ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2018-19 onwards

Electronics and Communication Engineering (ECE)

For

B.Tech. Four Year Degree Programme

(MR18 Regulations)

MALLA REDDY ENGINEERING COLLEGE

(Autonomous)

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

MALLA REDDY ENGINEERING COLLEGE
(AUTONOMOUS)
MR18 – ACADEMICREGULATIONS (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

Attempting to develop innovative, competent and quality electronic engineers. To impart state of art technology and to foster a climate of professionalism and ethical values.

DEPARTMENT MISSION

To enrich the knowledge of students through value based education and organize various effective training programs in order to compete the advanced technology and produce employable under graduates and post graduates.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO I: Graduates should emphasize their insight in mathematics, sciences, computing and fundamentals of engineering including breadth to meet global demand and competitiveness in terms of technological aspects.

PEO II: Our graduates should excel in the best post graduate schools, reaching advanced degrees in engineering and related disciplines; should have skills for continued independent, learning to become experts in their professions.

PEO III: Graduates should succeed with effective communicative skills and work efficiently on team based projects in electronics, communication, computational, or manufacturing firms with a sense of social responsibility

PROGRAM OUTCOMES (POs)

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. 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.

PO3. 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.

PO4. 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.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. 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.

PO7. 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.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. 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.

PO11. 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.

PO12. 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)

B.Tech graduates in Electronics and Communication Engineering will be able to:

PSO 1 (Engineering Knowledge and Analyzing Skills): Understand the basics of Electronics and Communications and will be able to apply them in analyzing problems related to Electronics, Communications, Signal processing, VLSI, Embedded Systems, Image Processing etc.

PSO 2 (Problem Solving and System Design Skills): Solve any problem related to Electronics and Communication Engineering with the help of latest softwares (like LabVIEW, Cadence EDA tool, Matlab, Keil, Proteus etc.) and Specialized hardware (Microprocessors /Microcontrollers development boards, FPGAs, DSP Processor development boards, NI LabVIEW Boards , etc.). They will also be able to design a working prototype of the solution.

PSO 3 (Applying Knowledge in Solving Society/ Environment Problems): Will be able to apply the knowledge of Electronics and Communication Engineering and design projects for the betterment of people's life (health, security, resource management, etc.) in society and to maintain ecological balance.

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

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

2. Eligibility for Admission

2.1 Admission to the UGP shall be made either on the basis of the merit rank obtained by the qualifying candidate in entrance test conducted by the Telangana State Government (TSEAMCET), or the University, or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government of Telangana from time to time.

2.2 The medium of instructions for the entire UGP in E&T will be ENGLISH only.

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

3.1 A student after securing admission shall pursue the Under Graduate Programme in B.Tech. in a minimum period of **four** academic years (8 semesters) and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester. Further 2 years of extension is allowed for appearing examinations, failing which student shall forfeit seat in B.Tech. Course. Each semester is structured to provide around 20 credits, totaling to 160

credits for the entire B.Tech. Programme. Each student shall secure 160 credits (with CGPA ≥ 5) required for the completion of the Under Graduate Programme and award of the B.Tech. Degree.

3.2 UGC/ AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below.

3.2.1 Semester Scheme:

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

3.2.2 Credit Courses:

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

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

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

3.2.3 Subject/ Course Classification:

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

(a) Foundation Courses (FC)
(b)Core Courses (CC)
(c) Elective Courses (EC)
(d) Mandatory Courses (MC)
(e) Audit Courses (AC)

- **Foundation Courses (FC**) are further categorized as:
  - (i) Humanities and Social Sciences including Management courses (HSMC)
  - (ii) Basic Science Courses (BSC)
  - (iii) Engineering Science Courses (ESC).
- **Core Courses (CC) and Elective Courses (EC)** are categorized as Professional Subjects (PS), which are further subdivided as –
  - (i) Professional Core Courses(PCC)
  - (ii) Professional Elective Courses(PEC)
  - (iii) Open Elective Courses (OEC)
  - (iv) Project (PROJ)

- **Mandatory Courses** (**MC** - Non-credit with evaluation).
- **Audit Courses** (**AC** – Non- credit without evaluation).

3.2.4 Course Nomenclature:

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

Sl. No.	Classification		Course Work – Subject Area	Distribution of credits	AICTE Suggested Breakup of Credits (Total 160)
	AICTE	UGC			
1	HSMC	Foundation Courses	Humanities and Social sciences including Management courses.	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.	22	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.	64	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-Requisite and interest.

4.2 Academic section of the College invites 'Registration Forms' from students within 15 days from the commencement of class work for the first semester through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE registration requests for any 'SUBSEQUENT SEMESTER' shall be completed

BEFORE the commencement of SEEs (Semester End Examinations) of the 'CURRENT SEMESTER'.

4.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from the Faculty Advisor/Counselor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor/Counselor and the Student).

4.4 A Student may be permitted to register for the Subjects/ Course of CHOICE with a typical deviation of ±3 credits of the semester, based on his PROGRESS and SGPA/CGPA and completion of the 'PRE-REQUISITE' 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
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
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 $\geq$ 5.0 (in each semester) and CGPA (at the end of each successive semester) $\geq$ 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 midterm 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 70marks 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:

8.8.1 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.

8.8.2 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 ≥ 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.
$\text{CGPA} = \left\{\sum_{j=1}^{M} C_j G_j\right\} / \left\{\sum_{j=1}^{M} C_j\right\}$… for all 'S' semesters registered
(i.e., up to and inclusive of 'S' semesters, S ≥ 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 1^{st}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:

9.12.1 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.

9.12.2 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.

9.12.3 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 Under Graduate Degree with honours or additional minor Engineering ,if he / she completes an additional 20 Credits through MOOCs

12 Withholding of Results

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

13 Transitory Regulations

A. **For students detained due to shortage of attendance**:

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

B. **For students detained due to shortage of credits**:

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

C. **For readmitted students in MR 18 regulations**:

1 A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.

2 The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including MR18 regulations. The performance evaluation of the student will be done after the exemption of two subjects if total credits acquired are ≤ 206, three subjects if total credits acquired are > 206 (see MR18 regulations for exemption details).

3 If a student readmitted to MR18 regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in MR18 regulations will be substituted by another subject to be suggested by the College Academic Committee (CAC).

Note: If a student readmitted to MR18 regulations, has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in MR18 regulations, the departments concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

14 Student Transfers

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

14.2 The students seeking transfer to Malla Reddy Engineering College (Autonomous)-MREC(A) from various other Universities/ Institutions have to pass the failed subjects which are equivalent to the subjects of MREC(A) and also pass the subjects of MREC(A) which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of MREC(A), the students have to study those subjects in MREC(A) inspite of the fact that those subjects are repeated.

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

15 Scope

(i) Where the words "he", "him", "his", occur in the write – up of regulations, they include "she", "her", "hers".

(ii) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".

(iii) The academic regulations should be read as a whole, for the purpose of any interpretation.

(iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the College Academic Committee headed by the Principal is final.

Academic Regulations for B.Tech.(Lateral Entry Scheme)
w.e.f the A Y 2019-20

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.

1. 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**.**

2. 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.

3. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech.(LES).

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
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
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)

4. 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 organizes a walk out or instigates others to walk out, or threatens the	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester. The

	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	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)

Maisammaguda, Dhulapally (Via & Post) Kompally, Secunderabad-500100

Department of ELECTRONICS & COMMUNICATION ENGINEERING

COURSE STRUCTURE for ACADEMIC YEAR 2018-19

SEMESTER I

S.No	Category	Course Code	Name of the Course	Contact hours/week			Credits
				L	T	P	
1	-	-	Induction Programme	-	-	-	-
2	HSMC	80H01	English	3	-	-	3
3	BSC	80B01	Engineering Mathematics-I	3	1	-	4
4	BSC	80B02	Applied Physics	3	1	-	4
5	ESC	80501	Programming for Problem Solving	3	-	-	3
6	HSMC	80H02	English Language Lab	-	-	2	1
7	BSC	80B04	Applied Physics Lab	-	-	2	1
8	ESC	80502	Programming for Problem Solving Lab	-	-	2	1
9	ESC	80303	Engineering workshop	-	-	2	1
Total				12	2	8	**18**
Total contact hours				**22**			

SEMESTER II

S.No	Category	Course Code	Name of the Course	Contact hours/week			Credits
				L	T	P	
1	BSC	80B06	Engineering Mathematics-II	3	1	-	4
2	BSC	80B03	Engineering Chemistry	3	1	-	4
3	ESC	80201	Basic Electrical and Electronics Engineering	3	-	-	3
4	ESC	80503	Data Structures	3	-	-	3
5	ESC	80301	Engineering Graphics	1	-	2	2
6	BSC	80B05	Engineering Chemistry Lab	-	-	2	1
7	ESC	80202	Basic Electrical and Electronics Engineering Lab	-	-	2	1
8	ESC	80504	Data Structures Lab	-	-	2	1
9	ESC	80302	Engineering Graphics Lab	-	-	2	1
10	AC	80A01	NSS/Sports/Yoga	-	-	3	-
Total				13	2	13	**20**
Total contact hours				**28**			

SEMESTER III

S.No	Category	Course Code	Name of the Course	Contact hours/week			Credits
				L	T	P	
1	BSC	80B10	Special functions and complex variables	3	-	-	3
2	PCC	80401	Analog Electronics	3	-	-	3
3	PCC	80402	Signals and Systems	2	1	-	3
4	PCC	80403	Digital Electronics	2	1	-	3
5	PCC	80404	Probability Theory and Stochastic Processes	3	1	-	4
6	PCC	80405	Network Theory and Transmission lines	3	-	-	3
7	PCC	80406	Analog Electronics Lab	-	-	2	1
8	PCC	80407	Signals and Stochastic Processes Lab	-	-	2	1
9	MC	80M02	Gender Sensitization	2	-	-	0
10	AC	80A02	Internship-I	-	-	-	0
Total				18	3	4	**21**
Total contact hours				**25**			

SEMESTER IV

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	ESC	80209	Control Systems	3	-	-	3
3	ESC	80408	Electromagnetic Wave Theory	3	-	-	3
4	PCC	80409	Analog & Digital Communications	3	1	-	4
5	PCC	80410	Electronic Circuits & Pulse Circuits	3	1	-	4
6	PCC	80411	Analog & Digital Communications Lab	-	-	2	1
7	PCC	80412	Electronic Circuits & Pulse Circuits Lab	-	-	2	1
8	PCC	80413	Digital Electronics Lab	-	-	2	1
9	MC	80M01	Environmental Science	2	-	-	0
Total				17	2	6	**20**
Total contact hours				**25**			

SEMESTER V

S. No	Category	Course Code	Name of the Course	Contact hours/week			Credits
				L	T	P	
1	PCC	80414	Microprocessors and Microcontrollers	3	-	-	3
2	PCC	80415	Linear & Digital Integrated Circuit Applications	3	1	-	4
3	PCC	80416	Data Communications and Computer Networks	3	-	-	3
	PEC-I		**Professional Elective-I:**	3	-	-	3
		80429	Advanced Digital Communication				
		80537	Computer Organization and Operating Systems				
		80430	Bio-Medical Electronics				
5	OEC-I		**Open Elective-I**	3	-	-	3
6	PCC	80417	Microprocessors and Microcontroller Lab	-	-	3	1.5
7	PCC	80418	Linear & Digital Integrated Circuit Applications Lab	-	-	3	1.5
8	PCC	80419	Data Communications and Computer Networks Lab	-	-	2	1
9	MC	80M04	Indian Constitution	2	-	-	0
10	AC	80A03	Internship-II	-	-	-	0
Total				17	01	08	**20**
Total contact hours				**26**			

SEMESTER VI

S.No	Category	Course Code	Name of the Course	Contact hours/week			Credits
				L	T	P	
1	PCC	80420	Digital Signal Processing	3	-	-	3
2	PCC	80421	VLSI Design	3	-	-	3
3	PCC	80422	Antennas and Wave Propagation	3	1	-	4
4	PEC-II		**Professional Elective-II**	3	-	-	3
		80431	Cellular and Mobile Communications				
		80432	Electronic Measurements and Instrumentation				
		80508	JAVA Programming				
5	OEC-II		**Open Elective-II**	3	-	-	3
6	HSMC	80H03	English Communication and Presentation Skills Lab	-		2	1
7	PCC	80423	Digital Signal Processing Lab	-	-	3	1.5
8	PCC	80424	VLSI Design Lab	-	-	3	1.5
9	MC	80M03	Essence of Indian Traditional Knowledge	2	-	-	0
Total				17	1	8	**20**
Total contact hours				**26**			

SEMESTER VII

S.No	Category	Course Code	Name of the Course	Contact hours/week			Credits
				L	T	P	
1	HSMC	80H05	Management fundamentals	3	-	-	3
2	PCC	80425	Digital Image Processing	3	-	-	3
3	PCC	80426	Microwave Engineering and Radar Systems	3	-	-	3
4	PEC-III		**Professional Elective-III**	3	-	-	3
		80433	Fundamentals of Machine Learning				
		80434	Optical Communications				
		80435	Embedded System Design				
5	PEC-IV		**Professional Elective-IV**	3	-	-	3
		80436	Advanced Digital Signal Processing				
		80437	Wireless Communications				
		80438	Fundamentals of Artificial Intelligence				
6	PCC	80427	Digital Image Processing Lab	-	-	2	1
7	PCC	80428	Microwave Engineering Lab	-	-	2	1
8	PROJ	80P01	Internship-III /Mini project	-	-	-	2
9	PROJ	80P02	Project Stage I	-	-	4	2
Total				15	-	8	**21**
Total contact hours				**23**			

SEMESTER VIII

S.No	Category	Course Code	Name of the Course	Contact hours/week			Credits
				L	T	P	
1	PEC-V		**Professional Elective-V**	3	-	-	3
		80439	Internet of Things (IOT) and Applications				
		80440	ADHOC Wireless Sensor Networks				
		80441	System On Chip Architecture				
2	PEC-VI		**Professional Elective-VI**	3	-	-	3
		80442	Advanced Microcontrollers				
		80443	Satellite Communications				
		80444	Wavelets & Its Applications				
3	OEC-III		**Open Elective - 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: 80H01	ENGLISH	L	T	P
Credits: 3	(Common for EEE, ECE,CSE and IT)	3	-	-

Pre-Requisites: Nil

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

MODULE I: **[10 Periods]**

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

MODULE II: **[10 Periods]**

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

MODULE III: **[10 Periods]**

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

MODULE IV: **[9 Periods]**

Biography **:** "Jesse Owens"
Poem **:** "I too Sing America" by Langston Hughes
Grammar **:** Question Tags; Degrees of Comparison
Vocabulary **:** One Word Substitutions; Synonyms and Antonyms
Reading **:** Reading for Interpretation
Writing **:** Letter Writing- Both Formal and Informal

MODULE V: **[9 Periods]**

Essay : "Pecuniary Independence" by P.T Barnum
Poem **:** "Human Family" by Maya Angelou
Grammar **:** Direct and Indirect Speech, Misplaced Modifiers
Vocabulary **:** Integrated Exercises in Vocabulary
Reading **:** Reading for Specific Purposes, Reading Comprehension
Writing **:** Summarizing, Redundancies and Clichés

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

Text Books:

1. T.V. Surendranatha Reddy, B.Vijay Kumar and K.James "Effecive English " First Edition Maruthi Publications,2017.

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, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
COS	**Programme Outcomes(POs)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1								2	2	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. I Semester		
Code: 80B01	ENGINEERING MATHEMATICS-I	L	T	P
Credits: 4	(Common for CE, EEE, ME, ECE, CSE, IT and Min.E)	3	1	-

Pre-Requisites: Basics of Matrices and Calculus

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

MODULE I: Matrices [12 Periods]

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

MODULE II: Eigen values and Eigen vectors [14 Periods]

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

MODULE III: Sequences & Series [12 Periods]

A: Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences. Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert's ratio test;

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

MODULE IV: Fourier Series [12 Periods]

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

MODULE V: Calculus [14 Periods]

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

Text Books:

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

Reference Books:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

E-Resources:

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

Course Outcomes:

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

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

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

COS	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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: 80B02	APPLIED PHYSICS	L	T	P
Credits: 4	(Common for EEE, ECE, CSE and IT)	3	1	-

Pre-Requisites: Fundamentals of Physics

Course Objectives: The main objective of this course is to provide an adequate exposure and develop insight about the basic principles of semiconductor physics along with the possible applications

MODULE I: Principles of Quantum Mechanics [12 Periods]

Qualitative discussion on black body radiation spectrum problem, Photo electric effect concept and Einstein's explanation; Postulates of Quantum mechanics, Louis de Broglie's concept of matter waves, Davisson and Germer's experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time Independent Wave Equation, Physical Significance and properties of the Wave Function; Energy of a particle in One Dimensional infinite Potential well.

MODULE II: Band Theory of Solids [12 Periods]

Band Theory of Solids: Free electron theory of metals(Qualitatively), Fermi Level, Density of Energy States and Energy Band Diagrams, Bloch theorem for particle in a periodic potential (Qualitatively), Kronig-Penny Model(Qualitatively), E-K Diagram, Origin of Energy Bands in solids, Effective mass of an electron, Distinction between Metals, Semiconductors and Insulators.

MODULE III: Semiconductor Physics [12 Periods]

A: Intrinsic and Extrinsic Semiconductors, Expression for carrier concentration in intrinsic and extrinsic semiconductor, Qualitative treatment of Fermi energy level in Intrinsic and extrinsic semiconductors.

B: Direct and indirect band gap semiconductors, Carrier generation and Recombination, Drift and Diffusion, Equation of Continuity. P-N Junction: Formation & V-I Characteristics, LED: Construction and Working Principle, Solar Cell: Construction & I-V Characteristics.

MODULE IV [14 Periods]

Lasers and Fiber Optics:

Lasers: Introduction to interaction of radiation with matter, Coherence, Einstein's coefficients, Principle and working of Laser, Population inversion, Pumping, Semiconductor LASER, Applications of laser.

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: Electromagnetic Theory [14 Periods]

Gradient of Scalar field and its Physical Significance; Divergence and Curl of Vector field; Qualitative treatment of Gauss's Law of electrostatics and Gauss law of magnetostatics, Ampere's law and its modification, Faraday's law of electromagnetic induction, Induced E.M.F in a conductor, Lenz's Law, Maxwell equations in differential form, wave equation for free space.

Text Books:

1. K Vijaya Kumar, S Chandralingam, "Modern Engineering Physics'' Volume I & II, S. Chand, 1st Edition, 2017.
2. J.Singh,"Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill.ink, 1995.

Reference Books:

1. P K Palanisamy, "Engineering Physics", SciTech Publication, 4th Edition, 2014.
2. B K Pandey and S. Chaturvedi, "Engineering Physics" Cengage Learning India Revised Edition, 2014.
3. R K Gaur and SL Gupta, "Engineering Physics" Dhanpat Rai Publications, Eighth Revised Edition, 2006.
4. D K Bhattacharya, Poonam Tandon, "Engineering Physics", Oxford University Press, 1st Edition, 2015.
5. P. Bhattacharya, "Semiconductor Optoelectronic Devices", Prenticehall of India,1997

E-Resources:

1. https://www.researchgate.net/publication/259574083_Lecture_Notes_on_Engineering_Physics
2. https://www.researchgate.net/publication/292607115_Applied_Physics
3. http://www.springer.com/physics/theoretical%2C+mathematical+%26+computational+physics/journal/40094
4. http://www.springer.com/physics/journal/340
5. http://nptel.ac.in/courses/113104012/
6. https://www.youtube.com/watch?v=jnjjWI1s9_s&list=PLzJaFd3A7DZse2tQ2qUFChSiCj7jBidO0
7. https://www.youtube.com/watch?v=4a0FbQdH3dY

Course Outcomes:

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

1. Acquire the theoretical information about matter in terms of quantum physics
2. Analyze the formation the bands thereby classification of materials on the basis of transport properties.
3. Understand the fundamentals of semiconductor physics and also the Optoelectronics
4. Be aware of the concepts and applications of LASER and Optical fibers.
5. Apply basic knowledge on electromagnetic principles and using these wave equations for the propagation

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: 80501	PROGRAMMING FOR PROBLEM SOLVING (Common for EEE, ECE, CSE, and IT)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: 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.

Reference Books:

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, PSO 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	PS O 1	PS O2	PS O3
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. I Semester		
Code: 80H02	ENGLISH LANGUAGE LAB (Common for EEE, ECE, CSE, and IT)	L	T	P
Credits: 1		-	-	2

Course Objectives: To sensitize the students to the intelligibility in their pronunciation of English, speech sounds, word accent, intonation and rhythm. It also helps to improve the fluency in spoken English and make them aware of nuances of major skills, *viz* listening and speaking skills. Hence it helps to train the students to understand nuances of both verbal and nonverbal 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.
6. Prescribed Lab Manual: Rani Sudha, "***English Language Communication Skills laboratory"*** *Manual* Published by **Pearson Publication**, 5 edition, New Delhi 2014

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: 80B04	APPLIED PHYSICS LAB	L	T	P
Credits: 1	(Common to EEE, ECE, CSE and IT)	-	-	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. **Planck's constant:** To determine Planck's constant using Photo electric effect.
2. **Energy band –gap of a semiconductor**: To determine the energy band gap of a semiconductor
3. **V-I and P-I characteristics of light emitting diode:** Plot V-I and P-I characteristics of light emitting diode
4. **Laser diode:** To study the Characteristics of Laser diode
5. **Solar Cell:** To study the V-I Characteristics of solar cell
6. **LCR Circuit:** To determination of resonant frequency, bandwidth and quality factor of RLC circuit.
7. **Numerical Aperture of an Optical fiber:** To determine the Numerical aperture of the given fiber
8. **Bending Loss of a Fiber:** To determine the bending loss of the given fiber.
9. **Light Dependent Resistance (LDR):** To determine the characteristics of a LDR
10. **Stewart and Gee's experiment:** Determination of Magnetic field along the axis of current carrying circular coil
11. **Torsional Pendulum:** To determine the rigidity modulus of a given wire
12. **Sonometer:** To verify the frequency of AC power supply

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

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: 80502	PROGRAMMING FOR PROBLEM SOLVING LAB (Common for EEE, ECE, CSE, and IT)	L	T	P
Credits: 1		-	-	2

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

Software Requirements: Turbo C

List of Programs:

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

in a given list of integers using linear search.

b. Write a C program that uses recursive and non -function to search for a Key value in a given sorted list of integers using Binary search.

12 a. Write a C program that implements the Selection sort method to sort a given array of integers in ascending order.

b. Write a C program that implements the Bubble sort method to sort a given list of names in ascending order.

Text Books:

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

Reference Books:

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

Course Outcomes:

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

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

CO- PO, 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 O 1**	**PS O2**	**PS O3**
CO1		2	3	2									3	2	
CO2			3		2								2	3	
CO3		2	2		2									2	
CO4			3		3								2	3	
CO5		2	2		3								3	2	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: 80303	ENGINEERING WORKSHOP (Common for EEE, ECE, CSE, and IT)	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.

1. 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		
	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				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. II Semester
Code: 80B06	ENGINEERING MATHEMATICS-II	L	T	P
Credits: 4	(Common for CE, EEE, ME, ECE, CSE, IT and Min.E)	3	1	-

Pre-Requisites: 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

Reference Books:

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, 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**
CO1	3	3	3	3	2	2			2	2		3		2	
CO2	3	3	3	3	2	2			2			3		2	
CO3	3	3	3	3	2	2			2	2		3		2	
CO4	3	3	3	3	3				2			3		2	
CO5	3	3	3	3	2	3			2	2		3		2	

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: 80B03	ENGINEERING CHEMISTRY	L	T	P
Credits: 4	(Common for EEE, ECE, CSE, and IT)	3	1	-

Pre-Requisites: 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

A: Electrochemistry: [16 Periods]

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 [10 Periods]

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

Text Books:

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

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) ttps://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. II Semester		
Code: 80201	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common for EEE, ECE, CSE, and IT)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

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

MODULE I: DC Circuits [9 Periods]

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

MODULE II: AC Circuits [9 Periods]

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

MODULE III: Introduction to Electrical Machines [10 Periods]

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

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

MODULE IV: P-N Junction Diode [10 Periods]

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

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

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

MODULE V: BJT and Junction Field Effect Transistor (JFET) [10 Periods]

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

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

Text Books:

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

Reference Books:

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-ofohms-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, 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
CO1	3	3	3									3			
CO2	3	3	3									3			
CO3	3	3	3									3			
CO4	3	3	3									3			
CO5	3	3	3									3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: 80503	DATA STRUCTURES (Common for EEE, ECE, CSE and IT)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Programming for Problem Solving

Course Objectives: This course will deliver the knowledge in introducing the concepts of various data structures such as linked lists, stacks, queues, trees and graphs along with the applications.

MODULE I: Performance Analysis and Introduction to data structures [10 Periods]

Performance Analysis: Algorithm definition and characteristics, time and space complexity, Asymptotic Notations – Big O, Omega and Theta notations.

Introduction to data structures: Types of data structures: Linear and Non-linear data structures. Recursion definition- Linear and Binary recursion, Design methodology and implementation of recursive algorithms, Recursive algorithms for Towers of Hanoi.

MODULE II: Linked Lists [9 Periods]

Single Linked Lists: Definition, Operations-Insertion, Deletion and Searching, Concatenating single linked lists, Circular linked lists, Operations- Insertion, Deletion.

Double Linked Lists: Definition, Operations- Insertion, Deletion. Applications of Linked list. Sparse matrices - Array and linked representations.

MODULE III: Stacks and Queues [10 Periods]

A: Stacks: Basic stack operations, Representation of a stack using arrays and linked lists, Stack Applications - Reversing list, factorial calculation, postfix expression evaluation, infix-to-postfix conversion.

B: Queues: Basic queue operations, Representation of a queue using array and Linked list, Classification and implementation – Circular queue and Dequeue, Applications of Queues.

MODULE IV: Trees and Graphs [10 Periods]

Trees: Basic concepts of Trees, Binary Tree: Properties, Representation of binary tree using array and linked lists, operations on a binary tree, binary tree traversals, creation of binary tree from in, pre and post-order traversals, Tree traversals using stack, Threaded binary tree.

Graphs: Basic concepts of Graphs, Representation of Graphs using Linked list and Adjacency matrix, Graph algorithms, Graph traversals- (BFS & DFS).

MODULE V: Search Trees [9 Periods]

Binary Search Trees and Height balanced Binary Search Trees: Binary Search Tree, Definition, Operations - Searching, Insertion and Deletion, AVL Trees (Elementary treatment-only Definitions and Examples).B-Trees and Red-Black Tree: B-Trees, Red-Black and Splay Trees (Elementary treatment-only Definitions and Examples), Comparison of Search Trees.

