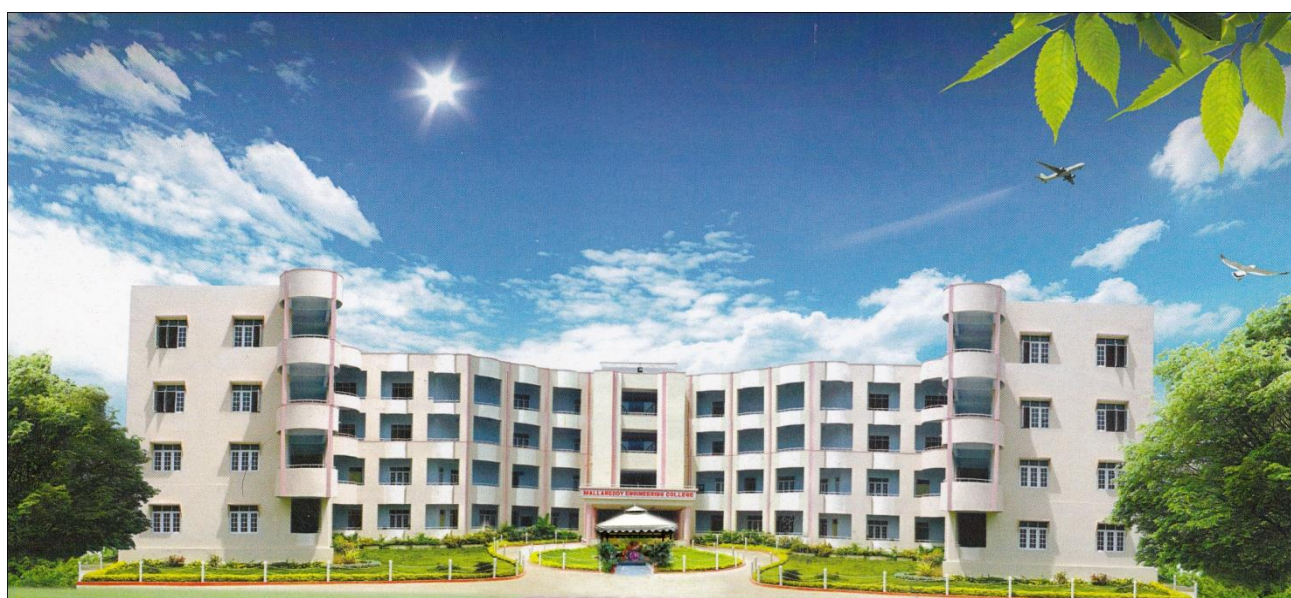# ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2020-21 onwards

Department of Electrical and Electronics Engineering(EEE)

For

B.Tech. Four Year Degree Programme

(MR20 Regulations)

Department of Electrical and Electronics Engineering

MALLAREDDY 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 (PostViaKompally), Secunderabad-500 100
Website: www.mrec.ac.in, E-mail: principal@mrec.ac.in

MALLA REDDY ENGINEERING COLLEGE
(AUTONOMOUS)
MR20 – ACADEMICREGULATIONS (CBCS)
forB.Tech. (REGULAR) DEGREE PROGRAMME

Applicable for the students of B.Tech. (Regular) programmeadmitted from the Academic Year *2020-21* 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.

INSTITUTION VISION

To be a premier center of professional education and research, offering quality programs in a socio-economic and ethical ambience.

INSTITUTION MISSION

- To impart knowledge of advanced technologies using state-of-the-art infrastructural facilities.
- To inculcate innovation and best practices in education, training and research.
- To meet changing socio-economic needs in an ethical ambience.

DEPARTMENT VISION

To become a reputed centre for imparting quality education and research in the field of Electrical and Electronics Engineering with human values, ethics and social responsibility.

DEPARTMENT MISSION

- To impart quality education and research to undergraduate and postgraduate students in Electrical and Electronics Engineering.
- To produce professionally competent and ethically committed engineers to meet changing socio-economic needs.
- To impart knowledge of advanced technologies for continual improvement in teaching, learning and research.

PROGRAMME OUTCOMES (POs)

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complexengineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation ofdata, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques,resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextualknowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of theprofessional engineering solutions in societal and environmental contexts,and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics andresponsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineeringactivities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge andunderstanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1	Graduates will utilize analytical skills, problem solving skills and design skills which are necessary for a successful career in the diverse fields of Electrical and Electronics Engineering.
PEO 2	Graduates will be receptive to new technologies and attain professional competence through lifelong learning such as post graduate programmes, research, publications and other professional activities.
PEO 3	Graduates will possess excellent communication, team work skills, leadership qualities, along with good professional and ethical attitude.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1	Apply fundamental knowledge to identify, formulate, design and investigate various problems of electrical and electronic circuits, power electronics, power systems and renewable energy systems for specific requirements.
PSO2	Demonstrate proficiency in use of modern software tools & hardware to engage in life-long learning and to successfully adapt in multi-disciplinary environments.
PSO3	Solve ethically and professionally various Electrical Engineering problems in societal and environmental context and communicate effectively.

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 Branchesof Engineering.

S. No.	Branch Code	Branch	Intake
1	01	Civil Engineering (CE)	180
2	02	Electrical and Electronics Engineering (EEE)	120
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	07	Computer Science and Engineering (Cyber Security)	60
8	08	Computer Science and Engineering (Data Science)	60
9	09	Computer Science and Engineering (AI &ML)	60
10	12	Computer Science and Engineering (IOT)	60
11	25	Mining Engineering (Min.E)	60

2. Eligibility for Admission

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

2.2 The medium of instructions for the entire UGP in E&T willbe 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 firstsemester. 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 entireB.Tech. programme.Each student shall secure 160credits (with CGPA ≥ 5) required for the completion of theUnder Graduate Programme and award of the B.Tech. degree.

3.2 UGC/ AICTE specified Definitions/ Descriptions are adoptedappropriately for various terms and abbreviations used inthese Academic Regulations/ Norms, which are as listedbelow.

3.2.1 Semester Scheme:

Each under graduate programme is of 4 academic years (8 Semesters), withthe academic year divided into two semesters of 22 weeks (≥90 Instructionaldays)each, each semester having **'Continuous Internal Evaluation (CIE)'** and **'Semester End Examination (SEE)'**under Choice Based Credit System (CBCS) and Credit BasedSemester System (CBSS) as indicated by UGC andCurriculum/ Course Structure as suggested by AICTE arefollowed.

3.2.2 Credit Courses:

All Subjects/ Courses are to be registered by a studentin a semester to earn credits. Credits shall be assignedto each Subject/ Course in a L: T: P: C (Lecture Periods:Tutorial Periods: Practical Periods: Credits) Structure, basedon 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 Knowledgeand other student activities like Internship, Sports/Yoga and NSS are identified as Mandatory/Audit courses. These courses will not carry anycredits.

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 Institutehas 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)   ProfessionalCore Courses(PCC)
    (ii)   ProfessionalElectiveCourses(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 B.Tech. Programmes, is as listed below (along with AICTE specified range of total credits).

Sl. No.	Classification		Course Work – Subject Area	Distribution of credits	AICTESuggested Breakupof Credits (Total 160)
	AICTE	**UGC**			
1	HSMC		Humanities and Social sciences including Management courses.	11	12
2	BSC	Foundation Courses	Basic Sciences (BSC) including Mathematics, Physics,Chemistryand Biology.	21	25

3	ESC		Engineering Science Courses (ESC) including Engineering Workshop, Engineering Graphics, Basics of Electrical and Electronics / Mechanical / Computer Engineering.	39	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.	47	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.	09	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 B.Tech. Programme, its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.

4.2 The students have to submit registration form (Online/Offline) to the Academic section of the college within 15 days from the commencement of class work for the first semester. The registration forms for the *subsequent semester*s hall be completed before the commencement of SEEs (Semester End Examinations) of the *current semester*.

4.3 A Student has to submit the registration form through the Head of Department (a copy of it being retained with Head of Department).

4.4 A Student may be permitted to register for the Subjects/ Course of CHOICE with a typical deviation of ±3 credits of the semester, based on his PROGRESS and SGPA/CGPA and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses in the department course structure and syllabus contents. It needs specific approval and signature of the Faculty Advisor/Counselor and Head of the Department, 'within a period of 15 days' from the beginning of the current semester.

4.5 If the student submits ambiguous choices or multiple options or erroneous entries during ON-LINE registration for the Subject(s) / Course(s) under a given specified Course/ Group/ Category as listed in the course structure, only the first mentioned Subject/ Course in that category will be taken into consideration.

4.6 Subject/ Course options exercised through registration forms will be treated as 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 B.TechProgramme. 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 B.TechProgramme. 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, 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 correspondingtheory 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 fromthe student for registration in that semester and thesecond focus, if needed, will be on CGPA of the student).

5.4 If more entries for registration of a subject come intopicture, then the concerned Head of the Department shall takenecessary actions, whether to offer such a Subject/ Coursefor 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 / sheacquire a minimum of 75% of attendance inaggregate 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 begranted by the College Academic Committee (CAC) on genuine and **valid grounds** based on the student's representationwith supporting evidence.

6.3 A stipulated fee prescribed by the CAC,shall be payable towards condoning of shortageof attendance.

6.4 Shortage of attendance below 65% in aggregate shall in NOcase be condoned.

6.5 Students, whose shortage of attendance is not condoned in anysemester, are not eligible to register their Semester End Examinations, they get detained and their registration for thatsemester shall stand cancelled. They will not be promoted to thenext semester. They may seek re-registration for all thoseSubjects registered in that Semester in which he gotdetained, by seeking re-admission for that semester asand when offered; in case if there are any ProfessionalElectives and/ or Open Electives, the same may also be **re-registered**if offered, however, if those electives are notoffered in later semesters, then alternate electives may bechosen from the **same** set of elective subjects offeredunder 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, inaddition to the attendance requirements mentioned in itemNo.**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 Examinationand with a minimum of 40% of thetotal 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 atleast 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 AcademicRequirements and earned the credits allotted to Mini Project/Technical Seminar/ Project, if he / shesecure not less than40% of the total marks to be awarded for each. The student would be treated as failed, if he (i) does notsubmit a report on his / her Mini Project / Technical Seminar / Project ordoes not make a presentation of the same before theEvaluation 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 thesame in the next subsequent semester, as and when it isscheduled.

7.3 Promotion Rules: Everystudent has to fulfil the Attendance and Academic requirements by securing the required creditsagainst 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 firstsemester. (I Semester)
2.	First year second semester (II Semester) to second year first semester (III Semester)	• Regular course of study of first year secondsemester (II Semester). • Must have secured at least50%credits up to first year second semester (II Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations ornot.
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 firstsemester (V Semester)	• Regular course of study of second year secondsemester (IV Semester). • Must have secured at least 60% credits up to second year second semester (IV Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations ornot.
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 secondsemester (VI Semester). • Must have secured at least 60% credits up to third year second semester (VI Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations ornot.
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 covering160credits as specified and listed (with the relevant Course/ Subject Classifications as mentioned) in the Course Structure, fulfils all the Attendance and Academic requirements for 160credits securing a minimum of 'P' Grade (Pass Grade) or above in each subject and earn 160credits securing SGPA ≥ 5.0 (in

each semester) and CGPA (at the end of each successive semester) ≥ 5.0, to successfully complete the UGP.

7.5 After securing the necessary 160 credits as specified for the successful completion of the entire under graduate programme, the student can avail exemption of two subjects up to 6 credits, that is, one open elective and one professional elective subject or two professional elective/open electives subjects for optional drop out from these 160 credits earned; resulting in 154 credits for under graduate programme performance evaluation, i.e., the performance of the student in these 154credits 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 160credits as specified in the Course Structure of his / herdepartment, the performances in those 'extra Subjects' (although evaluated and graded using the same procedure as that of the required 160credits) will not be taken into account while calculating the SGPA and CGPA. For such extra subjectsregistered, 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 inany 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 GradeAllotments or SGPA/ CGPA calculations will be done for thatentire semester in which he / she got detained.

7.8 When a student is detained due to lack of credits in anyyear, 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 orfailed (thereby failing to secure 'P' Grade or above) mayreappear for that Subject/ Course at the supplementaryexamination 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 beobtained in the SEE supplementary examination, forevaluating his / her performance in that subject.

8.0 Evaluation, Distribution and Weightage of Marks

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

8.2 Theory Courses:

8.2.1 Continuous Internal Evaluation (CIE):

CIE shall be carried out for all courses of UG Programmes twice in a semester (2 Midterm examinations) with the help of objective evaluation, subjective evaluation, regular assignments and Attendance. Each mid term examination shall consist of objective test with a duration of 20 minutes, subjective paper shall be conducted with a duration of 90 minutes andone 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	Internal choice questions (Module-wise)	5	5	25
Mid Term Exam Total				45
Assignment				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 weightage for the midterm examination shall be given as average of both mid-term examination. The student shall appear for both midterm examinations, in case of any specific reason the student appears only one midterm examination, 50% 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 submittedby the head of the respective department.

Semester End Examination - UG			
Type of Questions	No. of Questions	Marks per Question	Total
Internal choice questions (Module-wise)	5	14	70

8.3 Practical Courses:

8.3.1 Continuous Internal Evaluation (CIE):

CIEmarks shall be awarded with a distribution of40% for day - to-day performance and timely submission of lab records, 40% for internal lab exam (best out of two exams) and20% 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/Principalof thecollege. The external examiner should be selected from the outsidecollege among the autonomous/reputedinstitutions 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	Internal choice questions (Module-wise)	5	6	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
Internal choice questions (Module-wise)	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 anInternship-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 100marks. 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 infront of the committee.

8.6.2 Project:

Major Project has to be carried out during the VIII semester, as per the instructions of the project supervisor assigned by the Head of the Department. Out of total 200 marks allotted for the major project, 50 marks shall be for CIE (Continuous Internal

Evaluation) and 150 marks for the SEE (Semester End Viva-voce Examination). CIE marks shall be awarded by a Departmental Committee consisting of Project coordinator, Supervisor of Major Project and a senior Faculty member, from two reviews (average). Review - I will be conducted within a month from the commencement of class work (problem definition, objective, literature survey and brief description - each 10 marks) and Review - II will be conducted before second mid examination (progress of work, results, discussion and presentation - each 10 marks). The Major Project Viva-voce (SEE) shall be conducted by a committee comprising of an External Examiner, Head of the Department and Project Supervisor. In SEE of 150 marks, 75 marks for working model / simulation / data collection, 35 marks for report preparation and 40 marks for presentation and viva - voce. The external examiner should be selected by Chief Controller of Examinations from outside the college among the autonomous / reputed institutions from a panel of three examiners submitted by the concerned Head of the Department / Board of Studies (BOS) Chairman.

The topics for mini project and seminar shall be different from one another.

The student is deemed to be failed, if he/ she (i) does not submit a report on Project, 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.

8.6 Seminar:

ForSeminar presentation, the student shall collect theinformation on a specialized topic, prepare a Technical Reportand submit to the department at the time of seminarpresentation. The seminar presentation (along with thetechnical report) shall be evaluated by a committee consisting of Seminar coordinator and two senior faculty memberswith appropriate grade. The seminar report shall be evaluated internally for 100 marks. Thereshall be no semester end examination for the seminar.

8.7 Non-Credit Courses:
8.7.2 Mandatory Courses:

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

8.7.3 Audit Courses:

Audit Courses offered in any Semester, a '**Satisfactory Participation Certificate**' shall be issued to the student from the concerned authorities, only after securing≥ 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 eachstudent 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 asspecified in Item No. 9 and a corresponding Letter Gradeshall be given.

9.2 As a measure of the student's performance, a 10-point AbsoluteGrading System using the following Letter Grades (UGCGuidelines) and corresponding percentage of marks shall befollowed.

% of Marks	Grade Points	Letter Grade
$\geq$90	10	O (Out Standing)
$\geq$80 to < 90	9	A^+ (Excellent)
$\geq$70 to < 80	8	A (Very Good)
$\geq$60 to < 70	7	B^+ (Good)
$\geq$50 to <60	6	B (Average)
$\geq$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) willremain 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 anySubject/ Course (s) only for the sake of 'Grade Improvement'or 'SGPA / CGPA Improvement'. However, he / shehas to repeatall the Subjects/ Courses pertaining to that semester, whenhe / 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 thatSubject/ Course (excluding Mandatory non-credit Courses).Then the corresponding 'Credit Points' (CP) are computedby multiplying the Grade Point with credits for that particularSubject/ Course.

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

9.7 The Student passes the Subject/ Course only when he / she getsGP $\geq$ 5('C' Grade or above).

9.8 The Semester Grade Point Average (SGPA) is calculated bydividing the Sum of Credit Points (ΣCP) secured from ALLSubjects/ Courses registered in a semester by the TotalNumber of Credits registered during that semester. SGPA isrounded off to TWO Decimal Places. SGPA is thuscomputed as

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

where 'i' is the subject indicator index (takes into accountall subjects in a semester), 'N' is the number of Subjects'REGISTERED' for the semester (as specifically requiredand 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 measureof the overall cumulative performance of a student over allsemesters considered for registration. The CGPA is theratio of the Total Credit Points secured by a student in ALLregistered courses in ALL semesters and the totalnumber of credits registered in ALL the semesters. CGPAis rounded off to TWO decimal places. CGPA is thuscomputed from the II semester onwards, atthe end of each semester, as per the formula.

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

(i.e., upto and inclusive of 'S' semesters, S ≥ 2)

where 'M' is the TOTAL numberof subjects (as specificallyrequired and listed under the course structure of the parent department) the student has 'REGISTERED' from the 1stSemester onwards upto and inclusive of the semester 'S' (obviously M > N), 'j' is the subject indicator index (takesinto account all subjects from '1' to 'S'semesters) is thenumber of credits allotted to the jthsubject, andrepresents the Grade Points (GP) corresponding to theLetter Grade awarded for that jthsubject. After registrationand completion of I Year I Semester however, the SGPA of that semester itself may be taken as the CGPA, asthere 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	21	7	21 X 7 = 147
Semester II	19	6	19 X 6 = 114
Semester III	22	6.5	22 X 6.5 = 143
Semester IV	20	6	20 X6 = 120

Semester V	22	5.75	22 X 5.75 = 126.5
Semester VI	18	7.25	18 X 7.25 = 130.5
Semester VII	18	8	18 X 8 = 144
Semester VIII	20	8.5	20 X 8.5 = 170
	160		1095

CGPA = 1095/160 = 6.84

9.10 For merit ranking or comparison purposes or any otherlisting, ONLY the 'ROUNDED OFF' values of the CGPAswill be used.

