources›Engineering.
3. http://Hyd.uod.ac/material/CE404_02_Seepage_Theories.pdf.

Course Outcomes:

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

1. Understand the need and mode of irrigation by designing the gravity dams and ability to handle and plan any type of irrigation project.
2. Design hydraulic structures such as earth dams and spillways and water flow controlling and management devices.
3. Gain knowledge about creep theories and design of structures on permeable foundations and their management.
4. Understand Design of man-made water carrying structures and their regulatory works.
5. Acquire knowledge about hydel power.

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

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	1	-	-	-	-	-	-	-	2	3	
CO 2	3	3	3	3	1	-	-	-	-	-	-	-	3	3	
CO 3	3	2	3	3	-	-	-	-	-	-	-	-	2	3	
CO 4	3	3	3	2	-	-	-	-	-	-	-	-	3	3	
CO 5	3	2	2	-	-	-	-	-	-	-	-	-	3	3	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: 80145	ADVANCED REINFORCED CONCRETE DESIGN [Professional Elective-VI]	L	T	P
Credits: 3		3	-	-

Course Objectives:
To study the fundamentals of designing advanced RCC structure like Deep beam, Corbel, Curved beam, Domes and Multi storied buildings.

MODULE I: Design of RC Deep Beams and Corbels [10 Periods]
Introduction, Minimum thickness, Steps of Designing, Design by IS456 method, Checking for Local Failures, Detailing, Design of corbel, Analysis for design forces, Determination of reinforcement

MODULE II: Design of Beams Curved in Plan [09 Periods]
Introduction, Circular beam symmetrically supported, Semi-circular beam supported on three equally spaced columns.

MODULE III: Redistribution of Moments in RC beams [10 Periods]
A. Introduction, Redistribution of moments in a fixed beam, Position of points of contra flexures, conditions for moment redistribution, Final shape of redistributed bending moment diagram.
B. Moment redistribution for a two span continuous beam, Advantages and disadvantages of moment redistribution, Modification of clear distance between bars in beams (for limiting crack width) with redistribution.

MODULE IV: Design of Domes [09 Periods]
Introduction, Stresses in domes, Formulae for forces in spherical domes, Design of a spherical dome

MODULE V: Design of Multi-Storey Buildings [10 Periods]
Introduction, Example frame, Structural layout, Estimation of loads, Load combinations, Analysis, Design of elements of frames, Use of computer software for analysis and design, Design example.

TEST BOOKS
1. Dr. H. J. Shah, "**Reinforced Concrete**", Vol-1 and Vol-2, Charotar, 8th Edition – 2009 and 6th Edition – 2012 respectively.
2. P.C Varghese "**Advanced Reinforced Concrete Design**" -. Prentice Hall of India – 2004.

REFERENCES

1. N. Krishna Raju "**Advanced Reinforced Concrete Design**", 2nd edition, CBS Publishers and Distributors.- 2009.
2. M.L.Gambhir, "**Design of Reinforced Concrete Structures**", PHI Pvt. Ltd, New Delhi, 2008 4. IS456, SP16, SP34

E – RESOURCES

1. http://nptel.ac.in/courses/105105105/
2. http://nptel.ac.in/noc/individual_course.php?id=noc17-ce23
3. http://www.darshan.ac.in/DIET/CI/137/advanced-design-of-concrete-structures/SubjectDetail

Course Outcomes:

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

1. Understand the concept of designing a deep beam.
2. Design beams curved in plan.
3. Idealize the concept of moment redistribution.
4. Analyze and design a spherical dome.
5. Analyze and design a multistoried building.

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	3	3	3	3	3	1	-	-	-	-	-	-	-	2	3
CO 2	3	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO 3	3	3	2	3	3	-	-	-	-	-	-	-	-	2	3
CO 4	3	3	3	3	2	-	-	-	-	-	-	-	-	3	3
CO 5	3	3	2	2	-	-	-	-	-	-	-	-	-	3	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: 80146	PRINCIPLES OF BRIDGE ENGINEERING [Professional Elective-VI]	L	T	P
Credits: 3		3	-	-

Prerequisite: DRCS, PSC

Course Objective: Develop an understanding of basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality intuitive feeling about the sizing of bridge elements. Understand the load flow mechanism and identify loads on bridges.