Text Books:

1. Jean Paul Tremblay, Paul G Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hills, 2nd Edition, 1984.
2. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures: A Pseudo code approach with C ", Thomson (India), 2nd Edition, 2004.

Reference Books:

1. Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, "Fundamentals of Data Structure in C", University Press (India), 2nd Edition, 2008.
2. A. K. Sharma, "Data structures using C", Pearson, 2nd Edition, June, 2013.
3. R. Thareja, "Data Structures using C", Oxford University Press, 2nd Edition, 2014.

E-Resources:

1. http://gvpcse.azurewebsites.net/pdf/data.pdf
2. http://www.sncwgs.ac.in/wp-content/uploads/2015/11/Fundamental-Data-Structures.pdf
3. http://www.learnerstv.com/Free-Computer-Science-Video-lectures-ltv247-Page1.htm
4. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7-3lcmoMApVUMmjlExpIb1zste4YXX1pSpX8a2mLgDzZ-E41CJ6PVmY4S0MqVbxsFQ
5. http://nptel.ac.in/courses/106102064/1

Course Outcomes:

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

1. Identify the appropriate data structures and analyze the performance of algorithms.
2. Understand and implement single, double, and circular linked-lists.
3. Implement Stacks and Queues using array and linked-list representations.
4. Develop programs by using nonlinear data structures such as trees and graphs.
5. Design and Implement applications of advanced data structures using BST.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: 80301	ENGINEERING GRAPHICS (Common for EEE, ECE, CSE, and IT)	L	T	P
Credits: 2		1	-	2

Pre-Requisites: 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.

Text Books:

1.K.L. Narayana, S.Bheemanjaneyulu "Engineering Drawing with Auto CAD-2016" New Age International Publishers, 1st Edition, 2018.

2.N.D. Bhat, "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2014.

Reference Books:

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

E - Resources

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

Course Outcomes:

At the end of the course students will be able to

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

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

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: 80B05	ENGINEERING CHEMISTRY LAB (Common for EEE, ECE, CSE, and IT)	L	T	P
Credits: 1		-	-	2

Pre-Requisites: Nil

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)											
	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	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. II Semester		
Code: 80202	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB (Common for EEE, ECE, CSE, and IT)	L	T	P
Credits: 1		-	-	2

Course Objectives: To get practical knowledge about basic electrical circuits, electronic devices like Diodes, BJT, JFET and also analyze 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. Analyze electrical circuits by applying basic laws
2. Analyze the performance of DC Motor, three phase Induction motor and transformer
3. Understand V-I Characteristics of various diodes
4. Design Different Rectifier Circuits
5. Differentiate the Transistors and their Operations

CO- PO, 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
CO1	3	3	3	3					3			3			
CO2	3	3	3	3					3			3			
CO3	3	3	3	3					3			3			
CO4	3	3	3	3					3			3			
CO5	3	3	3	3					3			3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: 80504	DATA STRUCTURES LAB (Common for EEE, ECE, CSE and IT)	L	T	P
Credits: 1		-	-	2

Course Objectives: This course will deliver the knowledge in introducing the concepts of various data structures such as linked lists, stacks, queues, trees and graphs along with the applications.

Software Requirements: Turbo C

List of Programs:

1 Write a recursive program to solve Towers of Hanoi problem - N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.
2 Write a program to create a single linked list, with the following operations:
   a) Insertion
   b) Deletion
   c) Display the elements
   d) Count no of elements.
3 Write a program to create a circular linked list, with the following operations:
   a) Insertion
   b) Deletion
   c) Display the elements
   d) Count number of elements.
4 Write a program to create a double linked list, with the following operations:
   a) Insertion
   b) Deletion
   c) Display the elements
   d) Count number of elements.
5 Write a program to implements stack operations using:
   a) Arrays
   b) Linked list
6 Write a program to:
   a) Evaluate Postfix expression.
   b) Convert infix expression into postfix expression
7 Write a program to implements Linear Queue operations using:
   a) Arrays
   b) Linked list
8 Write a program to implements Circular Queue operations using Arrays
9 Write a program to implements Double-ended Queue operations using:
   a) Arrays
   b) Double Linked List
10 Write a recursive program to create a Binary Tree of integers, traverse the tree in preorder, in order and post order and also print the number of leaf nodes and height of the tree.
11 Write a program to create a Binary Search Tree (BST) and perform insert and search operations on it.
12 Write a program for implementing the following graph traversal algorithms:
   a) Breadth First Search (BFS)
   b) Depth First Search (DFS)

Text Books:

1. Jean Paul Tremblay, Paul G Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hills, 2nd Edition, 1984.
2. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures: A Pseudo code approach with C ", Thomson (India), 2nd Edition, 2004.

Reference Books:

1. Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, "Fundamentals of Data Structure in C", University Press (India), 2nd Edition, 2008..
2. A. K. Sharma, "Data Structures using C", Pearson, 2nd Edition, June, 2013.
3. R. Thareja, "Data Structures using C", Oxford University Press, 2nd Edition, 2014.

Course Outcomes:

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

1. Identify the appropriate recursive algorithms and analyze the performance of algorithms.
2. Understand and implement single, double, and circular linked-lists.
3. Implement linear data structures such as Stacks and Queues using array and linked-list representations.
4. Implement nonlinear data structures such as trees and graphs.

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	2	3	2									
CO2	2	2	3									
CO3		2	3									
CO4		2	3									

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

Course Objectives: 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)											
	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		1		3				2	3		2
CO2	3		1		3				2	3		2
CO3	3		1		3				2	3		2
CO4	3		1		3				2	3		2
CO5	3		1		3				2	3		2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: 80A01	NSS/SPORTS/YOGA	L	T	P
Credits: NIL	(Common for EEE, ECE, CSE, and IT)	-	-	3

Pre-Requisites: Nil

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

MODULE-I **[6 Periods]**

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

MODULE-II **[6 Periods]**

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

MODULE-III **[6 Periods]**

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

MODULE-IV **[6 Periods]**

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

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

MODULE-V **[6 Periods]**

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

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

Text Books:

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

Reference Books:

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

E-Resources:

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

Course Outcomes:

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

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

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

COS	Programme Outcomes(POs)											
	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	1			
CO2						3	2	2	1			
CO3						3	2	2	1			
CO4						3	2	2	1			
CO5						3	2	2	1			

2018-19 Onwards (MR-18)	MALLA REDDY ENGNEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80B10	SPECIAL FUNCTIONS AND COMPLEX VARIABLES (Common for EEE & ECE)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Complex Numbers, Differentiation and Integration

Course Objectives: The objective of this course is to familiarize the students, in some detail, about the analysis on Special Function s & Complex Number field. The central idea of analytic functions and the various series and transformations will find ready application in many branches of engineering.

MODULE I: Series Solution to the differential equations: [9 Periods]

Motivation for series solution, Ordinary point and Regular singular point of a differential equation, Series solutions to differential equations around zero, Frobenius Method about zero.

MODULE II: Legendre's & Bessel's Polynomials: [10 Periods]

Legendre's Differential equation, General solution of Legendre's equation, Legendre's Polynomials & Recurrence relations, Generating function, orthogonality, related problems

Bessel's Differential equation, General solution of Bessel's equation, Bessel functions, Recurrence relations, Generating function, and orthogonality, related problems.

MODULE III: Complex Functions –Differentiation and Integration [10 Periods]

A: Complex functions and its representation on Argand plane, Concepts of limit, Continuity, Differentiability, Analyticity, Cauchy-Riemann conditions, Harmonic functions– Milne – Thompson method.

B: Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

MODULE IV: Power series expansions of complex functions and contour Integration: [10 Periods]

Radius of convergence -Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point –Isolated singular point – pole of order m – essential singularity. Residue – Evaluation of residue by formula and by Laurent series – Residue theorem. Evaluation of integrals by indentation

(a) $\int_c^{c+2\pi} f(\cos\theta \ , \sin\theta)d\theta$ (b) $\int_{-\infty}^{\infty} f(x)dx$

MODULE V: Conformal mapping: [9 Periods]

Transformation of z-plane to w-plane by a function, conformal mapping. Standard transformations, Translation; Magnification and rotation; inversion and reflection, Transformations like e^Z, log z, z^2

Bilinear transformation, Properties of Bilinear transformation, determination of bilinear transformation when mappings of 3 points are given.

Text Books:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edit ion, John Wiley & Sons, 2006.
2. Murray R Spiegel, Complex variables, Schaum's Outlines, 2nd Edition, Mc.Graw Hill Publications.
3. J N Sharma, Functions of a complex variable, Krishna Publications.

Reference Books:

1. Michel D Greenberg, Advanced Engineering Mathematics, Second Edition, Pearson Publications.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. R.K.Jain, S.R.K.Iyengar, Advanced Engineering Mathematics, 5th edition, Narosa Publications

E-Resources:

1. http://www.math.odu.edu/~jhh/ch25.PDF (Function Of Complex Variable)
2. https://www.math.ust.hk/~maykwok/courses/ma304/06_07/Complex_4.pdf (Complex Integration)
3. http://www.math.psu.edu/papikian/Kreh.pdf (Bessel Function)
4. http://nptel.ac.in/courses/111103070/10 (Cauchy-Riemann Equations and Differentiability)
5. http://nptel.ac.in/courses/111103070/16 (Contour Integration)
6. http://nptel.ac.in/courses/111103070/32 (Conformal mapping)

Course Outcomes:

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

1. Evaluate the improper integrals using Beta and Gamma functions.
2. Understand the Bessel's and Legendre's Polynomials.
3. Understand the concept of Analytic function and conformal mapping.
4. Understand the concept of Complex integration.
5. Understand the concepts of Laurent's series, Taylor series expansions of complex functions and Contour integration

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80401	ANALOG ELECTRONICS	L	T	P
Credits: 3	(Common for EEE & ECE)	3	-	-

Pre-Requisites: Applied Physics, Basic Electrical and Electronic Engg.

Course Objectives: This course provides the knowledge of Transistor and FET Biasing Techniques, Amplifiers particularly Single Stage Amplifiers and also provides knowledge of study about different amplifiers and understand small signal analysis of different transistor configurations and study about feedback and oscillators.

MODULE I: BJT Biasing & FET Biasing [10 Periods]

BJT Biasing: Need for biasing, operating point, load line analysis, bias stabilization techniques: fixed bias, collector to base bias, self - bias, Stabilization against variations in Ico, VBE and β for the self -bias circuit, bias compensation techniques, thermal runaway and thermal stability.

FET Biasing: Biasing techniques: Fixed bias, Source self - bias, Voltage divider bias

MODULE II: BJT Small Signal Analysis [10 Periods]

Small signal low frequency transistor Amplifier circuits: h-Parameter representation of a Transistor, Analysis of single stage transistor Amplifier (CE, CB, CC) using h-parameters: voltage gain, current gain, input impedance and output impedance. Comparison of transistor configurations in terms of Ai, Ri, Av, Ro. Analysis of CE Amplifier with Emitter resistance and Emitter follower, Millers theorem and its Dual. Simplified h-parameter Model.

MODULE III: Single Stage Amplifiers [10 Periods]

A: Classification of Amplifiers, Distortion in Amplifiers, Low Frequency response of common emitter Amplifiers, Common Base Amplifiers and Common Collector Amplifier.

B: Small signal JFET model, JFET Amplifiers: Common Drain Amplifier, Common Source Amplifier and Common Gate Amplifier. Gain band width product. Analysis of Common Source Amplifier with resistive load.

MODULE IV: Feedback Amplifiers [8 Periods]

Feedback concept and types, Transfer Gain with feedback, General Characteristics of Negative Feedback Amplifiers, Types of Negative Feedback Connections, Method of Identifying Feedback Topology, Stability of Feedback Amplifier.

MODULE V: Oscillators [10 Periods]

Constituents of an Oscillator, Barkhausen Criterion, Classification of Oscillators, Sine Wave Feedback Oscillators of LC Type - General Form of Oscillator Circuit, Hartley Oscillator, Colpitts Oscillator Sine Wave Feedback Oscillator of RC type - RC Phase Shift Oscillator, Wein Bridge Oscillator, Crystal Oscillator, Frequency Stability. Design of an RC Phase - Shift Oscillator.

Text Books:

1.Jacob Milliman, Christos C. Halkias, SatyabrataJit, "Electronic Devices and Circuits", McGraw Hill (India) ,3rd edition, 2013.

2. Shalivahana N. Suresh Kumar, A. Vallavaraj, "Electronic Devices and Circuits", Tata McGraw Hill (India), 3rd edition, 2007.

Reference Books:

1.Robert Boylestad, LowisNashelsky, "Electronic Devices and Circuit Theory", Prentice Hall of India, 5th Edition, 1993.

2.G. K. Mithal, "Electronic Devices and Circuits", Khanna Publications, 22nd Edition,1999.

E-Resources:

1.http://electronicsforu.com/

2.https://www.elektormagazine.com/

3.http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?reload=true&punumber=101

4.http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=16

5.http://nptel.ac.in/courses/117101106/6

Course Outcomes:

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

1.Study different biasing techniques and design the DC bias circuits using BJT & FET

2. Understand the small signal analysis of different transistor configurations.

3. Understand the design of single stage Amplifiers

4. Understand the design of Feedback amplifiers and their frequency response.

5. Understand the design of various oscillators such as RC Phase Shift Oscillator, Wein Bridge Oscillator, Crystal Oscillator, LC Oscillator etc

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80402	SIGNALS AND SYSTEMS	L	T	P
Credits: 3		2	1	-

Pre-Requisites: Nil

Course Objectives: This course is introducing the basic concepts of signals and introduce the Fourier series for the analysis of periodic signals, the Fourier transform for the analysis of non-periodic signals and familiarize the concept of sampling and different types of sampling techniques. This course also introduces the LTI system and the concepts of convolution and correlation applied for the signal analysis, the concept of Laplace transform, its properties and its applications for continuous time domain signals, the concept of Z- transform, its properties and its applications for discrete time domain signals

MODULE I: Introduction to Signals [10 Periods]

Definition, Classification of Signals (continuous - time and discrete - time), Elementary signals (continuous - time and discrete - time).

Signal Analysis: Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of orthogonal functions, Orthogonality in Complex functions.

Fourier series: Overview of Fourier series.

MODULE II: Fourier Transforms &Sampling [10 Periods]

Fourier Transforms: Derivation of Fourier Transform from Fourier Series, Existence of Fourier Transform, Fourier Transform of Standard signals, Properties of Fourier Transform, Fourier Transform of periodic signals, and Introduction to Hilbert Transform.

Sampling: Sampling theorem – Graphical and analytical proof for Band Limited Signals, Types of Sampling – Impulse Sampling, Natural and Flat Top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

MODULE III: LTI System, Convolution and Correlation [10 Periods]

A: Signal Transmission through Linear Systems: System Definition, Classification of systems, Properties of LTI systems, Transfer Function of an LTI system, Filter Characteristics of Linear System, Distortionless Transmission through a system.

B: Convolution and Correlation of Signals: Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution, Convolution property of Fourier Transforms, Cross Correlation and Auto Correlation functions, Properties of Correlation function, Energy density spectrum, Parseval's Theorem.

MODULE IV: Laplace Transforms [10 Periods]

Unilateral and Bilateral Laplace Transform, Relation between Laplace Transform and Fourier Transform, Laplace Transform of some commonly used signals and its Region of Convergence (ROC), Properties of Laplace Transform, Inverse Laplace Transform, Solution of Differential equations using Laplace Transform, Laplace Transform of signals using waveform synthesis.

MODULE V: Z–Transforms **[8 Periods]**

One sided and Bilateral Z-Transform, Z-Transform of some commonly used signals and its Region of Convergence (ROC), Properties of Z-Transform, Inverse Z-Transform-Long Division, Partial Fraction and Residue Methods.

Text Books:

1. B. P. Lathi, "Signals Systems & Communications", BSP, 2nd Edition, 2013.
2. P Ramakrishna Rao and Shankar Parkriya, "Signals and Systems", MGH International, 2nd Edition, 2013.

Reference Books:

1. A.V. Oppenheim, A. S. Willsky, S.H. Nawab, "Signals and Systems", PHI, 2nd Edition, 2014.
2. A. Anand Kumar, "Signals and Systems", PHI, 3rd Edition, 2013.
3. Simon Haykin and Van Veen, "Signals & Systems", Wiley, 2nd Edition, 2007.

E-Resources:

1. http://www.tutorialspoint.com/signals_and_systems/
2. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/
3. http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?reload=true&punumber=78
4. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=8919
5. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=82
6. http://nptel.ac.in/courses/117104074
7. http://nptel.ac.in/courses/117101055

Course Outcomes:

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

1. Represent any arbitrary signals in terms of complete sets of orthogonal functions and understand the principles of impulse functions, step function and signum function.
2. Express periodic signals in terms of Fourier series and aperiodic signals in terms of Fourier transform.
3. Understand the principle of linear system, filter characteristics of a system and its bandwidth, the concepts of auto correlation and cross correlation and power Density Spectrum.
4. Express continuous time domain signals in terms of Laplace Transform ie. complex frequency domain (s-plain) and waveform synthesis.
5. Express discrete time domain signals in terms of Z-Transform and its Region of Convergence.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80403	DIGITAL ELECTRONICS	L	T	P
Credits: 3		2	1	-

Pre-Requisites: Nil

Course Objectives: This course introduces various number systems and conversion from one number system to other and also to understand different binary codes**,** the theory of Boolean algebra and to study representation of switching functions using Boolean expressions and their minimization techniques. Understanding the combinational logic design of various logic and switching devices and their realization**,** the basic flip flops and sequential logic circuits design both in synchronous and Asynchronous modes for various complex logic and switching devices, their minimization techniques and their realizations and to analyze a given sequential circuit by using state tables and state diagrams.

MODULE I: Number systems& Binary codes [8 Periods]

Number systems: Number Systems, Radix conversions, complement of numbers.

Binary codes: Binary codes, Weighted and non-Weighted codes, BCD code, gray code, excess 3 codes - Error detecting code, Error Correcting code, Hamming Code.

MODULE II: Boolean Algebra & Boolean functions [10 Periods]

Boolean Algebra: Postulates and Theorems - Canonical and Standard forms: SOP and POS forms, Minterms and Maxterms –Logic gates: NOT, OR, AND, NOR, NAND, XOR, XNOR - Universal gates

Simplification of Boolean functions: Simplification of functions: Karnaughmap (2,3,4,5,6 Variables) and Quine McCluskey method (Tabular Method) - Prime implicants, essential prime implicants.

MODULE III: Combinational Logic Circuits [10 Periods]

A: Arithmetic circuits: Half adder, full adder, half subtractor, full subtractor, binary adder, Carry look ahead adder, BCD adder

B: Code conversion circuits, Comparator, Decoder, Encoder, Priority Encoder, Multiplexers and Design, De – Multiplexers, ROM, PLA, PAL.

MODULE IV: Sequential Logic Circuits - I [10 Periods]

Introduction –Latches and Flip flops: Basic Flip flop circuit, RS, D, JK and T Flip-flops – Triggering of Flip flops: Master Slave Flip flop, edge triggered flip flop – Conversion of one type of Flip flop to another,Setup time, hold time.

Registers and Counters: Shift Register, Universal Shift Register, Applications of Registers, Asynchronous counter, Synchronous counter, Mod-N Counter, binary up/down counter, Ripple counter, Johnson counter.

MODULE V: Sequential Logic Circuits - II **[10 Periods]**

Analysis of Sequential Logic circuit: State Diagram, state table, reduction of state table, state Assignment –- Design procedure of sequential circuits using state diagram, state table and Flip flops. Example design Sequence detector.

Finite State Machine: Introduction, FSM capabilities and Limitations, Mealy and Moore models – minimization of completely specified and incompletely specified sequential Machines. Partition techniques and Merger charts

Text Books:

1. ZviKohavi, "Switching and Finite Automata Theory",TMH, 2nd edition, 2006.
2. Morris Mano, "Digital Design", PHI, 3rd Edition, 2009.
3. A.Anand Kumar, "Switching Theory and Logic Design", PHI 2nd Edition, 2014.
4. John F.Wakerly, "Digital Design Principles & Practices", PHI/ Pearson Education Asia, 3rd Ed., 2005.

Reference Books:

1. Stephen Brown and Zvonka Vramesic, "Fundamentals of Digital Logic with VHDL Design", McGraw Hill, 2nd Edition, 2008.
2. William I. Fletcher, "An Engineering Approach to Digital Design", PHI, 1st Edition, 2009.

E-Resources:

1. https://www.researchgate.net/publication/264005171_Digital_Electronics
2. https://www.cl.cam.ac.uk/teaching/0708/DigElec/Digital_Electronics_pdf.pdf
3. http://ieeexplore.ieee.org/abstract/document/753678/
4. http://docshare01.docshare.tips/files/20257/202573063.pdf
1. http://nptel.ac.in/courses/117106086/1
2. http://nptel.ac.in/courses/117105080/
3. http://nptel.ac.in/courses/117106114/

Course Outcomes:

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

1. Perform radix conversions
2. Minimize a given boolean function by using k-map or tabular method
3. Design a combinational circuit
4. Design a sequential circuit by using various flipflops
5. Analyze and minimize the circuitry of a given sequential circuit and will be able to design a sequence detector

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80404	PROBABILITY THEORY AND STOCHASTIC PROCESSES	L	T	P
Credits: 4		3	1	-

Pre-Requisites: Nil

Course Objectives: To build an understanding of the fundamental concepts of probability theory, independent and conditional events, the concept of random variables and statistical operations on it, multiple random variables, random processes and their analysis in time domain and familiarize the student with the spectral characteristics of random processes and to determine linear system response in the presence of random noise

MODULE I: Review of Probability Theory [10 Periods]

Probability introduced through sets and Relative Frequency, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes'Theorem, Independent events.

MODULE II: Random Variable & Operations [14 Periods]

Random variables: Definition of A Random Variable, Classification of Random Variables, Cumulative Distribution Function(CDF) and its properties, Probability Density function(pdf) and its Properties, CDF & pdf of Random Variables – Uniform, Gaussian, Rayleigh, Bernoulli, Binomial, Exponential, Poisson, Conditional distribution and density functions.

Operations on Single Random Variable: Expectation, Moments, Variance and Skew, Characteristic Function, Moment Generating Function, Transformations of a Random Variable

MODULE III: Multiple Random Variables &Operations [12 Periods]

A: Multiple Random Variables: Joint Distribution and its Properties, Joint Density and its Properties, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Central Limit Theorem (Without Proof).

B: Operations On Two Random Variables: Joint Moments about the origin, Joint Central Moments, Joint Characteristic functions. Transformation of Multiple Random Variables, Linear Transformation of Gaussian Random Variable.

MODULE IV: Random Processes-Temporal Characteristics [14 Periods]

Classification of Random Processes, Stationary – WSS and SSS Processes, Time Averages and Ergodicity, Mean-Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties, Linear System Response of Mean and Mean-squared Value, Autocorrelation Function, Cross-Correlation Functions.

MODULE V: Random Processes-Spectral Characteristics [14 Periods]

Power Density Spectrum and its Properties. Relationship between PSD and Autocorrelation Function, Cross-Power Density Spectrum and its Properties, Relationship between Cross PSD and Cross-correlation Function, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Spectral Density of Input and Output of a Linear System

Text Books:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", TMH, 4th Edition, 2001.

Reference Books:

1. Y. Mallikarjuna Reddy, "Probability Theory and Stochastic Process", University Press, 4th Edition, 2013.
2. Athanasius Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", TMH, 4th Edition, 2002.
3. Henry Stark and John W. Woods,"Probability and Random Processes with Application to Signal Processing", PE, 3rd Edition, 2001.

E-Resources:

1. https://ocw.mit.edu/courses/mathematics/18-440-probability-and-random-variables-spring-2014/lecture-notes/
2. http://nptel.ac.in/courses/IIT- MADRAS/Principles of_Communication1/Pdfs/1_5.pdf
3. http://pages.ucsd.edu/~ssaiegh/Slides8.pdf
4. http://nptel.ac.in/courses/117105085/
5. http://nptel.ac.in/courses/111104032/
6. http://www.nptelvideos.in/2012/12/probability-random-variables.html

Course Outcomes:

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

1. Understand the basics of probability, events, sample space and how to use them to real life problems
2. Analyze that the random variable is always a numerical quantity and will know the importance of cdf, pdf in characterizing random variables; they can also perform all the statistical operations on single random variables
3. Understand the multiple random variables and will be able to perform statistical operations on random vectors
4. Understand the concept of random processes and their temporal characteristics; they will be able to determine correlation and covariance.
5. Understand power density spectrum and its properties and its relation with correlation

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:80405	NETWORK THEORY AND TRANSMISSION LINES	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Basic Electrical and Electronics Engineering

Course Objectives: This course introduces the basic concepts of transient analysis of the circuits, the basic two port network parameters. It also introduces the students the fundamental theory and concepts of transmission lines and their practical applications and understanding the use of transmission lines with different lengths and also about smith chart.

MODULE I: Network Theorems & Transient Analysis [11 Periods]

Network Theorems (A.C. & D.C): Norton's Theorem, Reciprocity Theorem, Tellegen's Theorem, Milliman's and Compensation theorems for A.C & D.C excitations.

Transient Analysis (First and Second Order Circuits): Transient Response of RL, RC Series, RLC Circuits for DC excitations, Initial Conditions, Solution using Differential Equations approach and Laplace Transform Method.

MODULE II: Two Port Networks [9 Periods]

Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, Conversion of one Parameter to another, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations, Image Parameters, Illustrative problems.

MODULE III: Locus Diagrams, Resonance and Magnetic Circuits: [10 Periods]

A: Locus Diagrams, Resonance: Locus diagrams- Series and Parallel RL, RC and RLC circuits with variation of various parameters- Resonance-series and parallel circuits, concepts of Bandwidth and Quality factor.

B: Magnetic Circuits: Faraday's laws of electromagnetic induction, concept of self and mutual inductance, Dot convention coefficient of coupling, composite magnetic circuits, Analysis of series and parallel magnetic circuits.

MODULE IV: Transmission Lines - I [9 Periods]

Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness / Low Loss Characterization, Distortion – Condition for Distortionless and Minimum Attenuation, Loading - Types of Loading, Illustrative Problems.

MODULE V: Transmission Lines – II [9 Periods]

Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements; $\lambda/4$, $\lambda 2$, $\lambda/8$ Lines – Impedance Transformations, Significance of Z_{min} and Z_{max}, Smith Chart – Configuration and Applications, Single and Double Stub Matching, illustrative Problems.