9.11 For calculations listed in Item Nos.9.6 to9.10, performance infailed Subjects/ Courses (securing 'F' Grade) will also betaken into account and the credits of such Subjects/Courses will also be included in the multiplications andsummations. However, Mandatory Courses will not be takeninto consideration.

9.12 Passing Standards:

9.12.1 A student shall be declared successful or 'passed' in asemester, only when he / she gets a SGPA $\geq$ 5.00 (at the endof that particular semester); and a student shall bedeclared successful or 'passed' in the entire UGP, onlywhen he / she gets a CGPA $\geq$ 5.00; subject to the condition that he / she secures a GP $\geq$ 5 ('C' Grade or above) in every registeredSubject/ Course in each semester (during the entire UGP) forthe 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 aSGPA < 5.00 and/ or CGPA < 5.00 at the end of such asemester, then he / she 'may be allowed' (on the 'specificrecommendations' of the Head of the Department andsubsequent approval from the Principal) (i) to go into the next subsequent semester (subject tofulfilling all other attendance and academic requirements as listed under Items Nos. 7&8);(ii) to 'improve his / her SGPA of such a semester (and henceCGPA) to 5.00 or above', by reappearing for ONE orMORE (as per student's choice) of the same course(s) in which he / she has secured 'P' Grade(s) in thatsemester, at the Supplementary Examinations to be heldin the next subsequent semester(s). In such cases, his / her Internal Marks (CIE Marks) in those subject(s) willremain same as those he / she obtained earlier. In these considerations, the newly secured Letter Gradeswill be recorded and taken into account for calculation ofSGPA and CGPA, only if there is an improvement.

9.12.3 A student shall be declared successful in anyNon-Credit Course, if he / shesecures a 'SatisfactoryParticipation Certificate' for that Audit Course and "Satisfactory Grade' for Mandatory Course.

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

10   Declaration of Results

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

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

% of Marks = (final CGPA – 0.5) x 10

11   Award of Degree

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

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

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

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

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

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

12   Withholding of Results

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

13   Transitory Regulations

A. For students detained due to shortage of attendance:

1. A student who has been detained in I year of MR15 (2016 admitted)/ MR17/MR18 regulations due to lack of attendance, shall be permitted to join I year I Semester of MR20 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 MR15/MR17/MR18 regulations for want of attendance shall be permitted to join the corresponding semester of MR20 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 MR20 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 ofcredits:

A student of MR15/MR 17/MR18 regulations, who has been detained due to lack of credits, shall be promoted to the next semester of MR20 regulations only after acquiring the required credits as per the corresponding regulations of his/her first admission. The student is required to complete the B.Tech Programme within the stipulated period of eight academic years from the year of first admission. The MR20 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 MR20regulations:

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 MR20 regulations. The performance evaluation of the student will be done after the exemption of two subjects if total credits acquired are ≤ 160, (see item 7.5).

3 If a student readmitted to MR20 regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in MR20 regulations will be substituted by another subject to be suggested by the College Academic Committee (CAC).

Note: If a student readmitted to MR20 regulations, has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in MR20 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 ofadmission 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–upof regulations, they include "she", "her", "hers".

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

(iii) The academic regulations should be read as a whole, forthe 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 2021-22

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

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

2. The student shall register for 120 credits and secure 120 credits with CGPA ≥ 5 from II year to IVyear B.Tech. Programme (LES) for the award of B.Tech. degree. **Out of the 120 credits secured, the student can avail exemption up to 6 credits**, that is, one open elective subject and one professional elective subject or two professional elective subjects resulting in 114 credits for B.Tech. Programme performance evaluation**.**

3. The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech. Programme.

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

5. **Promotion Rule:**

Sl.No.	Promotion	Conditions to be fulfilled
1	Second year first semester (III Semester) to second year second semester (IV Semester)	Regular course of study of second year first semester (III Semester).

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

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

MALPRACTICES RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

Sl.No.	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to that course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that semester. The hall ticket of the candidate shall be cancelled.
3	Impersonates any other candidate in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination (including practical's and project work) already appeared and shall not

		be allowed to appear for examinations of the remaining courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The student is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	Refuses to obey the orders of the Chief Controller of Examinations (CCE) / Controller of Examinations (CE) / Assistant Controller of Examinations (ACE) / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police cases registered against them.

	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	
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 studentfor 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 aboveguidelines.

MALLA REDDY ENGINEERING COLLEGE
B.Tech. - ELECTRICAL AND ELECTRONICS ENGINEERING
COURSE STRUCTURE
MR20 Regulations -Academic Year 2020-21
SEMESTER I

S. No	Category	Course Code	Name of the Course	L	T	P	Credits
1.	HSMC	A0H01	English	3	-	-	3
2.	BSC	A0B03	Linear Algebra and Applied Calculus	3	1	-	4
3.	BSC	A0B10	Applied Physics	3	1	-	4
4.	ESC	A0301	Engineering Graphics	2	-	2	3
5.	ESC	A0501	Programming for Problem Solving	3	-	-	3
6.	BSC	A0B11	Applied Physics Lab	-	-	2	1
7.	ESC	A0502	Programming for Problem Solving Lab	-	-	2	1
8.	HSMC	A0H02	English Language Lab	-	-	2	1
9.	ESC	A0302	Engineering Workshop	-	-	2	1
10.	AC	A00A1	NSS/SPORTS/YOGA	-	-	3	-
Total				14	2	13	**21**
Total contact hours					29		

SEMESTER II

S. No	Category	Course Code	Name of the Course	L	T	P	Credits
1	BSC	A0B04	Advanced Calculus	3	1	-	4
2	BSC	A0B17	Engineering Chemistry	3	1	-	4
3	PCC	A0201	Basic Electrical and Electronics Engineering	3			3
4	ESC	A0401	Digital Electronics	2	1	-	3
5	BSC	A0B18	Engineering Chemistry Lab	-	-	2	1
6	PCC	A0202	Basic Electrical and Electronics Engineering Lab	-	-	2	1
7	ESC	A0402	Digital Electronics Lab	-	-	2	1
8	ESC	A0553	Basic Python Programming Lab	-	-	4	2
Total				11	3	10	**19**
Total contact hours					24		

MALLA REDDY ENGINEERING COLLEGE
B.Tech. - ELECTRICAL AND ELECTRONICS ENGINEERING
COURSE STRUCTURE
MR20 Regulations -Academic Year 2020-21

SEMESTER-III

Sl. No.	Category	Course Code	Name of the Subject	L	T	P	Credits
1	BSC	A0B08	Complex Variables and Numerical Methods	3	-	-	3
2	ESC	A0403	Analog Electronics	3	-	-	3
3	ESC	A0313	Fluid Mechanics and Hydraulic Machines	3	-	-	3
4	PCC	A0203	Electrical Circuit Analysis and Synthesis	2	1	-	3
5	PCC	A0204	Electromagnetic Fields	3	-	-	3
6	ESC	A0554	Fundamentals of Data Structures Lab	-	-	4	2
7	ESC	A0407	Analog Electronics Lab	-	-	2	1
8	PCC	A0205	Electrical Circuits Lab	-	-	4	2
9	MC	A00M2	Environmental Science	2	-	-	-
10	AC	A00A2	INTERNSHIP – I	-	-	-	-
11	AC	A00A4	NPTEL-I	-	-	-	-
Total				**16**	**1**	**10**	**20**
						Total Contact Hours: 27	

SEMESTER-IV

Sl. No.	Category	Course Code	Name of the Subject	L	T	P	Credits
1	HSMC	A0H08	Engineering Economics & Accountancy	3	-	-	3
2	ESC	A0404	Signals and Systems	2	1	-	3
3	PCC	A0206	Power Generation and Distribution	3	-	-	3
4	PCC	A0207	DC Machines and Transformers	2	1	-	3
5	PCC	A0208	Control Systems	3	-	-	3
6	ESC	A0450	Basic Simulation Lab	-	-	2	1
7	PCC	A0209	DC Machines Lab	-	-	4	2
8	ESC	A0555	Object Oriented Programming Through JAVA Lab	-	-	4	2
9	MC	A00M1	Gender Sensitization	-	-	2	-
10	AC	A00A5	NPTEL-II	-	-	-	-
11	AC	A00A6	Co-curricular activity - I	-	-	-	-
			Total	**13**	**2**	**12**	**20**
						Total Contact Hours: 27	

MALLA REDDY ENGINEERING COLLEGE
B.Tech. - ELECTRICAL AND ELECTRONICS ENGINEERING
COURSE STRUCTURE
MR20 Regulations -Academic Year 2020-21

SEMESTER-V

Sl. No.	Category	Course Code	Name of the Subject	L	T	P	Credits
1.	PCC	A0210	Electrical Measurements and Instrumentation	3	-	-	3
2.	PCC	A0211	Power Transmission Systems	3	-	-	3
3.	PCC	A0212	AC Machines	2	1	-	3
4.	PCC	A0213	Power Electronics	3	-	-	3
5.	PEC-I	A0222	High Voltage Engineering	3	-	-	3
		A0223	Graphical Programme and Applications				
		A0224	Advanced Control Systems				
		A0225	Digital Control Systems				
		A0226	Fundamentals of Nanoscience				
6.	OEC-I		Open Elective - I	3	-	-	3
7.	PCC	A0214	AC Machines Lab	-	-	3	1.5
8.	PCC	A0215	Control Systems Lab	-	-	3	1.5
9.	ESC	A0562	Fundamentals of Database Management Systems Lab	-	1	2	2
10.	MC	A00M3	Quantitative Aptitude and Verbal Reasoning - I	1	1	-	-
11.	MC	A00M6	Introduction to Artificial Intelligence	1	1	-	-
			Total	19	4	6	23

Total Contact Hours: 29

SEMESTER-VI

Sl. No.	Category	Course Code	Name of the Subject	L	T	P	Credits
1.	PCC	A0216	Power System Analysis	3	-	-	3
2.	PCC	A0217	Switchgear and Protection	3	-	-	3
3.	ESC	A0414	Microprocessors and Microcontrollers	3	-	-	3
4	PEC-II	A0227	Electrical Drives	3	-	-	3
		A0228	Electrical Machine Design				
		A0229	Electrical Estimation & Costing				
		A0230	SMPS and UPS				
		A0231	Bio Medical Instrumentation				
5.	PEC-III	A0232	Electrical Power Quality	3	-	-	3
		A0233	Special Machines				
		A0234	Supervisory Control and Data Acquisition				
		A0235	Industrial Electrical System				
		A0236	Wearable Electronics				
6.	OEC-II		Open Elective - II	3	-	-	3
7.	HSMC	A0H03	English Communication and Presentation Skills Lab	-	-	2	1
8.	PCC	A0218	Electrical Measurements and Instrumentation Lab	-	-	3	1.5
9.	PCC	A0219	Power Electronics Lab	-	-	3	1.5
10	MC	A00M4	Quantitative Aptitude and Verbal Reasoning - II	1	1	-	-
11	MC	A00M5	Introduction to Cyber Security	1	1	-	-
			Total	20	2	8	22

Total Contact Hours: 30

MALLA REDDY ENGINEERING COLLEGE
B.Tech. - ELECTRICAL AND ELECTRONICS ENGINEERING
COURSE STRUCTURE
MR20 Regulations -Academic Year 2020-21
SEMESTER-VII

Sl. No.	Category	Course Code	Name of the Subject	L	T	P	Credits
1	HSMC	A0H09	Management Fundamentals	3	-	-	3
2	PCC	A0220	Power System Operation and Control	3	-	-	3
3	PEC-IV	A0237	Non-Conventional Energy Sources	3	-	-	3
		A0238	Electrical Hybrid Vehicles				
		A0240	Digital Signal Processing				
		A0241	Modern Power Converters				
		A0242	Power Systems Transients				
4	PEC-V	A0243	Utilization of Electrical Energy	3	-	-	3
		A0244	HVDC and FACTS				
		A0245	Electrical Energy Conservation and Auditing				
		A0246	Power System Reliability				
		A0247	PLC and their Applications				
5	PEC-VI	A0248	Wind and Solar Energy Systems	3	-	-	3
		A0249	Electrical Smart Grid				
		A0250	AI Applications in Electrical Engineering				
		A0251	Neural Network and Fuzzy Logic				
		A0252	Automotive Electrical and Electronics Systems				
6	OEC-III		Open Elective - III	3	-	-	3
7	PROJ	A00P1	MINI PROJECT/INTERNSHIP-III	-	-	-	2
8	PCC	A0221	Power Systems Lab	-	-	2	1
9	ESC	A0422	Microprocessors and Microcontrollers Lab	-	-	2	1
			Total	18	-	4	22
			Total Contact Hours: 22				

SEMESTER-VIII

Sl. No.	Category	Course Code	Name of the Subject	L	T	P	Credits
1	PROJ	A00P2	MAJOR PROJECT	-	-	24	12
2	PROJ	A00P3	SEMINAR	-	-	2	1
			Total	-	-	26	13
			Total Contact Hours: 26				

LIST OF OPEN ELECTIVES

A	Branch	Course Code	Name of The Course	No. of Credits
1		A0145	Environmental Impact Assessment and Life Cycle Analysis	3
2	CIVIL	A0146	Green Buildings	3
3		A0147	Disaster Management & Mitigation	3
4		*A0245*	*Electrical Energy Conservation and Auditing*	3
5	EEE	*A0253*	*Electrical Safety and Energy Management*	3
6		*A0254*	*Energy Storage Systems*	3
7		A0340	Energy Conservation and Management	3
8	MECH	A0345	New and Renewable Energy Sources	3
9		A0350	Total Quality Management	3
10		A0438	Embedded System Design	3
11	ECE	A0448	Principles of Communication Engineering	3
12		A0449	Basics of VLSI Design	3
13		A0519	Free and Open Source Software	3
14	CSE	A0520	Cloud Computing	3
15		A0542	Big Data Analytics	3
16		A0505	Android Application Development	3
17	IT	A0624	Python Programming	3
18		A0625	Artificial Intelligence	3
19		A2507	Drilling and Blasting	3
20	MINING	A2537	Material Handling	3
21		A2542	Tunneling Engineering	3
22		A0H04	English Language Skills	3
23	ENGLISH	A0H05	Interpretation Skills and Analytical Writing	3
24		A0H06	English for Academic and Research Writing	3
25			Computational Mathematics	3
26	MATHEMATICS		Applied Statistics	3
27			Optimization Techniques	3
28		A0B14	Advanced Physics for Engineers	3
29	PHYSICS	A0B15	Nano Materials	3
30		A0B16	NDT and Vacuum Technology	3
31		A0B19	Chemistry In Daily Life	3
32	CHEMISTRY	A0B20	Nano Chemistry	3
33		A0B21	Polymer Chemistry	3
34			Digital Marketing	
35	MBA		Learning and Development	
36				

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE	B.Tech. I / II Semester		
Code: A0H01	ENGLISH (Common for CE, EEE, ME, ECE, CSE, IT and Min.E)	L	T	P
Credits: 3		3	-	-

Course Objectives:

The objective of this course is to improve the English Language and Literary competence of the students. The course provides requisite insights into grammar, vocabulary, prose, and short stories. Further, it also helps in developing the skills of Reading and Writing. The course also equips students to study their academic subjects more effectively using the theoretical and practical components of the English language and literature.

MODULE – I

Speech	: "Go Kiss the World" by Subroto Bagchi
Poem	: "Leisure" by W. H. Davies
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

Short story	: "Gift of Magi" by O' Henry
Poem	: "No Man is an Island" by John Donne
Vocabulary	: One Word Substitutions; Synonyms and Antonyms
Grammar	:Degrees of Comparison, Voice – Exercises
Reading	: Intensive Reading and Extensive Reading
Writing	: Paragraph Writing- Cohesive devices; Jumbled Sentences; Punctuation

Module – III

Essay	: "Lucidity, Simplicity, Euphony" by W. Somerset Maugham
Poem	: "The Mask" by Maya Angelou
Grammar	:Tense and Aspect
Vocabulary	: Homonyms, Homophones, Homographs
Reading	: Reading for Topic and Theme
Writing	: Letter Writing

MODULE – IV

Short story	: "The Night Train at Deoli" by Ruskin Bond
Poem	: "Gift of India" by Sarojini Naidu
Grammar	:Question Tags; Concord
Vocabulary	: Idiomatic Expressions; Phrasal Verbs

Reading : Reading for Interpretation
Writing : Essay Writing, Describing, Defining and Classifying

Module – V
Essay : "Toasted English" by R. K. Narayan
Poem : "If' by Rudyard Kipling
Grammar : Direct and Indirect Speech, Misplaced Modifiers
Vocabulary : Redundancies and Clichés
Reading : Reading for Specific Purposes, Reading Comprehension practice
Writing : Paraphrasing & Summarizing,
* Exercises from the texts not prescribed shall also be used for classroom tasks.

Prescribed Textbook:
Reference Books:
1. Azar, Betty and Stacy A, Hagen. *Understanding and Using English Grammar*. 4th edition, Foundation Books, 2009.
2. Chaudhuri, Santanu S. *Learn English: A Fun Book of Functional Language, Grammar and Vocabulary.* Tata McGraw Hill Education, New Delhi, 2013.
3. Eastwod, John. *Oxford Guide to English Grammar.* 4th edition,Oxford University Press, 1994.
4. Field, Marion. *Improve Your Written English*. 5th Edition. How to Books, UK, 2009.
5. Leech, Geoffrey and Svartvik, J. *A Communicative Grammar of English*. 3rd edition, Routledge, 2013.

Related Websites:
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 written and spoken English considerably well for academic purposes.

2. communicate in Enrich accurately and fluently.

3. employ extensive and intensive reading skills.

4. gain confidence in writing for academic and real life situations.

5. use standard grammar, punctuation, and spelling in technical documents.

Prerequisites: Matrices, Differentiation and Integration.

Course Objectives:

1. To learn types of matrices, Concept of rank of a matrix and applying the concept of rank to know the consistency of linear equations and to find all possible solutions, if exist.
2. To learn concept of Eigen values and Eigen vectors of a matrix, diagonalization of a matrix, Cayley Hamilton theorem and reduce a quadratic form into a canonical form through a linear transformation.
3. To learn methods of solving differential equations and its applications to basic engineering problems.
4. To learn series solution of the given differential equations.
5. To learn the concept of the mean value theorems, partial differentiation and maxima and minima.