MODULE I: Introduction to Concrete Bridges [10 Periods]
Introduction- History of Bridges – Types of Bridges, Components of Bridge and its definitions- Classification of Bridges - Selection of Site and Initial Decision Process - Survey and Alignment; Geotechnical Investigations and Interpretations. -Economic span length

MODULE II: Loads on Bridges [10 Periods]
Types of loading-Dead load-live load-Impact Effect-Centrifugal force-wind loads-Lateral loads-Longitudinal forces-Seismic loads-Frictional resistance of expansion bearings, IRC bridge loading standards, Load combinations for different working state and limit state designs

MODULE III: Stresses and design requirements [10 Periods]
A: Secondary Stresses-Temperature Effect- Erection Forces and effects-
B: Width of road way and footway-General Design Requirements of bridges

MODULE IV: Solid Slab Bridges [09 Periods]
Introduction-Method of Analysis and Design-Box Culverts, Pipe Culverts

MODULE V: Girder Bridges [09 Periods]
Introduction-Method of Analysis and Design- Tee Beam Bridge- Courbon's Theory, Grillage analogy

TEST BOOKS:
1. Victor D J, essentials of Bridge Engineering, Oxford & IBH, 2007
2. Raju N K, Design of Bridges, Oxford & IBH, 2009

REFERENCE:
1. Concrete Bridge Design and Practice by V.K.Raina. 3rd edition Ponnuswamy.S‖,Bridge Engineering, TataMc-Grawhill. 2008.
2. Jagadeesh.T.R.&Jayaram.M.A, Design of bridge structures, ―Prentice hall of India. 2nd edition 2009.

E RESOURCES:
1. http://teaching.ust.hk/~civl603c/

2. http://www.structuremag.org/?p=10561
3. http://nptel.ac.in/syllabus/105999906/
4. http://nptel.ac.in/syllabus/syllabus_pdf/105102011.pdf
5. http://nptel.ac.in/courses/105106113/9_bridges/1_introduction.pdf

Course Outcomes:

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

1. To develop an understanding of an appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
2. Understand the different types of loads on bridges.
3. Understand the different types of stresses acting on bridges.
4. To carry out a design of Solid Slab bridge starting from conceptual design with geometry to sizing of its elements.
5. To carry out a design of Girder bridge starting from conceptual design with geometry to sizing of its elements

CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	3	3	3	2	-	-	-	-	-	-	-	-	2	3	
CO 2	3	3	2	2	-	-	-	-	-	-	-	-	3	3	
CO 3	3	3	2	2	-	-	-	-	-	-	-	-	2	3	
CO 4	3	3	2	2	-	2	2	-	-	-	1	-	3	3	
CO 5	3	3	2	2	-	2	2	-	-	-	1	-	3	3	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: 80147	FINITE ELEMENT METHODS	L	T	P
Credits: 3	[Professional Elective-VI]	3	-	-

Prerequisite: Structural analysis

Course Objective: To provide the fundamental concepts of the theory of Finite Element Methods. To understand the application of FEM for 1D and 2D problems and the proficiency in the application of the Finite element methods to realistic engineering problems.

MODULE I: Introduction to Finite Element Method [09 Periods]
Introduction - Basic Equations in Elasticity– concept of plane stress – plane strain advantages and disadvantages of FEM. Nodes – nodal degree of freedom – strain displacement relations.

MODULE II: Finite Element Analysis [09 Periods]
one dimensional problems–Bar element–Shape functions stiffness matrix–stress – strain, FEA Two dimensional problem – CST – LST element – shape function – stress – strain

MODULE III: FEA of Truss and Beam Elements [10 Periods]
A: Stiffness matrix - shape function – continuous beams. Lagrangian – Serendipity elements
B: Hermit polynomials – regular, Irregular 2 D & 3D – Element –shape functions.
Truss element – stiffness matrix

MODULE IV: Isoparametric Formulation [10 Periods]
Concepts of isoparametric elements for 2D analysis - formulation of CST element, 4 – noded and 8-noded isoparametric quadrilateral elements. Use of jacobian and gauss quadrature techniques - load matrix for 8 noded rectangular isoparametric element [for body forces and surface traction].