Text Books:

1. William Hayt and Jack E. Kemmerly, "Engineering circuit analysis", Mc Graw Hill Company, 7th Edition.
2. B.L.Theraja and A.K. Theraja, "A Textbook of Electrical Technology Volume I", S.Chand publications.
3.Umesh Sinha and Satya Prakashan, "Transmission Lines and Networks", (Tech. India Publications), New Delhi, 7th Edition, 2006.

Reference Books:

1. A. Chakrabarhty, Electrical Circuits, Dhanipat Rai & Sons.
2. S.N. Singh, "Basic Electrical Engineering", PHI.
3. K. S. Suresh Kumar, "Electric Circuit Analysis", Pearson Education.
3. John D. Ryder, "Networks, Lines and Fields", PHI, 2nd Edition, 1999.

E-Resources:

1. http://nptel.ac.in/courses/108108076/
2. https://www.electrical4u.com/electrical-power-transformer-definition-and-types-oftransformer/
3.www.dannex.se/theory/1.html
4.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-013-electromagnetics-and-applications-spring-2009\
5.www.tandfonline.com/toc/uemg20/current
6.nptel.ac.in/courses/108104087
7.nptel.ac.in/courses/115101005

Course Outcomes:

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

1. Apply network theorem to analyze the various electrical circuits.
2. Determine the transient behavior of first and second order circuits.
3. Differentiate various types of transmission lines and its parameters
4. Understand the use of transmission lines with different lengths and also about smith chart.
5. Analyze the two port networks by determining the various parameters.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80406	ANALOG ELECTRONICS LAB (Common for EEE & ECE)	L	T	P
Credits: 1		-	-	2

Course Objectives: To design different amplifiers, Feedback amplifiers and Oscillator circuits according to the given specifications.

PART - A: Implement the following Simulation using Multisim or Any equivalent open source software

1. Common Source Amplifier.
2. Common Gate Amplifier.
3. Voltage Shunt Feedback Amplifier
4. Wein Bridge Oscillator using Transistors.
5. Hartley Oscillator Using Transistors.
6. Colpitt's Oscillator Using Transistors.

PART - B: To be performed Using Discrete Electronic Components

1. Common Emitter Amplifier.
2. Common Collector Amplifier.
3. Common Drain Amplifier.
4. Voltage Series Amplifier.
5. Current Series Amplifier
6. RC Phase Shift Oscillator using Transistors.

Course Outcomes:

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

1. Design Amplifiers Circuits.
2. Design Oscillator Circuits.
3. Analyze Feedback topology for amplifiers .

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
CO1	2	3	3	3	3		2			1	1	2	3	3	1
CO2	2	3	3	3	3		2			1	1	2	3	3	1
CO3	2	3	3	3	2		1			1		2	3	3	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80407	SIGNALS AND STOCHASTIC PROCESSES LAB	L	T	P
Credits: 1		-	-	2

Course Objectives: To get knowledge on how to write program for various operation on signals, to verify various functions of random process.

Implement the following Programs using MATLAB/Octave/Equivalent Software

1. (A)Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit impulses, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
2. Operation of Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Generation of random variables (inverse CDF method)- generate a number from uniform distribution, substitute it in inverse CDF to get the random number from the wanted distribution, finally plot the pdf and CDF of the following distributions:
   a) Uniform, Gaussian, Rayleigh, Exponential
   b) Bernoulli, Binomial, Poisson

   Verify this by using standard (in-built) function in MATLAB/Octave/Equivalent Software.
4. Program to view the 'pdf' (and CDF) of different random variables. Prove that it is a "valid pdf"
5. Operations on Single Random Variable: Mean, Variance, Skew of different distributions
6. Operations on Multiple Random Variables- Correlation and Covariance of any given two random variables
7. Verification of Stationarity of a given Random Process
8. Verification of Ergodicity of a given Random Process
9. A) Calculation of autocorrelation function and power-spectral density of a given random process

   B) Calculation of cross-correlation function and cross-power-spectral density of two random processes
10. Calculation of Temporal Characteristics of Response of Linear-Time Invariant Systems when input is a WSS random process
11. Calculation of Spectral Characteristics of Response of Linear-Time Invariant Systems when input is a WSS random process
12. Gibbs Phenomenon.

Course Outcomes:

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

1. Generate different signals with different parameters.
2. Do operations on random variables.
3. Verify & do the calculation on various random process.

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**
CO1	3	3	2	3	3				1	2		1	2	3	2
CO2	3	3	2	3	3				2	2		2	2	3	2
CO3	3	3	2	3	3				2	2		2	2	3	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. III Semester		
Code: 80M02	**GENDER SENSITIZATION**	**L**	**T**	**P**
Credits: NIL	(Common for EEE, ECE, CSE and IT)	**2**	**-**	**-**

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

MODULE I: Understanding Gender [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 *-12) 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." Women's Work: Its Politics and Economics *(Towards a* **B:** *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.

Text 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. http://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:

1. http://www.actforyouth.net/resources/rf/rf_gender1_1213.cfm(UNDERSTANDING GENDER)
2. https://www.simplypsychology.org/gender-biology.html(GENDERAND BIOLOGY)
3. http://www.yourarticlelibrary.com/essay/essay-on-gender-issues-in-labour-market-in-india/40442/ (GENDER AND LABOUR)
4. http://journals.sagepub.com/doi/abs/10.1177/107780120000600700 4(ISSUES OF VIOLENCE)
5. 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**
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 III Semester		
Code:80A02	INTERNSHIP-I	L	T	P
Credits: NIL		-	-	-

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech IV Semester		
Code:80H04	ENGINEERING ECONOMICS AND ACCOUNTANCY (Common for EEE, ECE, CSE and IT)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: 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).

Text Books:

1. Aryasri, "Managerial Economics and Financial Analysis", TMH, 2nd edition, 2005.
2. Varshney & Maheswari, "Managerial Economics", 5th edition Sultan Chand, 2003.

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/

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.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80209	CONTROL SYSTEMS (Common to EEE and ECE)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil.

Course Objectives: This course introduces different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response. It also emphasis on analysis of system performance in time and frequency domain and techniques for improving the performance.

MODULE I: Introduction [10 Periods]

Concepts of Control Systems - Open Loop and closed loop control systems and their differences -Different examples of control systems - Classification of control systems, Feedback Characteristics, Effects of feedback, Mathematical models – Differential equations, Impulse Response and transfer functions.

Transfer Function Representation: Block diagram representation of systems considering electrical systems as examples - Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula. Synchros, AC & DC servo motors and stepper motor.

MODULE II: Time Response Analysis [9 Periods]

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

MODULE III: Stability Analysis in S-Domain [9 Periods]

A: The concept of stability – Routh's stability criterion – Qualitative stability and conditional stability – Limitations of Routh's stability.

B: Root Locus Technique: The root locus concept - Construction of root loci - Effects of adding poles and zeros to G(s) H(s) on the root loci.

MODULE IV: Frequency Response Analysis [10 Periods]

Introduction, Frequency domain specifications - Bode diagrams - Determination of frequency domain specifications and Phase margin and Gain margin - Stability analysis from Bode Plots - Polar Plots - Nyquist Plots.

Compensation Techniques: Lag, Lead and Lead -Lag Controllers design in frequency Domain**.**

MODULE V: State Space Analysis of Continuous Systems [10 Periods]

Concepts of state, state variables and state model, derivation of state models from block diagrams, diagonalization - Solving the Time invariant state equations - State Transition Matrix and it's Properties – Concepts of Controllability and observability.

Text Books:

1. I.J.Nagrath and M.Gopal, "Control Systems Engineering", New Age International Publishers, 5th Edition, 2007.
2. Benjamin.C. Kuo, "Automatic Control Systems", Prentice Hall of India, 7th Edition, 1995.

Reference Books:

1. A.Nagoor kani, "Control Systems", RBA Publications, 2nd Edition, 2006.
2. M.Gopal, "Control System: Principles and Design", Tata McGraw Hill, 2 nd Edition, 2002.
3. Joseph J Distefano, "Schaum's Outline Series of Feedback and Control Systems", Tata McGraw Hill, 2nd Edition, 2014.
4. K. Ogata, "Modern Control Engineering", Pearson Education, New Delhi, 5th Edition, 2010.
5. M. Gopal, "Control Systems, Principles & Design", Tata McGraw Hill, 4th Edition,2012.

E-Resources:

1. https://www.electrical4u.com/control-engineering-historical-review-and-types-of-control-engineering/
2. http://ieeecss.org/CSM/library/2011.html
3. http://nptel.ac.in/courses/108101037/

Course Outcomes:

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

1. Apply transfer function models to analyze physical systems.
2. Determine the transient and steady state behavior of systems subjected to standard test signals.
3. Analyze the linear systems for absolute and relative stability in time and frequency domain.
4. Analyze the stability of the linear system in frequency domain and design compensators.
5. Familiarize with state space analysis and system properties like Controllability and Observability.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80408	ELECTROMAGNETIC WAVE THEORY	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Vector Calculus, Engineering Physics, Applied Physics

Course Objectives: This course introduces to learn the basic principles of electrostatics and Magnetostatics. It also introduces the students the fundamental theory and concepts of electromagnetic waves.

MODULE I: Electrostatics [11 Periods]

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

MODULE II: Magnetostatics [9 Periods]

Biot - Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems.

MODULE III: Time Varying Fields [10 Periods]

A: Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements.

B: Conditions at a Boundary Surface: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

MODULE IV: EM Wave Characteristics -I [10 Periods]

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

MODULE V: EM Wave Characteristics -II [8 Periods]

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem – Applications, Power Loss in a Plane Conductor., Illustrative Problems.

Text Books:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics", Oxford Univ. Press, 4th Edition, 2007.
2. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2nd Edition, 2000.

Reference Books:

1. Nathan Ida, "Engineering Electromagnetics", Springer (India) Pvt. Ltd, New Delhi, 2nd Edition, 2005.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", TMH, 7th Edition, 2006.

E-Resources:

1. www.dannex.se/theory/1.html
2. ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-013-electromagnetics-and-applications-spring-2009\
3. www.tandfonline.com/toc/uemg20/current
4. nptel.ac.in/courses/108104087
5. nptel.ac.in/courses/115101005

Course Outcomes:

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

1. Understand the principals of electrostatics using Maxwell's Equations.
2. Understand the principles of in magentostatics using Maxwell's Equation.
3. Observe the change in Maxwell's equations for time varying fields and also observe the condition at the boundary surfaces.
4. Get knowledge on propagation of EM wave in different media.
5. Get knowledge on propagation characteristics of EM wave in different media.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80409	ANALOG & DIGITAL COMMUNICATIONS	L	T	P
Credits:4		3	1	-

Pre-Requisites: Signals and Systems, Probability Theory and Stochastic Processes.

Course Objectives: This course introduces the concept of modulation and various techniques for amplitude modulation of analog signals. This course also introduces the concept of angle modulation techniques for Frequency modulation of analog signals. This course also introduces the radio transmitters and receivers, the effect of noise on communication systems and various pulse analog & digital binary modulation techniques.

MODULE I: Amplitude Modulation Techniques [13 Periods]

Introduction to communication system, Need for modulation, Amplitude Modulation, Definition, Time domain and frequency domain description of AM system, single tone modulation, power relations in AM waves. Time domain and frequency domain description of DSB-SC**,** SSB-SCand VSB-SC systems**.** Comparison of AM Techniques, Applications of different AM Systems.

MODULE II: Frequency Modulation Techniques [12 Periods]

Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves with Direct and Indirect methods, Detection of FM Waves: Balanced Frequency discriminator, Phase locked loop, Comparison of FM and AM.

MODULE III: Radio Transmitters &Receivers [14 Periods]

A: Transmitters: Block diagram of AM Transmitter and FM Transmitter. Types of Noise: Resistive (Thermal) Noise Source, Shot noise, Extraterrestrial Noise, Arbitrary Noise Sources, White Noise, Narrowband Noise- In phase and Quadrature phase components and its Properties, Average Noise Figures, Average Noise Figure of cascaded networks. Noise Analysis in AM and FM Systems.

B: Radio Receivers: Introduction, Receiver Types - Tuned radio frequency receiver, Super hetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, AM & FM Receivers, Comparison with AM Receiver, Amplitude limiting. Frequency Division Multiplexing.

MODULE IV: Elements of Digital Communication Systems [13 Periods]

Model of Digital Communication System, Advantages of Digital Communication Systems.

Pulse Analog Modulation: Introduction, PAM, PWM, PPM Modulation and Demodulation Techniques.

Pulse Digital Modulation: PCM Generation and Reconstruction, Quantization Noise, Non Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

MODULE V: Digital Binary Carrier Modulation Schemes [12 Periods]

Introduction, ASK, ASK Modulator, Coherent ASK Detector, Non-Coherent ASK Detector, FSK, Bandwidth and Frequency Spectrum FSK, Non Coherent FSK Detector, Coherent FSK Detector, FSK Detection using PLL, BPSK, Coherent PSK Detection, Differential PSK.

Text Books:

1. H Taub& D. Schilling, GautamSahe, "Principles of Communication Systems", TMH, 3rd Edition, 2007.
2. Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley, 2005

Reference Books:

1. Simon Haykin, John Wiley, "Digital Communication", 1st Edition, 2005.
2. B.P. Lathi, "Communication Systems", BS Publication, 2006.

E-Resources:

1. https://courses.engr.illinois.edu/ece458/comms2.pdf
2. http://www.ece.lehigh.edu/~jingli/teach/F2005CT/notes/AnalogCommunication.pdf
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-450-principles-of-digital-communications-i-fall-2006/
4. International Journal of Communication Systems - http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1099-1131
5. Lecture Series - http://nptel.ac.in/courses/117102059/
6. Lecture Series - http://nptel.ac.in/courses/117101051/

Course Outcomes:

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

1. Understand the concepts of modulation, demodulation of various analog modulation techniques i.e., AM, DSB and SSB.
2. Analyze the Frequency Modulation signal transmission and reception and calculate the Narrowband FM, Wideband FM.
3. Understand the concepts and working of radio transmitters, radio receivers and noise analysis of analog communication systems.
4. Understand the basic components of digital communication systems.
5. Understand the concepts and working of various digital binary modulation techniques.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80410	ELECTRONIC CIRCUITS & PULSE CIRCUITS	L	T	P
Credits: 4		3	1	-

Pre-Requisites: Basic Electrical and Electronic Engineering, Analog Electronics.

Course Objectives: This course provides the knowledge of Transistor Amplifier Particularly Multistage Amplifiers and power Amplifiers and also provides knowledge of different types of non - Sinusoidal signals and understanding responses of sinusoidal and non-sinusoidal signals to high pass and low pass RC circuits. It also introduces Diode and transistor clippers, Clampers and their types, Transistor switching times and Transistor as switch design, multivibrators, different types of multivibrators, Applicative areas of multivibrators and Schmitt trigger.

MODULE I: Multistage Amplifiers [14 Periods]

Multistage Amplifiers: Different Coupling Schemes used in Amplifiers, General Analysis of Cascaded RC Coupled BJT Amplifiers Choice of Transistor configuration in a Cascade Amplifier, RC Coupled Amplifier, Transformer Coupled Amplifier, Direct Coupled (DC) Amplifiers, and Darlington Pair. Frequency Response: General Frequency Considerations, High Frequency Hybrid π Model for Common Emitter Transistor Model, Emitter Follower at Higher Frequencies, Design of Single -stage RC Coupled Amplifier using BJT.

MODULE II: Large Signal Amplifiers [12 Periods]

Introduction, Classification Based on Biasing Condition, Class A Large Signal Amplifiers, Second Harmonic Distortion, Higher - Order Harmonic Generation, Transformer Coupled Class an Audio Power Amplifier, Maximum Value of Efficiency of Class A Amplifiers, Class B Amplifier, Efficiency of Class B Amplifier, Push-Pull Amplifier (Class - B), Distortion in Power Amplifiers, Complementary Symmetry (Class B) Push - Pull Amplifier, Thermal Stability, Heat Sink.

MODULE III: Linear Wave Shaping [12 Periods]

A. High pass & Low pass RC circuits, their response for Sinusoidal, Step, Pulse, Square and Ramp inputs,

B. High pass RC circuit as differentiator and low pass RC circuit as integrator, Attenuators, Compensation, High pass and low pass RL circuits.

MODULE IV: Non - Linear Wave Shaping [12 Periods]

Non - Linear Wave Shaping: Diode clippers, transistor clippers, clipping at two independent levels, emitter coupled clipper, comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, clamping circuit theorem, practical clamping circuits.

Steady State Switching Characteristics of Diodes & Transistors: Diode as a switch, diode switching times, design of transistor as a switch, transistor - switching times.

MODULE V: Multivibrators [14 Periods]

A: BISTABLE Multivibrators: The stable state of a Bistable Multivibrator, design and analysis of fixed bias and self-biased Bistable Multivibrator, triggering of Bistable Multivibrator, emitter coupled Bistable Multivibrator, and Design and analysis of Schmitt trigger circuit using transistors.

B: MONOSTABLE and ASTABLE Multivibrators: Monostable Multivibrator, design and analysis of collector coupled Monostable Multivibrator and Monostable multi as voltage to - time converter, Astable Multivibrator, collector coupled Astable Multivibrator and Astable multi as voltage – to - frequency converter.

Text Books:

1. S. Salivahanan, N Suresh Kumar, "Electronic Circuit Analysis", Tata McGraw Hill Education Private Limited, New Delhi, 2ndEdition, 2012.
2. Jacob Milliman, Christos C. Halkias, Chetan D. Parikh "Integrated Electronics - Analog and Digital Circuits and Systems", Tata McGraw Hill Education Private Limited, New Delhi, 2ndEdition, 2011

Reference Books:

1. G. K. Mithal, "Electronic Devices and Circuits", Khanna Publishers, New Delhi, 2nd Edition, 1998.
2. David A. Bell "Solid state pulse circuits", Prentice Hall of India, New Delhi, India. 4th Edition, 2002.

E-Resources:

1. http://sureshq.blogspot.in/2015/12/pulse-and-digital-circuits-unit-2-and-3.html
2. http://wps.pearsoned.com/wps/media/objects/10581/10835513/Chapter4.pdf
3. http://www.radio-electronics.com/info/circuits/
4. http://electronicsforu.com/
5. http://www.serialsjournals.com/journal-detail.php?journals_id=315

Course Outcomes:

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

1. Design multistage transistor amplifiers and analyze the gain, impedance, bandwidth of amplifiers.
2. Design various Power amplifiers such as Class A, Class B, Class AB amplifiers etc.
3. Analyze the High pass and low pass RC circuits response for various non sinusoidal signals can be understood clearly.
4. Analyze and design different types of Clippers and Clampers along with reference voltages. Also switching times of Diodes and transistors can be understood.
5. Design and analyze Astable, Bistable and Monostable Mutivibrators.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80411	ANALOG & DIGITAL COMMUNICATIONS LAB	L	T	P
Credits: 1		-	-	2

Course Objectives: To get practical knowledge on analog and digital communication concepts.

List of Experiments:

PART A: Analog Communications (AC)

1. Amplitude modulation and demodulation.
2. DSB-SC Modulator & Detector
3. SSB-SC Modulator & Detector (Phase Shift Method)
4. Pre-emphasis & de-emphasis.
5. Time Division Multiplexing & De multiplexing
6. AGC Characteristics
7. Radio Receiver

PART B: Digital Communications (DC)

1. Pulse Amplitude Modulation and Demodulation
2. Pulse Width Modulation & Demodulation
3. Pulse Position Modulation & Demodulation
4. PCM Generation and Detection
5. Frequency shift keying. Generation and Detection
6. Phase shift keying. Generation and Detection
7. DPSK: Generation and Detection

Course Outcomes:

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

1. Perform analog modulation techniques like AM, DSB-SC & SSB-SC
2. Analyze the AGC Characteristics of Radio receiver.
3. Perform Pulse and Digital Modulation techniques

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
CO1	3	3	3	3	2	2	2	2	1	1	1	3	3	3	2
CO2	3	3	3	3	2	1	1	1		1		3	3	3	1
CO3	3	3	3	3	2	2	2	2	1	1	1	3	3	3	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80412	ELECTRONIC CIRCUITS & PULSE CIRCUITS LAB	L	T	P
Credits: 1		-	-	2

Course Objectives:

To design Multistage and Power amplifiers, linear, non-linear wave shaping circuits and multivibrators according to given specifications.

List of Experiments:

PART-A Electronic Circuits

1. Two Stage RC Coupled Amplifiers
2. Darlington Pair
3. Class A Power Amplifier (Transformer less).
4. Class B Complementary Symmetry Amplifier.

PART-B Pulse Circuits

1. Linear wave shaping.
2. Non Linear wave shaping – Clippers.
3. Non Linear wave shaping - Clampers.
4. Transistor as a switch.
5. Astable Multivibrator.
6. Monostable Multivibrator.
7. Bistable Multivibrator.
8. Schmitt Trigger.

Course Outcomes:

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

1. Understand the design of Multistage amplifiers
2. Design and calculate the efficiency of power amplifiers
3. Understand the different Pulse Circuits
4. Design and Applications of Multivibrators.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: 80413	DIGITAL ELECTRONICS LAB	L	T	P
Credits: 1		-	-	2

Course Objectives: To get programming knowledge on Verilog/VHDL programming of different digital circuits and CMOS circuits

Implement the following using Verilog/VHDL or any equivalent software

1. Introduction to Verilog/VHDL and Design of all the logic gates
2. Design of Half adder, Full adder using 3 modeling styles
3. Design of Half Subtractor, Full Subtractor using 3 modeling styles
4. Design of 4X16 Decoder using two 3x8 Decoders
5. Design of 8-to-3 encoder (without and with priority).
6. Design of Multiplexer & Demultiplexer.
7. Design of comparator
8. Design of 4-bit binary to gray converter vice versa
9. Design of BCD to Excess-3 code converter and vice versa
10. Design of flip flops: SR, D, JK, T.
11. Design of 4-bit binary up/down counter.
12. Design of Johnson counter.

Equipment required for laboratory

1. Computers – Dual Core.
2. Software – Verilog/VHDL or any equivalent software

Course Outcomes:

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

1. Design and verify the functionality of various combinational circuits using Verilog/VHDL coding.
2. Design and verify the functionality of various flip-flops and basic sequential circuits using Verilog/VHDL coding.

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
CO1	3	3	3	3	3		1		1	2	2	3	3	3	2
CO2	3	3	3	3	3		1		1	2	2	3	3	3	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech IV Semester		
Code:80M01	ENVIRONMENTAL SCIENCE (Common for EEE, ECE, CSE and IT)	L	T	P
Credits: Nil		2	-	-

Pre-Requisites: 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: [9 Periods]

A: Natural Resources: Classification of Resources: Living and Non-Living resources, Renewable and non-renewabl e-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: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Threats to Biodiversity (habitat loss, poaching of wildlife, man-wild life conflicts). Conservation of Biodiversity (In-situ and Ex-situ conservation),

Activity: case studies.

MODULE III: ENVIRONMENTAL POLLUTION AND CONTROL: [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]

Greenhouse 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).

Text Books:

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

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. Journal of earth science and climatic change (OMICS International Journal).
2. Journal of pollution effects & control (OMICS International Journal).
3. nptel.ac.in/courses/120108004/ (Principles of Environment Management Lectures).
4. 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, 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**
CO1	3		1		1	2	1								
CO2	2	3	2	3	1	3		2							
CO3	3	3	2	3	2	2		1							
CO4	3	2	2	1	2	1									
CO5	2	1	1			1	3	3							

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80414	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Digital Electronics.

Course Objectives: This course provides the students to understand operation and programming of 8085 Microprocessor, develops real time applications using 8086 processor, understand the basic concepts of 8051 Microcontroller and interfacing with I/O devices.

MODULE I: 8085 Architecture [8 Periods]

Introduction to Microprocessors, Architecture of 8085, Pin Configuration and Function, internal register & flag register, Generation of Control Signals: Bus Timings: De-multiplexing of address/ data bus; Fetch Cycle, Execute Cycle, Instruction Cycle, Machine cycles, T-states, memory interfacing.

MODULE II: Instruction Set and Programming with 8085 [10 Periods]

Instruction for Data Transfer, Arithmetic and Logical Operations, Branching Operation, Machine Cycle Concept, Addressing Modes, Instructions Format, Stacks, Subroutine and Related Instructions, Elementary Concepts of Assemblers, Assembler Directives, Looping and Counting, Software Counters with Time Delays, Simple Programs using Instruction Set of 8085, Debugging, Programs Involving Subroutines, Programs for Code Conversion e.g. BCD to Binary, Binary to BCD, Binary to Seven-Segment LED Display. Binary to ASCII, ASCII to Binary, Program for Addition Subtraction, Programs for Multiplication and Division of Unsigned Binary Numbers.

MODULE III: 8086 Architecture [09 Periods]

A:8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086- Common Function Signals, Timing diagrams, Interrupts of 8086.

B: Interfacing I/O Devices: Interfacing of 8086 with Memory, key board and display, A/D and D/A.

MODULE IV: Introduction to Microcontroller [10 Periods]

A brief History of Microcontrollers, Harvard Vs Von-Neumann Architecture; RISC Vs CISC, Classification of MCS-51family based on their features (8051,8052, 8031, 8751, AT89C51), Pin configuration of 8051.

8051 Microcontroller Architecture and Instruction Set: Registers of 8051, Inbuilt RAM, Register banks, stack, on-chip and external program code memory ROM, power reset and clocking circuits, I/O port structure, addressing modes, Instruction set and programming.

MODULE V: 8051 Real Time Control [11 Periods]

Counter/Timer and Interrupts of 8051: Introduction, Registers of timer/counter, Different modes of timer/counter, Timer/counter programming, Interrupt *Vs* Polling, Types of interrupts and vector addresses, register used for interrupts initialization, programming of external interrupts, Timer interrupts.

Asynchronous Serial Communication and Programming: Introduction to serial communication, Programming the Serial Communication Interrupts, RS232 standard, RS422 Standard, RS-485 standard, Max 232/233 Driver.

Interfacing with 8051: Interfacing and programming of: ADC (0804,0808/0809,0848) & DAC(0808), dc motor, stepper motor, Relays, LED and Seven segment display, LCD, 4x4 keyboard matrix.

Text Books:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programing and Application with 8085" , Penram, 5th Edition, 2002.
2. A.K.Ray, "Advanced Micro processors and Peripherals" 3rd Tata McGraw-Hill, Edition.
3. Mazidi, Mazidi&McKinlay, "The 8051 Microcontroller and Embedded Systems using Assembly and C" 2nd Edition,PHI.