MODULE I: Matrix Algebra **[12 Periods]**

VECTOR SPACE, BASIS, LINEAR DEPENDENCE AND INDEPENDENCE (ONLY DEFINITIONS)

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; solving system of Homogeneous and Non-Homogeneous linear equations, LU – Decomposition Method.

MODULE II: Eigen Values and Eigen Vectors **[12 Periods]**

Eigen values , 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; Singular Value Decomposition.

Quadratic forms: Nature, rank, index and signature of the Quadratic Form, Linear Transformation and Orthogonal Transformation, Reduction of Quadratic form to canonical forms by Orthogonal Transformation Method.

Module –III: Ordinary Differential Equations **[12 Periods]**

First Order and First Degree ODE: Orthogonal trajectories, Newton's law of cooling, Law of natural growth and decay.

Second and Higher Order ODE with Constant Coefficients: Introduction-Rules for finding complementary function and particular integral. Solution of Homogenous, non-

homogeneous differential equations, Non-Homogeneous terms of the type e^{ax} , sin(ax), cos (ax), polynomials in x, e^{ax} V(x), x V(x), Method of variation of parameters.

Module – IV: Series Solutions to the Differential Equations   [12 Periods]

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

Module -V: Differential Calculus   [12 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.

Limits, Continuity, Partial differentiation, partial derivatives of first and second order, Jacobian, Taylor's theorem of two variables (without proof). Maxima and Minima of two variables, Lagrange's method of undetermined Multipliers.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

2. R K Jain Srk Iyengar ,Advanced engineering mathematics, Narosa publications.

3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley publications.

References Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,
   Reprint, 2008.
3. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, AffiliatedEast–West press, Reprint 2005.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint,2010.

E – RESOURCES:

1. https://www.youtube.com/watch?v=sSjB7ccnM_I (Matrices – System of linear Equations)
2. https://www.youtube.com/watch?v=h5urBuE4Xhg (Eigen values and Eigen vectors)
3. https://www.youtube.com/watch?v=9y_HcckJ96o (Quadratic forms)
4. http://www.math.cmu.edu/~wn0g/noll/2ch6a.pdf(Differential Calculus)
5. https://www.intmath.com/differential-equations/1-solving-des.php(Differential Equations)

NPTEL:

1. https://www.youtube.com/watch?v=NEpvTe3pFIk&list=PLLy_2iUCG87BLKl8eISe4fHKdE2_j2B_T&index=5 (Matrices – System of linear Equations)
2. https://www.youtube.com/watch?v=wrSJ5re0TAw (Eigen values and Eigen vectors)
3. https://www.youtube.com/watch?v=yuE86XeGhEA (Quadratic forms)

Course Outcomes:

1. The student will be able to find rank of a matrix and analyze solutions of system of linear equations.
2. The student will be able to find Eigen values and Eigen vectors of a matrix, diagonalization a matrix, verification of Cayley Hamilton theorem and reduce a quadratic form into a canonical form through a linear transformation.
3. Formulate and solve the problems of first and higher order differential equations
4. The student will be able to Solve series solution of given differential equation.
5. The student will be able to verify mean value theorems nad maxima and minima of function of two variables.

CO- PO Mapping

| COS | CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak |
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	3	3				2			3
CO2	3	2	2	3	2				2			3
CO3	3	2	2	3	2				2			2
CO4	3	2	2	3	3				2			2
CO5	3	2	2	3	3				2			2

Prerequisites: 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 quantum mechanics, semiconductor physics and EM theory along with their possible applications.

Module – I: Quantum mechanics   **8 Periods**
Introduction, Discussion on Black body radiation spectrum; Louis de Broglie's concept of matter waves; Davisson and Germer experiment; G P Thomson Experiment; Schrodinger's time independent wave equation; Physical significance and properties of wave function; Heisenberg's uncertainty principle - Why an electron cannot exist inside the nucleus?; Particle in one dimensional infinite potential well.

Module – II: Band theory of solids   **13 Periods**
Qualitative discussion of Classical free electron theory; Qualitative treatment of Fermi - Dirac distribution function; Qualitative discussion of Quantum free electron theory; Density of energy states; Bloch theorem; Qualitative treatment of Kronig - Penney model; E Vs k relationship; Origin of energy band gap; Classification of materials into Conductors, Semi conductors and insulators; Concept of Effective mass.

Module –III: Semiconductor Physics   **13 Periods**
A: Elemental and compound semiconductors; Intrinsic and Extrinsic Semiconductors; Expression for carrier concentration in intrinsic and extrinsic semiconductors; 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 diode - Formation & V-I Characteristics; LED - Construction and Working Principle; Solar Cell - Construction & I-V Characteristics.

Module – IV   **12 Periods**
LASER: Introduction, Characteristics of LASER; Absorption, Spontaneous and Stimulated emission; Einstein's coefficients derivation; Population inversion; Pumping mechanisms; Basic components of a LASER system; three and four level LASER systems; Ruby LASER, He-Ne LASER, Semiconductor diode LASER (Homo junction and hetero junction); Applications of LASER - Computers, Medical, Military.
Optical Fibers: Introduction to Optical fibers; Total Internal Reflection; Acceptance angle

and acceptance cone, Numerical aperture; types of optical fibers; Losses in optical fibers - absorption losses, scattering losses and bending losses; Applications of optical fibers - Communications, Level Sensor, LASER angioplasty.

Module – V: Electromagnetic Theory   **10 Periods**
Gradient of Scalar field; Divergence and Curl of Vector field and their Physical Significance;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.

Course Outcomes:
At the end of the course, student will be able to
1. Explain the dual nature of the matter and evaluate the energy of a particle trapped in 1D infinite potential well.
2. Classify the materials into conductors, semiconductors and insulators based on the outcomes of Kronig - Penney model.
3. Analyze the working of semiconductor devices like PN junction diode, LED and Solar cell.
4. Explain the working of three LASERs.
5. Explain the applications of LASER and optical fibers.
6. Apply the basic knowledge of electromagnetic principles on different applications in electromagnetic devices.

Text Books
1. K Vijaya Kumar, S Chandralingam, "Modern Engineering Physics'' Volume I & II, S. Chand, 1st Edition, 2017.
2. Jasprit Singh, "Semiconductor Optoelectronics: Physics and Technology", McGraw-Hill, 1995.
3. B K Pandey and S. Chaturvedi, "**Engineering Physics**" Cengage Learning India Revised Edition, 2014.

Reference Books
1. P K Palanisamy, **"Engineering Physics"**, SciTech Publication, 4th Edition, 2014.
2. R K Gaur and SL Gupta, "**Engineering Physics**" Dhanpat Rai Publications, Eighth Revised Edition, 2006.
3. D K Bhattacharya, Poonam Tandon, "**Engineering Physics**", Oxford University Press, 1st Edition, 2015.
4. P. Bhattacharya, "**Semiconductor Optoelectronic Devices**", Prentice hall of India,1997.
5. S J Adams, "Electromagnetic Theory", Adams Press, 2013.

e-RESOURCES

1. https://www.researchgate.net/publication/259574083_Lecture_Notes_on_Engineering_Physics
2. https://www.livescience.com/33816-quantum-mechanics-explanation.html
3. **https://nptel.ac.in/courses/115/102/115102025/**

Journals
1. http://www.springer.com/physics/theoretical%2C+mathematical+%26+computational+physics/journal/40094
2. http://www.springer.com/physics/journal/340

NPTEL VIDEOS
1. http://nptel.ac.in/courses/113104012/
2. https://www.youtube.com/watch?v=9seDKvbaoHU&list=PLzJaFd3A7DZse2tQ2qUFChSiCj7jBidO0&index=29
3. https://nptel.ac.in/courses/108/108/108108122/
4. https://nptel.ac.in/courses/115/101/115101005/

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE	B.Tech. I Semester		
Code: A0301	ENGINEERING GRAPHICS (Common for CE, ME and Min.E)	L	T	P
Credits: 3		2	-	2

Prerequisites: Nil

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

MODULE I: Introduction to Engineering Drawing, Scales and Curves   12 Periods

Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance. Lettering and dimensioning. Geometrical Constructions: Regular polygons only.
Scales: Plane Scale, Comparative Scale, Diagonal Scale, Vernier Scale
Curves: Conic Sections, Cycloidal Curves and Involutes.

MODULE II: Projection of Points, Lines and Planes   12 Periods

Projection of Points: Principles of Orthographic Projections – Conventions – First and Third Angle projections. Projection of points including all four quadrants.
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: 12 Periods
Projection of Solids, Section of Solids and Development of Surfaces
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.
C. **Development of Surfaces:** Development of lateral surfaces of simple Solids.

MODULE IV :   10 Periods
Isometric Projections and Transformation of Projections
Isometric Projections: Principles of Isometric Projection – Isometric Views– Conventions –Plane Figures, Simple Solids.
Transformation of Projections: Conversion of Isometric Views to Orthographic Views and vice versa– simple objects

MODULE V : Introduction to Computer Aided Drafting   **10 Periods**

CAD workstation, Advantages of CAD, CAD Software, AutoCAD – Opening and Creating Drawings-Exploring the AutoCAD interface-Zooming and Panning, AutoCAD Commands and Toolbars-Basic Drawing and Editing Commands.

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

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

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

2020-21 Onwards (MR-20)	MALLA REDDYENGINEERINGCOLLEGE	B.Tech. I Semester		
Code:A0501	**PROGRAMMING FOR PROBLEM SOLVING** (Common forALL)	L	T	P
Credits:3		3	-	-

Prerequisites: NIL

Objectives

1. Understand the basic terminology, write, compile and debug programs in computer programming
2. Implement different control statements for solving problems.
3. Understand the concept of structured program and arrays.
4. Implement the idea of strings and pointers.
5. Analyse the usage of structures and different file operations.

MODULE I: Fundamentals and Introduction to 'C' Language   [10 Periods]

Introduction Fundamentals– Computer Systems, Computing Environments, ComputerLanguages, Creating and running programs, Software Development Method, Algorithms, Pseudo code,flow charts, applying the software development method.

Introduction to 'C' Language: – Background, C-tokens- Keywords, Identifiers, Basic data types,Variables, Constants,Preprocessor directives-include, define,Managing Input / Output functions - formatted input / output functions, Operators. Expressions, Precedence and Associatively, ExpressionEvaluation, Type conversions, Simple C Programming examples.

MODULE II: Conditional Statements and Repetition Statements[09 Periods]

Control Statements:if and switch statements, Repetition statements – while, for, do-while statements, Loopexamples, other statements related to looping – break, continue, go to, Simple C Programming examples.

Repetition statements – while, for, do-while statements, nested looping, other statements related to looping – break, continue, goto, Simple C Programming examples.

MODULE III: Designing Structured Programs and Arrays   [10 Periods]

Designing Structured Programs-Introduction to function, Advantages, user defined functions, inter function communication-call by value, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion – recursive functions-Towers of Hanoi problem.

Arrays: Basic Concepts, Types of arrays, applications- Selection sort, Bubble sort, Insertion sort,Linear search and Binary search methods, arrays and functions.

MODULE IV:Strings and Pointers [09 Periods]

Strings: Concepts, String Input / Output functions, arrays of strings, string manipulation functions, string conversion, C program examples.

Pointers – Basic Concepts, Pointers for inter function communication-call by reference, pointers to pointers, Pointer arithmetic, array of pointers, pointers to array, applications, pointers to void, pointers to functions, Dynamic memory allocation functions.

MODULE V: Structures and File Handling [10 Periods]

Structures – Declaration, definition and initialization of structures, accessing structure elements, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, difference between structures and union, typedef, bitfields, enumerated types, C programming examples.

Files – Basic Concept of a file,file input / output operations, text files and binary files, file status functions (error handling), Random file access functions, command –line arguments.

C program examples.

TEXTBOOKS

1. Computer Fundamentals and Programming in C, P. Dey, M Ghosh, Second edition, Oxford University Press.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Eighth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCES

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning
2. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

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

Outcomes:

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

1. Translate the algorithms/flowcharts to programs (in C language).
2. Decompose a problem into functions and to develop modular reusable code.
3. Apply different types of control structures and arrays in a computer programming.
4. Develop programs that make use of concepts such as strings, pointers and structures.
5. Analyse file operations and command line arguments.

COs	Programme Outcomes (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	3	2	2	2				2	1	1	3	3	2	2
CO2	3	3	2	2	2				2	1	1	3	3	2	1
CO3	3	3	3	2	2				1			3	3	2	1
CO4	3	2	3	2	2				1		1	2	3	2	1
CO5	3	3	3	2	2				1	1	1	2	3	2	1

CO- PO, PSO Mapping

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: A0B11	**APPLIED PHYSICS LAB** (Common for CSE, CSE (AI & ML), CSE (Cyb. Sec.), CSE (IoT), CSE (Data Science), IT, ECE and EEE)	L	T	P
Credits: 1		-	-	2

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

List of Experiments:

1. **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. **B-H Curve**
    To study the magnetization of ferromagnetic material in presence of magnetic field.
12. **Sonometer**
    To verify the frequency of AC Supply.
13. Construction of fundamental logic gates using discrete components and verification of truth tables
14. Verification of truth tables of fundamental logic gates using ICs
15. Construction of universal logic gates using fundamental logic gates

Course Outcomes:

At the end of the course, students will 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.

2020-21 Onwards (MR-20)	MALLA REDDYENGINEERINGCOLLEGE	B.Tech. ISemester		
Code:A0502	**PROGRAMMING FOR PROBLEM SOLVING LAB** (CommonforALL)	L	T	P
Credits:1		-	-	2

Prerequisites: NIL

Objectives:

1. Understand the various steps in Program development
2. Identify syntax and semantics of C Programming Language
3. Illustrate the usage of structured programming approach in solving problems.
4. Develop programs that make use of arrays, strings, pointers and structures in C language
5. Analyse different file operations

Software Requirements: C

List of Programs:

1.	a.	Practice various Internal and External DOS Commands.
	b.	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.
	c.	Write a C program to check whether given character is alphabet, digit or special symbol
3.	a.	Write a C program to find the sum of individual digits of a positive integer.
	b.	Write a C program to generate the first 'n' terms of the sequence. [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.]
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 non-recursive function to search for a Key value in a given list of integers using linear search. c. 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.	

7.	a. Write a C program that implements the Bubble sort method to sort a given array of integers in ascending order. b. Write a C program that implements the Selection sort method to sort a given list of names in ascending order.
8.	Write a C program to perform the following: a. Addition of Two Matrices b. Multiplication of Two Matrices.
9	Write a C program that uses functions to perform the following operations: a. To insert a sub-string into given main string from a given position. b. To delete n characters from a given position in a given string. c. To find substring in a given string
10	a. Write a C program to determine if the given string is a palindrome or not b. Write a C program to count the lines, words and characters in a given text.
11	a. Write a C program to swap two numbers, which implement call by value and call by reference. b. Write a C program to display the below student details using structures <table><tr><td>Roll Number</td><td>Name</td><td>Gender</td><td>Branch</td><td>Attendance percentage</td></tr><tr><td>501</td><td>John</td><td>male</td><td>CSE</td><td>77.3</td></tr><tr><td>502</td><td>Alice</td><td>male</td><td>ECE</td><td>80.5</td></tr><tr><td>503</td><td>Sam</td><td>female</td><td>IT</td><td>90.7</td></tr></table> c. Write a C program to find grade of a student using structures.
12	a. Write a C program which copies one file to another b. Write a C program to find sum of two numbers using command line arguments
13	a. Develop a mini project which implement the Library Management System b. Develop a mini project which implement the Student Record System

TEXT BOOKS:

1. Computer Fundamentals and Programming in C, P. Dey, M Ghosh, Second edition, Oxford University Press
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Eighth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCES:

1. CProgramming& Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning
2. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

Outcomes:

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

1. Analyse concepts in problem solving and write diversified solutions for a given problem.
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 execute 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

COs	ProgrammeOutcomes(POs)												PSOs		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
CO1	3	2	3										2	2	3
CO2	3	3	3										2	2	3
CO3	2	2	2										2	2	2

CO-PO,PSOMapping
(3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech. I / II Semester	
Code: A0H02	**ENGLISH LANGUAGE LAB** (Common for CE, EEE, ME, ECE, CSE, IT and Min.E)	**L**	**T**	**P**
Credits: 1		**-**	**-**	**2**

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Course Objectives:

The course aims to develop students' 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, namely, listening and speaking skills. It also trains students to understand nuances of both verbal and non-verbal communication during all activities. The course enables the learners to develop their confidence levels so as to participate in discussions, debates and 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.

Syllabus: 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

Minimum Requirement of infra structural facilities for EL Lab:
 1. **Computer Assisted Language Learning (CALL) Lab:**
    The Computer aided Language Lab for 40 students with 40 systems, one master console, LAN facility and English language software for self- study by learners.

    System Requirement (Hardware component):
    Computer network with Lan with minimum 60 multimedia systems with the following specifications:
    a) P – IV Processor   b) Speed – 2.8 GHZ   c) RAM – 512 MB Minimum
    d) Hard Disk – 80 GB   e) Headphones of High quality

 2. **Interactive Communication Skills (ICS) Lab**
    The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.
    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):

    Prescribed Lab Manual:
    Rani, Sudha. *English Language Communication Skills Laboratory*. 5th edition, Pearson Publication, 2014.

Reference Books:

1. Gairns, Ruth and Redman, Stuart. *Oxford Word Skills: Learn and Practice English Vocabulary.* 2nd edition, Oxford University Press, 2008.
2. Hughes, John and Mallett, Andrew. *Successful Presentations DVD and Student's Book Pack.* Oxford University Press, 2013.
3. Hancock, Mark. *English Pronunciation in Use* (Intermediate). 2nd edition, 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.* 11th edition,Tata McGraw Hill, 2011.

Websites:

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/2/14309868938d576a532b71360b735426838 0727a22/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.

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE	B.Tech. I Semester		
Code: A0302	**ENGINEERING WORKSHOP** (Common for EEE, ECE 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.