MODULE V: [10 Periods]
Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

TEXT BOOK:

1. J N Reddy **—Introduction to Finite element method**, Tata Mc Graw Hills, 11th Edition, 2010.
2. Chandrupatta, Belegunda "**Finite element method**", Prentice hall of India, 3rd Edition, 2004.

REFERENCES:

1. S.S. Bhavakatti **—Finite element analysis**, New age international publishers, 3rd Edition, 2015.
2. Robert D.Cook, David Malkus, Robert j witt "**Concepts and applications of Finite element method**", Prentice hall of India, 4th Edition, 2004.

E RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc16_me02/announcements
2. https://en.wikipedia.org/wiki/Finite_element_method
3. http:// nptel.ac.in/courses/105106051/
4. http:// nptel.ac.in/courses/105105041/
5. http://nptel.ac.in/Clarify_doubts.php?subjectId=105106051&lectureId=40

Course Outcomes:

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

1. Acquire knowledge on fundamental theory of elasticity and terminology used in FEA.
2. Gain knowledge on formulation of stiffness matrix by using CST and LST Methods.
3. Analyze the elements both regular and irregular by using lagrangian, serendipity and Hermit polynomial method.
4. Formulate Iso-parametric elements of 4 nodes, 8nodes by using Guass, Jacbion techniques.
5. Have knowledge on various solutions techniques like numerical integration, static condensation, assembly elements and static load techniques.

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

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	-	3	2					3	2		3	3	
CO 2	3	3	2	3	3					3	3		3	3	
CO 3	3	2	-	3	2					3	2		3	3	
CO 4	3	3	2	3	3					3	3		3	3	
CO 5	3	3	2	3	3					3	3		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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: 80P03	SEMINAR	L	T	P
Credits: 1		-	-	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80P04	PROJECT STAGE-II	L	T	P
Credits: 10		-	-	20

OPEN ELECTIVES

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80139	ENVIRONMENTAL IMPACT ASSESSMENT AND LIFE CYCLE ANALYSIS (Open Elective)	L	T	P
Credits: 3		3	-	-

Prerequisite: Environmental Sciences

Course Objective: 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.

TEST 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%20methodologies.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:

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**	**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.

TEST 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:

CO-PO MAPPING (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO 1		3	2	1	2		3	2	1	1	1	1			
CO 2		1	2			2	3			1		1			
CO 3	1	1	1				2					1			
CO 4				2			2			1	2	1			
CO 5			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.

TEST 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:

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:

CO-PO (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**	**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 Instruments [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.

TEST 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.
2. W.C.Turner, **"Energy Management Hand Book",** A John Wiley and Sons.

3. S. C. Tripathy, **"Utilization of Electrical Energy"**, Tata McGraw Hill, 1993.

4. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online).

5. 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:

CO-PO MAPPING (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO 1	**3**	**3**	**3**	**3**								**3**	**1**		
CO 2	**3**	**3**	**3**	**3**								**3**	**1**		
CO 3	**3**	**3**	**3**	**3**								**3**	**1**		
CO 4	**3**	**3**	**3**	**3**								**3**	**1**		
CO 5	**3**	**3**	**3**	**3**								**3**	**1**		

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	-	-

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 [09 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 [09 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 [10 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 – chocking – 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 [10 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.
TEST 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:

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**								**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	-	-

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 **[10 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.

TEST 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:

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**								**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.

TEST BOOKS

1. Dale H. Besterfiled, "**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:

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

2018-18 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.

TEST 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:

CO-PO MAPPING (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO 1	**1**		**2**			**3**	**3**			**2**		**3**			
CO 2	**1**		**2**			**3**	**3**			**2**		**3**			
CO 3	**1**		**2**			**3**	**3**			**2**		**3**			
CO 4	**1**		**2**			**3**	**3**			**2**		**3**			
CO 5	**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 titled 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.

TEST 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/onbasiogl1/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:

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**					**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	-	-

Prerequisites: 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.