Reference Books:

1. D. V Hall TMH, "Microprocessors and Interfacing" 2nd Edition, 2006
2. K. Uday Kumar, B.S. Umashankar, "The 8085 Microprocessor: Architecture, programming and Interfacing" Pearson, 2008.
3. Liu and Gibson, "Micro Computer System 8086/8088 Family Architecture, Programming and Design" PHI, 2nd Edition
4. Kenneth. J. Ayala, Cengage Learning, "The 8051 Microcontroller" 3rd Edition, 2004.

E-Resources:

1. https://www.tutorialspoint.com › Microprocessor › Microprocessor - 8085 Architecture
2. http://www.cpu-world.com/CPUs/8086/
3. https://www.journals.elsevier.com/microprocessors-and-microsystems/
4. http://rtcmagazine.com/technologies/view/Microcontrollers
5. http://nptel.ac.in/courses/106108100/
6. http://nptel.ac.in/courses/108107029/
7. nptel.ac.in/courses/106108100/

Course Outcomes:

After Completion of this course the student will able to

1. Learn basic concepts, organization of 8085 microprocessor.
2. Program the 8085 microprocessor.
3. Understand the 8086 microprocessor and it's interfacing with I/O devices.
4. Know the architecture and instruction set of 8051 Microcontroller.
5. Interface I/O devices with 8051 microcontroller.

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 O 1**	**PSO 2**	**PSO 3**
CO1	2	1				1			`1			1	1		
CO2		3	2	1	1	1		2	2		2	2	2	2	2
CO3	2	2	2			1		1	1		2	1	1		
CO4	1	1	2	2	1						1	2	2		1
CO5	1	3	3		2	2	1	2	2		3	3	2	2	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80415	LINEAR & DIGITAL INTEGRATED CIRCUIT APPLICATIONS	L	T	P
Credits: 4		3	1	-

Pre-Requisites: Digital Electronics, Electronic Circuits & Pulse Circuits.

Course Objectives: This course introduces the basic op-amp IC741 and study various linear and non-linear applications of op-amps. This also introduces the types of filters, timers and PLLs and their implementation and also how to design regulators, converters and combinational logic circuits.

MODULE I: Integrated Circuits & Operational Amplifier [10 Periods]

Introduction, Classification of IC's, IC chip size and circuit complexity, basic information of Op-Amp IC741 Op-Amp and its features, the ideal Operational amplifier, Op-Amp internal circuit, Op-Amp characteristics - DC and AC.

MODULE II: Applications of OP - AMP [12 Periods]

Linear Applications of OP-AMP: Inverting and non-inverting amplifiers, adder, subtractor, Instrumentation amplifier, AC amplifier, V to I and I to V converters, Integrator and differentiator.

Non-Linear Applications of OP-AMP: Sample and Hold circuit, Log and Antilog amplifier, multiplier and divider, Comparators, Schmitt trigger, Multivibrators, Triangular and Square waveform generators, Oscillators.

MODULE III: Filters, Timers and Phase Locked Loops (PLL) [12 Periods]

A: Filters: Introduction, Butterworth filters – 1st order, 2nd order low pass and high pass filters, band pass, band reject and all pass filters.

B: Timer and Phase Locked Loops(PLL): Introduction to IC 555 timer, description of functional diagram, mono stable and a stable operations and applications, schmitt trigger, PLL - introduction, basic principle, phase detector/comparator, voltage controlled oscillator (IC 566), low pass filter, monolithic PLL and applications of PLL.

MODULE IV: Regulators and Converters [12 Periods]

Voltage Regulator: Introduction, Series Op-Amp regulator, IC Voltage Regulators, IC 723 general purpose regulators, Switching Regulator.

Converters: Introduction, basic DAC techniques - weighted resistor DAC, R-2R ladder DAC, inverted R-2RDAC, A to D converters - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

MODULE V: CMOS Logic and Digital Circuits [14 Periods]

CMOS Logic: CMOS logic levels, MOS transistors, Basic CMOS Inverter, NAND and NOR gates, CMOS AND-OR-INVERT and OR-AND-INVERT gates, implementation of any function using CMOS logic.

Combinational Circuits Using TTL *74XX* ICS: Study of logic gates using*74XX*ICs, Four-bit parallel adder (IC 7483), Comparator (IC 7485), Decoder (IC 74138, IC 74154), BCD-to-7-segment decoder (IC 7447), Encoder (IC 74147), Multiplexer (IC 74151),

Demultiplexer (IC 74154).

Sequential Circuits Using TTL 74XX ICS: Flip Flops (IC 7474, IC 7473), Shift Registers, Universal Shift Register (IC 74194), 4- bitasynchronous binary counter (IC 7493).

Text Books:

1. D. Roy Choudhury, Shail B. Jain, "Linear Integrated Circuit", New Age International Pvt. Ltd., New Delhi, India, 4th edition, 2012.
2. Ramakant A. Gayakwad, "OP-AMP and Linear Integrated Circuits", Prentice Hall / Pearson Education, New Delhi, 4th edition, 2012.
3. Floyd, Jain, "Digital Fundamentals, Pearson Education", New Delhi, 8th edition, 2009.

Reference Books:

1. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", McGraw Hill, New Delhi, 1997.
2. Gray, Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, New Delhi, 1995.
3. John F. Wakerly, "Digital Design Principles and practices", Prentice Hall / Pearson Education, New Delhi, 4th Edition, 2007.

E-Resources:

1. http://fmcet.in/ECE/EC6404_uw.pdf
2. http://smec.ac.in/sites/default/files/lecture_notes/Course%20File%20of%20LDIC(Linear%20and%20Digital%20IC%20Applications).pdf
3. https://www.journals.elsevier.com/microelectronics-journal
4. http://nptel.ac.in/courses/117107094/
5. https://www.youtube.com/watch?v=NVj_Eu3sJL4
6. http://freevideolectures.com/Course/2915/Linear-Integrated-Circuits

Course Outcomes:

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

1. To understand the information of Operational Amplifier with its DC and AC characteristics.
2. Analyze the linear and non-linear applications, waveform generators and sinusoidal oscillators using Operational Amplifier.
3. Design of Butterworth filters using Operational Amplifiers, IC-555 Timers and PLL with theory and applications.
4. To understand the voltage regulators using Integrated Circuits, D/A and A/D Converters.
5. Analyze the CMOS logic and design of combinational and sequential circuits using the TTL 74xx ICs.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. V Semester		
Code: 80416	DATA COMMUNICATIONS AND COMPUTER NETWORKS	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: This course provides students to understand the fundamental concepts of computer networking and communications make use of IEEE standards in the construction of LAN, build the skills of subnetting and supernetting, explain the concepts of protocols of Tranport Layer, QoS and Congestion control mechanisms and demonstrate different protocols of Application Layer.

MODULE I: Basics of Networking and Physical layer [10 Periods]

Basics of Networking - Components – Direction of Data flow – Networks – Components and Categories – Types of Connections – Topologies –Protocols and Standards – ISO / OSI model, TCP/IP model.

Physical layer - Digital transmission, Multiplexing, Transmission Media, Switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

MODULE II: Data link layer [11 Periods]

Functionalities of Data link layer - Introduction, Framing, Error Detection and Correction – Parity – LRC – CRC- Hamming code, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocols. Random access, Controlled access, Channelization, Collision Free Protocols.

LAN - LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 - IEEE 802.11

MODULE III: Network Layer [09 Periods]

A: Basics of Network Layer - Logical Addressing, Internetworking, Tunneling, Address mapping,

B: Communication Protocols - ICMP, IGMP, Forwarding, Unicast Routing Protocols, Multicast Routing Protocols.

MODULE IV: Transport Layer [09 Periods]

Connection Oriented and Connectionless Protocols - Process to Process Delivery, UDP and TCP protocols, SCTP.

Congestion Control - Data Traffic, Congestion, Congestion Control, QoS, Integrated Services, Differentiated Services, QoS in Switched Networks.

MODULE V: Application layer [09 Periods]

DNS - Domain name space, DNS in internet, Electronic mail

Protocols and Network Security - FTP, WWW, HTTP, SNMP, Network Security, Cryptography.

Text Books:

1. Behrouz A. Forouzan, "Data Communications and Networking", 4th Edition, TMH, 2006.
2. Andrew S Tanenbaum, "Computer Networks", 4th Edition, Pearson Education/PHI.

Reference Books:

1. P.C. Gupta, "Data communications and computer Networks", PHI.
2. S.Keshav, "An Engineering Approach to Computer Networks", 2nd Edition, Pearson Education.
3. W.A. Shay, "Understanding communications and Networks", 3rd Edition, Cengage Learning.
4. James F.Kurose& Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", 3rd Edition, Pearson Education.

E-Resources

1. https://www.saylor.org/site/wp-content/uploads/2012/02/Computer-Networking-Principles-Bonaventure-1-30-31-OTC1.pdf
2. http://ebook-dl.com/downloadbook/230
3. https://doi.org/10.1016/0169-7552(89)90019-6
4. http://nptel.ac.in/courses/106105081/

Course Outcomes:

At the end of the course students will be able to

1. Understand the Layered Architecture of Computer Networks.
2. Conceptualize the protocols of Data Link Layer and can build Local area networks.
3. Apply Subnet and Supernet concepts in the construction of computer network.
4. Summarize the protocols used in Transport Layer, QoS and Congestion control mechanisms.
5. Analyze different protocols of Application Layer and various security risks.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80429	ADVANCED DIGITAL COMMUNICATION	L	T	P
Credits: 3	(Professional Elective – I)	3	-	-

Pre-Requisites: Probability theory & Stochastic Processes, Analog & Digital Communications.

Course Objectives: This course introduces basic components of M-array digital communication systems, different digital modulation techniques such as QPSK,8-PSK etc., Information theory and different source coding techniques. This course also introduces different error detecting and error correcting codes like block codes, cyclic codes and convolution codes, spread spectrum techniques and performance of spread spectrum, PN codes in jamming, noise etc. and concepts of OFDM.

MODULE I: Baseband Data Transmission & M-Array Carrier Modulation Schemes [10 Periods]

Baseband Data Transmission: Introduction**,** base band data transmission system**,** Pulse Shaping for Optimum Transmissions, A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Optimal of Coherent Reception, Signal Space Representation and Probability of Error and Eye Diagrams for ASK, PSK, FSK, Cross Talk and Duo binary coding.

M-array Schemes: Introduction toDigital M-Array Carrier Modulation Schemes, Transmitters and Receivers of QPSK, 8-PSK, 16-PSK and 8-QAM.

MODULE II: Information Theory [10 Periods]

Information and entropy, conditional entropy and redundancy, Shannon Fano coding, Mutual Information, Information loss due to noise, source codings – Huffman Code, variable length coding, Source coding to Increase Average Information per bit, Lossy source coding.

Line Coding Formats-Unipolar, Polar, Bipolar, Manchester, AMI, Gray coding and M-array coding. Shanon's Channel Capacity Theorem, Bandwidth-S/N Tradeoff, Hartley Shanon Law, Binary symmetric channels.

MODULE III: Error Control Codes [9 Periods]

A: Linear Block Codes: Matrix Description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes.

B: Cyclic Codes: Algebraic Structure, Encoding, Syndrome Calculation, Decoding.

Convolution Codes: Encoding, Decoding using State, Tree and Trellis Diagrams, Decoding using Viterbi Algorithm.

MODULE IV: Spread Spectrum Modulation [10 Periods]

Use of Spread Spectrum, Direct Sequence Spread Spectrum (DSSS), Code Division Multiple Access, ranging using DSSS, Frequency Hopping Spread Spectrum, PN - Sequences: Generation and Characteristics, Synchronization in Spread Spectrum Systems.

MODULE V: OFDM **[09 Periods]**

Introduction to OFDM, Single Carrier Verses Multi carrier Modulation and Cyclic Prefix, Modulation and demodulation in OFDM Systems. OFDM Issues-PAPR, Frequency and timing Offset issues.

Text Books:

1. Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley, 2005.
2. Simon Haykin, John Wiley, "Digital Communication", 1st Edition, 2005.

Reference Books:

1. John G. Proakis, MasoudSalehi, "Digital Communications", Mcgraw-Hill, 5th Edition, 2008.
2. Herbert Taub, Donald L Schiling, GoutamSaha, "Principles of Communication Systems",Mcgraw-Hill, 2nd Edition, 2008.

E-Resources:

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-450-principles-of-digital-communications-i-fall-2006/
2. https://courses.engr.illinois.edu/ece458/comms2.pdf
3. http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1099-1131
4. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5449605
5. http://nptel.ac.in/courses/117101051/

Course Outcomes:

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

1. Understand the basic components of M-array digital communication systems.
2. Analyze the error performance of base band digital modulation techniques, Design optimum receivers for digital modulation techniques and Know about the concepts of information theory and source coding techniques.
3. Know about different error detecting and error correcting codes like block codes, cyclic codes and convolution codes.
4. Understand the advantages of spread spectrum techniques and performance of spread spectrum, PN codes in jamming, noise etc.
5. Understand the concepts and working of OFDM.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80537	COMPUTER ORGANIZATION AND OPERATING SYSTEMS (Professional Elective-I)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: This course will make students to understand the basic structure and operation of digital computer, study the micro programmed control, I/O organizations and serial communication of peripheral devices and study the overview of operating systems & memory management components, demonstrate the knowledge of functions of management scheduling, file system and interfaces, security and deadlocks.

MODULE I: [10 Periods]

Basic Structure of Computers: Computer Types, Functional UNIT, Basic OPERATIONAL Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation, Fixed Point Representation, Floating – Point Representation. Register Transfer Language and Micro Operations: Register Transfer Language, Register Transfer Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit, Instruction Codes, Computer Registers Computer Instructions – Instruction Cycle. Memory – Reference Instructions, Input – Output and Interrupt, STACK Organization, Instruction Formats, Addressing Modes, DATA Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

MODULE II: [09 Periods]

Micro Programmed Control: Control Memory, Address Sequencing, Micro program Examples, Design of Control Unit, Hard Wired Control, Micro programmed Control The Memory System: Basic Concepts of Semiconductor RAM Memories, Read-Only Memories, Cache Memories Performance Considerations, Virtual Memories Secondary Storage, Introduction to RAID.

MODULE III:

A: Input-Output Organization [10 Periods]

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Direct Memory Access, Input –Output Processor (IOP)

B: Serial Communication

Serial Communication; Introduction to Peripheral Components, Interconnect (PCI) Bus, Introduction to Standard Serial Communication Protocols like RS232, USB, IEEE1394.

MODULE IV: [10 Periods]

Operating Systems Overview: Overview of Computer Operating Systems Functions, Protection and Security, Distributed Systems, Special Purpose Systems, Operating Systems Structures Operating System Services and Systems Calls, System Programs, Operating Systems Generation Memory Management: Swapping, Contiguous Memory Allocation, Paging, Structure of The Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Thrashing Case Studies - UNIX, Linux, Windows Principles of Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

MODULE V: **[9 Periods]**

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection. File System Implementation: File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

Text Books:

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky, "Computer Organization", McGraw Hill, 5th Edition
2. M.Moris Mano, "Computer Systems Architecture",Pearson Education,3rd Edition
3. Abraham Silberchatz,Peter B. Galvin, Greg Gagne, "Operating System Principles" 8th Edition, John Wiley.

Reference Books:

1. William Stallings, "Computer Organization and Architecture", Pearson Education,6th Edition
2. Andrew S. Tanenbaum, "Structured Computer Organization",PHI,4th Edition
3. Sivaraama Dandamudi, "Fundamentals of Computer Organization and Design", Springer Int. Edition.
4. Stallings, "Operating Systems – Internals and Design Principles", Pearson Education,6th Edition 2009
5. Andrew S Tanenbaum, "Modern Operating Systems", Pearson/PHI, 2nd edition
6. B.L.Stuart, "Principles of Operating Systems", Cengage Learning, India Edition

E-Resources:

1. https://www.scribd.com/doc/129430301/Hamacher-Computer-Organization-5th-Ed
2. https://archive.org/details/2005OperatingSystemConcepts7thEditionAbrahamSilberschatz
3. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7-Eh9eBOsT1ELoYpKlg_xngrkluevXOJL-s1TbxS8q2icgUs3hL4_KAi5So5FgXcVg
4. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7xAYUzYSlXl4znudlsolr-e7wQNrNXLxbgGFxbkoyx1iN3YbHuFrzI2jc_70rWMEwQ
5. http://nptel.ac.in/courses/106106092/
6. http://nptel.ac.in/courses/106108101/

Course Outcomes:

On the successful completion of the course, a student will be able to:

1. Develop the structure of digital computer Arithmetic operations of binary number system.
2. Classify the micro programmed control and memory operations
3. Design input & output organization serial communication
4. Understand the operating systems overview and memory management techniques impact of instruction set architecture of computer design.
5. Examine various file systems interfaces and implementation

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80430	BIO-MEDICAL ELECTRONICS (Professional Elective – I)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Basics of bioelectronics, modern medical practices, biomechanics and bio transport.

Course Objectives: This course is tailored to the needs of both Engineers and Medicos. It seeks to encourage dialogue between both disciplines to enable Medicos and Engineers to appreciate more fully the applications, requirements, specifications, and limitations of medical electronic instrumentation. This is particularly important when multi-disciplinary teams liaise to specify, design and evaluate new medical technologies. Using an understanding the fundamental principles electronics to gain knowledge in more complicated circuit designs, field effect transistors, amplifiers, frequency response, signal generation, timers, and wave-shaping circuits. Apply knowledge of engineering and science to identify, formulate, and solve problems in these areas.

MODULE I: Anatomy and physiology [9 Periods]

Elementary ideas of cell structure, Heart and circulatory system, Central nervous system, Muscle action, Respiratory system, Body temperature and Reproduction system.

Overview of Medical Electronics Equipments: Classification, application and specifications of diagnostic, therapeutic and clinical laboratory equipment, method of operation of these instruments

MODULE II: Electrodes [9 Periods]

Bioelectric signals, Bio electrodes, Electrode, Electrode tissue interface, Contact impedance, Types of Electrodes, Electrodes used for ECG, EEG.

Transducers: Typical signals from physiological parameters, pressure transducer, flow transducer, temperature transducer, pulse sensor, respiration sensor.

MODULE III: Sensors and Biomedical Recorders [12 Periods]

A: Sensors: Imaging sensors, DNA Biosensors, Microbial Biosensors, Ozone Biosensors, Bioreceptors, Chemical sensors, Optical biosensors, biomedical sensors, electrochemical biosensors, Surface Plasmon resonance, Graphene biosensors and Biotransducers.

B: Biomedical Recorders:

Electro Encephalogram: EEG lead system, behavior of EEG signal Basic concepts block diagram description and applications of ECG, EEG and EMG machines.

MODULE IV: Patient Monitoring Systems [9 Periods]

Heart rate measurement, Pulse rate measurement, Respiration rate measurement, Blood pressure measurement, Principle of defibrillator and pace mark, use of Microprocessors in patent monitoring, Basic body physiology, vital signs and diseases, Building a simple

heart-rate detector using photo resistors and op-amps, Automatic Wireless Health monitoring System.

MODULE V: Safety Aspects of Medical Instruments [9 Periods]

Gross current shock, Micro current shock, macro current shock Special design from safety considerations, Safety standards. Physiological effects of electrical currents, preventive measures to reduce shock hazards, Leakage current, isolation of patient circuits, safety of electrically susceptible patients, radiation hazards and safety, shielding, open ground problem and earthing methods.

Text Books:

1. RS Khandpur, "Handbook of biomedical Instrumentation", Mcgraw Higher Ed.
2. RS Khandpur, "Modern Electronics Equipment"", TATA MCGraw- Hill publications.

Reference Books:

1. Edward J. Perkstein, Howard B,""Introduction to Biomedical Electronics", PHI, New Delhi.
2. Cromwell, "Biomedical Instrumentation" Prentice-Hall.

E-Resources:

1. http://biomedikal.in/2010/04/lecture-notes-on-medical-electronics/
2. https://lecturenotes.in/subject/27/biomedical-instrumentation-bi
3. https://ieeexplore.ieee.org/document/5269075/
4. https://www.journals.elsevier.com/journal-of-biomedical-informatics?
5. http://nptel.ac.in/courses/117105082/32
6. http://nptel.ac.in/courses/108105101/

Course Outcomes:

1. Analyze and evaluate the effect of different diagnostic and therapeutic methods, their risk potential, physical principles, opportunities and possibilities for different medical procedures.
2. To have a basic understanding of medical terminology, relevant for biomedical instrumentation.
3. To understand and describe the physical and medical principles used as a basis for biomedical instrumentation.
4. Understand the elements of risk for different instrumentation methods and basic electrical safety.
5. Understand the position of biomedical instrumentation in modern hospital care.

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

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80417	MICROPROCESSORS AND MICROCONTROLLERS LAB	L	T	P
Credits: 1.5		-	-	3

Course Objectives: To introduce programming skills related to microcontrollers.

Lab Experiments

1. Arithmetic operations of 8-bit numbers using 8085.
2. Logical operations of 8-bit numbers using 8085.
   a) Binary to BCD code conversions
3. BCD to Binary code conversions using 8085.
4. Arithmetic logical operations of 16 bit numbers using 8086
5. Programming using arithmetic, logical and bit manipulation instructions of 8051.
6. Program to toggle all the bits of Port P1 of 8051 continuously with 250 ms delay.
7. Program to interface seven segment display unit using 8051
8. Program to transmit/receive a message from Microcontroller to PC serially using RS232 using 8051
9. Program to interface Stepper Motor to rotate the motor in clockwise and anticlockwise directions using 8051
10. Program to interface a relay using 8051.
11. Program to interface LCD data pins to port P1 of 8051 and display a message on it.
12. Program for Traffic Light Controller using 8051

Software required:

1. GNU sim8085, MASM, Keil / µVision , Flash Magic

Course Outcomes:

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

1. Understand and develop the 8085microprocessor based system
2. Able to program 8086microprocessor.
3. Interface different input &output devices to Microcontroller.

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
CO1	1			2	2	1							1	3	
CO2	2	2	2	3	3	2	2		1		2	3	3	3	2
CO3	2	2	2	3	3	2	2		1		2	3	3	3	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80418	LINEAR & DIGITAL INTEGRATED CIRCUIT APPLICATIONS LAB	L	T	P
Credits: 1.5		-	-	3

Course Objectives: To design various applications using IC 741 OP AMP and IC 74 series.

PART - A: To Verify the Following Functions

1. Adder, Subtractor, Comparator Circuits using IC 741 OP AMP.
2. Integrator and Differentiator Circuits using IC 741 OP AMP.
3. Active Low pass, High pass Butterworth (Second Order).
4. RC Phase Shift and Wien Bridge Oscillators using IC 741 Op-Amp.
5. IC 555 Timers – Monostable Operation Circuits.
6. Schmitt Trigger Circuits – using IC 741 and IC 555.

PART - B: To Verify the Following Functionality

1. D-Flip Flop (74LS74) and JK Master Slave Flip-flop (74LS73)
2. Decade counter (74LS90) and Up-down Counter (74LS192)
3. Universal shift Register (74LS194/195)
4. 3-8 Decoder using (74LS138).
5. 4 – bit comparator (74LS85)
6. 8x1 Multiplexer - 74LS151 and 2x4 DeMultiplexer-74155.

Course Outcomes:

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

1. Identify and use different IC's for Application development
2. Use IC 555 for Triggering type Application Development
3. Understand and use Decoders, Comparators and MUXs

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
CO1	2		1	3	1	1			1		2	2	3	3	1
CO2	1		1	3	1				1		1	2	3	3	1
CO3	3	2	2	3	3	1			1	1	1	2	3	3	2

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80419	DATA COMMUNICATIONS AND COMPUTER NETWORKS LAB	L	T	P
Credits: 1		-	-	2

Course Objectives: To understand communication between two desktop computers, to study about various types of cables used in guided media like coaxial cable, optical fiber cable, twisted pair cables and its categories, to understand difference between straight cable and cross over cable.

List of Experiments

1. Connect the computers in Local Area Network
2. Configure Host IP, Subnet Mask and Default Gateway in a system in LAN (TCP/IP configuration)
3. Establish peer to peer network connection using two systems (direct connection or via switch/router) in a LAN for sharing the drives and folders
4. Study of basic network commands and network configuration commands
5. Configure different Network topologies
6. Simulation of Ethernet LAN protocol connected via hubs, switches
7. Simulation of Wireless LAN
8. Configure a Network using Distance Vector Routing algorithm
9. Configure a Network using Link State Routing Algorithm
10. Standard access control list (ACL) configuration in packet tracer.
11. Extended access control list (ACL) configuration in packet tracer.
12. Building a LAN with HUPs and Switches.

Software Required

1. Packet Tracer, Cloonix, CORE, GNS3, IMUNES, Mininet and Netkit, NS-3 or any equivalent softwares.

Course Outcomes:

1. Ability to apply appropriate algorithm for the finding of shortest route.
2. Ability to configure the routing table System / Software Requirement.
3. Analysis the performance of various protocols in different layers.
4. Ability to communicate between two desktop computers.
5. Ability to apply appropriate algorithm for the finding of shortest route.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code:80M04	INDIAN CONSTITUTION (Common for EEE, ECE, CSE and IT)	L	T	P
Credits: NIL		2	-	-

Pre-Requisites: Nil

Course Objectives: To understand the importance of Indian constitution, Administration, Concept and Development of Human Rights, election commission.

MODULE-I **[6 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 **[7 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 **[6 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 **[7 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 **[6 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.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

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 Outcomes:

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: 80A03	INTERNSHIP-II	L	T	P
Credits: NIL		-	-	-

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80420	DIGITAL SIGNAL PROCESSING	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Signals & Systems.

Course Objectives: This course introduces the processing of Discrete time signals using various transforming techniques and structures of IIR and FIR filters and also the concept of Multi-rate Digital signal Processing.

MODULE I: Discrete Time Signals, Systems and Discrete Fourier Series **[12 Periods]**

Discrete Time Signals, Systems: Discrete time signals & discrete time systems, time response & frequency response analysis of Discrete Time Linear time invariant Systems, Discrete time systems described by difference equations. Convolution of Discrete Time Signals and sequences

Discrete Fourier Series: DFS Representation of periodic sequences and Properties of Discrete Fourier Series.

MODULE II: Transforms **[8 Periods]**

Discrete Fourier Transform (DFT): Discrete Fourier Transforms: Definition and Properties of Discrete Fourier Transforms, Linear Convolution of sequences using DFT and Circular Convolution, Problems on DFT.

Fast Fourier Transforms (FFT): Definition, Radix-2 decimation in time and decimation in frequency FFT Algorithms and Inverse FFT.

MODULE III: IIR Digital Filters **[10 Periods]**

A: Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance

B: Bilinear transformation- LPF, HPF, BPF, BRF filters design using frequency translation, Realization of IIR filters.