I. Trades for Exercises:

At least two exercises from each trade:

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

II. Trades for Demonstration & Exposure

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

Course Outcomes:

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

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE	B.Tech. II Semester		
Code: A0B04	ADVANCED CALCULUS	L	T	P
Credits: 4	(Common for EEE & ECE)	3	1	-

Pre-requisites: Differentiation and integration,

Course Objectives: To Learn

1. The Methods of solving Partial differential equations.
2. The Beta and Gamma functions.
3. The Evaluation of multiple integrals and their applications in the allied fields.
4. The physical quantities involved in engineering problems related to vector valued functions.
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals.

MODULE -I: Partial Differential Equations   [12 Periods]

Formation of partial differential equations by eliminating arbitrary constants or arbitrary function, solutions of first order linear(Lagrange) equations, solutions of non linear first order equations (four standard types). Equations reducible to linear, Charpits Method.

MODULE – II: Beta and Gamma Functions   [12 Periods]

Introduction to Improper Integrals, Definition of Beta and Gamma function, properties and other forms. Relation between Beta and Gamma function, Evaluation of Improper Integrals.

MODULE - III: Multiple Integrals   [12 Periods]

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

MODULE - IV: Vector Differentiation   [12 Periods]

Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Scalar potential functions. Solenoidal and Irrotational vectors. Vector Identities.

MODULE – V: Vector Integration   [12 periods]

Line, Surface and Volume Integrals. Green Theorem, Gauss Divergence Theorem and Stokes Theorem (without proofs) and their applications.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

2. R K Jain Srk Iyengar ,Advanced engineering mathematics, Narosa publications.
3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley publications.

Reference Books:
1. Kanti B.Datta, **Mathematical Methods of Science and Engineering**, Cengage Learning
2. Alan Jeffrey, **Mathematics for Engineers and Scientists**, 6th Ed, 2013, Chapman & Hall.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Ed, Pearson, Reprint, 2002.
4. S. L. Ross, **Differential Equations**, 3rd Ed., Wiley India, 1984.
5. *Amarnath* T, **An Elementary Course in** *Partial Differential Equations*, Narosa Publishing House 2nd Ed, 2012.

Course Outcomes: After learning the contents of this paper the student must be able to

1. Identify whether the given partial differential equation can be solvable with the methods or not.
2. Solve the problems which are not solvable with the usual methods and solve using Beta and Gamma functions.
3. Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelepiped.
4. Finds the directional derivatives, angle between vectors understands the physical interpretation of vector, solenoidal and irrotational vectors.
5. Evaluate the line, surface and volume integrals and converting them from one to another.

E-Resources:
a. **Concerned Website links**
1. https://mat.iitm.ac.in/home/sryedida/public_html/caimna/pde/first/partial.html
2. https://homepage.tudelft.nl/11r49/documents/wi4006/gammabeta.pdf
3. https://math.libretexts.org/Bookshelves/Calculus/Book%3A_Calculus_(OpenStax)/15%3A_Multiple_Integration/15.2%3A_Double_Integrals_over_General_Regions
4. https://math.libretexts.org/Bookshelves/Calculus/Book%3A_Calculus_(Apex)/12%3A_Functions_of_Several_Variables/12.06%3A_Directional_Derivatives
5. https://learn.lboro.ac.uk/archive/olmp/olmp_resources/pages/workbooks_1_50_jan2008/Workbook29/29_3_int_vec_thms.pdf

b. **NPTEL :**
1. https://www.digimat.in/nptel/courses/video/111105093/L01.html (PDE)
2. https://www.youtube.com/watch?v=JoyvDWZ0aMY (Beta & Gamma Functions)
3. https://www.youtube.com/watch?v=mIeeVrv447s (Multiple Integrals)
4. https://www.youtube.com/watch?v=M_Irtxhbq3E (Vector Differentiation)
5. https://www.youtube.com/watch?v=EtA0CK8SwkI (Vector Integral Theorems)

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

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

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

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 path way mechanisms and synthesis of drugs. Listing out various types of fuels and understanding the concept of calorific value and combustion.

MODULE I: Water and its treatment
[10 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: [10 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 $[Ni (CO)_4]$) fields - magnetic properties of complexes. Band structure of solids and effect of doping on conductance.

MODULE III: Electrochemistry and Corrosion
A. Electrochemistry: [7 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: [7 Periods]

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, Reaction mechanism & synthesis of drug [12 Periods]
molecules and NMR spectroscopy:

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

Introduction to Spectroscopy, Basic concepts of nuclear magnetic resonance spectroscopy, chemical shift and spin-spin splitting.

MODULE V: Fuels and Combustion [8 Periods]

Fuels: Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking – types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG.
Combustion: Definition, Calorific value of fuel – HCV, LCV; Calculation of air quantity required for combustion of a fuel. Determination of calorific value by Junkers gas calorimeter-Numerical problems on combustion.

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:

a) **Concerned Website links:**

1. https://books.google.co.in/books?isbn=0070669325 (Engineering chemistry bySivasankar).

2. https://www.youtube.com/watch?v=yQUD2vzfgh8 (Hot dipping Galvanization).

3. https://archive.org/stream/VollhardtOrganicChemistryStructureFunction6th/Vollhardt_Organic_Chemistry_Structure_Function_6th_djvu.txt.

b) **Concerned Journals/Magazines links:**

1. http://americanhistory.si.edu/fuelcells/sources.htm (Fuel Cell Information Sources)

2. https://www.abctlc.com/downloads/courses/WaterChemistry.pdf (Water Chemistry)

c) **NPTEL Videos:**

1. nptel.ac.in/courses/113108051/ (corrosion & electrochemistry web course)

2. https://www.youtube.com/watch?v=V7-8EOfZKeE (Stereochemistry)

Course Outcomes:

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

2. Understand water treatment, specifically hardness of water and purification of water by various methods.

3. Analyze microscopic chemistry in terms of atomic and molecular orbital's splitting and band theory related to conductivity.

4. Acquire knowledge on electrochemical cells, fuel cells, batteries and their applications.

5. Acquire basic knowledge on the concepts of stereochemistry, reaction mechanisms and interpretation of NMR in organic molecules.

6. Acquire the knowledge of various fuels and identify a better fuel source of less pollution.

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech. II Semester	
Code: A0201	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P
Credits: 3	(Common for EEE, ECE, CSE and IT)	3	-	-

Prerequisites: Nil

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

MODULE I: DC Circuits   9 Periods

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

MODULE II: AC Circuits   9 Periods

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

MODULE III: Introduction to Electrical Machines   10 Periods

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

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

MODULE IV: P-N Junction Diode   10 Periods

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

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

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

MODULE V: Bipolar Junction Transistor (BJT):   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.SuryaKalavathi, Ramana Pilla, Ch. Srinivasa Rao, Gulinindala Suresh, **" Basic Electrical and Electronics Engineering"**, S.Chand and Company Limited, New Delhi, 1st Edition, 2017.
2. R.L.Boylestad and Louis Nashlesky, **"Electronic Devices & Circuit Theory"**, Pearson Education, 2007.

References
1. V.K. Mehtha and Rohit Mehta, "Principles of Electrical Engineering and Electronics", S.Chand& Co., 2009.
2. Jacob Milliman, Christos C .Halkias, Satyabrata Jit (2011), "Electronic Devices and Circuits", 3 rd edition, Tata McGraw Hill, New Delhi.
3. Thomas L. Floyd and R. P. Jain, "Digital Fundamentals", Pearson Education, 2009.
4. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 2008.
5. Nagrath I.J. and D. P. Kothari, "Basic Electrical Engineering", Tata McGraw Hill, 2001.
6. Mittle N., "Basic Electrical Engineering", Tata McGraw Hill Education, New Delhi, 2nd Edition, 2005.

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

Course Outcomes:
1. At the end of the course, students should be able to
2. Apply basic laws in electrical circuit.
3. Analyze the single phase circuits.
4. Comprehend the construction and Operation of DC and AC machines.
5. Know the practical importance of Diode and its characteristics.
6. Recognize the construction and operation of BJT and JFET.

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. V Semester	
Code: A0401	DIGITAL ELECTRONICS	L	T	P
Credits: 3		2	1	-

Prerequisites: 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,**"DigitalDesign"**,PHI, 3rd Edition, 2009.
3. A.AnandKumar,**"Switching Theory and Logic Design"**,PHI 2nd Edition, 2014.
4. John F.Wakerly, **"Digital Design Principles & Practices"**, PHI/ Pearson Education Asia, 3rd Ed., 2005.

References
1. Stephen Brown and ZvonkaVramesic, **"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
5. http://nptel.ac.in/courses/117106086/1
6. http://nptel.ac.in/courses/117105080/
7. 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 Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**ProgrammeOutcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3								3	1		1
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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech.	
Code: A0B18	**ENGINEERING CHEMISTRY LAB** (Common for ECE, EEE, CE, ME and Min.E)	**L**	**T**	**P**
Credits: 1		**-**	**-**	**2**

Course objectives:

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

List of Experiments:

1. Calibration of Volumetric apparatus.
2. Estimation of Total Hardness of water by EDTA Method.
3. Estimation of pH of an acid (Three methods).
4. Estimation of alkalinity of water.
5. Estimation of strength of an acid by Conductometry.
6. Estimation of strength of an acid by Potentiometry.
7. Estimation of Mn^{+2} ion in $KMnO_4$ by Colorimetry.

8. Determination of viscosity of given liquids by Ostwald's viscometer.
9. Determination of surface tension of given sample using stalagmometer.
10. Estimation of iron (II) by dichrometry.
11. Determination of rate constant of hydrolysis of methyl acetate.
12. Preparation of Aspirin.

Course outcomes:

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech. II Semester		
Code: A0202	**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

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

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE	B.Tech. V Semester		
Code: A0402	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.

List of Experiments:

Introduction to Verilog/VHDL and Design of all the logic gates

1. Design of Half adder, Full adder using 3 modeling styles
2. Design of Half Subtractor, Full Subtractor using 3 modeling styles
3. Design of 4X16 Decoder using two 3x8 Decoders
4. Design of 8-to-3 encoder (without and with priority).
5. Design of Multiplexer &Demultiplexer.
6. Design of comparator
7. Design of 4-bit binary to gray converter viceversa,
8. Design of BCD to Excess-3 code converter and viceversa
9. Design of flip flops: SR, D, JK, T.
10. Design of 4-bit binary up/down counter.
11. 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, students will be able to

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

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

2020-21 Onwards (MR-20)	MALLAREDDYENGINEERINGCOLLEGE		B.Tech. IISemester	
Code:A0553	**BASIC PYTHON PROGRAMMING LAB** (Common for CE,EEE,ME,ECE,MiE)	L	T	P
Credits:2		-	-	4

Prerequisites: NIL

Course Objectives: To be able to introduce core programming basics and program design with functions using Python programming language, understand a range of Object-Oriented Programming, as well as in-depth data and information processing techniques.

Software Requirements: Python

List of Programs:

1. a) Write a program to demonstrate different number data types in Python.
   b) Write a program to perform different Arithmetic Operations on numbers in Python.
2. a) Write a program to create, concatenate and print a string and accessing sub-string from a given string.
   b) Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
3. Write a program to create, append, and remove lists in python.
4. Write a program to demonstrate working with tuples in python.
5. Write a program to demonstrate working with dictionaries in python.
6. a) Write a python program to find largest of three numbers.
   b) Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula : c/5 = f-32/9]
7. a) Write a Python script that prints prime numbers less than 20.
   b) Write a python program to find factorial of a number using Recursion.
8. a) Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
   b) Write a python program to define a module and import a specific function in that module to another program.
9. a) Write a program that defines and print a matrix.
   b) Write a program to perform addition of two square matrices.
   c) Write a program to perform multiplication of two square matrices.
10. a) Write a function dups to find all duplicates in the list.
    b) Write a function unique to find all the unique elements of a list.
11. a) Write a program to print each line of a file in reverse order.
    b) Write a program to compute the number of characters, words and lines in a file.
12. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.

TEXT BOOKS:

1. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson Publications.

2. Mark Lutz," Learning Python", Orielly Publishers

REFERENCES:

1. Allen Downey, "Think Python", Green Tea Press

2. W. Chun, "Core Python Programming", Pearson.

3. Kenneth A. Lambert, "Introduction to Python", Cengage

Course Outcomes:

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

1. **Develop** simple applications using python.

2. **Make use of** functions in python scripts.

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

CO- PO, PSO Mapping

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE	B.Tech. III Semester		
Code: A0B08	**COMPLEX VARIABLES AND NUMERICAL METHODS** (Common for EEE & ECE)	L	T	P
Credits: 3		3	-	-

Prerequisites: Differentiation, Partial differentiation, Integration

Course Objectives:

1. To learn the concept of analyticity of a function
2. To learn the concept of evaluation of Integrals
3. To learn the Power series expansions of complex functions and evaluation of contour integrals.
4. The various numerical techniques which are indispensable tools to solve many algebraic and transcendental equations and Interpolation.
5. Numerical methods of solving the ordinary differential equations and Numerical Integration.

MODULE I: Functions of Complex variable   **[12 Periods]**
Introduction, Complex functions and its representation on Argand plane, Concepts of limit, Continuity, Differentiability, Analyticity, Cauchy-Riemann conditions, Harmonic functions, Milne – Thompson method.

MODULE II: Complex Integration   **[9 Periods]**
Line integral, Evaluation along a path and by indefinite integration, Cauchy's integral theorem, Cauchy's integral formula, Generalized integral formula.

MODULE III :   Power series expansions of complex functions& Contour Integration
                                                                      [13 periods]
(A) 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.
(B) Residue, Evaluation of residue by formula and by Laurent series, Residue theorem,

Evaluation of integrals by indentation Improper real integrals (a) $\int\limits_{-\infty}^{\infty} f(x)dx$ (b)

$\int\limits_{0}^{2\pi} f(\cos\theta, \sin\theta)d\theta$

MODULE IV: : Algebraic and Transcendental equations and Interpolation [14 periods]
(A)   Solution of Algebraic and Transcendental Equations: Introduction-Errors, types of errors. Bisection Method, Method of False Position. The Iteration Method – Newton-Raphson Method
(B) Interpolation: 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 – V:Numerical solution of Ordinary Differential Equations and Numerical Integration [12 periods]
Numerical solution of Ordinary Differential Equations Introduction, Solution by Taylor's series method, Picard's Method of successive Approximations, Euler's Method, Modified Euler's Method, Runge-Kutta Methods.
Numerical Integration: Trapezoidal Rule, Simpson's 1/3rd Rule, Simpson's 3/8 Rule.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R K Jain SRK Iyengar ,Advanced engineering mathematics, Narosa publications.
3. M . K Jain, S R K Iyengar, R.K Jain, Numerical Methods for Scientific and Engineering Computation, New age International publishers.

Reference Books:

1. Murray Spiegel, Complex variables by Schamus outline series.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley publications.
3. S.S.Sastry, **Introductory Methods of Numerical Analysis**,5th Edition,PHI Learning Private Limited

E – RESOURCES:

6. http://nptel.ac.in/courses/104101002/downloads/lecturenotes/module1/chapter6.pdf (Numerical Differentiation and Integration)
7. https://www.youtube.com/watch?v=6vs-pymcsqk (Regula Falsi Method and Newton Raphson Method)
8. https://www.youtube.com/watch?v=1pJYZX-tgi0 (Interpolation)
9. https://www.youtube.com/watch?v=Atv3IsQsak8&pbjreload=101 (Numerical Solution of ODE)
10. https://www.youtube.com/watch?v=iviiGB5vxLA (Numerical Integration)
11. https://www.youtube.com/watch?v=HVHtGVOQySI (Functions of Complex Variables)
12. https://www.youtube.com/watch?v=v4yV2t4KBhs (Complex Integration)

NPTEL:

4. https://www.youtube.com/watch?v=WbmLBRbp0zA (Bisection Method)
5. https://www.youtube.com/watch?v=0K6olBTdcSs (Regula Falsi and Newton Raphson Method)
6. https://www.youtube.com/watch?v=KSFnfUYcxoI (Interpolation)
7. https://www.youtube.com/watch?v=QugqSa3Gl-w&t=2254s (Numerical Solution of ODE)

8. https://www.youtube.com/watch?v=NihKCpjx2_0&list=PLbMVogVj5nJRILpJJO7K rZa8Ttj4_ZAgl
(Numerical Solution of ODE)
9. https://www.youtube.com/watch?v=hizXlwJO1Ck (Numerical Integration)
10. https://www.youtube.com/playlist?list=PLNKx0RorxX44HBsItvZP5CzFX1qCQOwp 5 (Complex Analysis)

Course Outcomes:

1. The student will be able to apply the concept of analyticity of a function
2. The student will be able to evaluate of Integrals
3. The student will be able to find Power series expansions of complex functions and evaluation of contour integrals.
6. The student will be able to find the root of a given equation by various methods and estimate the value for the given data using interpolation.
7. The student will be able to find the numerical solutions for a given ODE's and evaluations of integrals using numerical techniques.

CO- PO Mapping

COS	CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak											
	Programme Outcomes(POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	3	3				2			1
CO2	2	2	2	3	2				2			1
CO3	2	2	2	3	2				2			1
CO4	3	2	2	3	3				2			2
CO5	2	2	2	3	3				2			2

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. III Semester	
Code: A0403	ANALOG ELECTRONICS		L	T	P
Credits: 3	(Common for EEE & ECE)		3	-	-

Prerequisites: Applied Physics, Basic Electrical and Electronic Engineering

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.

References
1. Robert Boylestad, LowisNashelsky, "Electronic Devices and Circuit Theory", Prentice Hall of India, 5th Edition, 1993.
2. David. A. Bell, "Electronic Devices and Circuits", Prentice Hall of India, 4th Edition, 1986.
3. G. K. Mithal, " Electronic Devices and Circuits", Khanna Publications, 22nd Edition,1999.
4. Theodore. F. Bogart Jr. Jeffrey S. Beasley, Guillermo Rico, "Electronic Devices and Circuits", Pearson Education (India), 6th edition , 2004.