TEST BOOKS:

1. Shibu K. V, **"Introduction to Embedded Systems"**, McGraw Hill, 2013.
2. Raj Kamal, **"Embedded Systems"**, TMH.

REFERENCE BOOKS:

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:

CO-PO MAPPING (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO 1	**2**	**1**	**1**			**1**									
CO 2	**2**		**2**	**1**		**1**	**1**					**1**			
CO 3	**2**		**3**	**1**	**1**	**2**	**1**				**1**	**1**			
CO 4	**1**		**3**	**1**	**1**	**2**	**1**					**1**			
CO 5	**1**		**2**	**1**	**1**	**1**						**1**			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80446	PRINCIPLES OF COMMUNICATION ENGINEERING (Open Elective)	L	T	P
Credits: 3		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.

TEST BOOKS

1. Wayne Tomasi, ―Advanced Electronic Communication Systems‖, 6th Edition, PearsonEducation, 2007.
2. Simon Haykin, ―Communication Systems‖, 4thEdition, John Wiley &Sons, 2001.

REFERENCES

1. H.Taub,DL Schilling,G Saha,―Principles of Communication‖, 3rdEdition,2007.
2.B.P.Lathi,―Modern Analog And Digital Communication systems‖, OxfordUniversity 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. Notes on 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:

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**	**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, EncapsulationMetallization.

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 µm 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 [9 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 [9 Periods]

Application Specific Integrated Circuits – Channel gate array, Channel less gate array and structured gate array.

Programmable Logic Devices - Architectures of CPLDs and FPGAs.

TEST 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.

REFERENCE BOOKS:

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:

CO-PO MAPPING (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO 1	**1**	**1**	**2**	**1**	**2**		**1**					**2**			
CO 2	**2**	**2**	**2**	**2**	**1**										
CO 3	**2**	**1**	**2**	**2**	**1**						**2**	**2**			
CO 4	**2**	**1**	**2**	**2**	**2**		**1**				**2**	**2**			
CO 5	**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 l, 6th edition

REFERENCE BOOKS:
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://airccse.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**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**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	-	-

PRE-REQUISITES: 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, Bl 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, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections.

Implementation - Implementing a Custom Writable: Implementing a Raw Comparator 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

REFERENCE BOOKS:

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		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	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 [13 Periods]
Understanding Cloud Computing - Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage –Why Cloud Computing Matters.
Issues in Cloud Services - Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services.

MODULE II: Development of Services [13 Periods]
Developing Cloud Services - Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service.
Web Services -Web Services – On-Demand Computing – Discovering Cloud Services, development Services and Tools – Amazon EC2 – Google App Engine – IBM Clouds.

MODULE III: Cloud Computing Security Architecture [13 Periods]
A: Cloud Security - Cloud security fundamentals - Vulnerability assessment tool for cloud- Privacy and Security in cloud. Cloud computing security architecture: Architectural Considerations- General Issues-Trusted Cloud computing- Secure Execution Environments and Communications-Micro-architectures.
B: Identity Management - Identity Management and Access control, Identity management-Access control, Autonomic Security.

MODULE IV: Community Services [13 Periods]
Cloud Computing For Everyone - Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-do Lists – Collaborating Contact Lists.
Community in Services - Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation.
MODULE V: Case Studies and Applications [12 Periods]
Cloud Computing Case Studies - Cloud computing case studies: Google App Engine – IBM Clouds –Windows live.
Applications - Micro soft dynamic CRM- Salesforce.com CRM- App Exchange – Amazon S3 – Oracle OBIEE.

TEXTBOOKS

1. John W.Rittinghouse, James F.Ransome, **"Cloud Computing: Implementation, Management and Security"**, CRC Press, 2012.
2. Anthony T.Velte, Toby J Velte Robert Elsenpeter, **"Cloud Computing a practical approach"**, TMH, 2010.

REFERENCES

1. Michael Miller, **"Cloud Computing: Web-Based Applications That Change the Way you Work and Collaborate Online"**, Que Publishing, 2008.
2. Haley Beard, **"Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs"**, Emereo Pty Limited, 2nd Edition, 2009.
3. Raj Kumar Buyya, **"Mastering Cloud computing"**, TMH, 2013.