MODULE IV: FIR Digital Filters **[10 Periods]**

Characteristics of FIR Digital Filters, Frequency Response, Design of Linear phase FIR Digital Filters using Fourier Series and Window Techniques, Comparison of IIR & FIR filters, Realization of FIR filters

MODULE V: DSP Applications and Processors **[8 Periods]**

Multirate Digital Signal Processing: Decimation, Interpolation, Sampling rate conversion by a rational Factor.

DSP Processors: Architecture and features of TMS320C67XX processor.

Text Books:

1. John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithms, and Applications", Pearson Education / PHI, 4th Edition, 2007.
2. A.Nagoorkani, "Digital signal processing", Tata McGraw Hill, 2nd Edition, 2012.
3. Avtar Singh and S. Srinivasan, Digital Signal Processing Implementations Using DSP Microprocessors – with Examples from TMS320C54xx, CENGAGE Learning, India, 1st Edition, 2008.

Reference Books:

1. Shalivahana, VallavaRaju,GnanaPriya, "Digital Signal Processing",TATA McGraw Hill, 2nd Edition, 2010.
2. Alan V. Oppenheim, Ronald W. Schafer, "Digital Signal Processing", PHI Education, 2006.

E-Resources:

1. https://archive.org/details/DIGITALSIGNALPROCESSING.
2. http://freevideolectures.com/Course/2339/Digital-Signal-Processing-IITKharagpur
3. https://www.journals.elsevier.com/digital-signal-processing/
4. https://www.journals.elsevier.com/signal-processing/
5. https://www.youtube.com/watch?v=6dFnpz_AEyA
6. http://nptel.ac.in/courses/117102060/

Course Outcomes:

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

1. Understand the nature of discrete time signals and DFS computation
2. Understand DTFT, DFT and the fast computation of DFT using FFT algorithms and implement in real-time applications.
3. Design IIR Digital filters for the given specifications.
4. Design FIR Digital filters for the given specifications.
5. Design Real time systems using the multirate processing techniques and the DSP processors.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80421	VLSI DESIGN	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Analog Circuits-I, Switching Theory & Logic Design / Digital Logic Design

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 Circuit Concepts, Gate Level Design, Basic architectures of Data path subsystems, Application Specific Integrated Circuits, of CPLDs and FPGAs.

MODULE I: IC Fabrication and Technologies [8 Periods]

IC Fabrication: Steps in Fabrication-Oxidation, Lithography, Diffusion, Ion implantation, Encapsulation and Metallization.

IC Technologies – Review of Enhancement and Depletion MOS transistors, NMOS, PMOS & CMOS fabrications, Comparison of NMOS, CMOS & BiCMOS technologies.

MODULE II: Basic Electrical Parameters [10 Periods]

I_{ds}-V_{ds} relationships, MOS transistor threshold Voltage (Vt), transconductance(gm), output conductance(gds) & figure of merit(wo).

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: Basic Circuit Concepts and Gate Level Design [10 Periods]

Basic Circuit Concepts: Sheet Resistance R_s and Gate Capacitance C_g, Wiring Capacitances, Fan-in and fan-out, Choice of layers.

Gate Level Design: Logic Gates using CMOS and complex gates, Switch logic, Alternate gate circuits – Pseudo NMOS logic, Dynamic CMOS logic, Clocked CMOS logic(C^2MOS) and Cascaded Voltage Switch logic(CVSL).

MODULE V: Data Path Subsystems, ASIC's and PLD's [10 Periods]

Data Path Subsystems: Subsystem Design – Barrel Shifter, Carry Select and Carry look Ahead Adder, Serial-Parallel and Braun Array Multiplier.

Application Specific Integrated Circuits – Channel gate array, Channel less gate array and structured gate array. **Programmable Logic Devices -** Architectures of CPLDs and FPGAs.

Text Books:

1. Kamran Eshraghian, Douglas A. Pucknell, "Essentials of VLSI circuits and systems", PHI, 1st Edition, 2005.
2. K. Lal Kishore, VSV. Prabhakar, "VLSI Design", I. K international Publishing House Private Ltd, 2009.

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. Describe Basic Circuit Concepts like resistance, capacitance and the effect of it, various Gate Level Designs.
5. Understand Basic architectures of Data path subsystems, Application Specific Integrated Circuits, of CPLDs and FPGAs.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80422	ANTENNAS & WAVE PROPAGATION	L	T	P
Credits: 4		3	1	-

Pre-Requisites: Electromagnetic wave theory

Course Objectives: This course introduces basic terminology and concepts of Antennas and its radiation mechanism and also analyzes the electric, magnetic field emission and power radiated from various basic antennas and their mathematical formulation for the analysis and design of antennas. This course also introduces various microwave antennas, their mechanical structures and their operational behavior to obtain the radiation patterns and also procedures to measure antenna parameters. This course also introduces different EM wave propagation techniques in free space.

MODULE I: Antenna Basics [12 Periods]

Introduction: Antenna Radiation Mechanism. Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity - Gain-Resolution, Antenna Apertures, Effective Height, Illustrative Problems. Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Antenna Impedance. Friis Transmission formula.

MODULE II: Thin Linear Wire Antennas [12 Periods]

Radiation, Maxwell's equations, Retarded Potentials – Helmholtz Theorem. Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height.

Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre - fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small and Large Loops (Qualitative Treatment).

MODULE III: Antenna Arrays and Non resonant Radiators [12 Periods]

A: Antenna Arrays: Point Sources – Definition, Patterns**,** arrays of 2 Isotropic Sources **-** Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays, Illustrative Problems.

Arrays with Parasitic Elements, Yagi - Uda Array, Folded Dipoles, and their Characteristics.

B: Non resonant Radiators: V-antennas, Rhombic Antennas and Design Relations, Helical Antennas - Helical Geometry, Helix Modes, Practical Design Considerations for Mono filar.

MODULE IV: Microwave Antennas [14 Periods]

Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas.

Impact of Different Parameters on Characteristics. **Reflector Antennas** – Introduction, Flar Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features, Illustrative Problems. **Lens Antennas:** Introduction, Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications. **Horn Antennas**: Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3 - Antenna Methods).

MODULE V: Wave Propagation [14 Periods]

Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Qualitative Treatment) – Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections.

Space Wave Propagation – Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Tropospheric Propagation.

Sky Wave Propagation – Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

Text Books:

1. J. D. Kraus, R. J. Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation", TMH, New Delhi, (Special Indian Edition), 4th Edition, 2010.

Reference Books:

1. C. A. Balanis, John Wiley & Sons, "Antenna Theory", 3rd Edition, 2005.
2. John D. Kraus, "Antennas", McGraw-Hill (International Edition), 2nd Edition, 1988.
3. E. C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2nd Edition, 2000.

E-Resources:

1. http://www.radio-electronics.com/info/antennas/
2. https://www.tutorialspoint.com/antenna_theory/
3. http://www.bookrix.com/_ebook-prabhakar-sharma-antenna-and-wave-propagation/
4. http://www.creativeworld9.com/2011/02/learn-antennas-and-wave-propagation.html
5. http://nptel.ac.in/courses/117101056/48
6. http://nptel.ac.in/courses/117107035/

Course Outcomes:

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

1. Aware of the parameter considerations viz. antenna efficiency, beam efficiency, radiation resistance etc. in the design of an antenna.

2. Capable to analyze the designed antenna such as half wave, quarter wave and loop antennas .
3. Understand the Array system of different antennas and filed analysis under application of different currents to the individual antenna elements.
4. Understand the characteristics, features and applications of Micro strip and parabolic reflector antennas.
5. Knows about the means of propagation of Electromagnetic waves.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80431	CELLULAR AND MOBILE COMMUNICATIONS (Professional Elective – II)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Analog Communications, Digital Communications.

Course Objectives: This course builds an understanding of the Cellular concept, Frequency reuse, Hand-off strategies, Co-channel and Non-Co- channel interferences, cell coverage for signal and mobile antennas. This course also introduces the concept of frequency management, Channel assignment, handoff and dropped calls.

MODULE I: **[12 Periods]**

Introduction to Cellular Mobile Radio Systems:

Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, Evolution of First, Second, Third and Fourth Generation Cellular Wireless Systems, Uniqueness of Mobile Radio Environment- Fading -Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

Cellular Radio System Design: Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I from a Normal Case in an Omni Directional Antenna System, System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept.

MODULE II: **[10 Periods]**

Co-Channel Interference:

Measurement of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and Their Effects, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.

Non-Co-Channel Interference:

Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

MODULE III: **[10 Periods]**

A: Cell Coverage for Signal and Traffic:

Signal Reflections in Flat and Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope, General Formula for Mobile Propagation Over Water and Flat Open Area, Near and Long Distance Propagation, Path Loss from a Point to Point Prediction Model in Different Conditions, Merits of Lee Model.

B: Cell Site and Mobile Antennas:

Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas.

MODULE IV: **[8 Periods]**

Frequency Management and Channel Assignment:

Numbering and Grouping, Setup Access and Paging Channels, Channel Assignments to Cell Sites and Mobile Units, Channel Sharing and Borrowing, Sectorization, Overlaid Cells, Non Fixed Channel Assignment.

Cellular Communication:

Cellular Networks, Multiple Access: FDM/TDM/FDMA/TDMA, Spatial reuse.

MODULE V: **[8 Periods]**

Handoffs and Dropped Calls:

Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

Text Books:

1. W.C.Y. Lee, "Mobile Cellular Telecommunications", Mc Graw Hill, 2nd Edition, 1989.

Reference Books:

1. Theodore. S. Rapport, "Wireless Communications", Pearson Education, 2nd Edition, 2002.
2. Gottapu Sashibhushana Rao, "Mobile Cellular Communication", Pearson, 2012.
3. Gordon L. Stuber, "Principles of Mobile Communications", Springer International, 2nd Edition, 2001.

E-Resources:

1. https://books.google.co.in/books?id=OnDGbzMRcbwC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false for cellular and mobile communications
2. https://books.google.co.in/books?id=cptA0ZqDs2QC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false for mobile cellular communication
3. http://nptel.ac.in/courses/117102062/4
4. https://www.youtube.com/watch?v=nMjkeEHR2j8
5. https://www.youtube.com/watch?v=oiuPU29SktQ

Course Outcomes:

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

1. Analyze and design wireless and mobile cellular systems.
2. Understand types of interferences, impairments due to multipath fading channel, and designing of different antennas.
3. Familiar with cell coverage for signal and traffic in different paths, diversity techniques and antennas patterns.
4. Understand numbering and grouping of systems, Channel assignment, sharing and borrowing.
5. Understand the fundamental techniques to assign a handoff without termination of call, different handoffs, how a dropped call can be overcome.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80432	ELECTRONIC MEASUREMENTS AND INSTRUMENTION (Professional Elective – II)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Basic Electrical and Electronics Engineering

Course Objectives: This course introduces measurement techniques and different types of instruments and their operation like signal generators, wave analyzers, cathode ray oscilloscope and special purpose oscilloscopes, different types of transducers, DC & AC bridges.

MODULE I: Measurement Errors and Measuring Instruments [10 Periods]

Measurements and Errors: Block Schematics of Measuring Systems, Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

Measuring Instruments: D' Arsonval Movement, DC Voltmeters, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Electronic Voltmeters, Digital Voltmeters: Ramp type, Staircase Ramp, Dual Slope Integrating type, Integrating type, Successive Approximation type.

MODULE II: Signal Generators and Analyzers [10 Periods]

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications.

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Logic Analyzer.

MODULE III: Oscilloscopes [10 Periods]

A: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

B: Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs. Recorders: Strip Chart, X-Y Oscillographic recorders

MODULE IV: Transducers [10 Periods]

Definition, Classification, Principle of Analogue transducer: Resistive (Strain Gauge, POT, Thermistor and RTD), Capacitive, Piezoelectric, Thermocouple and Inductive (LVDT) and RVDT) transducer, Working principle of Digital Transducer and Optical transducer. Photo sensitive Transducer. Applications of transducers - Velocity, Force, Pressure Measurement. Data Acquisition Systems.

MODULE V: DC and AC Bridges **[8 Periods]**

Wheat stone Bridge, Kelvin Bridge, AC Bridges, Maxwell, Hay, Schering, Wien, Anderson Bridges, Resonance Bridge, The Owen Bridge, De'Sauty Bridge, Wagner's Earth (Ground) Connection, and Types of Detectors.

Text Books:

1. H. S. Kalsi, "Electronic Instrumentation", TMH, 2nd Edition 2004.
2. A.K. Sawhney, "Electrical and Electronic Measurements and Instrumentation".

Reference Books:

1. K. Lal Kishore, "Electronic Measurements and Instrumentation", Pearson Education, 2010.
2. David A. Bell, "Electronic Instrumentation and Measurements", Oxford Univ. Press, 1997.

E-Resources:

1. https://docs.google.com/file/d/0B21HoBq6u9TsMlFHYVpUbjJYdzQ/view
2. https://www.slideshare.net/saurabhmaheshwari944/seminar-ppt-on-transducer
3. https://rodzah.files.wordpress.com/2011/07/topic_4_dc_bridges.pdf
4. https://www.mepits.com/tutorial/303/Instrumentation/Sensors
5. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5289
6. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=19

Course Outcomes:

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

1. Understand and estimate errors in a measurement system.
2. Operate signal sources and measuring instruments such as Wave Analyzer, Harmonic Distortion Analyzer and Spectrum Analyzer.
3. Understand the operation of the Different types of CROs.
4. Understand the basic principles of transducers and their applications.
5. Estimate accurately the values of R, L and C for suitable bridges.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code:80508	JAVA PROGRAMMING (Professional Elective-II)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: This course will make students able to learn and understand the concepts and features of object oriented programming and the object oriented concept like inheritance and will know how to make use of interfaces and package, to acquire the knowledge in Java's exception handling mechanism, multithreading, to explore concepts of Applets and event handling mechanism. This course makes students to gain the knowledge in programming using Layout Manager and swings.

MODULE I: OOP Concepts & Introduction to C++, Java [09 Periods]

OOP Concepts & Introduction to C++: Object, class, methods, instance variables; C++ program structure; Standard Libraries; accessing class data members; Overview of Inheritance, Overloading, Polymorphism, Abstraction, Encapsulation and Interfaces.

Introduction to Java - History of Java, Java buzzwords, data types, variables, scope and life time of variable, arrays, operators, expressions, control statements, type conversion and type casting, simple Java program.

MODULE II: Basics of Java [09 Periods]

Classes and Objects - Concepts of classes, Objects, constructors, methods, this key word, garbage collection overloading methods, constructors parameter passing, recursion. String handling: String, String Buffer, String Tokenizer classes.

Inheritance - Base class object, subclass, member access rules, super uses, using final with inheritance, method overriding, abstract classes.

MODULE III: Interfaces and Exception Handling [12 Periods]

A: Interfaces - Defining an interface, implementing interface, differences between classes and interfaces, extending interfaces. Packages - Defining, creating and accessing a package, importing packages, access control, exploring package-java.io.

B: Exception handling - Concepts of Exception handling, benefits of exception handling, exception hierarchy, checked and unchecked exceptions, usage of try, catch, throw, throws and finally, built-in exceptions, creating own exception subclasses.

MODULE IV: Multithreading and Event handling [09 Periods]

Multithreading - Differences between multithreading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

Event handling - Events, Event sources, event classes, event listeners, delegation event model, handling mouse and keyboard events, adapter classes, AWT class hierarchy, user interface components-labels, buttons, canvas, scrollbars, text components, checkbox, checkbox groups, choices, lists.

MODULE V: Layout manager and Swings [09 Periods]

Layout manager - Layout manager types-border, grid, flow, card and grid bag.

Swings - Introduction, limitations of AWT, components, containers, exploring swing-JApplet, JFrame and JComponent, Icons and Labels, Text Fields, buttons – the JButton class, Checkboxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees and Tables.

Text Books:

1. Herbert Schildt, "Java The complete reference", TMH, 8th edition
2. T. Budd, "Understanding OOP with Java", updated edition, Pearson Education.
3. Joyce Farrell, Cengage, "Object Oriented Programming C++", 4th Edition ,2013

Reference Books:

1. P.J. Deitel and H.M. Deitel, "Java for Programmers", Pearson education.
2. P. Radha Krishna, "Object Orientd Programming through Java", Universities Press.
3. S. Malhotra and S. Choudhary, "Programming in Java", Oxford Univ. Press.
4. Bruce Eckel, "Programming in Java", Pearson Education.
5. Herbert Schildt , "The Complete Reference, C++", TMH, 4th edition.

E-Resources

1. http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVlXBW-RPf64_TFk2i4LJhgQFPQWAEt-Zobbm3twyubjRA1YOe9WVwkN2qGcxBwdHaPdi_mMQ
2. https://ndl.iitkgp.ac.in/result?q={"t":"search","k":"object%20oriented%20programming","s":["type=\"video\""],"b":{"filters":[]}}
3. http://www.rehancodes.com/files/oop-using-c++-by-joyce-farrell.pdf
4. http://www.nptel.ac.in/courses/106103115/36

Course Outcomes:

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

1. Differentiate structured programming and object oriented programming and know the concepts of classes, objects, members of a class.
2. Apply object oriented programming features and concepts for solving given problems using inheritance and will know how to organize files in packages and concept of interface.
3. Capable of handling run time errors using Exceptional Handling and develop applications for concurrent processing using Thread Concept.
4. Design Applets that take user response through various peripheral devices such as mouse and keyboard by event handling mechanism.
5. Design interactive applications for use on internet.

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

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code: 80H03	ENGLISH COMMUNICATION AND PRESENTATION SKILLS LAB (Common for EEE, ECE, CSE and IT)	L	T	P
Credits: 1		-	-	2

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

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

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

MODULE I: Oral Presentations

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

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

MODULE II: E - Correspondence and Social Media Etiquette

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

- This Module is purely for internal assessment/evaluation

MODULE III: Group Discussion

Initiators- Contributor-Informer-Team Leader-Motivator-Creative Contributor, Importance of, Nonverbal 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-Hil: 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, 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
CO1					1					2		2			
CO2										1		2			
CO3		1		1						2		2			
CO4					1	1			1	2		2			
CO5				1	1				1	2		2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80423	DIGITAL SIGNAL PROCESSING LAB	L	T	P
Credits: 1.5		-	-	3

Course Objectives:

To learn programming for various digital signal processing concepts.

List of Experiments:

1. Verification of linearity and Time Invariance Properties of a given Discrete-Time System
2. Generation of Sinusoidal waveform / signal based on recursive difference equation.
3. Computation of Unit Sample, Unit Step and Sinusoidal responses of the given LTI Discrete-Time System
4. To find frequency response of a given first order Discrete-Time system.
5. To find DFT / IDFT of given Discrete-Time signal.
6. Linear convolution using DFT & IDFT method.
7. Circular Convolution using Matrix Method.
8. Implementation of FFT and Power spectrum of given sequence.
9. Implementation of IIR Low pass & High Pass filter for a given sequence
10. Implementation of FIR Low pass filter for a given sequence.
11. Implementation of FIR High Pass filter for a given sequence.
12. Implementation of Decimation and Interpolation Process.

Software Required:

1. MATLAB / Lab view / C programming / OCTAVE / Equivalent Software

Course Outcomes:

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

1. Use simulation tool for Signal Processing Applications
2. Apply DFT/IDFT on Signals
3. Design IIR filters on Signals
4. Design FIR Filters on Signals
5. Perform Spectrum operations on Signals

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80424	VLSI DESIGN LAB	L	T	P
Credits: 1.5		-	-	3

Course Objectives: To get programming knowledge on Verilog/VHDL programming of different digital circuits and CMOS circuits, Design of Digital Circuits using CADANCE, SYNOPSIS, mentor graphics or any equivalent software.

List of Experiments:

1. Design and Implementation of SISO shift registers on FPGA Board.
2. Design of Sequence Detector using Melay Machines on FPGA Board.
3. Design and Implementation of SIPO shift registers on FPGA Board
4. Design of Sequence Detector using Moore Machines on FPGA Board.
5. Design of Barrel shifter.
6. Design of Carry select adder
7. Design of Serial Multiplier
8. Design of Booth Multiplier
9. Layout of CMOS Inverter.
10. Layout of CMOS NOR/ NAND Gates.
11. Layout of CMOS 1-bit Full Adder.
12. Layout of Pseudo NMOS /Dynamic CMOS logic.

Software required

1. Verilog/VHDL or any equivalent software
2. CADANCE, SYNOPSIS, mentor graphics or any equivalent software.

Course Outcomes:

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

1. To develop the Verilog/VHDL code.
2. Design basic combinational circuits.
3. Design flip-flops, basic sequential circuits.

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
CO1	2	1	1				1		1			1	2	3	1
CO2	1	1	1	1	1								1	3	1
CO3	1	1	1	1	1	1	1						1	3	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: 80M03	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (Common for EEE, ECE, CSE and IT)	L	T	P
Credits: NIL		2	-	-

Pre-Requisites: Nil

Course Objectives: To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

MODULE I: **[7 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: **[6 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: Legal frame work and TK: **[6 Periods]**

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);

B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

MODULE IV: **[6 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: **[7 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 Kapoor1, Michel Danino2

E-Resources:

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

Course Outcomes:

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

1. Upon completion of the course, the students are expected to:
2. Understand the concept of Traditional knowledge and its importance
3. Know the need and importance of protecting traditional knowledge.
4. Know the various enactments related to the protection of traditional knowledge.
5. Understand the concepts of Intellectual property to protect the traditional knowledge.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VII Semester		
Code:80H05	MANAGEMENT FUNDAMENTALS (Common for EEE, ECE, CSE and IT)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: Through reading the text, references and discussion of cases students should be able to understand the fundamentals underlying the management of an organization.

MODULE I: Management and Principles of Management [9 Periods]

A: Introduction to Management: Concepts of Management and organization-nature, importance and Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management.

B: Management Theories: Mayo's Hawthorne Experiments, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Corporate Social responsibility.

MODULE II: Planning, Organization and types of Structures [10 Periods]

A: Planning: Need for planning- -Steps in the process of Planning-Advantages and limitation of planning. Types of planning - Vision, Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Management by Objectives (MBO).

B: Organization and types of Structures: Basic concepts related to Organization - Departmentation and Decentralization, Types of Organizations- Line organization, Line and staff organization, functional organization, committee organization, matrix organization, Virtual Organization, Cellular Organization, boundary less organization, inverted pyramid structure, lean and flat Organization structure.

MODULE III: Staffing and controlling [10 Periods]

A: Staffing: Basic concepts of HRM, functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development. Performance Appraisal, Job Evaluation and Merit Rating.

B: Controlling: process of controlling, types of controlling, managing productivity, Quality Control: chart, R chart, C chart, P chart, (simple Problems), Deming's contribution to quality.

MODULE IV: Operations and Materials Management [9 Periods]

A: Operations Management: Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement.

B: Materials Management: Objectives, need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records.

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 and Capability Maturity Model (CMM) Levels, Bench marking, Balanced Score card.

Text Books:

1. Aryasri, Management Science, 4th edition TMH, 2004.
2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 6th Ed, 2004.

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. Thomas N.Duening & John M. Ivancevich "Management - Principles and Guidelines", Biztantra, 5th edition 2003.
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://freevideolectures.com/Course/2689/Management-Science
2. http://www.onlinevideolecture.com/?course=mba-programs&subject=human-resource-management
3. http://www.onlinevideolecture.com/?course=mba-programs&subject=marketing-fundamental
4. http://freevideolectures.com/Course/2371/Project-and-Production-Management
5. http://nptel.ac.in/courses/110105034/

Course Outcomes:

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

1. Understand the various concepts, principles and theories of management.
2. Understand the basic concepts of planning and various structures of organizations.
3. Understand the process of staffing and controlling
4. Understand the process of operations management. Also learn the concepts of materials management and marketing management at an organization.
5. Understand the various contemporary management practices. Also the project management techniques.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80425	DIGITAL IMAGE PROCESSING	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Digital Signal Processing.

Course Objectives: The course introduces the fundamentals concepts of digital image processing to the student and focuses on the various image transforms used in digital image processing, the basic image processing operations, image restoration techniques, image compression and segmentation used in digital image processing.

MODULE I: Digital Image Fundamentals [10 Periods]

Fundamental Steps in Digital Image Processing, Components of an Image Processing System, A Simple Image Formation Model, Image Sampling and Quantization, Relationships Between Pixels, Imaging Geometry.

MODULE II: Image Transforms [8 Periods]

2-D Fourier Transform, Properties, FFT, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar transform, Slant transform, Hotelling transform.

MODULE III: Image Enhancement [10 Periods]

A: Spatial Domain: Introduction, Gray Level Transformations, Histogram Processing, Arithmetic and Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

B: Frequency Domain: Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering.

MODULE IV: Image Restoration and Color Image Processing [10 Periods]

Image Restoration: Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filters.

Color Image Processing: Pseudo-color Image Processing, Full-color Image Processing.

MODULE V: Image Compression and Segmentation [10 Periods]

Image Compression: Fundamentals, Image Compression Models, Elements of information Theory, Error Free Compression, Lossy Compression.

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds

Text Books:

1. R. C. Gonzalez, R. E. Woods, "Digital Image processing", Addison Wesley/ Pearson education, New Delhi, India, 3rd edition, 2002.

Reference Books:

1. A. K. Jain, "Fundamentals of Digital Image processing", Prentice Hall of India, New Delhi, 2nd Edition, 1997.
2. Rafael C. Gonzalez, "Digital Image processing using MATLAB", Richard E. Woods and Steven Low price Edition, Pearson Education Asia, India, 2nd Edition, 2004.
3. William K. Pratt, "Digital Image Processing", John Wiley & Sons, New Delhi, India, 3rd edition, 2004.
4. Arthur R. Weeks, Jr, "Fundamentals of Electronic Image Processing", SPIE Optical Engineering Press, New Delhi, India, 2nd Edition, 1996.

E-Resources:

1. https://engineering.purdue.edu/~bouman/ece637/
2. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=83
3. http://www.springer.com/computer/image+processing/journal/11554
4. http://nptel.ac.in/courses/106105032/6
5. nptel.ac.in/courses/117105079/
6. https://www.youtube.com/watch?v=CVV0TvNK6pk
7. www.nptelvideos.in/2012/12/digital-image-processing.html
8. nptel.ac.in/courses/117105079/12
9. nptel.ac.in/courses/117105079/20
10. nptel.ac.in/courses/117105079/22

Course Outcomes:

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

1. Understand the fundamentals of Digital image processing including the simple image formation and relationship between pixels
2. Understand the different types of Image transform techniques.
3. Understand the different types of Image enhancement techniques in spatial and frequency domain .
4. Understand the different types of image degradation like linear image restoration techniques and nonlinear image restoration techniques
5. Understand the image compression like lossy and loss less image compression techniques and also understand the need of image segmentation.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80426	MICROWAVE ENGINEERING AND RADAR SYSTEMS	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Electromagnetic theory &Waves, Network Theory & Transmission Lines.
Course Objectives: This course introduces the microwave frequency, microwave waveguide, microwave components, microwave tubes, microwave solid state devices and the various metrics / parameters used in microwave measurement and its requirement, the basics of Radars and its types.