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
6. http://nptel.ac.in/courses/117101106/1
7. http://sureshq.blogspot.in/2015/11/click-bellow-link-to-download-this.html
8. http://www.aiet.edu.eg/FeedbackOscillatorCircuits.pdf
9. http://www.cs.tut.fi/kurssit/TLT-8016/Chapter9.pdf
10. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=4807109
11. http://www.springer.com/engineering/electronics/journal/34
12. http://nptel.ac.in/courses/122106025/1

COURSE OUTCOMES
At the end of the course, students should 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 Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**ProgrammeOutcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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			

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech. III Semester	
Code: A0313	FLUID MECHANICS AND HYDRAULIC MACHINES (Common for EEE and Min.E.)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objectives:

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

MODULE I: Fluid statics   **10 Periods**

Dimensions and units: physical properties of fluids- specific gravity, viscosity surface tension- vapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure –measurement of pressure- Piezometer, U-tube and differential manometers.
Hydro static forces on plane and curved surfaces. Buoyancy and floatation: Meta center, stability of floating body, Submerged bodies, Calculation of metacentric height.

MODULE II: Fluid Kinematics & Fluid Dynamics   **10 Periods**

Fluid kinematics: Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform & non uniform, laminar & turbulent, rotational and irrotational flows-equation of continuity for one dimensional flow. Velocity potential and stream function – flow net.
Fluid dynamics : Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, Measurement of flow: pitot tube, venturimeter and orifice meter, Flow nozzle, Turbine flow meter, momentum equation and its application on pipe bend.

MODULE III: Closed Conduit Flow & Boundary Layer Concepts   **10 Periods**

A: Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses i pipes- pipes in series and pipes in parallel - total energy line - hydraulic gradient line.
B: Boundary Layer Concepts: Definition, thickness, characteristics along thin plate, laminar and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.

MODULE IV: Turbo machinery and Hydraulic Turbines   **09 Periods**

Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, workdone and efficiency, flow over radial vanes.
Hydraulic Turbines : Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, workdone, efficiencies, hydraulic design – draft tube theory - functions and efficiency. Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

MODULE V: Centrifugal Pumps & Reciprocating Pumps   **09 Periods**

Centrifugal pumps: Classification, working, workdone – manomertic head- losses and efficiencies

specific speed- pumps in series and parallel-performance characteristic curves, NPSH. Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

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

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

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

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech. III Semester	
Code: A0203	ELECTRICAL CIRCUIT ANALYSIS AND SYNTHESIS	L	T	P
Credits: 3		2	1	-

Prerequisites: Basic Electrical and Electronics Engineering

Course Objectives: This course deals about the network theorems and three phase circuits. It also emphasis on network parameters, synthesis and transient analysis of electrical network. It is the foundation for all courses of the Electrical and Electronics Engineering discipline.

MODULE I   Network Theorems and Magnetic Circuits   13 Periods

Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millman's and Compensation and Tellegen's theorems - Statement of theorems and numerical problems in DC and AC Networks.
Magnetic Circuits – Faraday's laws of electromagnetic induction – concept of self and mutual inductance – dot convention – coefficient of coupling – composite magnetic circuit - Analysis of series and parallel magnetic circuits. Hysteresis and Eddy currents.

MODULE II   Resonance and Three Phase Circuits   12 Periods

Resonance: Resonance – Series & parallel circuits, concept of bandwidth and Q factor.
Locus diagrams: Series R-L, R-C, R-L-C Circuits.
Three Phase Circuits: Introduction to three phase circuits – types of connection - Star and delta– Relation between line and phase voltages and currents in balanced systems – Analysis of balanced and Unbalanced three phase circuits.

MODULE III   Two Port Network Parameters   13 Periods

A: Open circuit impedance (Z) network parameters, Short circuit admittance(Y) network parameters –Transmission (ABCD)
B: Inverse Transmission ($A^1B^1C^1D^1$) and Hybrid parameters – Relationship between two port network parameters – Reciprocity and Symmetry concepts of two port network parameters.

MODULE IV   Transient Analysis (Both AC & DC Networks)   13 Periods

Introduction - Initial conditions of all elements-Transient response of Series R-L, R-C and R-L-C circuits (Independent Sources Only) – Solution using Laplace transform approach.

MODULE V   Network Synthesis   13 Periods

Hurwitz Polynomials, Positive Real Functions, Frequency Response of Reactive One-Port network, Synthesis of Reactive One Port by Foster's Method, Synthesis of Reactive One Port By Cauer Method, Synthesis of RL, RC and LC One Port Networks by Foster and Cauer Methods.

Text Books

1. William H. Hayt and Jack E. Kimmerly, **"Engineering Circuit Analysis"**, McGraw Hill Company, 6th Edition, 2005.
2. Joseph Edminister and Mahmood Nahvi, **" Electric Circuits"**, Schaum Outline Series, Tata McGraw Hill, 3rd Edition, 1999.

References

1. Vanvalken burg, "**Network Analysis**", Prentice Hall of India, 3rd Edition, 1994.
2. A. Chakrabarthy, "**Circuit Theory**", Dhanpat Rai & Co., 6th Edition, 2010.
3. N. N. Parker Smith, "**Problems in Electrical Engineering**", Prentice Hall of India, 9th Edition, 1981.
4. Sudhakar A. and Shyammohan S.P., "**Circuits and Networks: Analysis and Synthesis"**, Tata McGraw Hill, New Delhi, 2004.
5. Arumugam M. and Premkumar N., **"Electric Circuit Theory"**, Kanna Publishers, New Delhi, 1991.

E - Resources

1. http://www.ece.ucsb.edu/Faculty/rodwell/Classes/ece2c/resources/two_port.pdf
2. http://nptel.ac.in/courses/117106108/
3. http://nptel.ac.in/courses/108102042/
4. https://www.vssut.ac.in/lecture_notes/lecture1423722706.pdf

Course Outcomes

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

1. Analyze electrical circuits using network theorems and magnetic circuits.
2. Apply the concepts of three phase electrical circuits to electrical machines and power systems and understand the resonance concepts.
3. Evaluate the different parameters of a given two port electrical network.
4. Analyze the transient response of a network for the given input.
5. Construct the electrical circuit for the given impedance, admittance functions.

COs	\multicolumn{12}{c}{**Programme Outcomes(POs)**}				\multicolumn{3}{c}{**PSOs**}		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE	B.Tech. III Semester		
Code: A0204	ELECTROMAGNETIC FIELDS	L	T	P
Credits: 3		3	-	-

Prerequisites: Applied Physics.

Course Objectives: This course deals about the electrostatics, electric potential, energy density and their applications. It emphasis on magneto statics, magnetic flux density scalar and vector potential and its applications. It also deals with the time varying fields along with their mathematical formulations.

MODULE I   Introduction to Electrostatics   10 Periods

Sources and effects of electromagnetic fields – Vector fields – Different co-ordinate systems– Divergence theorem –Stroke's theorem. Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge –Electric Potential– Properties of potential function – Potential gradient – Gauss' s law – Application of Gauss's Law – Maxwell's first law. Laplace's and Poison's equations – Solution of Laplace's equation in one variable.

MODULE II   Conductors, Dielectric & Capacitance   10 Periods

Electric dipole – Dipole moment – potential and EFI due to an electric dipole. Conductors and Insulators. Introduction to permanent magnets, their characteristics and applications. Electric field inside a dielectric material – polarization – Dielectric – Conductor and Dielectric – Dielectric boundary conditions, Capacitance – Capacitance of parallel plate and spherical and co-axial capacitors with composite dielectrics – Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm's law in point form – Equation of continuity.

MODULE III   Magneto Statics, Ampere's Circuital Law   10 Periods

A: Static magnetic fields – Biot-Savart's law – Oesterd's experiment - Relation between magnetic flux, magnetic flux density and Magnetic field intensity (MFI) – MFI due to a straight current carrying filament
B: MFI due to circular, square and solenoid current – Carrying wire –and MFI – Maxwell's second Equation. Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament – Maxwell's third equation.

MODULE IV   Force in Magnetic Fields, Magnetic Potential   9 Periods

Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field.Scalar Magnetic potential and its limitations – vector magnetic potential and its properties – vector magnetic potential due to simple configurations – vector Poisson's equations.

MODULE V   Inductance, Time Varying Fields   9 Periods

Self and Mutual inductance – Neumann's formulae – determination of self-inductance of a solenoid, toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field. Time varying fields – Faraday's laws of electromagnetic induction – Maxwell's fourth equation – Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell's equations for time varying fields – Displacement current – Poynting Theorem and Poynting vector.

Text Books
1. William H. Hayt& John. A. Buck, **"Engineering Electromagnetics"**, McGraw-Hill Companies, 7th Edition, 2012.
2. Mathew N. O. Sadiku, **"Principles of Electromagnetics"**, Oxford University Press Inc. 4th Edition, First India Edition, 2009.

References
1. J P Tewari, **" Electromagnetics"**, Khanna Publishers, 2nd Edition, 2005.
2. J. D Kraus,**" Electromagnetics"**, Mc Graw-Hill Inc, 4th Edition, 1992.
3. S. Kamakshaiah, **"Electromagnetic Fields"**, Right Publishers, 2007.
4. K.A. Gangadhar, P.M. Ramanathan, **"Electromagnetic Field Theory (Including Antennas and Wave Propagation)"**, Khanna Publications, 16th Edition, 2007**.**
5. Bhag Singh Guru and Hüseyin R. Hiziroglu, **"Electromagnetic Field Theory Fundamentals"**, Cambridge University Press, 2nd Revised Edition, 2009.

E - Resources
1. http://www.tandfonline.com/toc/tewa20/current
2. https://www.eeweb.com/passives
3. nptel.ac.in/courses/108106073/

Course Outcomes
At the end of the course, students will be able to
1. State and apply the laws of electromagnetic fields to practical circumstances.
2. Determine the electric field intensity resulting from various configurations of charge distribution.
3. Analyze the concepts of magneto static field and solve the magneto static field problems using laws associated with it.
4. Apply the concept of magnetic fields to compute magnetic potential in scalar and vector forms.
5. Apply the concept of electro dynamic fields and analyze the behavior of conductors using laws associated with it.

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech. III Semester		
Code: A0554	**FUNDAMENTALS OF DATA STRUCTURES LAB**		**L**	**T**	**P**
Credits: 2	**(Common for CE, EEE, ME, ECE, MiE)**		**-**	**-**	**4**

Prerequisites: C Programming.

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: C

List of Programs:

1 Write a program to create one dimensional array, with the following operations:
   a) Insertion
   b) Deletion
   c) Display the elements
   d) Count number of elements
2 Write a program to create a single linked list, with the following operations:
   a) Insertion
   b) Deletion
   c) Display the elements
   d) Count number 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 Arrays
10 Write a recursive program to create a Binary Tree of integers, traverse the tree in preorder, in order and post order 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)

TEXTBOOKS

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.

REFERENCES

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 non linear data structures such as trees and graphs.

COs	Programme Outcomes(POs)												PSOs		

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech. III Semester		
Code: A0407	ANALOG ELECTRONICS LAB		L	T	P
Credits: 1	(Common for EEE & ECE)		-	-	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 Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes(POs)**												**PSOs**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3		2			1	1	2	1		1
CO2	3	3	3	3	3		2			1	1	2	1		1
CO3	3	3	3	3	2		1			1		2	1		1
CO4	3	3	3	3	3		2			1	1	2	1		1
CO5	3	3	3	3	3		2			1	1	2	1		1

Course Objectives:

To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics and simulation of time response.

List of Experiments:
1. Verification of Thevenin's & Norton's Theorems for the given circuit.
2. Verification of maximum Power Transfer Theorem for Excitation for the Given 'T' Network.
3. Verification of Super Position Theorem for given electrical Network.
4. Verification of Compensation Theorem for DC Excitation for the given 'T' Network.
5. Verification of Reciprocity Theorem for DC Excitation for the given electrical Network.
6. Experimental determination of Quality Factor, Bandwidth and resonant frequency for the given Series & Parallel RLC Circuit.
7. Experimental Determination of Z & Y Parameters for the given 'T' network.
8. Experimental determination of Transmission & Hybrid Parameters for the given two port network.

Simulation Experiments:
9. Determination of branch currents in a given electrical circuit.
10. Determination of node voltages of a given electrical network.
11. Determination of transient response of a given RL & RC Circuit.
12. Determination of load current and voltage for a given electrical Network.

Course Outcomes

At the end of the course, students should be able to
1. Reduce the given complex circuit to simple circuit by applying theorems and can verify the theoretical and practical outputs.
2. Find the impedance value of the given circuit at which the maximum power is transferred and also confirms with the practical results.
3. Design a circuit to accept or reject a particular frequency using resonance principle.
4. Estimate the parameters of the given network.
5. Find the magnitudes of voltages and currents in the given circuit.

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE	B.Tech. III Semester		
Code: A00M2	**ENVIRONMENTAL SCIENCE**	L	T	P
Credits: NIL		2	-	-

Prerequisites: Nil
Course Objectives:
An interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences, including geo systems, biology, chemistry, economics, political science and international processes. The ability to work effectively as a member of an interdisciplinary team on complex problem of environment.

Module I: Ecosystems   **5 Periods**

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

Module II: Natural resources, Biodiversity and Biotic resources:
A: Natural Resources: **5 Periods**
Classification of Resources: Living and Non-Living resources, Renewable and non-renewable resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources–case studies. Energy resources: growing energy needs, introduction to renewable and non renewableenergy sources.

B: Biodiversity and Biotic resources: **4 Periods**
Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Threats to Biodiversity (habitat loss, poaching of wildlife, man-wild life conflicts). Conservation of Biodiversity (In-situ and Ex-situ conservation),
Activity: case studies.

Module III: ENVIRONMENTAL POLLUTION 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**
Green houseeffect, 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. ErachBharucha,**"Environmental studies"** University Grants Commission, and University Press,I Edition, 2005.
2. M. Anji Reddy **"Text book of Environmental Science and Technology"** 3rd Edition, 2007
3. Richard T.Wright,**"Environmental Science: towards a sustainable future"** PHL Learning, Private Ltd. New Delhi, 2nd Edition., 2008
4. Gilbert McMasters and Wendell P.Ela,**"Environmental Engineering and science"**,3rd Edition, PHI Learning Pvt. Ltd.,2008.

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

Course Outcomes:
After completion of the course, students will be able to:
1. To enable the students to realize the importance of ecosystem, its structure, services. To make the students aware of Different natural functions of ecosystem, which helps to

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A00A2	**INTERNSHIP - I**	L	T	P
Credits: 0		-	-	-

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A00A4	NPTEL - I	L	T	P
Credits: 0		-	-	-

2020-21 Onwards (MR-20)	**MALLA REDDY ENGINEERING COLLEGE**	**B.Tech IV Semester**		
Code:A0H08	**ENGINEERING ECONOMICS AND ACCOUNTANCY** (Common for EEE, ECE, CSE and IT)	**L**	**T**	**P**
Credits: 3		**3**	**-**	**-**

Prerequisites: 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   9Periods
 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   9Periods
 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.

References

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

Prerequisites: 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.

References
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.

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech. IV Semester	
Code: A0206	POWER GENERATION AND DISTRIBUTION	L	T	P
Credits: 3		3	-	-

Prerequisites: Engineering Chemistry, Electrical Circuit Analysis and Synthesis

Course Objectives: This course deals about the layout of different types of power stations and various power distribution systems. It also emphasis on the importance of economic aspects & tariff.

MODULE I   Power Stations   10 Periods
Thermal Power Stations: Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses. Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and Cooling towers.
Nuclear Power Stations: Nuclear Fission and Chain reaction - Nuclear fuels - Principle of operation of Nuclear reactor. Reactor Components: Moderators, Control rods, Reflectors and Coolants. Radiation hazards: Shielding and Safety precautions. Types of Nuclear reactors and brief description of PWR, BWR and FBR.
Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only).

MODULE II   Hydroelectric Power Stations and Turbines   10 Periods
Hydroelectric Power Stations: Elements of hydro electric power station – Types - Concept of pumped storage plants - Storage requirements, mass curve (explanation only) estimation of power developed from a given catchment area - Heads and efficiencies.
Hydraulic Turbines: Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine - Working proportions, work done, efficiencies, hydraulic design - Draft tube theory - Functions and efficiency.

MODULE III   Air & Gas Insulated Substations   9 Periods
 A: Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.
B: Introduction to Gas insulated substations, Single line diagram of gas insulated substations, bus bar, Construction aspects of GIS, Maintenance and Advantages of GIS, Comparison of Air insulated substations and Gas insulated substations.

MODULE IV   D.C. and A.C Distribution Systems   10 Periods
Classification of Distribution Systems - Comparison of DC vs AC Distribution Systems, Under Ground vs Over Head Distribution Systems - Requirements and Design features of Distribution Systems. Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor. Voltage Drop Calculations (Numerical

Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

MODULE V   **Economic Aspects of Power Generation & Tariff**   **9 Periods**
                 Methods

Define - Load curve, Load duration and Integrated load duration curves - Load, Demand, Diversity, Capacity, Utilization and Plant Use Factors - Numerical Problems. Costs of Generation and their division into Fixed, Semi-fixed and Running Costs.Desirable Characteristics of a Tariff Method. Tariff Methods: Flat Rate, Block-Rate, two-part, three – part and power factor tariff methods and Numerical Problems**.**

Text Books
1. V.K Mehta and Rohit Mehta, **"Principles of Power Systems",** S.Chand& Company Ltd, New Delhi, 2004.
2. PSR. Murty**, "Electrical Power Systems",**Butterworth-Heinemann Publications, 2017.

References
1. R. K. Rajput, **"A Text Book of Power System Engineering"**, Laxmi Publications (P) Limited, 2nd Edition, 2016.
2. S.N.Singh , **"Electrical Power Generation, Transmission and Distribution"** , PHI Learning Pvt. Ltd., 2nd Edition, 2008.
3. C.L.Wadhwa, **"Electrical Power Systems"**, New Age international (P) Limited, 6th Edition, 2010.
4. Dr.B.R.Gupta, **"Generation of Electrical Energy"** , S.Chand& Company Ltd, 6th Edition, 2008.
5. G.Ramamurthy, **"Handbook of Electrical power Distribution"**, Universities Press, 2013.

E - Resources
1. https://www.electrical4u.com/power-plants-types-of-power-plant/
2. http://spectrum.ieee.org/energy
3. http://nptel.ac.in/courses/108102047/

Course Outcomes
At the end of the course, students will be able to
1. Understand the layouts of Thermal Power station, Nuclear Power Plant and Gas Power plant.
2. Demonstrate the operation of hydro electric power plants and turbines.
3. Comprehend about various types of substations and its equipment.
4. Analyze the voltage drops in DC and AC distribution systems.
5. Evaluate the cost of generation and tariff.