E-RESOURCES

1 http://www.motc.gov.qa/sites/default/files/cloud_computing_ebook.pdf
2 http://www.ishuchita.com/C.S.E/Cloud%20Computing/Cloud%20Computing%20Practical%20Approach.pdf
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. Articulate the main concepts, strengths and limitations of Cloud computing.
2. Explain the development of cloud and web services.
3. Identify the core issues of cloud computing security architecture and their execution environments.
4. Generate new ideas and innovations in cloud computing.
5. Apply the appropriate technologies, algorithms, and approaches for the related issues.

CO-PO Mapping:

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**				**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.

TEST 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).

REFERENCE BOOKS:

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

On successful completion of the course, a student 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:

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**													
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.

TEXT BOOKS

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://kvspgtcs.org/wp-content/uploads/2013/08/Python-Programming-for-the-Absolute-Beginner.pdf 2
2. http://www.bogotobogo.com/python/files/pytut/Python%20Essential%20Referenc e,%20Fourth%20Edition%20(2009).pdf
3. https://periodicals.osu.eu/ictejournal/dokumenty/2015-02/ictejournal-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:

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**										
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	L	T	P
Credits: 3	(Open Elective)	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 AI, 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, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional 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
3. Rich, Kevin Knight, Shiv Shankar B Nair, "**Artificial Intelligence**", 3rd Ed, TMH
4. Patterson,"**Introduction to Artificial Intelligence**", PHI

REFERENCES

1. George F Lugar, **"Atificial intelligence, structures and Strategies for Complex problem solving"**, 5th edition, PEA
2. Ertel, Wolf Gang, "**Introduction to Artificial Intelligence**", Springer
3. Blay WhitBY "**Artificial Intelligence**" Rosen Publishing.

E-RESOURCES

1. https://i4iam.files.wordpress.com/2013/08/artificial-intelligence-by-rich-and-knight.pdf
2. https://books.google.co.in/books?id=pVR9W5LEZUwC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
3. https://www.journals.elsevier.com/artificial-intelligence/
4. http://www.ceser.in/ceserp/index.php/ijai
5. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7_M07uyea_7zp_zRG3BvdUVy2TIab45fvPeNJfynQsAbmBEgDSUqzidwcse6xwotJA
6. http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVlXBW-YWRBg_vrHK12-lgOzTVbb5oZ6eQOBjCWDfRvquHJLEOFENjI5AmOqRc9Ar3eJF4CGFrw

Course Outcomes:

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

1. Describe the key components of the artificial intelligence (AI) field.
2. Classify knowledge representation techniques.
3. Interpret various types of reasoning and processing.
4. Discover game playing and apply knowledge representation.
5. Demonstrate learning and the analyze aspects of leaning.

CO-PO Mapping:

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**										
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, 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.

TEST 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 .

REFERENCE BOOKS:

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:

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**	**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.

TEST BOOKS:

1. Allegri (Sr.), T.H., Material Handling – Principles and Practices, CBS Publishers and Distributors, Delhi, 1987.
2. Hustrulid, W., and Kuchta, M. Open Pit Mine Planning & Design, Vol. 1, Fundamentals, Balkema, Rotterdam, 1998.

REFERENCE BOOKS:

1. Kennedy, B.A., Surface Mining – 2nd Edition, SME, New York, 1990.
2. Deshmukh, D.J., Elements of Mining Technology, Vol.I, II and III, EMDEE Publishers, Nagpur, 1979.
3. Peng, S.S., and Chiang, H.S., Longwall Mining, John Wiley and Sons, New York, 1984.
4. Hartman, H.L., (Ed.), SME Mining Engg. Handbook Vol.I and II, Society for Mining,
5. Metallurgy, and Exploration, Inc., Colorado, 1992.

E RESOURCES:

1. www.bmt.org
2. www.canadianminingjournal.com/tag/material-handling/

Course Outcomes:

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

1. Understand Basic principles in material handling exclusive to mining industry and its benefits
2. Understand Short Conveyors and Haulage Systems
3. Understand Belt Conveyor System
4. Understand New Types of Belt Conveyor Systems
5. Understand Material Handling in Mines, Plants and Workshops

CO-PO Mapping:

CO-PO MAPPING (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO 1	**3**	**3**	**3**	**1**	**2**						**1**				
CO 2	**1**	**1**	**2**	**2**	**1**						**2**				
CO 3	**1**	**2**	**3**	**3**	**2**						**2**				
CO 4	**2**	**2**	**1**	**2**	**3**						**3**				
CO 5	**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.