MODULE I: **[11 Periods]**

Introduction of Microwave: - Introduction, Microwave Spectrum and Bands, Applications of Microwaves, Advantages and Limitations of Microwave Systems;
Microwave Transmission Lines: Rectangular Waveguide - Solutions of wave equations in Rectangular Coordinates, TE, TM Modes, Power Transmission, Power loss in rectangular waveguide. Micro strip Lines – Introduction, Z_o Relations, Effective Dielectric Constant, Losses, Q factor.
Waveguide components – Probe, Loop Bends and Twist, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Different Types, Waveguide Phase Shifters – Different Types

MODULE II: **[11 Periods]**

Waveguide Multiport Junctions & Scattering Matrix – E plane and H plane Tees, Magic Tee. Directional Couplers – 2 Hole, Isolator, Circulator, Gyrator. Significance, Formulation and properties of S-matrix. S-matrix calculation of 2 port Junctions, E, H plane, Magic Tee, Directional Coupler Illustrative Problems.
Conventional Tubes: Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes – O Type and M Type Classifications
O-type Tubes: 2 Cavity Klystrons –Structure, Reentrant Cavities, Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram (Qualitative Analysis)

MODULE III: **[10 Periods]**

A: M-Type Tubes: Introduction, Cross-field Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron – Hull Cut-off and Hartee Conditions, Modes of Resonance and PI-Mode Operation (Qualitative Analysis).
B: Microwave Solid State Devices: Introduction, Classification, Applications. TED's-introduction, Gunn Diode, Gunn Effect: Principle and Mode of Operation, RWH Theory
Microwave Measurements: Description of Microwave Bench – Different Blocks and their Features, Microwave Power Measurement, Bolometers Measurement of Attenuation, Frequency measurements, Measurement of Low and High VSWR, Cavity Q, Impedance Measurements

MODULE IV: **[8 Periods]**

Basics of Radar: Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications.

Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems.

Radar Equation: SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

MODULE V: [8 Periods]

CW Modulated Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems

MTI Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, MTI Radar Parameters, Limitations to MTI Performance,

Text Books:

1. Microwave Devices and Circuits- Samuel Y. Liao, Pearson, 3rd Edition,
2. Microwave Semiconductor Devices - Roy & Mitra, PHI
3. Microwave and Radar Engineering – M Kulkarni , Umesh Publications , 5th Edition
4. Introduction to Radar Systems- Merrill I. Skolnik,, Special Indian Edition, TMH, 2nd Edition, 2007.

Reference Books:

1. R. E. Collin, "Foundations for Microwave Engineering" 2nd Edition, 2005.
2. G S Raghuwanshi , "Microwave Engineering" Cengage Publication 1st edition (2012)
3. Annapurna Das and Sisir K. Das, "Microwave Engineering" TMH, 2nd Edition, 2000.
4. D. M.Pozar, "Microwave Engineering" 2nd Edition, John Wiley.
5. Peter A. Rizzi, "Microwave Engineering Passive Circuits" PHI, 1999
6. M. L Sisodia, Vijay Laxmi Gupta, "Microwaves: Introduction to Circuits, Devices and Antennas" 1st Edition (2001), New Age International Publishers

Course Outcomes:

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

1. Understand the waveguides, strip lines used to transmit the microwave frequencies, terminologies associated with microwaves like, TE, TM, microwave components
2. Understand Various microwave multiport junctions like, E-Plane Tee, H-plane Tee, Directional Couplers, attenuators, Gyrator, circulator, isolator and to understand microwave conventional tubes and o type tubes.
3. Understand Microwave tubes like , Magnetrons, Microwave SSD's like Gunn diode, ATTD's, Microwave measurement parameters like VSWR, Resonance, Cavity Q, impedance, attenuation etc.
4. To understand principle of radars and factors affecting the radar performance, to analyze the various technologies involved in the design of radar transmitter and receiver
5. Analyze different types of radar systems to assess their performance .and to illustrate the characteristics of radar receivers and their performance

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80433	FUNDAMENTALS OF MACHINE LEARNING (Professional Elective – III)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Probability Theory and Stochastic Processes, Engineering Mathematics
Course Objectives: To give intelligence to the computer systems without teaching them manually.

MODULE I: Introduction to Machine Learning [9 Periods]
Introduction to Artificial Intelligence and Machine Learning- Machine Learning Techniques- Examples of ML Applications - Learning associations - Data Preprocessing- Math Refresher.

MODULE II: Classification & Regression [10 Periods]
Regression- Classification- Clustering- kernels- Support vector machine (SVM) and kernels, kernel optimization Introduction, linear classification, perceptron update rule - Perceptron convergence, generalization- Maximum margin classification- Classification errors, regularization-logistic regression Linear regression -estimator bias and variance-active learning Active learning- non-linear predictions.

MODULE III: Deep Learning & Unsupervised Learning [10 Periods]
A: Introduction to Deep Learning- NN architecture - Forward/Back propagation-Vectorization -Other Optimization Tricks-Clustering. K-means-EM.
B: Mixture of Gaussians-Factor analysis- PCA (Principal components analysis)-ICA (Independent components analysis)

MODULE IV: Semi-Supervised learning [10 Periods]
Semi-supervised learning**-** Introduction - Generative Models - Low Density Separation - Graph Based Methods - Self-Training - Multi-View Learning- Large Scale Algorithms in Practice - Risks of Semi-Supervised Learning - Perspectives - Metric Based Approach - Transductive Inference - Case Study: Semi Supervised analysis of Protein Synthesis

MODULE V: Reinforcement Learning and Control [9 Periods]
MDPs. Bellman equations- Value iteration and policy iteration- Linear quadratic regulation (LQR) LQG- Q-learning- Value function approximation. Current problems in machine learning, wrap up.

Text Books:

1. Ethem Alpaydin, "Introduction to Machine Learning", 3rd Edition, MIT Press, 2014.
2. Chapelle, Olivier, Bernhard, ZienAlexander "Semi-supervised learning" Cambridge, MIT Press 2006.

Reference Books:

1. MacKay, David. Information Theory, Inference, and Learning Algorithms. Cambridge, UK: Cambridge University Press, 2003.
2. Tom M. Mitchell. "Machine Learning" McGraw-Hill, 1997.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc17_cs26/
2. https://www.springer.com/computer/ai/journal/10994
3. https://mitpress.mit.edu/books/fundamentals-machine-learning-predictive-data-analytics

Course Outcomes:

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

1. Understand different machine learning techniques and applications
2. Apply regression techniques to solve supervised learning problems
3. Solve unsupervised learning problems using deep neural networks
4. Apply different techniques to solve semi-supervised learning problems
5. Apply reinforcement learning techniques

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80434	OPTICAL COMMUNICATIONS (Professional Elective-III)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Engineering Physics, Applied Physics, Analog & Digital Communications.

Course Objectives: This course introduces the significance of optical fiber communications, characteristics and signal distortion in optical fiber cable. This course develops the knowledge of various optical detector devices, fiber splicing techniques and launching power. This course also helps to design an optical system.

MODULE I: Overview of Optical Fiber Communication [11 Periods]

Historical development, the general system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides- Introduction, Ray Theory Transmission, Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays, Cylindrical Fibers- Modes, Vnumber, Mode Coupling, Step Index Fibers, Graded Index Fibers. Single Mode Fibers **-** Cut Off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials Glass, Halide, Active Glass, Chalgenide Glass, Plastic Optical Fibers.

MODULE II: Signal Distortion in Optical Fibers [10 Periods]

Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Information Capacity Determination, Group Delay, Types of Dispersion - Material Dispersion, Wave-Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening, Optical Fiber Connectors- Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

MODULE III: Fiber Splicing and Power Launching [10 Periods]

A: Fiber Splicing: Splicing Techniques, Splicing Single Mode Fibers, Fiber Alignment and Joint Loss- Multimode Fiber Joints, Single Mode Fiber Joints, Optical Sources- LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes- Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies, Reliability of LED & ILD.

B: Source to Fiber Power Launching: Output Patterns, Power Coupling, Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling.

MODULE IV: Optical Detectors [9 Periods]

Physical Principles of PIN and APD, Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors, Optical Receiver Operation- Fundamental Receiver Operation, Digital Signal Transmission, Error Sources, Receiver Configuration, Digital Receiver Performance, Probability of Error, Quantum Limit, Analog Receivers.

MODULE V: Optical System Design **[8 Periods]**

Considerations, Component Choice, Multiplexing, Point-to- Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples.

Transmission Distance, Line Coding in Optical Links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

Text Books:

1. Gerd Keiser, "Optical Fiber Communications", TMH, 4th Edition, 2008.
2. John M. Senior, "Optical Fiber Communications", Pearson Education, 3rd Edition, 2009.

Reference Books:

1. D. K. Mynbaev, S.C. Gupta and Lowell L. Scheiner, Fiber "Optic Communications", Pearson Education, 2005.
2. S. C. Gupta, Text Book on "Optical Fibre Communication and its Applications", PHI, 2005.
3. Govind P. Agarwal, John Wiley, "Fiber Optic Communication Systems", 3rd Ediition, 2004.
4. Donald J. Sterling Jr, "Introduction to Fiber Optics", Cengage learning, 2004.
5. John Gowar, "Optical Communication Systems", PHI, 2nd Edition, 2001.

E-Resources:

1. http://www.optics.rochester.edu/users/gpa/opt428a.pdf
2. https://www.slac.stanford.edu/slac/sass/talks/opticalfiber.pdf
3. http://www.cse.wustl.edu/~jain/tutorials/ftp/t_3opt.pdf
4. http://nptel.ac.in/courses/117104127/
5. https://www.osapublishing.org/jocn/home.cfm
6. http://nptel.ac.in/courses/117104127/

Course Outcomes:

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

1. Understand significance of Optical communication and fundamental operating principles
2. Estimate the signal distortion phenomena by various parameters like losses and pulse broadening
3. Acquire knowledge on light sources and power launching techniques
4. Acquire knowledge on Constructural features of receivers and its performance as well as error estimations
5. Differentiate various optical system components and get knowledge on link power budget and able to give measures for attenuation

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80435	EMBEDDED SYSTEM DESIGN (Professional Elective-III)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Microprocessors and Microcontrollers.

Course Objectives: This course introduces the difference between Embedded Systems and General purpose systems. This course familiarizes to compare different approaches in optimizing General purpose processors. This course provides the design tradeoffs made by different models of embedded systems.

MODULE I: Introduction to Embedded Systems [8 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 [9 Periods]

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

MODULE V: Task Communication [9 Periods]

Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS

Text Books:

1. Shibu K. V, “Introduction to Embedded Systems”, McGraw Hill, 2013.
2. Raj Kamal, “Embedded Systems”, TMH.

Reference Books:

1. Frank Vahid, Tony Givargis, John Wiley,“Embedded System Design”.
2. Lyla, “Embedded Systems”, Pearson, 2013.

3. David E. Simon, “An Embedded How to Choose an RTOS 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, 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
CO1	2	1	1			1							1	1	3
CO2	2		2	1		1	1					1	2	3	3
CO3	2		3	1	1	2	1				1	1	2	3	3
CO4	1		3	1	1	2	1					1	2	3	3
CO5	1		2	1	1	1						1	2	3	3

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80436	ADVANCED DIGITAL SIGNAL PROCESSING (Professional Elective-IV)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Digital Signal Processing.

Course Objectives: The objective of the course is to introduce the concepts of multi rate Digital signal Processing, to emphasize the importance of estimation of power spectral density and its evaluation using Non-Parametric methods, to evaluate power spectral density using Parametric methods. The course enables the student to learn the design approaches and realization structures of Digital Filters and to know the effect of Finite Word Length.

MODULE I: Multi-Rate Signal Processing [8 Periods]

Multi Rate Signal Processing: Introduction, Decimation by a factor D. Interpolation by a factor I. sampling rate conversion by a rational factor I/D. Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion, Applications of Multirate Signal Processing.

MODULE II: Non - Parametric methods of Power Spectral Estimation [10 Periods]

Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman & Tukey methods, Comparison of all Non-Parametric methods.

MODULE III: Parametric Methods of Power Spectrum Estimation [10 Periods]

A: Autocorrelation & its Properties, Relation between auto correlation & model parameters

B:AR Models - Yule – Waker & Burg Methods, MA & ARMA models for power spectrum estimation.

MODULE IV: Implementation of Digital Filters [10 Periods]

Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, implementation of lattice structures for IIR filters, Advantages of lattice structures.

MODULE V: Finite Word Length Effects [10 Periods]

Analysis of finite word length effects in Fixed-Point DSP Systems–Fixed, Floating Point Arithmetic – ADC quantization noise & signal quality – Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

Text Books:

1. J. G. Proakis& D. G. Manolokis, “Digital Signal Processing, Principles, Algorithms & Applications”, PHI, 4th Edition.

2. Alan V Oppenheim & Ronald W.Schaffer, “Discrete Time signal processing”, PHI.
3. Emmanuel C. Ifeacher, Barrie, W.Jervis, “DSP – A Practical Approach”, Pearson Education, 2nd Edition.

Reference Books:

1. S. M. Kay, “Modern nspectral Estimation: Theory & Application”, PHI, 1988.
2. P. P. Vaidyanathan, “Multirate Systems and Filter Banks”, Pearson Education.
3. S. Salivahanan, A. Vallavaraj, C. Gnanapriya ,“Digital Signal Processing”, TMH, 2000.

E-Resources:

1. http://www-syscom.univ-mlv.fr/~zaidi/teaching/dsp-esipe-oc2/Course-Notes__Advanced-DSP.pdf
2. https://www.dss.tf.uni-kiel.de/en/teaching/lectures/adv.-digital-signal-processing
3. http://www.springer.com/engineering/signals/journal/13634
4. https://www.youtube.com/watch?v=4ufeTZ6fSNY
5. http://www.nptelvideos.in/2012/12/advanced-digital-signal-processing.html

Course Outcomes:

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

1. Understand multi-rate signal processing techniques
2. Estimate the power spectrum using non-parametric methods
3. Estimate the power spectrum using parametric methods
4. Implement both IIR and FIR digital filter structures
5. Analyze finite word length effects in fixed point DSP systems

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80437	WIRELESS COMMUNICATIONS (Professional Elective-IV)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Analog & Digital Communications, Advanced digital communications.

Course Objectives: The course targets to provide a good understanding of the examples of wireless communication systems, paging systems, cordless telephone systems and generations. It familiarizes the student with the various propagation mechanisms, large scale fading, small scale fading phenomena and models for multipath fading channels. The focus of the course is also in enabling the student to understand the different types of equalization and diversity techniques, capacity of various wireless channels.

MODULE I: Introduction to Wireless Communication Systems [8 Periods]

Evolution of mobile radio communications, examples of wireless communication systems -paging systems, cordless telephone systems, cellular telephone systems, comparison of common wireless communication systems.

Modern Wireless Communication Systems: Second generation (2G) cellular networks, third generation (3G) wireless networks, wireless local loop (WLL) and LMDS, wireless local area networks (WLANs), Bluetooth and personal area networks (PANs).

MODULE II: Mobile Radio Propagation: Large-Scale Path Loss [10 Periods]

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, outdoor propagation models-Okumara model, Hata model, indoor propagation models-Log-distance path loss model.

MODULE III: Mobile Radio Propagation: Small Scale Fading and Multipath [10 Periods]

A: Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements - Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

B: Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Rayleigh and Ricean distributions.

MODULE IV: Capacity of Wireless Channels [10 Periods]

AWGN channel capacity, capacity of flat fading channels, capacity of Frequency-selective fading channels -Time Invariant Channels, Time Varying Channels.

MODULE V: Equalization and Diversity Techniques [10 Periods]

Introduction, fundamentals of equalization, adaptive equalizer, equalizers in a communications receiver, survey of equalization techniques, linear equalizers, on linear equalization, algorithms for adaptive equalization. Diversity techniques-derivation of selection diversity improvement, derivation of maximal ratio combining improvement, practical space diversity consideration-selection diversity, feedback diversity, maximal ratio combining, equal gain combining, frequency diversity, time diversity, Rake receiver

Text Books:

1. Theodore S Rappaport, "Wireless Communications", Pearson Education, Asia, New Delhi, 2010.
2. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, New Delhi, 2009.

Reference Books:

1. Dr. KamiloFeher, "Wireless Digital Communications", Prentice Hall of India, New Delhi, 2003.
2. Jochen Schiller, "Mobile Communications", Pearson Education, India, 2nd edition, 2009.
3. Andreas F. Molisch, "Wireless Communications", Wiley - India, New Delhi, 2006.

E-Resources:

1.https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-450-principles-ofdigital-communications-i-fall-2006/lecture-notes/book_9.pdf
2. http://www.wirelesscommunication.nl/reference/about.htm

Course Outcomes:

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

1.Understand the Fundamentals of Wireless Communication System and Generations and Networks of Modern Wireless Communication System.
2. Demonstrate various Radio Propagation Models of Mobile Radio Propagation.
3. Understand the different types of small scale fading and its effects
4. Understand the capacity of flat fading and frequency selective fading channels
5. Understand the various types of equalization and diversity techniques

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80438	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE (Professional Elective – IV)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: To learn the difference between optimal reasoning Vs human like reasoning, and understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities. To learn different knowledge representation techniques and to understand the applications of AI namely, Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

MODULE I **[10 Periods]**

Foundations of AI: What is AI, History of AI, Strong and weak AI, The State of the Art. **Intelligent Agents:** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

MODULE II **[10 Periods]**

Solving Problems by Searching: Problem – Solving Agents, Example Problems, Searching for Solutions, uniformed search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

MODULE III **[9 Periods]**

Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World.

MODULE IV **[10 Periods]**

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Learner Models, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning.

MODULE V **[9 Periods]**

Learning Probabilistic Models: Statistical Learning, Learning with Complete data, Learning with Hidden variables: The EM Algorithm.

Text Books:

1. Stuart J. Russell & Peter Norvig "Artificial Intelligence A Modern Approach" Pearson.
2. Elaine Rich, Kevin Knight &Shivashankar B Nair "Artificial Intelligence", McGraw Hill Education.

Reference Books:

1. "Artificial Intelligence: A New Sythesis" by Nils J Nilsson
2. "Artificial Intelligence" by Negnevitsky

E-resources:

1. https://www.springer.com/in/book/9783540167822
2. https://www.e-booksdirectory.com/listing.php?category=28
3. https://nptel.ac.in/courses/109101003/downloads/Lecture.../Lecture-19-20-21.pd
4. https://onlinecourses.nptel.ac.in/noc18_cs51
5. https://nptel.ac.in/courses/106106140

Course Outcomes:

1. Possess the ability to formulate an efficient problem space for a problem expressed in English
2. Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
3. Possess the skill for representing knowledge using the appropriate technique
4. Ability to classify the problem into a suitable form of learning and solve it
5. Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems and Machine Learning.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80427	DIGITAL IMAGE PROCESSING LAB	L	T	P
Credits: 1		-	-	2

Course Objectives: To learn programming for various digital Image processing concepts.

List of Programs

1. Write program to read, display, resize and perform various conversions on digital image.
   a. Read and display image
   b. Resize given image
   c. Convert given color image into gray-scale image
   d. Convert given color/gray-scale image into black & white image
   e. Generation of histogram of a given gray-scale image
   f. Separate color image in three R G & B planes
   g. Create color image using R, G and B three separate planes
2. To write and execute image processing programs using point processing method.
   a. Obtain Negative image
   b. Obtain Flip image
   c. Thresholding
   d. Contrast stretching
3. To write and execute programs for image arithmetic operations.
   a. Addition of two images
   b. Subtract one image from other image
   c. Calculate mean value of image
   d. Different Brightness by changing mean value
4. To write and execute programs for image logical operations.
   a. AND operation between two images
   b. OR operation between two images
   c. Calculate intersection of two images
5. To write a program for histogram calculation and equalization.
6. To write and execute program for geometric transformation of image.
   a. Translation
   b. Scaling
   c. Rotation
   d. Shrinking
   e. Zooming
7. To write and execute programs for any two Image transforms.
8. To write and execute programs to remove noise using spatial filters.
   a. Understand 1-D and 2-D convolution process
   b. Use 3x3 Mask for low pass filter and high pass filter
9. To write and execute programs for image frequency domain filtering.
   a. Apply FFT on given image

b. Perform low pass and high pass filtering in frequency domain
c. Apply IFFT to reconstruct image

10. To write a program for edge detection using different edge detection mask.
11. To write and execute program for converting from RGB to HSI.
12. Image compression Using Discrete Cosine Transform

Software Required:

1. Computers with MATLAB / OCTAVE/ Equivalent Software

Note: The programs shall be implemented in software (Using MATLAB / Lab view / C programming / OCTAVE Equivalent).

Course Outcomes:

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

1. Implement Image Acquisition operations
2. Implement various basic Image operations
3. Implement Full color image processing operations
4. Implement the edge detection and compression techniques

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**
CO1	3	2	2	2	3							3	3	3	1
CO2		2	2	2	3							3	3	3	1
CO3	2	1	1	3						3		3	3	3	1
CO4	2	2	3	2	1					1	1	3	3	3	1

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: 80428	MICROWAVE ENGINEERING LAB	L	T	P
Credits: 1		-	-	2

Course Objectives: To understand microwave test bench and microwave components, to verify the characteristic of Reflex Klystron Tube, GUNN Diode

List of Experiments:

1. Introduction of microwave bench, microwave components
2. To measure Microwave Frequency using Frequency Meter.
3. To study the characteristics and behavior of Attenuator.
4. To study the characteristics of the Reflex Klystron Tube
5. To study the characteristics of a GUNN Diode
6. To determine the standing wave ratio and reflection coefficient.
7. To Measure Impedance of a given Load
8. To study the characteristics of the Directional Coupler
9. To study the characteristic and behavior of a E plane Tee & H plane Tee
10. To study the characteristic and behavior of a Magic Tee.
11. To study the characteristics and behavior of Isolator and Circulators.
12. To measure parameters of a waveguide

Course Outcomes:

1. Able to understand working and parameters measurements of various microwave components using microwave bench.
2. Able to understand characteristics of microwave components and devices.

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
CO1	3		2	2							2		2		1
CO2	3		2	2							2		2		1

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		-	-	-

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. VIII Semester		
Code: 80439	INTERNET OF THINGS (IOT) AND APPLICATIONS (Professional Elective-V)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IOT Devices.

MODULE- I **[8 Periods]**

Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels.

MODULE II **[8 Periods]**

Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

MODULE III **[12 Periods]**

A: M2M & System Management with NETCONF-YANG: M2M, Difference between IOT and M2M, SDN and NFV for IOT, Software defined Networking, Network Function Virtualization, Need for IOT Systems Management,

B: Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

MODULE IV **[10 Periods]**

Developing Internet of Things & Logical Design using Python: Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, **MODULE**s, Packages, File Handling, Date/ Time Operations, Classes, Python Packages

MODULE V **[10 Periods]**

IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming & IOT Devices.

Text Books:

3. Vijay Madisetti, Arshdeep Bahga, Internet of Things A Hands-On- Approach",2014, ISBN:978 0996025515
4. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN 0989973700

Reference Books:

1. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013, ISBN: 978-1-118-43062-0

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc17_cs22/course
2. https://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=6488907
3. https://www.sciencedirect.com/science/article/pii/S0007681315000373
4. https://www.springer.com/gp/book/9783319697147

Course Outcomes:

After Completion this course the student will able to

1. Understand and Analyze the IOT Designs.
2. Design IOT kind of Application for Different Domains.
3. Understand and Design the IOT Network Architecture.
4. Develop and Code the Algorithm for IOT.
5. Interface the Different devices to IOT.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: 80440	ADHOC WIRELESS SENSOR NETWORKS (Professional Elective-V)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Computer Networks

Course Objectives: To study the fundamentals of wireless Ad-Hoc Networks, operation and performance of various ADHOC wireless network protocols. To study the architecture and protocols of Wireless sensor networks.

MODULE- I: Wireless LANs and PANs **[9 Periods]**

Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF.

ADHOC Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks.

MODULE- II:MAC Protocols **[10 Periods]**

Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention – Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

MODULE III: Routing Protocols **[9 Periods]**

A: Introduction, Issues in Designing a Routing Protocol for ADHOC Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols,

B: Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

MODULE IV: Transport Layer Protocols **[12 Periods]**

Introduction, Issues in Designing a Transport Layer Protocol for ADHOC Wireless Networks, Design Goals of a Transport Layer Protocol for ADHOC Wireless Networks, Classification of Transport Layer Solutions, TCPOver ADHOC Wireless Networks, Other Transport Layer Protocol for ADHOC Wireless Networks.

MODULE– V: Wireless Sensor Networks **[9 Periods]**

Introduction, Sensor Network Architecture, Data Dissemination, DataGathering, MAC Protocols for Sensor Networks, Location Discovery,Quality of a Sensor Network, Evolving Standards, Other Issues.

Text Books:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S. Manoj, 2004, PHI.
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – Jagannathan Sarangapani, CRC Press.

Reference Books:

1. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh ,1st Ed. Pearson Education.
2. Wireless Sensor Networks - C. S. Raghavendra, Krishna M.Sivalingam, 2004, Springer

E-Resources:

1. https://ebooks.benthamscience.com/book/9781608050185
2. https://www.springer.com/la/book/9780387685656
3. https://onlinecourses.nptel.ac.in/noc17_cs07
4. textofvideo.nptel.ac.in/106105160/lec1.pdf
5. https://nptel.ac.in/noc/individual_course.php?id=noc17-cs07
6. https://publons.com/journal/334/ad-hoc-sensor-wireless-networks

Course Outcomes:

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

1. Understand the basis of ADHOC wireless networks.
2. Understand design, operation and the
3. performance of MAC layer protocols of ADHOC wireless networks.
4. Students will be able to understand design, operation and the
5. performance of routing protocol of ADHOC wireless network.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: 80441	SYSTEM ON CHIP ARCHITECTURE (Professional Elective-V)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Computer Architecture, Digital circuits and Embedded Systems.
Course Objectives: This course introduces computer system design with emphasis on fundamental ideas, analytical techniques that are applicable to a range of applications & architectures, hardware and software programmability verses performance, entire memory organization, starch pads, cache memories and objective in cache data how to deal the write polices.