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech. IV Semester	
Code: A0207	DC MACHINES AND TRANSFORMERS	L	T	P
Credits: 3		2	1	-

Prerequisites: Electrical Circuits Analysis and Synthesis, Electro Magnetic Fields.
Course Objectives:
This course introduces the basic concepts of rotating machines. It emphasis on construction and operation of DC generators, DC Motors, Single phase transformers, Auto transformer and poly phase transformers. It also deals about the methods to evaluation the performance of DC Generators, DC Motors and Single phase transformers.

**MODULE I   Electro Magnetic Induction & Basic Concepts in   12 Periods
                    Rotating Machines**

Introduction to magnetic circuits – Magnetically induced EMF and force – AC operation of magnetic circuits – Hysteresis & Eddy Current Loss. Energy in magnetic systems – Field energy & Mechanical force – Single and Multiple excited systems. MMF of distributed windings – Magnetic fields in rotating machines.

MODULE II   DC Generators   13 Periods

Construction & Principle of Operation of DC Generators – E.M.F Equation- Types of D.C Generators – Armature reaction – Methods of decreasing the effects of armature reaction – Compensating winding – Commutation – Methods of improving commutation. OCC - Voltage build up in generators - Critical field resistance and critical speed - Causes for failure to self excite and Remedial measures – Load characteristics of shunt, series and compound generators.

MODULE III   DC Motors   13 Periods

A: Principle of operation – Back E.M.F. - Torque equation – Characteristics and application of shunt, series and compound motors and Speed control.
B: 3 point and 4 point starters – Constant and Variable losses - Calculation of efficiency – Condition for maximum efficiency – Electric Braking – Brake test – Swinburne's test – Hopkinson's test.

MODULE IV   Single Phase Transformers   13 Periods

Types - Constructional details - EMF equation - Operation on no load and load - Phasor diagrams – Equivalent circuit - Losses and efficiency - Regulation. All day efficiency - Effect of frequency & supply voltage on core losses. OC and SC tests - Sumpner's test - Predetermination of efficiency and regulation - Separation of losses test - Parallel operation with equal and unequal voltage ratios.

MODULE V   Auto Transformers & Poly-Phase Transformers   13 Periods

Auto transformers - Comparison with two winding transformers - Poly-phase transformers – Poly-phase connections - Y/Y, Y/Δ, Δ /Y, Δ / Δ - Open -Scott connection - Three winding transformers – Tertiary windings - Determination of Z_p, Z_s and Z_t. Inrush Current - Off load and on load tap changing.

Text Books
1. J.B.Gupta, **"Theory & Performance of Electrical Machines"**, S.K. Kataria& Sons, 15th Edition, 2015.
2. I.J.Nagrath&D.P.Kothari, **"Electric Machines"** ,Tata Mc Graw Hill, 4th Edition, 2010.

References
1. P.S. Bimbra, **"Electrical Machinery"** , Khanna Publishers, New Delhi, 7th Edition, 2011.
2. A.E.Fitzgerald, C.Kingsley and S. Umans, **"Electric Machinery"**, Tata Mc Graw-Hill Companies, 7th Edition, 2013.
3. Ashfaq Husain, **"Electric Machines"**, Danapati Rai & Co, New Delhi, 2002.
4. S.K.Bhattacharya, **"Electrical Machines"**, Tata McGraw Hill, New Delhi, 4th Edition, 2014.
5. M.V. DESHPANDE, "ELECTRICAL MACHINES", PHI LEARNING PVT. LTD., 2011.

E - Resources
1. https://www.electrical4u.com/electrical-motor-types-classification-and-history-of-motor/
2. https://www.eeweb.com/electromechanical
3. http://nptel.ac.in/courses/108105017

Course Outcomes
At the end of the course, students will be able to
1. Apply the magnetic induction principles and have the awareness on basic concepts of rotating machines.
2. Analyze the performance of DC generators.
3. Analyze the performance of DC motors and starting methods of DC motor.
4. Evaluate the performance of single phase transformer.
5. Understand the construction and operation of poly phase transformers and auto transformer.

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A0208	CONTROL SYSTEMS (Common for EEE & ECE)	L	T	P
Credits: 3		3	-	-

Prerequisites: Engineering Mathematics – I .

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 consideringelectrical 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 addingpoles 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 frequencyDomain**.**

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.

References

1. A.Nagoorkani, "**Control Systems**", RBA Publications, 2nd Edition, 2006.
2. M.Gopal, "**Control System: Principles and Design**", Tata McGraw Hill, 2nd 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.

<table>
<tr><th colspan="15">CO-PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</th></tr>
<tr><td rowspan="2">COS</td><th colspan="14">ProgrammeOutcomes(POs)</th></tr>
<tr><th>PO1</th><th>PO2</th><th>PO3</th><th>PO4</th><th>PO5</th><th>PO6</th><th>PO7</th><th>PO8</th><th>PO9</th><th>PO10</th><th>PO11</th><th>PO12</th><th>PSO1</th><th>PSO2</th><th>PSO3</th></tr>
<tr><td>CO1</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>1</td><td></td><td>1</td></tr>
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<tr><td>CO4</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>1</td><td></td><td>1</td></tr>
<tr><td>CO5</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>1</td><td></td><td>1</td></tr>
</table>

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A0450	**BASIC SIMULATION LAB**	L	T	P
Credits: 1.0		-	-	2

Course Objectives:

To get knowledge on how to write programs for various operations on signals and LTI systems.

List of Experiments

1. Basic Operations on Matrices.

2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit impulses, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.

3. Operation of Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.

4. Finding the Even and Odd parts of Signal Sequence and Real and Imaginary parts of Signal.

5. Convolution between Signals and Sequences.

6. Auto Correlation and Cross Correlation between signals and Sequences.

7. Verification of linearity and Time Invariance Properties of a given Continuous/ Discrete System.

8. Computation of unit Sample, Unit Step and sinusoidal responses of the given LTI System and Verifying its Physical reliability and stability Properties.

9. Gibbs Phenomenon.

10. Finding the Fourier Transform of a given Signal and Plotting its magnitude and Phase Spectrum.

11. Waveform Synthesis using Laplace Transform.

12. Sampling Theorem Verification.

Course Outcomes:

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

1. Generate Different Signals with different Parameters

2. Perform Different Operation on Matrices

3. Implement Different algorithms for small operations on a signal

4. Apply FT & LT on Signals

5. Verify the Different theorems on Signals

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. IV Semester	
Code: A0209	DC MACHINES LAB	L	T	P
Credits: 2		-	-	4

Course Objectives:

To provide students with a strong back ground in different types of electrical machines. To train the students with well practical knowledge of different DC machines.

List of Experiments:

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Load test on DC series generator. Determination of characteristics.
4. Load test on DC compound generator. Determination of characteristics.
5. Hopkinson's test on DC shunts machines. Predetermination of efficiency.
6. Fields test on DC series machines. Determination of efficiency.
7. Swinburne's test and speed control of DC shunt motor. Predetermination of efficiencies.
8. Brake test on DC compound motor. Determination of performance curves.
9. Brake test on DC shunt motor. Determination of performance curves.
10. Retardation test on DC shunt motor. Determination of losses at rated speed.
11. Separations of losses in DC shunt motor.
12. Brake test on DC series motor. Determination of performance curves.

Course Outcomes

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

1. Assess the performance of DC shunt, series and compound motors.
2. Determine the efficiency of DC shunt, series and compound motors.
3. Perform the speed control methods of DC shunt motor.
4. Predetermine the efficiency of DC shunt motor.
5. Determine the performance characteristics of DC machines.

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. IV Semester		
Code: A0555	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB** (Common for CE, EEE, ME, ECE, MiE)		**L**	**T**	**P**
Credits: 2			**-**	**-**	**4**

Prerequisites: 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.

Software Requirements: Java

List of Programs:

1. Write a Java program to implement
    a.   Single Inheritance
    b.   Multilevel Inheritance
    c.   Hierarchical Inheritance
2. Write Java programs that uses the following keywords…
    a.   this
    b.   super
3. Write Java programs that uses the following keywords…
    a.   static
    b.   final
4. Write a Java program to implement
    a.   Method overriding.
    b.   Dynamic method dispatch
5. Write a Java program to implement
    a.   abstract method
    b.   Interfaces
6. Write a Java program to create user defined packages.
7. Write a Java program to implement Exception Handling using
    a.   try-catch clause
    b.   Multiple Catch clauses
    c.   Nested try blocks
8. Write a Java program that
    a.   create user defined Thread by extending Thread class.
    b.   create user defined Thread by implementing Runnable Interface
    c.   create two user defined Threads i.e.Multi Threading using Thread
9. Write a Java program
    a.   checks whether a given string is a palindrome or not.
    b.   for sorting a given list of names in ascending order.
    c.   that reads a line if integers and then displays each integer and the sum of all integers   (use string tokenizer class of java.util).
10. Write a Java program that

a. reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

b. reads a file and displays the file on the screen, with a line number before each line.

TEXT BOOKS:

1. Herbert Schildt, "**Java The complete reference**", TMH, 8th edition, 2011.
2. T. Budd, "**Understanding OOP with Java**", Pearson Education, updated edition, 1998.

REFERENCES:

1. P.J. Deitel and H.M. Deitel, "**Java for Programmers**", Pearson education.
2. P. Radha Krishna, "**Object Oriented Programming through Java**", Universities Press.
3. Bruce Eckel," **Programming in Java**", Pearson Education.
4. S. Malhotra and S. Choudhary," **Programming in Java**", Oxford Univ. Press.

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 exploring strings.
4. Develop applications for concurrent processing using Thread Concept.
5. Capable of handling IO operations using Files.

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

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	3										3	2	
CO2			3		2								2	3	
CO3		2	2		2									2	
CO4			3		3									2	
CO5		2	2		3								2	2	

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. IV Semester		
Code: A00M1	GENDER SENSITIZATION (An Activity-based Course) (Common for CE, EEE, ME, ECE, MiE, CSE, CSE(DS), CSE(AI and ML), CSE(Cyber Security), CSE(IOT) and IT)		L	T	P
Credits: NIL			-	-	2

Prerequisites: NIL

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course:

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

MODULE I: UNDERSTANDING GENDER   [06 Periods]
Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudestowards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

MODULE II: GENDER ROLES AND RELATIONS   [06 Periods]
Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

MODULE III: GENDER AND LABOUR [07 Periods]

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Sharethe Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.-Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming.

MODULE IV: GENDER - BASED VIOLENCE [07 Periods]

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a HumanRights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping withEveryday Harassment- Further Reading: "*Chupulu".*

Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. RebuildingLives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life...."

MODULE V: GENDER AND CULTURE [07 Periods]

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and PopularLiterature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender andPopular Literature - Just Relationships: Being Together as Equals

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

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 from engineering departments.**

> *Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".*
>
> **ESSENTIAL READING**: The Textbook, "*Towards a World of Equals: A Bilingual Textbook onGender" written* by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote,Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu**published by Telugu Akademi, Telangana Government in 2015.**

ASSESSMENT AND GRADING:

* Discussion & Classroom Participation: 20%
* Project/Assignment: 30%
* End Term Exam: 50%

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

REFERENCES:
1. Sen, Amartya. "More than One Million Women are Missing.' New York Review of Books 37.20 (20 December 1990). Print. We Were Making History...' Life Stories of Women in the ToIrmgana People's Struggle. New Delhi: Kali for Women, 1989.

2. TriptiLahiri. "By the Numbers: Where Indian Women Work." Women's Studios Journal (14 November 2012) Available online at: http:// blogs.visj.com/ India real time/2012/11/14/by - the-numbers-where-Indan-womenworkP

3. K. Satyanarayana and Susie Thant (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada htto://harooreollins.co.in/BookDetailasp?FlookCndet,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/10.1177/1077801200006007004 (ISSUES OF VIOLENCE)

5. http://www.nordiclabourjournal.org/emner/likestilling (GENDER AND BIOLOGY)

Course Outcomes:

At the end of the course,

- Students will have developed a better understanding of important issues related to gender in contemporary India.

- Students will be sensitized to 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.

- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.

- Students will acquire insight into the gendered division of labour and its relation to politics and economics.

- Men and women students and professionals will be better equipped to work and live together as equals.

- Students will develop a sense of appreciation of women in all walks of life.

- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

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

CO-PO Mapping

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A00A5	**NPTEL-II**	L	T	P
Credits: 0		-	-	-

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: A00A6	**Co-curricular Activity - I**	L	T	P
Credits: 0		-	-	-

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERINGCOLLEGE		B.Tech. V Semester	
Code:A0210	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION	L	T	P
Credits: 3		3	-	-

Prerequisites: Applied Physics, Electrical Circuits Analysis and Synthesis.

Course Objectives:
This course deals about the different types of instruments to measure electrical quantities, various kinds of bridges for measurement of electrical parameters, measurement of high voltage and current by instrument transformers. It also emphasis on electronic measurements and measurement of physical quantities by transducers.

MODULE I   **Measuring Instruments**   **10 Periods**
Classification of measuring Instruments- Methods of measurements, Block Diagram- Measurement system, Types of Errors, Deflecting, Control and Damping Torques PMMC, Moving iron type instruments- Expression for the deflecting torque and control torque- Extension of range using shunts and series resistance, dynamometer type instruments, Electrostatic Voltmeters.

MEASUREMENT OF POWER AND ENERGY:

Electro–Dynamic wattmeter, Wattmeter methods, Three ammeter and three voltmeter methods-forlow frequency power measurement, Single phase energy meter, Errors and compensation testing by phantom loading using R.S.S. meter- Power factor meters.

MODULE II   **MEASUREMENT OF RESISTANCE, INDUCTANCE**   **10 Periods**
                                    AND CAPACITANCE

Measurement to flow, medium and high resistances– Wheatstone's bridge, Carey Foster's bridge, Kelvin's double bridge, insulation resistance measurement, loss of charge method, Megger,Wagner's Earthing device.

AC BRIDGES:

Inductance measurement-Maxwell'sbridge, Hay's bridge, Anderson's bridge, Owen's bridge **Capacitance measurement** – De-Sauty's bridge, Schering Bridge (LV&HV bridges), Wein's bridge.

MODULE III   **InstrumentTransformers**   **10 Periods**
A: Current and Potential transformers , ratio and phase angle errors, testing and measurement of power using instrument transformers.

B: Potentiometers: Applications and DC potentiometers Principle and operation of D.C. Crompton's potentiometer – standardization– AC polar and coordinate types standardization– Measurement of unknown resistance, current, Calibration of Voltmeters and Ammeters using potentiometers.

MODULE IV   **Electronic Measurements**   **9 Periods**
Electronic Voltmeter, Multimeter, Wattmeter & Energymeter. Time, Frequency and

phaseangle measurements using CRO. Spectrum & Wave analyzer. Digitalcounter, frequency meter and storage oscilloscope.

MODULE V INSTRUMENTATION 9 PERIODS

Transducers, classification & selection of transducers, Calibration, Calibration procedures. Resistance transducer- Strain gauges, inductive transducers-LVDT & Capacitive transducers, piezoelectric and Hall-effect transducers, thermistors, thermocouples, photo-diodes & photo-transistors, encoder type digita transducers. Signal conditioning and telemetry. Basic concepts of smart sensors and application. Data Acquisition Systems–Introduction and block diagram.

TEXT BOOKS

1. A.K. Sawhney, **"A Course in Electrical and Electronic Measurements and Instrumentation"**, DhanpatRai & Sons Publications, NewDelhi, 2012.

2. W. Golding&F. C. Widdis,**"Electrical Measurement & Measuring Instrument"**, 5thEdition, A.H.Wheeler& Co.,India, 2011.

REFERENCES

1. Jones, B.E, **"Instrumentation Measurement and Feedback"**,TataMcGrawHill, 1986.
2. Helfrick Albert D, Cooper William. D, **"Modern Electronic Instrumentation and Measurement Techniques",** Prentice-Hall of India, Reprint 1992.
3. J.B.Gupta,**"A Course in Electronic and Electrical Measurements"**, S. K. Kataria & Sons, Delhi, 2003.
4. Doebelin E.O.and Manik D.N., **"Measurement Systems– Applications and Design"**, Tata McGrawHill Education Pvt.Ltd.,Special Indian Edition, 2007.
5. D.V.S.Moorthy,**"Transducers and Instrumentation"**,Prentice Hall of India Pvt.Ltd.,2007.

E- RESOURCES

1. https://www.electrical4u.com/electrical-measuring-instruments-types-accuracy-precision-resolution-speed/
2. https://www.eeweb.com/test-and-measure
3. https://www.youtube.com/watch?v=moSUpIRCKMk

COURSE OUTCOMES

At the end ofthe course,students should be able to
1. Understand the methodsof measurementand its types.
2. Determine thecircuitparameters(R,Land C) usingbridges.
3. Understand the principleof operationofcurrent and potential transformers
4. Comprehend the construction, operation and application of voltmeter, wattmeter & energy meter and understand the measurement of parameters using CRO.
5. Explain the function and working of various transducers for measuring physical quantities.

COS	CO-POMapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak

COS	ProgrammeOutcomes(POs)
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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

2020-21 Onwards (MR-20)	MALLAREDDY ENGINEERINGCOLLEGE		B.Tech. V Semester	
Code: A0211	**POWER TRANSMISSION SYSTEMS**	L	T	P
Credits:3		3	-	-

Prerequisites: Electro Magnetic Fields, Electrical Circuit Analysis and Synthesis.
CourseObjectives:
This course deals with basic theory of transmission lines modeling and their performance analysis. Also this course gives emphasis on mechanical design of transmission lines, cables and insulators.

MODULE I **General Concepts** **13 Periods**
Introduction to distribution systems, Load modeling and characteristics. Load factor, Coincidence factor, Contribution factor and Loss factor - Relationship between the Load factor and loss factor. Classification of loads (Residential, Commercial, Agricultural and Industrial) and their characteristics.

MODULE II **Performance of Transmission Lines** **13 Periods**
Classification of Transmission Lines - Short, Medium and Long Line and Their Exact Equivalent Circuits- Nominal-T, Nominal-Pie. Mathematical Solutions to Estimate Regulation and Efficiency of All Types of Lines. Long Transmission Line-Rigorous Solution, Evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations – Surge Impedance and Surge Impedance Loading - Wavelengths and Velocity of Propagation – Ferranti Effect , Charging Current-Numerical Problems.