TEST 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:

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**	**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	-	-

Course Objective:

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 [9 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 [9 Periods]

Characteristics of writing – mechanics of writing – methodology of writing – format & style- structures of writing – circular writing – memo writing – instructions writing, Report Writing, SOP.

REFERENCE BOOKS:

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. https://www.youtube.com/watch?v=cQruENyLNYI&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH (Communication Skills)
6. https://www.youtube.com/watch?v=p1-etClsXdk&index=5&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH (Conversation Skills)

Course Outcomes:

After completion 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:

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**		**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	-	-

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.

Methodology:

- Giving them exercises pertaining to translation of their thoughts into words.
- Giving them vocabulary exercises in different contexts.
- Find supporting evidence.
- Make an outline

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 [9 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 **[9 Periods]**

- Figurative Language
- Imagery
- Writing a short Poem
- Writing a short Story

REFERENCE BOOKS:

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:

- http://www.brad.ac.uk/staff/pkkornakov/META.htm(Introduction to Interpretation Skills)
- 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)
- https://www.csuohio.edu/writing-center/critical-reading-what-critical-reading-and-why-do-i-need-do-it (Critical Reading)
- https://www.ets.org/gre/revised_general/about/content/analytical_writing (Analytical Writing)
- http://www.writerstreasure.com/creative-writing-101/ (Creative Writing)
- http://scholarworks.rit.edu/jcws/aimsandscope.html (Creative Writing)

Course Outcomes:

After completion 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:

CO-PO MAPPING (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	Programme Outcomes(POs)														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1			1	2				2		1	2				
CO 2										2	1				
CO 3			1			2	1			1					
CO 4						1		2				1			
CO 5				1		1						1			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80H09	ENGLISH FOR ACADEMIC AND RESEARCH WRITING (Open Elective)	L	T	P
Credits: 3		3		-

Course Objectives:

This paper helps the students use pre-writing strategies to plan writing. Further it improves writing through the process of drafting essays, reports, abstracts, etc. In addition to this, it improves accuracy and complexity of Sentence structure in academic writing. On the other hand the student will be able to analyze and interpret data . This course also intends to develop research skills to identify and incorporate relevant resources for research writing.

MODULE I Features of Academic Writing [9 periods]

Language: Clear, Correct, Concise, Inclusive language
Tone: Formal, Objective, Impersonal, Cautious tone
Style: Appropriate, Accurate, Organized, Empirical style
Ethics: Honesty, Integrity, Responsibility, Accountability

MODULE II Kinds of Academic Writing [9 periods]

Essays, Reports, Reviews, SOPs, Abstracts, Proposals

MODULE III Academic Writing Skills [10periods]

- Paraphrasing
- Summarizing
- Quoting
- Rewriting
- Expansion

MODULE IV Research Process [10 periods]

Selection of Topic, Formulation of Hypothesis, Collection of Data, Analysis of Data, Interpretation of Data, Presentation of Data

MODULE V Structure of a Research Document [10periods]

Title, Abstract, Introduction, Literature Survey, Methodology, Discussion, Findings/Results, Conclusion, Documenting Sources

REFERENCE BOOKS:

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
7. https://www.sciencedirect.com/journal/journal-of-english-for-academic-purposes/v ol/7/issue/2

Course Outcomes:

After completion 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:

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**	**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.		
Code: 80B11	COMPUTATIONAL MATHEMATICS (Open Elective)	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 $1/3^{rd}$, $3/8^{th}$ 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).

TEST 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.

REFERENCE BOOKS:

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/122102009 (Algebraic and transcendental equation)
7. http://nptel.ac.in/courses/111107063 (Numerical solution of Ordinary Differential Equations)
8. http://nptel.ac.in/courses/111105038 (Numerical Solution of Partial Differential Equations)

Course Outcomes:

After completion of this 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:

CO-PO MAPPING **(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**															
CO S	**Programme Outcomes(POs)**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO 1	**3**	**3**	**2**	**3**	**2**				**3**			**2**			
CO 2	**3**	**3**	**2**	**3**	**3**				**3**			**2**			
CO 3	**3**	**3**	**2**	**3**	**2**				**2**			**2**			
CO 4	**3**	**3**	**2**	**2**	**3**				**3**			**2**			
CO 5	**3**	**3**	**2**	**3**	**2**				**3**			**2**			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80B12	APPLIED STATISTICS (Open Elective)	L	T	P
Credits: 3		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-wav 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 [10 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 .