MODULE I: Introduction to the System Approach [8 Periods]
System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

MODULE II: Processors [10 Periods]
Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

MODULE III: Memory Design for SOC [10 Periods]
A: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time,
B: Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation, SOC Memory System, Models of Simple Processor – memory interaction.

MODULE IV: Interconnects Customization and Configuration [10 Periods]
Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses , Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

MODULE V: Application Studies / Case Studies [08 Periods]
SOC Design approach, AES algorithms, Design and Evaluation, Image compression – JPEG compression.

Text Books:

1. Michael J. Flynn and Wayne Luk, "Computer System Design System on Chip", Wiely India Pvt. Ltd., 2012.

Reference Books:

1. Steve Furber, "ARM System on Chip Architecture", Addison Wesley Professional, 2nd Edition, 2000.
2. Ricardo Reis, "Design of System on a Chip: Devices and Components", Springer, 1st Edition, 2004.

E-Resources:

1. https://ieeexplore.ieee.org/document/1652898/
2. https://ieeexplore.ieee.org/document/5196691
3. https://dl.acm.org/citation.cfm?id=557024
4. https://nptel.ac.in/courses/108102045/10
5. https://freevideolectures.com/course/2341/embedded-systems/10

Course Outcomes:

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

1. Know how the system forms with the lot of component and has majority about system level interconnections.
2. Understand hardware and software programmability verses performance.
3. Know about entire memory organization, starch pads, cache memories and objective in cache data how to deal the write polices.
4. Know differentiate sequential language and concurrent language.
5. Understand different algorithms used for Image compression.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: 80442	ADVANCED MICROCONTROLLERS (Professional Elective-VI)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Microprocessors and Microcontrollers.

Course Objectives: This course introduces the PIC, AVR, ARM Micro Controllers and their architecture. This course helps to write efficient programs in assembly language programs and embedded c programming

MODULE I: Introduction to PIC Microcontroller [8 Periods]

Overview of PIC family, PIC 18 Microcontroller architecture- file register, status register, Memory organization, PIC 18F458 pin configuration, I/O ports, timers, serial ports, interrupts.

MODULE II: PIC Programming [10 Periods]

Data transfer, Arithmetic, Logic and Compare, Rotate and Shift, Branch and Call instructions, Addressing modes of PIC, data format and assembler directives, assembly language programs, Time delay loop**,** timer, serial communication and interrupt programming, I/O Port Programming, LCD, relay, stepper motor, DC motor interfacing and programming.

MODULE III: [11 Periods]

A: Introduction to AVR Microcontroller: Overview of AVR family, AVR Microcontroller architecture, Registers, AVR status register, ROM space and other hardware modules, ATmega32 pin configuration and function of each pin.

B: AVR Programming: AVR Instruction set, Addressing modes, Data types and Assembler directives, AVR assembly language programs, I/O Port Programming, Time delay loop, BCD, ASCII conversion Program, Bit addressability.

MODULE IV: [9 Periods]

AVR Programming in C: Data types, I/O programming, logic operations, Timer programming, Interrupt programming, Serial Port programming.

AVR Interfacing: LCD, ADC, DAC and sensor interfacing, SPI protocol and Display interfacing, I2C Protocol and RTC interfacing

MODULE V: [10 Periods]

Introduction to ARM Micro controllers: ARM 7 architecture, ARM Microcontrollers and Processor Cores, ARM Architecture and Organization, ARM/THUMB Programming Model, ARM/THUMB Instruction Set, ARM addressing modes.

Text Books:

1. Muhammad Ali Mazidi, PICMicrocontroller and Embedded Systems: Using Assembly and C for PIC 18, Pearson Education India; 1 edition (2008).
2. 2 Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, "The AVR Microcontroller and Embedded Systems Using Assembly and C", Pearson Education.
3. Steve Furber, ARM System-on-Chip Architecture, Pearson Education 2nd edition.
4. 4 Andrew Sloss, Dominic Symes, Chris Wright ,ARM System Developer's Guide Designing and Optimizing System Software, Elsevier India; First edition (18 October 2004)

Reference Books:

1. Leo Chartrand ,Han-Way Huang, PIC Microcontroller: An Introduction to Software and Hardware Interfacing, Delmar Cengage Learning
2. John B Peatman, Design with PIC Microcontrollers,Pearson Education India; 1 edition (2002),
3. MykePredko, Programming and Customizing the PIC Microcontroller, McGraw-Hill Education TAB; 3 edition (October 16, 2007)
4. Ajay Deshmukh , Microcontrollers: Theory And Applications, Tata McGraw-Hill Education(2005)
5. Muhammad Ali Mazidi, SarmadNaimi, SepehrNaimi, Janice Mazidi , ARM Assembly Language: Programming and Architecture,Pearson

E-Resources:

1. https://nptel.ac.in/courses/117104072/16
2. https://onlinecourses.nptel.ac.in/noc18_ec03/course
3. https://ieeexplore.ieee.org/document/6685076/

Course Outcomes:

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

1. Express architecture of PIC, AVR and ARM Micro Controllers.
2. Program a microcontroller system in assembly code and C.
3. Interface memory to the controllers.
4. Interface I/O devices with AVR microcontroller
5. Understand thumb instruction set of ARM controllers.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: 80443	SATELLITE COMMUNICATIONS (Professional Elective-VI)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Analog & Digital Communications.

Course Objectives: To prepare students to excel in basic knowledge of satellite communication principles to know link design of satellite with design examples multiple access systems

MODUEL -I: **[10 Periods]**

Communication Satellite: Orbit and Description: A Brief history of satellite Communication, Satellite Frequency Bands, Satellite Systems, Applications, Kepler's Laws, Newton's law, Orbital Period and Velocity, effects of Orbital Inclination, station keeping, geo stationary and non-Geo-stationary orbits, Azimuth and Elevation, Coverage angle and slant Range, Eclipse, Orbital Perturbations, Placement of a Satellite in a Geo-Stationary orbit, Launching Procedures - launch vehicles and propulsion.

MODULE -II: **[10 Periods]**

Satellite Sub-Systems: Attitude and Orbit Control system, Thermal control and Propulsion, communication Payload and supporting subsystems, TT&C subsystem, Attitude Control subsystem, Power systems, Communication subsystems, Satellite Antenna Equipment.

Satellite Link: Basic Transmission Theory, System Noise Temperature and G/T ratio, Basic Link Analysis, Interference Analysis, Design of satellite Links for a specified C/N, (With and without frequency Re-use), Link Budget, system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

MODULE -III: **[10 Periods]**

A: Propagation effects: Introduction, Atmospheric Absorption, Cloud Attenuation, Tropospheric and Ionospeheric Scintillation and Low angle fading, Rain induced attenuation, rain induced cross polarization interference, System noise – Antenna noise – Amplifier noise temperature – Amplifiers in cascade – Noise factor – Noise temperature of absorptive networks – Overall system noise temperature.

B: Multiple Access: Frequency Division Multiple Access (FDMA) – Inter modulation, Calculation of C/N, Time Division Multiple Access (TDMA) - Frame Structure, Burst Structure, Satellite Switched TDMA, On-board Processing, Demand Assignment Multiple Access (DAMA) – Types of Demand Assignment, Characteristics, CDMA Spread Spectrum Transmission and Reception.

MODULE -IV: **[10 Periods]**

Earth Station Technology: Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Power Test Methods, Lower Orbit Considerations.

Satellite Navigation and Global Positioning Systems: Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers, GPS C/A Code Accuracy, Differential GPS.

MODULE V: **[8 Periods]**

Satellite Packet Communications: Message Transmission by FDMA: M/G/1 Queue, Message Transmission by TDMA, PURE ALOHA-Satellite Packet Switching, Slotted Aloha, Packet Reservation, Tree Algorithm.

Text Books:

1. Timothy Pratt, Charles Bostian, Jeremy Allnutt, "Satellite Communications" 2nd Edition, 2003, John Wiley & Sons.
2. Wilbur, L. Pritchand, Robert A. Nelson and Heuri G. Suyderhoud, "Satellite Communications Engineering" 2nd Ed., Pearson Publications.
3. Tri.T.Ha, "Digital Satellite Communications" 2nd Edition, 1990, Mc.Graw Hill.

Reference Books:

1. Dennis Roddy, "Satellite Communications" 2nd Edition, 1996, McGraw Hill.
2. Design Principles – M. Richcharia, "Satellite Communications" 2nd Ed., BSP, 2003.
3. Tri. T. Ha, "Digital Satellite Communications" 2nd Ed., MGH, 1990.
4. K. N. Raja Rao, "Fundamentals of Satellite Communications" PHI, 2004.

E-Resources:

1. https://books.google.co.in/books/about/Satellite_Communication.html?id
2. https://www.springer.com/gp/book/9781461419938
3. https://onlinecourses.nptel.ac.in/noc17_ec14
4. https://nptel.ac.in/courses/106105082/33
5. https://nptel.ac.in/courses/106105081/18
6. www.inderscience.com/jhome.php?jcode=IJSCPM.

Course Outcomes:

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

1. understand the historical background, basic concepts and frequency allocations for satellite communication
2. demonstrate orbital mechanics, launch vehicles and launchers
3. demonstrate the design of satellite links for specified C/N with system design examples.
4. visualize satellite sub systems like Telemetry, tracking, command and monitoring power systems etc.
5. understand the various multiple access systems for satellite communication systems and satellite packet communications.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code: 80444	WAVELETS & ITS APPLICATIONS	L	T	P
Credits: 3	(Professional Elective-VI)	3	-	-

Pre-Requisites: Digital Signal Processing, Digital Image Processing.
Course Objectives: This course will provide an introduction to the theory of wavelets and its applications in mathematics and signal processing.

MODULE I: Introduction to Time-Frequency Analysis [10 Periods]
Fourier basis & Fourier Transform – failure of Fourier Transform – Need for Time-Frequency Analysis –Heisenberg's Uncertainty principle – Short time Fourier transform (STFT)- short comings of STFT- Need for Wavelets

MODULE II: CWT and MRA [10 Periods]
Wavelet basis – Continuous time Wavelet Transform (CWT) – need for scaling function – Multi-Resolution, Analysis (MRA) – important wavelets: Haar, Mexican hat, Meyer, Shannon, Daubachies.

MODULE III: Construction of Wavelets & Multirate Systems [10 Periods]
A: Necessary ingredients of wavelets, construction- semi orthogonal, orthogonal and biorthogonal wavelets, graphical display of wavelets
B: Decimation and Interpolation in Time domain - Decimation and Interpolation in Frequency domain – Multi rate systems for a rational factor

MODULE IV: Filter Banks, DWT & Special Topics [10 Periods]
A: Two channel filter bank – Perfect Reconstruction (PR) condition – relationship between filter banks and wavelet basis – DWT – Filter banks for Daubachies wavelet function
B: Special Topics (Only Introductory Level): Multiwavelets, Multidimensional wavelets – wavelet packet transform.

MODULE V: Applications [8 Periods]
Feature extraction using wavelet coefficients, Image compression, Wavelet based denoising

Text Books:
1. Jaideva C Goswami and Andrew K Chan, "Fundamentals of Wavelets – Theory, Algorithms and Applications", John Wiley &Sons, Inc. Singapore, 2011.
2. Soman K P and Ramachandran K I, "Insight into wavelets from Theory to practice", Prentice Hall, New Delhi, 2010.

Reference Books:

1. Sidney Burrus C, "Introduction to Wavelets and Wavelets Transforms", Prentice Hall, New Delhi, 2002.
2. Stephane G Mallat, "A Wavelet Tour of Signal Processing", Academic Press, 2009.
3. Raghuveer M Rao and Ajit S Bopardikar, "Wavelet Transforms: Introduction to Theory & Applications", PearsonEducation Asia, New Delhi, 2003

E-Resources:

1. https://ieeexplore.ieee.org/document/5067402/
2. https://epubs.siam.org/doi/book/10.1137/1.9781611971385
3. https://nptel.ac.in/courses/117101001/downloads/Lec-38_Script.pdf
4. https://onlinecourses.nptel.ac.in/noc17_ee09/

Course Outcomes:

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

1. Analyze Time- frequency analysis
2. Analyze principles of wavelet design
3. Analyze multi resolution analysis
4. Analyze scaling functions, wavelets and filters
5. Understand the different applications of wavelets

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

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. VIII 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	-	-

Pre-Requisites: Environmental Science

Course Objectives: The main objective of this course is to provide in-depth knowledge about various methodologies in assessing the environmental impact of various developmental projects. It also provides the knowledge to design a more publicly acceptable project which helps in achieving sustainable development.

MODULE I **[10 Periods]**

Concept of EIA: Significance of EIA, Factors affecting EIA, Classification of Environmental Parameters, Elements of EIA: Initial Environmental Examination, Preparation of Environmental Base map, Impact Evaluation and Analysis, Environmental Impact Statement (EIS) and Environmental Management Plan (EMP), List of Projects which require EIA.

EIA Methodologies: General methodology of EIA with flow chart, EIA Methods: Ad-hoc methods, Matrix methods, Network methods, Environmental Media Quality Index method, Overlay methods, Cost/Benefit Analysis.

MODULE II **[10 Periods]**

EIA of Soil: Methodology for the assessment of developmental activities on Soil: Delineation of study area, Identification of impacts, Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures, Environmental impacts of Deforestation: Causes, Effects and Mitigation measures.

EIA of Ground water: Ground water quantity and quality impacts, Systematic method for evaluation of various developmental activities on Ground water environment.

EIA of Surface water: Introduction, Projects which create concerns, Methodology for the assessment of Impacts on surface water environment.

MODULE III

A: EIA of Air and Noise environment: **[10 Periods]**

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 **[9 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 **[9 Periods]**

Life Cycle Assessment: Definition, Scope, Methodology, its applications and drawbacks.

Case studies: Preparation of EIA for developmental activities: Industrial projects, Land clearing projects, River valley projects, Construction projects, Highways and Road projects.

Text Books:

1. Y. Anjaneyulu, "Environmental Impact Assessment Methodologies", BS Publications, CRC Press, 2nd edition, 2011.
2. R.R. Barthwal "Environmental Impact Assessment", New Age International Publishers, 2nd edition, 2012.

Reference Books:

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, 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**
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	-	-

Pre-Requisites: 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 **[9 Periods]**

Introduction to green buildings, green materials, sources of green materials, high-performance green buildings Impacts of building construction, operation, and disposal Methods and tools for building assessment, Green Globes

MODULE II **[10 Periods]**

The green building process, Design and construction relationships, benefits of green building quality, healthy and safe environments, Site and landscape strategies.

MODULE III **[10 Periods]**

A: Building energy system strategies, Water cycle strategies, Materials selection strategies, Indoor Environmental Quality [IEQ]

B: Analysis and strategies, Construction, team responsibilities and controls, Building commissioning strategies

MODULE IV **[09 Periods]**

Economic issues and analysis, Use of the Green Strategies cost estimating tool, Future directions in green, high performance building technologies

MODULE V **[10 Periods]**

Carbon accounting Green Building Specification, Case Study on green buildings, Net Zero Energy Buildings, Sustainable Constructions in civil Engineering.

Text Books:

1. Abe Kruger and Carl,"Green Building, Principles and Practices in Residential Construction", In 2012, Seville Publication.
2. Ross Spiegel, Dru Meadows, "Green Building Materials: A Guide to Product Selection and Specification", 3rd Edition,October 2010

Reference Books:

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, 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**
CO1	-	3	2	1	2		3	2	1	1	1	1			
CO2	-	1	2	-		2	3	-	-	1	-	1			
CO3	1	1	1	-	-	-	2	-	-	-	-	1			
CO4	-	-	-	2	-	-	2	-	-	1	2	1			
CO5	-	-	1	-	-	1	1-		1	2	1	1			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80149	DISASTER MANAGEMENT & MITIGATION (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: 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 [9 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 [9 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, and Education & Training.

Text Books:

1. Jagbir Singh, "Disaster Management–Future Challenges and Opportunities", I.K.International Publishing House, 1st Edition, 2005.
2. Coppala P Damon, "Introduction to International Disaster Management", ABD Publishers,2007.

Reference Books:

1. R.B.Singh [Ed], "Environmental Geography", Heritage Publishers, New Delhi, 1st Edition,1990.
2. Kates,B.I & White. G.F, "The Environment as Hazards", oxford publishers, 5th Edition, New York, 1978.
3. R.B. Singh [Ed] - Disaster Management, Rawat Publication, New Delhi, 1st Edition, 2000.

E-Resources:

1. http://www.wcpt.org/disaster-management/what-is-disaster-management.
2. http://study.com/academy/lesson/what-are-cyclones-types-causes-effects.html.

Course Outcomes:

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

1. Analyze, evaluate and manage the environmental, social, cultural, economical, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
2. Assess the different public health aspects at local and global levels as a result of Disaster and can plan well to mitigate them.
3. Gain knowledge in various emerging approaches and measure in disaster management.
4. Understand the role of disaster management through Meteorological Observatory, Seismological Observatory, Volcanological Institution, etc.,
5. Acquire the information about Disaster Management, Ecological planning and sustainable development and Environmental policies, Disaster Reduction programs in India.

CO- PO, 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
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	-	-

Pre-Requisites: 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 nonlinear loads, effect of harmonics on power factor. Power factor motor controllers - Good lighting system design and practice, lighting control, lighting energy audit.

Energy Instruments: Watt meter, data loggers, thermocouples, pyrometers, lux meters, tongue testers, application of PLC's.

MODULE V: Economic Aspects and Analysis [10 Periods]

Economics Analysis - Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Energy efficient motors, Calculation of simple payback method, net present worth method - Power factor correction, lighting - Applications of life cycle costing analysis, return

on investment.

Text Books:

1. W.R. Murphy and G. Mckay, "Energy Management", Butter Worth Publications.
2. John. C. Andreas, "Energy Efficient Electric Motors", Marcel Dekker Inc Ltd, 2nd Edition, 1995.

Reference Books:

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, 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**
CO1	3	3	3	3								3			
CO2	3	3	3	3								3			
CO3	3	3	3	3								3			
CO4	3	3	3	3								3			
CO5	3	3	3	3								3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80240	ELECTRICAL SAFETY AND ENERGY MANAGEMENT (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: This course deals with the general safety requirements during the electrical installations. The course emphasis on the various objectives of energy management and auditing.

MODULE I: RULES & REGULATIONS [10 Periods]

Power sector organization and their roles – significance of IE rules & IE acts – general safety requirements: Span conductor configuration, spacing and clearing, sag, erection, hazards of electricity.

MODULE II: INSTALLATION & EARTHING OF EQUIPMENTS [10 Periods]

Classification of electrical installation - earthing of equipment bodies – electrical layout of switching devices and SC protection – safety in use of domestic appliances – safety documentation and work permit system – flash hazard calculations – tools and test equipments.

MODULE III: SAFETY MANAGEMENT AND FIRST AID [9 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 [9 Periods]

Objectives of energy management – energy efficient electrical systems – energy conservation and energy policy – renewable source of energy – energy auditing – types and tips for improvement in industry.

Text Books:

1. John Codick, "Electrical safety hand book", McGraw Hill Inc, New Delhi, 2000.
2. V. Manoilov, "Fundamentals of electrical safety", Mir Publishers, MOSCOW, 1975.

Reference Books:

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, 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**
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	-	-

Pre-Requisites: Nil

Course Objectives: This course deals with the need for electrical energy storage, different electrical storage technologies, types and features of energy storage systems and the applications of electrical energy storage.

MODULE I: ELECTRICAL ENERGY STORAGE TECHNOLOGIES [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 [9 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 [9 Periods]

Present status of applications, Utility use (conventional power generation, grid operation & service) , Consumer use (uninterruptable power supply for large consumers), New trends in applications ,Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles, Management and control hierarchy of storage systems, Internal configuration of battery storage systems, External

connection of EES systems , Aggregating EES systems and distributed generation (Virtual Power Plant), Battery SCADA– aggregation of many dispersed batteries.

Text Books:

1. James M. Eyer, Joseph J. Iannucci and Garth P. Corey, "Energy Storage Benefits and Market Analysis".
2. "The Electrical Energy Storage" by IEC Market Strategy Board.

Reference Books:

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, 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**
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	-	-

Pre-Requisites: Nil

Course Objectives: To give the students an overview of quality and TQM and explaining the salient contributions of Quality Gurus like Deming, Juran and Crosby and general barriers in implementing TQM and also get basic knowledge about ISO.

MODULE I: Introduction [10 Periods]

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, and Customer retention - Costs of quality.

MODULE II: TQM Principles [10 Periods]

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

MODULE III: Statistical Process Control (SPC) [10 Periods]

A: Statistical fundamentals – Measures of central Tendency and Dispersion - Population and Sample.

B: Control Charts for variables and attributes, Industrial Examples. Process capability. Concept of six sigma – New seven Management tools.

MODULE IV: TQM Tools [09 Periods]

Bench marking -Reason to bench mark, Bench marking process - FMEA - Stages, Types. Quality Function Deployment (QFD) - House of Quality - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures

MODULE V: Quality Systems [09 Periods]

Need for ISO 9000 and Other Quality Systems - ISO 9000-2008 Quality System - Elements, Implementation of Quality System Documentation, Quality Auditing - QS 9000 - ISO 14000 - ISO 18000, ISO 20000, ISO 22000 TS 16949, ISO 14000, AS9100– Concept, Requirements and benefits – case studies.

Text Books:

1.Dale H. Besterfiled, "Total Quality Management", 3rd, Pearson Education Asia, Indian Reprint, 2010.

2.Subburaj Ramasamy “Total Quality Management” Tata McGraw - Hill publishers, 2012.

Reference Books:

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

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, 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
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			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80356	INDUSTRIAL SAFETY (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: The purpose of this course is to teach the concept of Industrial Safety & provide useful practical knowledge for workplace safety which helps identification, evaluation and control of all the hazards and potential hazards to prevent or mitigate harm or damage to people, property or the environment.

MODULE I: Introduction [10 Periods]

Definition-Development before industrial Revolution-Milestones in industrial safety movement Development of accident prevention programs-3 E's of safety-Development of Safety Organizations-Safety and health movement- Managing emergency in industries.

MODULE II: Accident Prevention [10 Periods]

Safety and Productivity-Fallacies about Safety-Industrial psychology in accident prevention Basic philosophy of accident Prevention-Unsafe condition, Unsafe act, Injury, Fault of persons Cost of accidents- Safety education.

MODULE III: Safety Organization & Industrial Hygiene and Hazards [10 Periods]

A: Purpose of a safety Organization-Safety policy- Safety committee- types- Role of safety coordinator- Responsibilities, Interferences and Sufferings of safety Supervisor-Safety Publicity-Accident Reporting-Accident Investigation-Accident Statistics-Safety audits.

B: OSHA and industrial hygiene-work site analysis-recognizing and controlling hazards Occupational Diseases Prevention-Employee Welfare-Statutory welfare schemes, Non statutory Schemes-Health Hazards-Control strategies- Fire hazards and prevention, Electrical hazard prevention and safety.

MODULE IV: Industrial Process Safety [9 Periods]

Overview-Safety performance by industry Sector-Incident Pyramid-Process hazard and risk. Failure of defenses - Process Safety Management-Scope, Functions, Features and Characteristics. Role of organizational levels in Process Safety Management-Assessing organizations safety effectiveness.

MODULE V: Human Side of Safety [9 Periods]

Management of Change-Process and equipment Integrity-Human behavior aspects and modes-The Swiss cheese model of industrial Accidents-Active and Latent failures-examples - Safety Lessons Human Factors influencing the likelihood of Failure-Organizational culture, Demographic effects.

Text Books:

1. Krishnan N.V., “Safety in Industry", Jaico Publisher House, 2005.
2. Singh, U.K. and Dewan, J.M., "Safety, Security and risk management", APH Publishing Company, New Delhi, 2005.

Reference Books:

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80357	RENEWABLE ENERGY SOURCES (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: 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.

Text Books:

1.G.D. Rai, "Non-Conventional Energy Sources", Khanna publishers, 2011.

2.Tiwari and Ghosal, "Renewable Energy Resources", Narosa Publishing House, 2007.

Reference Books:

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, 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**
CO1	1					3	3					3			
CO2	1					3	3					3			
CO3	1					3	3					3			
CO4	1					3	3					3			
CO5	1					3	3					3			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80435	EMBEDDED SYSTEM DESIGN (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Microprocessors and Microcontrollers.

Course Objectives: This course introduces the difference between Embedded Systems and General purpose systems. This course familiarizes to compare different approaches in optimizing General purpose processors. This course provides the design tradeoffs made by different models of embedded systems.

MODULE I: Introduction to Embedded Systems [8 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 [9 Periods]

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

MODULE V: Task Communication [9 Periods]

Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

Text Books:

1. Shibu K. V, “Introduction to Embedded Systems”, McGraw Hill, 2013.
2. Raj Kamal, “Embedded Systems”, TMH.

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

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	-	-

Pre-Requisites: 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 [9 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 [9 Periods]

Satellite Communication Systems-Keplers Law,LEO and GEO Orbits, footprint, Link model Optical Communication Systems-Elements of Optical Fiber Transmission link, Types, Losses ,Sources and Detectors.

Text Books:

1. Wayne Tomasi, ―Advanced Electronic Communication Systems‖, 6th Edition, PearsonEducation, 2007.
2. Simon Haykin, ―Communication Systems‖, 4thEdition, John Wiley &Sons, 2001.

Reference Books:

1. H.Taub, DL Schilling, G Saha,―Principles of Communication‖, 3rdEdition,2007.
2. Blake, ―Electronic Communication Systems‖, Thomson Delmar publications,2002.

E-Resources

1. https://courses.engr.illinois.edu/ece458/ comms2.pdf
2. http://www.ece.lehigh.edu/~jingli/teach/ F2005CT/ notes/ Analog Communication. 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, 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**
CO1	3	3	3	3	1	2		2	1	1	1	3	3	3	2
CO2	3	3	3	3	2	2		2	1	1	1	3	3	3	2
CO3	3	2	2	2	2	1		1	1	1		2	2	3	1
CO4	3	3	3	3	3	2			1		1	2	2	3	2
CO5	3	2	2	2	2	2	2	2	1	1	1	2	2	3	3

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	-	-

Pre-Requisites: Basic Electrical and Electronics Engineering

Course Objectives: The course aims to enable the student to visualize IC Fabrication steps and various IC technologies and to understand electrical properties of MOS, CMOS and Bi CMOS circuits. The focus of the course is also on training the student to draw integrated circuit layouts following design rules. The course also helps the student to understand basic architectures of Data path subsystems, Application Specific Integrated Circuits, of CPLDs and FPGAs.

MODULE I: IC Technologies & IC Fabrication [10 Periods]

IC Technologies – Review of Enhancement and Depletion MOS transistors, NMOS, PMOS & CMOS fabrications, Comparison of NMOS, CMOS & BiCMOS technologies.