MODULE III **Mechanical Design of Transmission Lines &** **13 Periods**
Overhead Line Insulators
A:Insulators: Types of Insulators, String Efficiency and Methods for Improvement, Capacitance Grading and Static Shielding. Corona: Corona Phenomenon, Factors Affecting Corona, Critical Voltages and Power Loss, Radio Interference.
B: Sag and Tension Calculations: Sag and Tension Calculations with Equal and Unequal Heights of Towers, Effect of Wind and Ice on Weight of Conductor, Stringing Chart and Sag Template and Its Applications, Numerical Problems.

MODULE IV **Power System Transients & Travelling Waves** **13 Periods**
Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of Lines with Different Types of Conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

MODULE V **Cables** **12 Periods**
Types of Cables, Construction, Types of Insulating Materials, Calculations of Insulation Resistance and Stress in Insulation, Numerical Problems. Capacitance of Single and 3-Core Belted Cables, Numerical Problems. Grading of Cables - Capacitance Grading, Numerical Problems, Description of Inter-Sheath Grading.

TEXT BOOKS

1. C.L.Wadhwa, **"Electrical Power Systems"**, New Age International (P) Limited, Publishers,4th Edition, 2005.

2. John J Grainger and William D Stevenson, **"Power System Analysis"**, Tata McGraw Hill Edn., 4th Edition, 1994.

E - RESOURCES

https://www.electrical4u.com/types-of-electrical-insulator-overhead-insulator/

http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/power-system/chapter_2

http://nptel.ac.in/courses/108102047/

COURSE OUTCOMES

1. At the end of the course, students will be able to
2. Evaluate the parameters of transmission line for various configurations.
3. Model the transmission line and analyze their performance
4. Estimate the number of insulators based on string efficiency.
5. Determine reflection and refraction coefficients of the lines with various terminations.
6. Illustrate different types of cables and describe grading of cables.

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

COS	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3								3	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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech. V Semester	
Code: A0212	**AC MACHINES**	**L**	**T**	**P**
Credits:3		**2**	**1**	**-**

Prerequisites: Electromagnetic Fields

Course Objectives:
This course facilitates to study the performance of induction motors which is main drive for industrial applications. It also emphasis about the performance analysis of synchronous machines.

MODULE- I: Three Phase Induction Motors   13 Periods
Three phase induction motors - Construction details - Production of a rotating magnetic field - Principle of operation - Rotor EMF and rotor frequency - Rotor reactance, rotor current and power factor - Equivalent circuit - Phasor diagram - Crawling and cogging - Power stages.

MODULE-II: Performance of Induction Motors   13 Periods

Rotor power input, Rotor copper loss and mechanical power developed and their inter relation -Torque equation - Expressions for maximum torque and starting torque – Torque slip characteristics - Condition for maximum torque – Relation between torque and slip – Losses and efficiency – No load and blocked rotor test – Equivalent circuit – Circle diagram – Induction generator.

MODULE-III: Single Phase Induction Motors   12 Periods
A: Single phase induction motors – Principle of operation - Double revolving field theory - Split phase induction motor - Capacitor start induction motor - Capacitor start and run induction motor.
B: Equivalent circuit - Shaded pole induction motor.

MODULE IV   Synchronous Generators   13 Periods
Synchronous generator – Construction, working principle - EMF equation – Armature reaction – Regulation methods – EMF, MMF,ZPF methods – Synchronizing to infinite bus bars – Two reaction theory – Parallel operation of synchronous generators.

MODULE V   Synchronous Motors   13 Periods
Synchronous motor – Constructional features, principle of operation of synchronous motor – Methods of starting – Power developed by a synchronous motor – Synchronous motor with different excitations – Effect of increased load with constant excitation, effect of changing excitation constant load – Torque equation – V curve and inverted V curve – Hunting.

Text Books
1. P.S. Bimbra, **"Electrical Machinery"**, Khanna Publishers, New Delhi, 7th Edition, 2011.
2. J.B.Gupta, **"Theory & Performance of Electrical Machines"**, S.K. Kataria& Sons, 15th Edition, 2015.

References
1. M.G Say, **"Performance and Design of A.C Machines"**, 3rd Edition, BPB

Publishers, 2002.

2. A.E.Fitzgerald, C.Kingsley and S.Umans, **"Electric Machinery"**, Tata McGraw-Hill Companies, 7th Edition, 2013.

3. I.J.Nagrath&D.P.Kothari, **"Electric Machines"**, Tata McGraw Hill, 4th Edition, 2010.

4. S. Kamakashaiah, **"Electromechanics-II (Transformers and Induction Motors)"**, Hitech Publishers.

5. R.K.Rajput, **"Electrical Machines"**, Laxmi Publications Pvt., Ltd., New Delhi, 4th Edition, 2006.

E - Resources

1. https://www.electrical4u.com/induction-motor-types-of-induction-motor/
2. https://www.electrical4u.com/synchronous-motor-working-principle/
3. https://www.eeweb.com/electromechanical
4. http://nptel.ac.in/courses/108106072/

Course Outcomes

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

1. Impart knowledge on Poly Phase Induction Motors.
2. Analyze the performance of Induction Motors.
3. Understand the construction and operation of single phase Induction Motors.
4. Analyze the performance of Synchronous Generator.
5. Analyze the performance of Synchronous Motor.

<table>
<tr><td colspan="16">CO-PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COS</td><td colspan="15">ProgrammeOutcomes(POs)</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO2</td><td>PSO3</td></tr>
<tr><td>CO1</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>1</td><td></td><td>1</td></tr>
<tr><td>CO2</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>1</td><td></td><td>1</td></tr>
<tr><td>CO3</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>1</td><td></td><td>1</td></tr>
<tr><td>CO4</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>1</td><td></td><td>1</td></tr>
<tr><td>CO5</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>1</td><td></td><td>1</td></tr>
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2020-21 Onwards (MR-20)	MALLAREDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: A0213	**POWER ELECTRONICS**	L	T	P
Credits: 3		3	-	-

Prerequisites: Electrical Circuit Analysis and Synthesis, Analog Electronics.

Course Objectives: This course deals about the structure, operation and characteristics of power semiconductor devices. It also emphasis on the operation, characteristics and performance parameters of single phase controlled converters, three phase controlled converters, AC voltage controllers, choppers and Inverters.

MODULE I   Power Semiconductor Devices   10 Periods

Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics Basic theory of operation of SCR – Static and Dynamic characteristics of SCR - Salient points - Two transistor analogy - UJT firing circuit – Series and Parallel connections of SCRs - Snubber circuit details – Specifications and Ratings of SCRs, BJT, MOSFET, IGBT - Numerical problems. Natural and forced commutation (Principle only).

MODULE II   Single Phase Controlled Converters   9 Periods

Single Phase Half Controlled Converters: Half controlled converters with R, RL and RLE loads – Derivation of average load voltage and current - without and with freewheeling Diode – Numerical problems. Single Phase.

Fully Controlled Converters: Midpoint and Bridge connections with R, RL and RLE loads - Derivation of average load voltage and current - Performance parameter of single phase full bridge converter, Effect of source inductance – Derivation of load voltage and current - Numerical problems.

MODULE III   Three Phase Controlled Converters   9 Periods

A: Three phase three pulse converters – Mid Point and Bridge connections – Average load voltage with R and RL loads – Numerical Problems.

B: Three phase six pulse converters – Mid Point and Bridge connections – Average load voltage with R and RL loads – Effect of source Inductance – Numerical Problems.

MODULE IV   Choppers & AC Voltage Controllers   10 Periods

Choppers: Step-down and step-up chopper-control strategy–Forced commutated chopper–Voltage commutated, Current commutated, Load commutated, Switched mode regulators- Buck, boost, buck- boost converter.

AC Voltage Controllers : Single phase AC voltage controllers with R and RL loads-wave forms – Modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor – Numerical problems.

MODULE V   Inverters &Cyclo Converters   10 Periods

Inverters: Single phase inverter – Half and full bridge inverter – Wave forms - Performance parameters of inverters – Voltage control techniques for inverters, Pulse width modulation techniques - Single, multiple and sinusoidal PWM - Numerical Problems.

Three Phase Inverters: Analysis of 180 degree and 120 degree modes of operation with

resistive, inductive loads - Numerical Problems.

Cyclo Converters: Cyclo converters – Single phase midpoint cyclo converters withResistive and inductive load (Principle of operation only) - Bridge configuration of single phase cyclo converter (Principle of operation) – Wave forms.

Text Books

1. M.H. Rashid, **"Power Electronics: Circuits, Devices and Applications"**, 3rd Edition, Pearson Education, New Delhi, 2014.
2. P.S. Bimbra, **"Power Electronics"**, 5th Edition, Khanna Publishers, New Delhi, 2012.

References

1. A.Chakrabarti, **"Fundamentals of Power Electronics and Drives"**, Dhanpat Rai & Co, 2008.
2. S R Doradla, A Joshi, RMK Sinha and G K Dubey, **"Thyristorised Power Controllers"**, New Age International (P) Ltd., 2012.
3. Ned Mohan, Tore M. Undeland and William P. Robbins, **"Power Electronics: Converters, Applications and Design"**, John Wiley and Sons, 2nd Edition, 2007.
4. M.D. Singh, K.B.Khanchandani, **"Power Electronics"**, 2nd Edition, Tata McGraw Hill, New Delhi, 2008.
5. L. Umanand, **"Power Electronics Essentials and Applications"**, Wiley, 2010.

E - Resources

1. http://nptel.ac.in/courses/108105066/
2. https://www.elprocus.com/power-electronics-project-ideas/
3. https://www.eeweb.com/analog-design
4. http://nptel.ac.in/courses/108101038/

Course Outcomes

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

1. Describe the structure, operation and characteristics of power semi conductor devices.
2. Understand the operation, characteristics and performance parameters of single phase controlled converters.
3. Analyze three phase power converter circuits and understand their applications.
4. Analyze single phase AC voltage controllers and Cyclo Converters and their applications.
5. Understand the operation, characteristics and performance parameters of choppers and inverters.

2020-21 Onwards (MR-20)	MALLAREDDY ENGINEERINGCOLLEGE		B.Tech. V Semester	
Code: A0222	HIGH VOLTAGE ENGINEERING (Professional Elective– I)	L	T	P
Credits:3		3	-	-

Prerequisites: Engineering Chemistry, Power Transmission Systems.

Course Objectives: This course deals with the detailed analysis of Breakdown occur in gaseous, liquids and solid dielectrics. It also emphasis on generation and measurement of high voltage and current, high voltage testing methods.

MODULE I   **Introduction to High Voltage Technology and**   **9 Periods** **Applications**

Electric field stresses, gas / vacuum as insulator, liquid dielectrics, solids and composites, estimation and control of electric stress. Numerical methods for electric field computation, surge voltages, their distribution and control. Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings.

MODULE II   **Break Down in Gaseous, Liquid and Solid Dielectrics**   **10 Periods**

Gases as insulating media, collision process, ionization process, Townsend's criteria of breakdown in gases, Paschen's law. Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids.

Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, breakdown in composite dielectrics, solid dielectrics used in practice.

MODULE III   **Generation and Measurement of High Voltages and**   **10Periods** **Currents**

A: Generation of high direct current voltages, generation of high alternating voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

B: Measurement of high direct current voltages, measurement of high alternating voltages and impulse voltages, measurement of high currents - direct, alternating and impulse, oscilloscope for impulse voltage and current measurements.

MODULE IV   **Over Voltage Phenomenon and Insulation Co-Ordination**   **9 Periods**

Natural causes for over voltages – lightning phenomenon, overvoltage due to switching surges, system faults and other abnormal conditions, principles of insulation coordination on high voltage and extra high voltage power systems.

MODULE V   **Non-Destructive Testing of Material, Electrical**   **10 Periods** **Apparatus & High Voltage Testing**

Measurement of D.C resistivity, measurement of dielectric constant and loss factor, partial discharge measurements.Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements.

Text Books

1. M. S. Naidu and V. Kamaraju, **"High Voltage Engineering",** TMH Publications, 4th Edition, 2009.

2. E.Kuffel, W.S.Zaengl, J.Kuffel, **"High Voltage Engineering: Fundamentals"**, Cbs Publishers New Delhi, 2nd Edition, 2005.

References

1. C.L. Wadhwa, **"High Voltage Engineering",** New Age Internationals (P) Limited, 3rd Edition, 2010.
2. Ravindra Arora & Wolfgang Mosch ,**"High Voltage Insulation Engineering"**, New Age International (P) Limited, 1st Edition, 1995.
3. Subir Ray, **"An Introduction to High Voltage Engineering"**, PHI Learning Private Limited, New Delhi, 2nd Edition, 2013.
4. L.L. Alston, **"High Voltage Technology"**, Oxford University Press, First Indian Edition, 2011.
5. T.J.Gallagher and A.J Pearmain, **"High Voltage Measurement, Testing and Design"**, Wiley, New York, 2nd Edition, 2007.

E - Resources

1. http://www.mv.helsinki.fi/tpaulin/Text/hveng.pdf
2. www.electricity-today.com
3. http://nptel.ac.in/courses/108104048/

Course Outcomes

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

1. Appraise the applications of solid, liquid and gaseous dielectrics in electrical engineering.
2. Appraise in gaseous insulators media & Breakdown in Composite dielectrics and solid dielectrics.
3. To paraphrase the types of generation of high A.C., D.C. and Impulse voltage existing in research centers all over the world.
4. Appraise the causes for over voltage in EH and principles of insulation co-ordination in HV and EHV in power systems
5. Demonstrate the existing testing techniques to test all the electrical equipments before commissioning into service.

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

Prerequisites: Nil

Course Objectives: This course deals with the new concepts in measurement and automation. It also emphasis on controlling of external measuring device by interfacing computer, data acquisition and instrument control.

MODULE I   Virtual Instrumentation   9 Periods

Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Active X Programming.

MODULE II   Structures and Sequence   9 Periods

Controlling program execution with structures: While and For loops, Shift registers, Caseand Sequence structure and Sub VI**.**

MODULE III   Composite Data and Displays   10Periods

A: Arrays and Structures: Two dimension array, Auto Indexing to set the for loop count,Building arrays with auto indexing, Array Acrobats, Polymorphism, Cluster Order, Cluster topass data, Bundling and unbundling cluster, Interchangeable arrays and cluster , ErrorCluster and Error handling functions.

B: Chart update modes, Single Plot chart, Wiring multiple plot chart, Single Plot verus Multipleplot data types, The X scroll bar, clearing the chart, Stacked and overlaid plots, Multiple Yscales and chart history lengths.: Activity: Temperature monitor, Graphing a sine wave, XYplot to plot a circle, Temperature analysis and 3D graphs.

MODULE IV   Strings, File output and Signal Measurements   10 Periods
                              and Generation

Single line strings, online string updation, Scroll bar, Writing and reading a measurement file,Writing and reading from a spread sheet,Computer to real world interface using LabVIEW, Creating Ni DAQ Task in Measurement and Automation Explorer (MAX), Generating code from MAX, DAQ timing and trigger, Multichannel and continuous acquisition, Streaming Data file and Counting frequency and events.VI Chassis requirements. Common Instrument Interfaces: Currentloop, RS 232C/ RS485,GPIB.

MODULE V   Applications   10 Periods

Networking basics for office & Industrial applications, VISA and IVI, VI toolsets, DistributedI/O modules, Development of Control system, Industrial Communication, Image acquisitionand processing.

Text Books

1. Gary Johnson, **"LabVIEW Graphical Programming"**, 2nd edition, McGraw Hill, Newyork, 1997.
2. Lisa K. wells & Jeffrey Travis, **"LabVIEW for Everyone"**, Prentice Hall, New Jersey, 1997.

References

1. Kevin James, **"PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control"**, Newnes, 2000.

E- Resources

1. https://www.ni.com/getting-started/labview-basics/
2. https://www.allaboutcircuits.com/technical-articles/graphical-programming-languages-labview/
3. http://home.hit.no/~hansha/video/labview_basics.php

Course Outcomes

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

1. Develop a Virtual Instrument using LabVIEW to communicate with real world.
2. Simulate real time systems using arrays and structures in LabVIEW.
3. Identify salient traits of a virtual instrument and incorporate these traits in their projects.
4. Experiment, analyze and document in the laboratory prototype measurement.
5. Develop program for application like networking, Digital image processing ,controlsystem, etc

<table>
<tr><td colspan="16" align="center">CO-PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COS</td><td colspan="15" align="center">Programme Outcomes (POs)</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO2</td><td>PSO3</td></tr>
<tr><td>CO1</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td>3</td></tr>
<tr><td>CO2</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td>3</td></tr>
<tr><td>CO3</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td>3</td></tr>
<tr><td>CO4</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td>3</td></tr>
<tr><td>CO5</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td>3</td></tr>
</table>

2020-21 Onwards (MR-20)	MALLAREDDY ENGINEERINGCOLLEGE		B.Tech. V Semester	
Code: A0224	ADVANCED CONTROL SYSTEMS (Professional Elective– I)	L	T	P
Credits : 3		3	-	-

Prerequisites: Control Systems.

Course Objectives: To cater the knowledge of basic and modern control system for the real time analysis and design of control systems. To expose the students to the concepts of state variables analysis. To provide adequate knowledge of non linear systems. To provide comprehensive knowledge of optimal control and model control.

**MODULE I   State Space Analysis, Controllability and   10 Periods
                 Observability**

State Space Representation, Solution of State Equation, State Transition Matrix, Canonical Forms – Controllable Canonical Form, Observable Canonical Form, Jordan Canonical Form. Tests for controllability and observability for continuous time systems – Time varying case, time invariant case, Principle of Duality, Controllability and observability form, Jordan canonical form and other canonical forms.

**MODULE II   Describing Function Analysis & Phase-Plane   10 Periods
                  Analysis**

Introduction to nonlinear systems, types of nonlinearities, describing functions, describing function analysis of nonlinear control systems. Introduction to phase-plane analysis, Method of isoclines for constructing trajectories, singular points, phase-plane analysis of nonlinear control systems.

MODULE III   Stability Analysis   9 Periods

A: Stability in the sense of Lyapunov, Lyapunov's stability and Lyapunov's instability theorems.

B: Direct method of Lyapunov for the Linear and Nonlinear continuous time autonomous systems.