TEST 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 Publicaitons.

REFERENCE BOOKS:

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. These are very useful tools in many engineering and data management problems in the industry. It is useful for all branches of engineering.

CO-PO Mapping:

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**	**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 (Open Elective)	L	T	P
Credits: 3		3	-	-

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 to Operations Research [12 Periods]
Definition, scope, objectives, phases, objectives, models and limitation of Operations Research, Linear Programming Problem-Formulation of LPP, Graphical solution of LPP, Simplex method, Artificial variable, big-M method, two-phase method, degeneracy & unbound solution.

MODULE - II: Transportation Problems [12 Periods]
Formulation, solution, Unbalanced Transportation problem, Finding basic feasible solution-Northwest corner rule, least cost method and Vogel's approximation method.Optimality test: the stepping stone method and MODI method.
Assignment Models: Formulation. Hungarian method for optimal solution. Solving unbalanced problem. Travelling salesman problem as assignment problem.

MODULE - III: Sequencing & Replacement Mode [12 Periods]
A: Sequencing Models: Solution of sequencing problem-processing n jobs through 2 machines, processing n jobs through 3 machines, processing 2 jobs through m machines, processing n jobs through m machines.
B: Replacement Models: Replacement of items that deteriorate whose maintenance cost increase with time without change in the money value. Replacement of items that fail suddenly:individual replacement policy, group replacement policy.

MODULE - IV: Game Theory [12 Periods]
Competitive games, rectangular game, saddle point, minimax (maximin)method of optimal strategies, value of the game. Solution of games with saddle points, ominance principal. Rectangular games without saddle points-mixed strategy for2x2 games.

MODULE - V: Inventory Models [12 Periods]
Inventory cost, Models with deterministic demand model (a) demand rate uniform and production rate infinite model, model (b) demand rate non-uniform and production rate infinite model(c) demand rate uniform and production rate finite

TEST BOOKS:

1.S.D.Sharma **"Operations Research"** Kedarnath & Ramnath Publisher, 15th edition,2013.
2.J.K. Sharma **"Operations Research Theory & Applications"** Macmillan India Ltd, 4E.

REFERENCE BOOKS:

1. P. Sankara Iyer **"Operations Research"** Tata McGraw-Hill,2008
2. Taha **"Operations Research"** TMH,2010
3. A.M. Natarajan,P. Balasubramani,A.Tamilarasi **"Operations Research"**Pearson Education, 2005
4. Hiller & Libermann **"Introduction to Operations Research""** McGraw Hill Publications, 9th Edition,2010

E Resources:

1. http://www.mhhe.com/engcs/industrial/hillier/etext/PDF/chap03.pdf (LPP)
2. http://ocw.nctu.edu.tw/upload/classbfs121001503719748.pdf (Transportation Problems)
3. http://shodhganga.inflibnet.ac.in/bitstream/10603/19544/12/7_chapter%201.pdf (Replacement Models)
4. https://www.math.ucla.edu/~tom/GameTheory/mat.pdf (Game Theory)
5. http://www.ime.unicamp.br/~andreani/MS515/capitulo12.pdf (Inventory Models)

1. http://www.researchpublish.com/download.php?file=Some%20Applications-2812.pdf (LPP)
2. http://www.rspq.org/pubs/or.pdf (Sequencing Models)
3. http://elib.mi.sanu.ac.rs/files/journals/yjor/18/yujorn18p197-206.pdf (Inventory Models)

1. https://www.youtube.com/watch?v=a2QgdDk4Xjw&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX (LPP)
2. https://www.youtube.com/watch?v=Q31jKiEXxdc (Transportation Problems)
3. https://www.youtube.com/watch?v=BUGIhEecipE (Assignment Models)
4. https://www.youtube.com/watch?v=533dp83Er6E (Sequencing Models)
5. https://www.youtube.com/watch?v=a52BtWkyjl0&list=PLOEpD2bjMC9K4iTa9Y7x NToVdehbFRmR6 (Game Theory)
6. https://www.youtube.com/watch?v=9tJv5COGkD0 (Inventory Models)

Course Outcomes:

After completion of the course students will be able to:

1. find feasible solution to LPP by various Methods.
2. Students will be able to minimize the cost and time by using Travelling salesmen Problem.
3. Understand the various concepts of Replacement model problems.
4. Students will able to solve the game theory problems.
5. Understand the various concepts of inventory models.