IC Fabrication: Steps in Fabrication-Oxidation, Lithography, Diffusion, Ion implantation, Encapsulation and Metallization.

MODULE II: Basic Electrical Parameters [10 Periods]

I_{ds}-V_{ds} relationships, MOS transistor threshold Voltage (V_t), trans conductance (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.

Text Books:

1. Kamran Eshraghian, Douglas A. Pucknell, "Essentials of VLSI circuits and systems", PHI, 1st Edition, 2005.
2. K. Lal Kishore, VSV. Prabhakar, "VLSI Design", I. K international Publishing House Private Ltd, 2009.

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, 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**
CO1	1	1	2	1	2		1					2	2	1	1
CO2	2	2	2	2	1								2	2	2
CO3	2	1	2	2	1						2	2	2	3	2
CO4	2	1	2	2	2		1				2	2	2	3	2
CO5	2	1	2	2	3		2				3	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	-	-

Pre-Requisites: 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: **[09 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.

HashBased Indexing: Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

Text Books:

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+retri eval?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, 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**
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.

Text Books:

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, 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
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	-	-

Pre-Requisites: Computer Networks

Course Objectives: This course provides the students to gain knowledge in the cloud computing environment, security architecture and development of cloud services. Students will also examine the collaboration of real time cloud services and analyze the case studies from various cloud development tools.

MODULE I: Introduction to Cloud Computing [8 Periods]

Cloud Computing in a Nutshell, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

MODULE II: Virtualization [12 Periods]

Virtual Machines and Virtualization of Clusters and Data Centers: Levels of Virtualization, Virtualization Structures//Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation.

Case studies: Xen Virtual machine monitors- Xen API. VMware - VMware products-VMware Features. Microsoft Virtual Server - Features of Microsoft Virtual Server.

MODULE III: Cloud Computing Architecture over Virtualized Data Centers [8 Periods]

A: Data-Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds,

B: Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

MODULE IV: Cloud Security [8 Periods]

Cloud Security and Trust Management, Data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, Crypt Db: Onion Encryption layers-DET, RND, OPE, JOIN, SEARCH, HOM, and Homomorphic Encryption, FPE. Trust, Reputation and Security Management.

MODULE V: Cloud Programming and Standards [12 Periods]

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, parallel and distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

Common Standards in Cloud Computing: The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers, Standards for Messaging. Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

Text Books:

1. John W. Rittinghouse, "Cloud Computing: Implementation, Management, and Security ". James F. Ransome, CRC Press 2009.
2. Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, "Distributed and Cloud Computing From Parallel Processing to the Internet of Things", Elsevier, 2012.
3. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski," Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing ©2011

Reference Books:

1. Raluca Ada Popa, Catherine M.S. Redfield, Nickolai Zeldovich, and Hari Balakrishnan, "CryptDB: Protecting Confidentiality with encrypted Query Processing"23rd ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
2. Craig Gentry,"A Fully Homomorhic Encryption Scheme", September 2009.
3. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

E-Resources

1 http://www.motc.gov.qa/sites/default/files/cloud_computing_ebook.pdf
2 https://www.thesisscientist.com/docs/Study%20Notes/8ad50655-64f5-46d4-bc89-0c02feaf132f
3 http://ndl.iitkgp.ac.in/document/zyMnqgZQXCJME6wgSqrU87VCGcelOw5mZ-5ybmrhKBj79VQPP0_ZQHLqcOopPDoaFWhZybCrPg_joTbBU8ZpGA
4 http://www.springer.com/computer/communication+networks/journal/13677
5 http://nptel.ac.in/courses/106106129/28

Course Outcomes:

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

1. Understand the cloud enabling technologies and the Cloud service models.
2. Choose the levels of virtualization and tools for resource provisioning.
3. Compare the cloud platform architectures of virtualized data centers and Inter-cloud Resource Management.
4. Analyze the principles of Security and Trust management to protect confidentiality of data in the Cloud.
5. Propose the standards of Parallel and Distributed Programming Paradigms for improving user Access to Cloud Computing.

CO- PO, 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
CO1	1				2										
CO2		1		2	2							1			
CO3		1			3							2			
CO4	1											2			
CO5	1			2								1			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80605	ANDROID APPLICATION DEVELOPMENT (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: This course aims the students to learn the essentials of mobile apps development, aids in developing simple android applications, identify the essentials of android design, file settings, study about user interface design and develop android APIs.

MODULE I: Mobile and Information Architecture [10 Periods]

Introduction to Mobile: A brief history of Mobile, The Mobile Eco system, Why Mobile? Types of Mobile Applications.

Mobile Information Architecture: Mobile Design, Mobile 2.0, Mobile Web development, Small Computing Device Requirements.

MODULE II [10 Periods]

Introduction to Android: History of Mobile Software Development, The Open Handset Alliance-Android platform differences.

Android Installation: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building a Sample Android application.

MODULE III [10 Periods]

A: Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents.

B: Android File Settings: Android Manifest File and its common settings, Using Intent Filter, Permissions, Managing Application resources in a hierarchy, working with different types of resources.

MODULE IV [09 Periods]

Android User Interface Design: Essentials User Interface Screen elements, Designing User Interfaces with Layouts.

Animation Techniques: Drawing and Working with Animation- Drawing on the screen –Working with Text-Working with Bitmaps-Working with shapes-Working with animation.

MODULE V [09 Periods]

Android APIs-I: Using Common Android APIs Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers.

Android APIs-II: Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

Text Books:

1. James Keogh, "J2ME: The Complete Reference", Tata McGrawHill.
2. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011).

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:

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

1. Classify different types of Platforms.
2. Appreciate the Mobility landscape
3. Familiarize with Mobile apps development aspects.
4. Design and develop mobile apps, using Android as development platform, with key focus on user experience design, native data handling and background tasks and notifications.
5. Perform testing, signing, packaging and distribution of mobile apps

CO- PO, 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**
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	-	-

Pre-Requisites: 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

Reference Books:

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%20Reference,%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, 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
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	-	-

Pre-Requisites: Nil

Course Objectives:

This course enable the students to understand the basic fundamentals of Artificial Intelligence, determine various problem solving strategies, understand the logic concepts, different approaches to represent the knowledge, develop the expert systems in various phases and its applications, apply the fuzzy logic in various problem solving techniques.

MODULE I: Introduction [10 Periods]

Introduction to Artificial Intelligence: Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

MODULE II: Problem Solving [09 Periods]

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening a*, constraint satisfaction.

Problem reduction and game playing: Introduction, problem reduction, game playing, alphabeta 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]

Probability theory: Introduction, 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.

Text Books:

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

Reference Books:

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 field.
2. Identify various problem solving strategies.
3. Construct the solution for the problem using various logic and knowledge representation techniques.
4. Interpret the knowledge in various domains using expert systems.
5. Discover the solutions by using the probability theory and fuzzy logic.

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

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	-	-

Pre-Requisites: 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.

Text Books:

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

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, 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**
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	L	T	P
Credits: 3	(Open Elective)	3	-	-

Pre-Requisites: Engineering Mechanics and strength of Materials

Course Objectives: To introduce the basic principles in material handling and its equipment. To study the conveyor system and its advancement

MODULE I: Bulk Handling Systems [10 Periods]

Basic principles in material handling exclusive to mining industry and its benefits. Classification of material handling equipments. Current state of art of bulk handling materials in mining in the world and Indian scenario; Selection of suitable types of systems for application. Stacking, blending, reclaiming and wagon loading, machinery and systems used at the stack yards; stock piles, silos, bunkers – their design, reclamation from them, various types of weigh bridges. Segregation - size wise and grade wise, Railway sidings.

MODULE II: Short Conveyors and Haulage Systems [10 Periods]

Roller conveyor, overhead conveyor, screw conveyor, auger conveyor, apron feeder, bucket elevators, scraper haulage, conveyors in steep gradient, Armoured face conveyor, Off-highway Trucks, haul roads, In-pit crushers and modular conveyors, electric trolley assisted haulage, shuttle cars, skip hoist, winders, LHD's, pneumatic conveying, hydraulic transport.

MODULE III: Belt Conveyor System [10 Periods]

A:Design, capacity, calculations with respect to the size, speed, troughing, power requirement, tension requirement, belt selection, factor of safety.

B: Developments in the design, of various components of belt conveyor systems such as; structures, rollers, gear boxes and motors, drums and pulleys, belting, ancillary components and safety gadgets.

MODULE IV: New Types of Belt Conveyor Systems [09 Periods]

Curved conveyors, cable belts, pipe conveyors, rock belts – mine-run-rock conveyor, steel belt conveyors, steel slot conveyor, chain belt conveyors, etc., and other new developments, stackers and reclaimers, High Angle Conveyors (HAC); New inventions in HAC , Mobile or fixed installations; Woven wire belts, En Masse conveyor, Vibrating conveyor, gravity bucket conveyor.

MODULE V: Material Handling in Mines, Plants and Workshops [09 Periods]

Mobile cranes, derrick cranes, pillar cranes, tower cranes, radial cranes, bridge cranes, fork lifters, overhead gantry material handling in workshops. Mineral handling in dimensional stone quarries, Mineral handling plants(coal, etc.,) Locomotives, rail tracks, rail cars, railways wagons; Aerial ropeways, gravity

ropeways; Containers and shipping; Rope haulage - different types.

Text Books:

1. Allegri (Sr.), T.H., Material Handling – Principles and Practices, CBS Publishers and Distributors, Delhi, 1987.
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:

1. At the end of the course, students will be able to
2. Understand Basic principles in material handling exclusive to mining industry and its benefits
3. Understand Short Conveyors and Haulage Systems
4. Understand Belt Conveyor System
5. Understand New Types of Belt Conveyor Systems

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech		
Code: 82542	TUNNELING ENGINEERING (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: 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

B: Types of cuts- fan, wedge and others; blast design, tunnel blast performance - powder factor, parameters influencing, models for prediction; mucking and transportation equipment selection.

MODULE IV: Mechanization [09 Periods]

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

MODULE V: Tunnel Services [09 Periods]

Supports in Tunnels: Principal types of supports and applicability. Ground Treatment in Tunneling: Adverse ground conditions and its effect on tunneling; Excavation of large and deep tunnels, caverns. Tunnel Services: Ventilation, drainage and pumping; Tunneling hazards.

Text Books:

1. Hudson, J.A., Rock Engineering Systems – Theory and practice, Ellis Horwood, England.
2. Clark, G.B., (1987), Principles of Rock Fragmentation, John Wiley and Sons, New York.

Reference Books:

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, 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
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	-	-

Pre-Requisites: Nil

Course Objectives: To build business English vocabulary and grammar through lessons on the latest topics in the business world and to upgrade the learners communication and presentation skills and make the students competent in communication at an advanced level. In addition to the earlier mentioned, this course gives a room to groom the learners' personality and make the students self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills by giving hands-on experience about business presentations and attending team meetings.

MODULE I: Communication Skills [10 Periods]

Types of Communication-Oral, aural and written, Reading-Word Power-Vocabulary-technical vocabulary, Rate of speech- pitch, tone-clarity of voice.

MODULE II: Conversation Skills [10 Periods]

Informal and Formal conversation, Verbal and Non - verbal communication. Barriers to effective communication - Kinesics

MODULE III: Reading Skills [10 Periods]

A: Types of reading–reading for facts, guessing meaning from context

B: strategies of reading- scanning, skimming, inferring meaning, critical reading.

MODULE IV: Creative Writing [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. http://www.mansfield.edu/fye/upload/Academic-Reading-Skills.pdf (Reading Skills)
6. https://www.youtube.com/watch?v=cQruENyLNYI&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH (Communication 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, 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**
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	-	-

Pre-Requisites: Nil

Course Objectives: To determine how well the students can develop a compelling argument in writing for an academic audience. Further helps them to involve in critical thinking and persuasive writing exercises. This course also intends to develop effective writing skills to analyze and evaluate the data and ideas for better comprehension. On the other hand this course encourages students to learn strategies for becoming accurate readers and critical analysts.

MODULE I: Interpretation and Types of Reading [10 Periods]

- Interpretation in different settings
- Understanding the main ideas in the text
- Reading for inference
- Reading for theme
- Reading for interpretation

MODULEII: 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:

1. http://www.brad.ac.uk/staff/pkkornakov/META.htm(Introduction to Interpretation Skills)
2. http://literacyonline.tki.org.nz/Literacy-Online/Planning-for-my-students-needs/Effective-Literacy-Practice-Years-1-4/Approaches-to-teaching-reading (Approaches to Reading)
3. https://www.csuohio.edu/writing-center/critical-reading-what-critical-reading-and-why-do-i-need-do-it (Critical Reading)
4. https://www.ets.org/gre/revised_general/about/content/analytical_writing (Analytical Writing)
5. http://www.writerstreasure.com/creative-writing-101/ (Creative Writing)
6. http://scholarworks.rit.edu/jcws/aimsandscope.html (Creative Writing)

Course Outcomes:

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, economic, legal and technological issues.
5. Draw their career vision and mission independently.

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
CO1			1	2				2		1	2				
CO2										2	1				
CO3			1			2	1			1					
CO4						1		2				1			
CO5				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	-	-

Pre-Requisites: Nil

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 [10 periods]

- 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 [10 periods]

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/vol/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, 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
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	L	T	P
Credits: 3	(Open Elective)	3	-	-

Pre-Requisites: 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 [9 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 [9 Periods]

Classification of second order equations – Finite difference approximations to derivatives - standard 5 point formula – diagonal 5 point formula – solution of Laplace equation.Solution of poisson's equation. Solution of one dimensional heat, wave equations (by Crank-Nicolson explicit/implicit formula only).

Text Books:

1. Atkinson & Han, Elementary Numerical Analysis, 3rd Edition, Wiley Publications.
2. Francis Scheid, Numerical Analysis, Schaum's Outlines, 2nd Edition, Tata Mc. Graw Hill Publications.

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/111107063 (Numerical solution of Ordinary Differential Equations)
7. 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, 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
CO1	3	3	2	3	2				3			2			
CO2	3	3	2	3	3				3			2			
CO3	3	3	2	3	2				2			2			
CO4	3	3	2	2	3				3			2			
CO5	3	3	2	3	2				3			2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80B12	APPLIED STATISTICS	L	T	P
Credits: 3	(Open Elective)	3	-	-

Pre-Requisites: 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 [10Periods]

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 [9 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 [9 Periods]

Structure of a queuing system, Operating Characteristics of queuing system, Transient and Steady states, Terminology of Queuing systems, Arrival and service processes, Pure Birth-Death process Deterministic queuing models, (M/M/1):(∞:FIFO) Model, (M/M/1):(N:FIFO) Model .

Text Books:

1. Monte Gomery, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley Publications.
2. J K Sharma, "Operations research Theory and applications" Macmillan publishers india limited,4th edition.
3. Paul A Maeyer Introductory Probability and Statistical Applications, John Wiley 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 (Statistical Quality control)
3. http://irh.inf.unideb.hu/~jsztrik/education/16/SOR_Main_Angol.pdf (Basic Queueing Theory)
4. https://www.math.kth.se/matstat/gru/sf2943/ts.pdf (Time Series Analysis)
5. http://www.ijpcsonline.com/files/34-781.pdf (Design of Experiments)
6. http://nptel.ac.in/courses/110106064/5 (Introduction to Data Analysis)
7. http://nptel.ac.in/courses/111104075/ (ANOVA and Design of Experiments)

Course Outcomes:

1. The students will be able to perform Analysis of variance, ANCOVA and design of experiments in manufacturing firms.
2. Advanced design of experiments and their applications.
3. The students will learn the concept of quality control, Six Sigma and its importance to real life problems.
4. The student will be able to understand the concept of Multiple regression and Application of Time-series,
5. The students would be able to 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, 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**
CO1	3	2	2	3	1				3			1			
CO2	3	2	2	3	3							1			
CO3	3	2	2	3	2				2			2			
CO4	3	2	2	2	1				3			2			
CO5	3	2	2	3	2				3			2			

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80B13	OPTIMIZATION TECHNIQUES	L	T	P
Credits: 3	(Open Elective)	3	-	-

Pre-Requisites: Basic concepts of Linear Programming

Course Objectives: This course deals with the extremely important topics under the broad umbrella of optimization. This is synonymous with efficiency which is the underlying prime rationale for all scientific and technological advances and progress.

MODULE - I: Introduction and Basic Concepts of Optimization [10 Periods]

Historical Development; Engineering applications of Optimization; Art of Modeling - Objective function; Constraints and Constraint surface; Formulation of design problems as mathematical programming problems.

MODULE - II: Optimization using Calculus [9 Periods]

Classification of optimization problems Optimization techniques – classical and advanced techniques. Stationary points; Functions of single and two variables; Global Optimum - Convexity and concavity of functions of one and two variables - Optimization of function of one variable and multiple variables; Gradient vectors;

MODULE - III: Linear Programming Applications [10 Periods]

A: Optimization of function of multiple variables subject to equality constraints; Lagrangian function Optimization of function of multiple variables subject to equality constraints.

B: Hessian matrix formulation; Eigen values Kuhn-Tucker Conditions; Post optimality analysis - Other algorithms for solving LP problems – Karmarkar's projective scaling method

MODULE – IV: Dynamic Programming [10 Periods]

Sequential optimization; Representation of multistage decision process; Types of multistage decision problems; Concept of sub optimization and the principle of optimality - Recursive equations – Forward and backward recursions; Computational procedure in dynamic programming (DP)

MODULE – V: Applications of Dynamic Programming [9 Periods]

Problem formulation and application in Design of continuous beam and Optimal geometric layout of a truss - Water allocation as a sequential process - Capacity expansion and Reservoir operation

Text Books:

1. S.S. Rao,"Engineering Optimization: Theory and Practice", New Age International (P) Ltd., New Delhi, 2000.
2. G. Hadley,"Linear programming", Narosa Publishing House, New Delhi, 1990.

Reference Books:

1. H.A. Taha,"Operations Research:An Introduction", 5th Edition, Macmillan, New York, 1992.
2. K. Deb,"Optimization for Engineering DesignAlgorithms and Examples",Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.
3. K.Srinivasa Raju and D. Nagesh Kumar, "Multicriterion Analysis in Engineering and Management",PHI Learning Pvt. Ltd., New Delhi, India, ISBN 978-81-203-3976-7, pp.288,

E-Resources

1. http://www.mhhe.com/engcs/industrial/hillier/etext/PDF/chap03.pdf (LPP)
2. http://ocw.nctu.edu.tw/upload/classbfs121001503719748.pdf
3. http://shodhganga.inflibnet.ac.in/bitstream/10603/19544/12/7_chapter%201.pdf
4. http://www.ime.unicamp.br/~andreani/MS515/capitulo12.pdf

Course Outcomes:

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

1. Understand the historical development of OR and formulate the design Problems.
2. Find the optimum values using calculus.
3. Apply the linear programming to solve the engineering problems
4. Know the various concepts of Dynamic Programming.
5. Apply the Dynamic Programming techniques to solve the engineering problems.

CO- PO, 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**
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	L	T	P
Credits: 3	(Open Elective)	3	-	-

Pre-Requisites: Engineering Physics & Applied Physics

Course Objectives: The objective of this course is to make the students familiar with the recent advanced concepts in physics

MODULE I: Special Theory of Relativity: [9 Periods]

Introduction, Concept of theory of relativity, Frames of reference-Inertial, non-inertial; Galilean transformation equations, Michelson-Morley experiment, Einstein theory of relativity, Lorentz transformation of space and time, Length contraction, Time dilation, Variation of mass with velocity, Relativistic relation between energy and momentum.

MODULE II: Holography [9 Periods]

Introduction, Basic principle, Construction and Reconstruction of Hologram, Properties of Hologram, Types of Holograms, Applications- Holographic Interferometry, Acoustic Holography, Holographic Microscopy.

MODULE III: Thin films Synthesis and Characterization

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.

Text Books:

1. R K Gaur and SL Gupta, “Engineering Physics” Dhanpat Rai Publications, 8th revised Edition, 2006.

2. B K Pandey and S Chaturvedi, “Engineering Physics” Cengage Learning India, Revised Edition, 2014.

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80B15	NANO MATERIALS (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Engineering Physics

Course Objectives: 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

Text 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, 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**
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	L	T	P
Credits: 3	(Open Elective)	3	-	-

Pre-Requisites: Engineering Physics

Course Objectives: The objective is to provide a basic level of understanding on Non-destructive testing and Vacuum technology.

MODULE I: Introduction to Nondestructive testing [6 periods]

Introduction, Objectives of Nondestructive testing, Types of defects – Cracking, Spalling, Staining, Construction and Design defects, Honey combing, Dusting, Blistering, Rain damage.

MODULE II: Methods of Nondestructive 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

Text Books:

1. B K Pandey, S Chaturvedi, "Engineering Physics", Cengage learning, 1st Edition, 2014

2. John. F. O'Hanlon, "A User's guide to Vacuum technology", Wiley, 3rd Edition, 2003

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/https://www.journals.elsevier.com/vacuum
5. http://nptel.ac.in/courses/114106035/35
6. 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, 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
CO1	3	2													
CO2	3	2													
CO3	3	2			2										
CO4	2	2			2										
CO5	2	2			2										

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: 80B17	CHEMISTRY OF ENGINEERING MATERIALS (Open Elective)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: The objective is to make the students know about the concept of phase rule and alloys, phase diagrams of different systems. To give knowledge to the students regarding liquid crystals, abrasives, glass, ceramics, refractories, colloids and adhesives. To make the students for understand the basic concepts of chemistry to develop futuristic materials for high-tech. applications in the area of engineering.

MODULE I: Phase Rule and alloys [10 Periods]

Phase Rule: Definition of terms: Phase, component, degree of freedom, phase rule equation. Phase diagrams-one component system-water system. Two component system Lead-Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization. Introduction to alloys-fabrication of alloys-ferrous alloys-nonferrous alloys-industrial applications.

MODULE II: Composites, Abrasives and Adhesives [10 Periods]

Composites: Basics of composites, composition and characteristics-types of composites –particle and fiber reinforced composites and their applications. Abrasives- natural and artificial abrasives-grinding wheels-abrasive paper and cloth. Adhesives- classification -action of adhesives- factors influencing adhesive action development of adhesive strength.

MODULE III: Cement and Concrete [10 Periods]

A: Introduction-Classification of cement-natural-chemical composition of cement-port land cement-chemical reactions involved in setting and hardening of cement-additives for cement-mortars

B: concretes-pre stressed concrete-post tensioning-curing-overall scenario of cement Industry-Reinforced concrete, constructions-testing and decaying of cement-prevention of cement decay.

MODULE IV: Glass, Ceramics and Refractories [9 Periods]

Structure of Glass-Properties-Manufacturing of Glass-Types of glasses-uses Ceramics-clays-methods for fabrication of ceramic ware plasticity of clays. Ceramic products-glazes. Porcelain and vitreous enamels. Requisites of a good refractory-classification, properties and applications of refractories.

MODULE V: Colloids and surfactants [9 Periods]

Introduction to solution-types of colloids-characteristics of lyophilic and lyophobic solutions-preparation of colloids (Dispersion methods & Aggregation methods)-purification of colloids (Dialysis, Electrodialysis and Ultrafiltration). Characteristics of colloidal solutions-coagulation of colloids-origin of charge on colloids-protective

colloids-emulsions-gels-applications of colloids. Introduction to surfactants-classification of surfactants-CMC (critical micelle concentration)-HLB scale-detergents-cleaning action.

Text Books:

1. P.C.Jain and Monica Jain, "A text Book of Engineering Chemistry", DhanpatRai Publications, New Delhi, 12th Edition 2006.
2. B.Rama Devi, Ch.VenkataRamana Reddy and PrasanthaRath, "Text Book of Engineering chemistry" , Cengage Learning India Pvt.Ltd,2016.
3. J. Goodwin, "Colloids and Interfaces with Surfactants and Polymers" 2nd Edition 2009.

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, 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
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	-	-

Pre-Requisite: Nil

Course Objectives: The objective is to make the learners know about the scope of nanoscale materials and their versatile properties. To give knowledge of various instrumental techniques to the analysis the nanomaterials. To make aware of the learners of different applications of nanomaterials.

MODULE-I: Nanochemistry-I [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.

Text Books:

1. Mark A. Ratner, D. Ratner. "Nanotechnology a gentle introduction to the next big idea",Pearson Education Inc., Asia, 2003.

2. Pradeep.T. “Nano: The essentials-understanding nanoscience and nanotechnology”. Tata Mc.Graw Hill, New Delhi, 2007.

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 Nano solar cells.
5. Students will learn usage of nanomaterials in the purification of water.

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
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	-	-

Pre-Requisite: Nil

Course Objectives: The subject provides an introduction to polymer science along with the synthesis of macromolecules by step-growth and chain-growth polymerization. Compounding of polymers and different fabrications methods are discussed. Molecular weight determination of polymers is shown using gel permeation chromatography. An overview of biodegradable and conducting polymers is also given.

MODULE I: Introduction to Polymer Chemistry [10 Periods]

Definitions-Origin, Monomers and its requirements - Broad classification of polymers- types based on structure (homo & copolymers), processing (thermo plastics & thermosetting plastics) and applications. Molecular force and chemical bonding in polymers - tacticity. Determination of molecular weight (MW)-methods for number average- weight average- PDI (poly dispersity index)-effect of polymerization on PDI. Distribution and processing of polymers using Tg& Tm.

MODULE II: Polymerization mechanism [10 Periods]

Chain growth Polymerization – Addition Polymerization – Reaction Mechanism - Free Radical Reaction – Ionic Reaction – Coordination Polymerization – Ring – Opening Polymerization –Condensation (step) Polymerization – Degree of Polymerization–differences between addition and step growth polymerization. Polymerization techniques -bulk, solution, suspension, emulsion-advantages and disadvantages.

MODULE III: Compounding of Polymers & fabrication methods [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.

Text Books:

1. P.C.Jain and Monica Jain, "A text Book of Engineering Chemistry", DhanpatRai Publications, New Delhi, 12th Edition 2006.
2. S.S. Dara and S.S. Umare, "A Text Book of Engineering Chemistry", S Chand Publications, New Delhi, 12th Edition 2010.
3. P. C. Hiemenz and T. P. Lodge. "Polymer Chemistry", 2nd edition, CRC Press, 2007.
4. F.W. Billmeyer, "Text Book of Polymer Science", John Wiley & Sons, 4th Edition, 1996.
5. V.R. Gowariker, "Polymer Science", New Age International Publisher, 2nd Edition, 2015.

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. 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, 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
CO1	1	2		2	1										
CO2	2		1		2										
CO3		2	1	2	1										
CO4	2	1	2												
CO5	2	1		1	2		1								