CO-PO Mapping:

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**	**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 Objective:

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

A: Synthesis [6 Periods]

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.

TEST 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.

REFERENCE BOOKS:

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:

After completion of this 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:

CO-PO MAPPING (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO 1	**2**	**2**	**1**												
CO 2	**3**	**2**	**1**												
CO 3	**3**	**1**	**1**		**1**	**1**									
CO 4	**2**	**1**	**1**												
CO 5	**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 Objective:
The objective is to provide different methods of synthesis and characterization of nano materials.

MODULE I: Physical Methods [9 periods]
Bottom-up approachand 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
A: Thermal Methods: [7 periods]
Thermolysis route – spray pyrolysis and solved 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

TEST BOOKS:
1. C N R Rao, A Muller and A K Cheetham **"The chemistry of Nanomaterials: Synthesis, Properties and Appliocations"** John Wiley, First Edition, 2004
2. Hari Singh Nalwa, **"Nanostructured Materials and Nanotechnology",** Academic Press, First Edition, 2002.

REFERENCE BOOKS:

1. Charles P Poole Jr "**Introduction to Nanotechnology",** John Willey & Sons, 1st Edition, 2003

2**.** C Dupas, P Houdy, M Lahmani, Nanoscience**: "Nanotechnologies andNanophysics",** Springer-Verlag Berlin Heidelberg, 1st Edition, 2007

3. T Pradeep, "**NANO: The Essentials: Understanding Nanoscience and Nanotechnology".** Tata McGraw-HillPublishing 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:

After completion of this 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:

CO-PO MAPPING (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
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 Objective:

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
A: Introduction to Vacuum Technology [9 Periods]
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

TEST 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

REFERENCE BOOKS:

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:

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

1. aware of the concepts of NDT
2. Understand different methods of NDT.
3. Anaylize Vacuum technology and concepts of flow meters.
4. develop pressure gauges.
5. understand the concepts of different vacuum pumps

CO-PO Mapping:

CO-PO MAPPING (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO S	**Programme Outcomes(POs)**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO 1	**3**	**2**													
CO 2	**3**	**2**													
CO 3	**3**	**2**			**2**										
CO 4	**2**	**2**			**2**										
CO 5	**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.

TEST 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.

REFERENCE BOOKS:

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)
6) http://www.nptel.ac.in/courses/112104039/53 (liquid crystals)

Course Outcomes:

After completion 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 ofabrasives, adhesives andliquid.
3. The immense importance of basic constructional material, Portland cement in Civil Engineering works.
4. To 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:

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80B18	NANO CHEMISTRY (Open Elective)	L	T	P
Credits: 3		3	-	-

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 [9 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 [9 Periods]

Implications of Nanotechnology & Research needs-Nanostructured Catalysts TiO_2 Nanoparticles for Water purification- Nano membranes in drinking water treatment and desalination, Nanomembranes in Sea desalination-Nano particles for treatment of Chlorinated Organic Contaminants.

TEST 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.

REFERENCE BOOKS:

1. A. K. Haghi, Ajesh K. Zachariah, NandakumarKalariakkal. **"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 lalGarg. **"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:

After completion 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:

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**	**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 (Open Elective)	L	T	P
Credits: 3		3	-	-

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 [9 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 [9 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.

TEST 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.

REFERENCE BOOKS:

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 (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:

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

1. Analyse different mechanisms of polymer formation and use this information in thesynthesis 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:

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**	**2**		**2**	**1**										
CO2	**2**		**1**		**2**										
CO3		**2**	**1**	**2**	**1**										
CO4	**2**	**1**	**2**												
CO5	**2**	**1**		**1**	**2**		**1**								