MODULE IV   Modal Control & Calculus of Variations   10 Periods

Effect of state feedback on controllability and observability, Design of state feedback control through pole placement. Full order observer and reduced order observer. Minimization of functionals of single function, constrained minimization. Minimum principle. Control variable inequality constraints. Control and state variable inequality constraints. Euler Lagrange equation.

MODULE V   Optimal Control   9 Periods

Formulation of optimal control problem. Minimum time, minimum energy, minimum fuel problems. State regulator problem. Output regulator problem. Tracking problem, continuous-time linear regulators.

Text Books

1. M. Gopal, **"Modern Control System Theory"**, New Age International Publishers, 2nd Edition, 1996.

2. I.J.Nagarath and M.Gopal, **"Control Systems Engineering"**, New Age International Publishers, 5th Edition, 2007.

References

1. K. Ogata, **"Modern Control Engineering"**, Prentice Hall of India, 3rd Edition, 1998.
2. M.Gopal, **"Digital Control and State Variable Methods"**, Tata McGraw-Hill Companies, 1997.
3. Stainslaw H. Zak, **"Systems and Control"**, Oxford Press, 2003.
4. Stanley M. Shiners, **"Modern Control System Theory and Design"**, John Wiley and Sons Publications, 2nd Edition, 1998.
5. Khalil H.D., **"Nonlinear Systems"**, Prentice Hall Publications, 3rd Edition, 2003.

E - Resources
1. http://www.ieeecss-oll.org/
2. http://ieeecss.org/CSM/library/2011.html
3. http://nptel.ac.in/courses/108103007/

Course Outcomes
At the end of the course, students will be able to
1. Analyze the system controllability and observability using state space representation.
2. Analyze the non linear systems using describing function method and phase plane analysis.
3. Analyze the concept of stability of nonlinear systems using Lyapunov's theorems.
4. Design pole-assignment controller and the specific design procedures for minimization and Euler Lagrange theorem.
5. Apply the knowledge of basic and modern control system for the real-time analysis and design the solution for optimal control problems.

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

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

2020-21 Onwards (MR-20)	MALLAREDDY ENGINEERINGCOLLEGE	B.Tech. V Semester		
Code: A0225	**DIGITAL CONTROL SYSTEMS** (Professional Elective– I)	L	T	P
Credits:3		3	-	-

Prerequisites: Control Systems

Course Objectives: This course deals with z-transforms, the estimation of stability in different domains, the design of discrete time control systems, compensators, state feedback controllers, state observers through various transformations.

MODULE I   Discrete Representation Of Continuous Systems   9 Periods

Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modeling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.

MODULE II   10 Periods

Discrete System Analysis: Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system.

Stability of Discrete Time System: Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital control system with dead beat response. Practical issues with dead beat response design.

MODULE III   State Space Approach for Discrete Time   10 Periods
                            Systems

State space models of discrete systems, State space analysis. Lyapunov Stability. Controllability, reach-ability, Reconstructibility and observability analysis. Effect of pole zero cancellation on the controllability & observability.

MODULE IV   Design of Digital Control System   10 Periods

Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.

MODULE V   Discrete Output Feedback Control   9 Periods

Design of discrete output feedback control. Fast output sampling (FOS) and periodic output feedback controller design for discrete time systems.

Text Books
1. K. Ogata, "Digital Control Engineering", Prentice Hall, Englewood Cliffs, 1995.
2. M. Gopal, "Digital Control Engineering", Wiley Eastern, 1988.

References
1. G. F. Franklin, J. D. Powell and M. L. Workman, "Digital Control of Dynamic Systems", Addison-Wesley, 1998.
2. B.C. Kuo, "Digital Control System", Holt, Rinehart and Winston, 1980.

E- Resources

1.   https://www.coursehero.com/file/13785953/DIGITAL-CONTROL-SYSTEMSpdf/
2. http://nptel.ac.in/courses/108103008/
3. http://www.sciencedirect.com/science/book/9780123943910

Course Outcomes

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

1.   Obtain discrete representation of LTI systems.
2.   Analyze stability of open loop and closed loop discrete-time systems.
3.   Understand state space representation of the control systems, concepts of controllability and observability
4.   Design and analyze digital controllers.
5.   Design state feedback and output feedback controllers

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

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

2020-21 Onwards (MR-20)	MALLAREDDY ENGINEERINGCOLLEGE		B.Tech. Semester - V	
Code: A0226	**FUNDAMENTALS OF NANOSCIENCE** (Professional Elective–I)	L	T	P
Credits:3		3	-	-

Prerequisites: Undergraduate level Physics, Chemistry

Course Objectives:

- To learn about basis of nanomaterial science, preparation method, types and application

MODULE I   Introduction   8 periods

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms- multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

MODULE II   General Methods of Preparation   9 periods

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

MODULE III   Nanomaterials   12 periods

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO_2,MgO, ZrO_2, NiO, nanoalumina, CaO, $AgTiO_2$, Ferrites, Nanoclays- functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

MODULE IV   Characterization Techniques   9 periods

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

MODULE V   Applications   7 periods

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

OUTCOMES:

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

- Understand the implications of Nano-Technology for Physics, Chemistry, Biology and Engineering
- Understand the general methods of preparation of nanomaterials.
- Familiarize about the science of nanomaterials
- Compare the different characterization techniques of nanomaterials
- Describe the different applications of nanotechnology.

TEXT BOOKS:

1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale Charecterisation of surfaces & Interfaces", 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES

1. G Timp, "Nanotechnology", AIP press/Springer, 1999.
2. Akhlesh Lakhtakia,"The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations". Prentice-Hall of India (P) Ltd, New Delhi, 2007.

<table>
<tr><td colspan="16">CO- PO Mapping</td></tr>
<tr><td colspan="16">(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COS</td><td colspan="15">Programme Outcomes(POs)</td></tr>
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<tr><td>CO2</td><td>3</td><td>3</td><td>3</td><td></td><td>1</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td><td></td><td></td></tr>
<tr><td>CO3</td><td>2</td><td>3</td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td><td></td><td></td></tr>
<tr><td>CO4</td><td>2</td><td>2</td><td>2</td><td></td><td>2</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td><td></td><td></td></tr>
<tr><td>CO5</td><td>1</td><td>2</td><td>3</td><td>1</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td><td></td><td></td></tr>
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2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code:	**OPEN ELECTIVE - I**	**L**	**T**	**P**
Credits: 3		3	-	-

2020-21 Onwards (MR-20)	MALLAREDDY ENGINEERINGCOLLEGE		B.Tech. V Semester	
Code: A0214	AC MACHINES LAB	L	T	P
Credits:1		-	-	2

Course Objectives: This course deals with the practical aspects of various ac machines like transformer, induction motor and synchronous machines.

List of Experiments:
1. OC & SC Tests on Single phase Transformer.
2. Sumpner's test on a pair of single phase transformers.
3. Scott connection of transformers.
4. No-load & Blocked rotor tests on three phase Induction motor.
5. Regulation of a three –phase alternator by synchronous impedance &m.m.f. methods.
6. V and Inverted V curves of a three-phase synchronous motor.
7. Equivalent Circuit of a single phase induction motor.
8. Determination of X_d and X_q of a salient pole synchronous machine.
9. Parallel operation of Single phase Transformers.
10. Brake test on three phase Induction Motor.
11. Regulation of three-phase alternator by Z.P.F. and A.S.A methods.
12. Load test of a three-phase alternator.

Course Outcomes

At the end of the course, students should be able to
1. Assess the performance of single phase transformer using various methods.
2. Assess the performance of single phase induction motor.
3. Determine the regulation of alternator using different methods
4. Determine the performance of 3 phase induction motor by various methods.
5. Assess the performance of synchronous machines.

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

2020-21 Onwards (MR-20)	MALLAREDDY ENGINEERINGCOLLEGE	B.Tech. V Semester		
Code: A0215	**CONTROL SYSTEMS LAB**	L	T	P
Credits : 1		-	-	2

Course Objectives: This course will give the basic knowledge on practical control system and PLC applications. It emphasizes the knowledge on applications of machines & electronic devices with control systems.

List of Experiments:

1. Time response of Second order system.
2. Characteristics of Synchros.
3. Programmable logic controller – Study and verificat ion of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor.
5. Transfer function of DC motor..
6. Effect of P, PD, PI, PID Controller on a second order systems
7. Lag and lead compensation – Magnitude and phase plot.
8. Temperature controller using PID(open loop & closed loop).
9. Characteristics of magnetic amplifiers(series, parallel & separately-excited).
10. Characteristics of AC servo motor.
11. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB.
12. State space model for classical transfer function using MATLAB.

Course Outcomes

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

1. Formulate transfer function for given control system problems.
2. Ability to find time response of given control system model.
3. Plot Root Locus and Bode plots for given control system model by using MATLAB.
4. Ability to design Lead, Lag, Lead-Lag systems in control systems.
5. Ability to design PID controllers for given control system model.

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

2020-21 Onwards	MALLAREDDY ENGINEERINGCOLLEGE	B.Tech. V Semester

134

(MR-20)				
Code: A0562	**FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS LAB** (Common for CE, EEE, ME, ECE, MiE)	**L**	**T**	**P**
Credits:2		**-**	**1**	**2**

Prerequisites: NIL

Course Objectives: This course enables the students to practice the concepts learnt in the subject DBMS by developing a database for an example project. The student is expected to practice the querying a relational database i.e., "Mysql" with various functionalities of SQL and PL/SQL statements using a sample database.

Sample Database:

Railway Reservation System -(Redesigning IRCTC database)

Train (train Number, name, source, destination, start_time, reach_time, traveltime, distance, class,days, type)

Ticket (PNRNo, Transactionid, from_station, To_station, date_of_journey, class date_of_booking,total_ticket_fare, train number)

Passenger (PNR No, Serial no, Name, Age, Reservation_status)

Train_Route(Train No, route no, station_code, name, arrival_time, depart_time, distance, day) **Train_Ticket_fare**(Train No, class, base_fare, reservation_charge, superfast_charge, other_charge,tatkal_charge, service_tax)

List of Experiments:

1	SQL Data Definition Language Commands: Create all the tables specified above. Make underlined columns as primary key. (use number, number(m,n), varchar(n), date, time, timestamp data types appropriately) Insert at least 5 rows to each table. (Check www.irctc.co.in website for actual data)
2	SQL Data Manipulation Language Commands: 1. Change the name of the Passenger table to Passenger_Details. 2. List all train details. 3. List all passenger details. 4. Give a list of trains in ascending order of number. 5. List the senior citizen passengers details. 6. List the station names where code starts with 'M'. 7. List the trains details within a range of numbers. 8. Change the super fast charge value in train fare as zero, if it is null. 9. List the passenger names whose tickets are not confirmed. 10. Remove all the rows from Passenger table permanently.

3	Create (Alter table to add constraint) the necessary foreign keys by identifying the relationships in the table. 1) Add a suitable constraint to train table to always have train no in the range 10001 to 99999. 2) Add a suitable constraint for the column of station name, so that does not take duplicates. 3) Change the data type of arrival time, depart time (date -> timestamp or timestamp to date), and do the necessary process for updating the table with new values. 4) Add a suitable constraint for the class column that it should take values only as 1A, 2A, 3A, SL, C. 5) Add a not null constraint for the column distance in train_route.
4	Designing Employee Database with MySQL (Create and insert data in EMP table, DEPT table and SALGRADE table)
5	Multi row functions, GROUP By clause, HAVING clause, ORDER BY clause in SQL on sample database.
6	Use Join Query 1. Find the train names that stop in 'Katpadi'. 2. Find the train names that are superfast and the service tax is zero. 3. Find the Passenger name (and train name) who have booked for the train that starts from 'Chennai'. 4. Display the trains names, each type of class and the total fare for each type of class. 5. Display all the train details and the ticket details (if booked any).
7	Use Nested Query(in Operators) 1. Find the train names that stop in 'Warangal'. 2. Find the train names that are superfast and the service tax is zero. 3. Find the Passenger name who have booked for the train that starts from 'Secunderabad'. 4. Find the trains names that have all the AC coaches and the base fare is less than 3000 for each case.
8	Create sample Views and practice basic operation
9	Write a PL/SQL procedures to practice Conditional Statements
10	Write a PL/SQL procedures to practice Iterative Statements
11	Implementing simple trigger
12	Implementing simple cursor

Textbooks:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc GrawHill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

References:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel, 7th Edition.
2. SQL The Complete Reference, James R. Groff, Paul N. Weinberg, 3rd Edition,
3. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
4. Database Systems Using Oracle: A Simplified guide to SQL and PL/ SQL, Shah, PHI.

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

Module – I 8 Periods

Quants: Percentages, Profit and Loss.

- **Percentages-** *Percentage Increase/Decrease; Results on Population; Results on Depreciation.*
- **Profit & Loss-**Cost Price; Selling Price: Profit or Gain; Gain Percentage; Loss Percentage.*

Verbal: Articles, Para Jumbles

- **Articles-** *Types of articles, Countable nouns, Uncountable nouns, Usage of articles, Omission of articles.*
- **Para Jumbles**- *Para Jumbles, Types of Para Jumbles, Strategies to answer questions on Jumbled Paragraphs.*

Logical: Data Arrangements, Blood Relation

- **Data Arrangements-** *Linear Arrangement, Circular Arrangement, Multi-Dimensional Arrangement.*
- **Blood Relations-** *Classification of blood relations, Pointing a person, Equation related problems.*

Module – II 6 Periods

Quants: Interests

- **Interests-***Types of interest; Simple interest; principle; Rate of interest; compound interest; interest is compounded Annually; interest is compounded Half-yearly; interest is compounded Quarterly; Rates are different for different years, say R_1%, R_2%, R_3% for 1st, 2nd and 3rd year respectively; Present worth of Rs. x due n years.*

Verbal: Sentence Completion, Prepositions

- **Sentence Completion-** *Formats of Question; Strategies to solve sentence completion questions- Proactive and reactive solving, Identifying clues- Signposts, Types of signposts, Root words, Sentence structure clues.*
- **Prepositions-** *Definition, Types of prepositions, Preposition of Place, Preposition of Time, Preposition of Direction, Compound Prepositions, Prepositional Phrases.*

Logical: Coding and Decoding

- **Coding and Decoding-***Number Series, Alphabet Series, Analogy, Odd Man Out, Visual Reasoning.*

Module–III 6 Periods

Quants: Ratio and Proportion, Averages

- **Ratios & Proportion-**_The ratio of two quantities a and b in the same units; Proportion; The equality of two ratios is called proportion; Fourth Proportional; Mean Proportional; Comparison of Ratios; Duplicate Ratios; Variations._
- **Averages-** _Average Speed, Weighted average_

Verbal: Vocabulary

- **Vocabulary-**_Etymology, Root Words, Prefixes and Suffixes; Synonyms and Antonyms, Tips to solve questions on Synonyms and Antonyms; Word Analogy, Patterns of questions on Word Analogy; Miscellaneous Vocabulary._

Logical: Data Interpretation and Data Sufficiency

- **Data Interpretation-** _Tables, Pie charts, Bar Graphs, Line graphs_
- **Data Sufficiency-**_Strategies to solve._

Module – IV   **6   Periods**
Quants: Time and Work;

- **Time & Work-** _Work from Days: Calculate the one-day work; Days from Work: Shortcut to calculate the work in given time;_
  .**Verbal: Sentence Correction**

- **Sentence Correction-** _Subject-Verb Agreement; Modifiers; Parallelism; Pronoun-Antecedent Agreement; Verb Time Sequence; Comparisons; Determiners; Exercise Questions._

Logical: Clocks and Calendars

- **Clocks:**_Introduction, Derivation of angles, Angles between hands of the clock, Hands together, Hands at angular distance, Gain & Loss problems._
- **Calendars:** _- Leap year-Non leap year, Odd days, Finding the day from date, Repeated years._

Module - V: **6 Periods**
Quants: Mixtures and Alligations;

- **Alligation**- _Mean Price; Rule of Alligation; a container contains x of liquid from which y units are taken out and replaced by water;_

Verbal: Reading Comprehension, Critical Reasoning

- **Reading Comprehension-** _Speed reading strategies; Reading Comprehension - types of questions, tackling strategies; Critical Reasoning._

Logical: Directions, Cubes, Syllogisms

- **Directions -**_Introduction, Direction based questions, Shadow based problems._
- **Cubes-** _Cube & cuboid concepts, 3-2-1-0 faced problems._
- **Syllogisms**- _Statements and Conclusion, Syllogisms using Venn Diagrams._

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE	B.Tech. V Semester		
Code: A00M6	**INTRODUCTION ARTIFICIAL INTELLIGENCE** (Common for CE, EEE, ME, ECE, MiE, CSE and IT)	L	T	P
Credits: Nil		1	1	-

Prerequisites: Discrete Mathematics

Course Objectives:

To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

MODULE I: Introduction, Basic Search Strategies: [10 Periods]

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents.

Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search,Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), ConstraintSatisfaction (Backtracking, Local Search)

MODULE II: [09 Periods]

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search implementation,Minimax Search, Alpha-Beta Pruning.

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, ForwardChaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem.

MODULE III: [10 Periods]

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Non monotonic Reasoning, Other Knowledge Representation Schemes.

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule,Representing Knowledge in an Uncertain Domain, Bayesian Networks.

MODULE IV: [10 Periods]

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

MODULE V: [09 Periods]

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

TEXT BOOKS:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall, 2010.

REFERENCES:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

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=g bs_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_zRG3Bvd UVy2TIab45fvPeNJfynQsAbmBEgDSUqzidwcse6xwotJA
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.

<table>
<tr><th colspan="16">CO- PO, PSO Mapping</th></tr>
<tr><th colspan="16">(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</th></tr>
<tr><td rowspan="2">COs</td><td colspan="12">Programme Outcomes (POs)</td><td colspan="3">PSOs</td></tr>
<tr><th>PO1</th><th>PO2</th><th>PO3</th><th>PO4</th><th>PO5</th><th>PO6</th><th>PO7</th><th>PO8</th><th>PO9</th><th>PO10</th><th>PO11</th><th>PO12</th><th>PSO1</th><th>PSO2</th><th>PSO3</th></tr>
<tr><td>CO1</td><td>2</td><td>-</td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td>-</td><td>2</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td><td></td></tr>
<tr><td>CO3</td><td>2</td><td>2</td><td>2</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO4</td><td>2</td><td>2</td><td>2</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>2</td></tr>
<tr><td>CO5</td><td>1</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: A0216	**POWER SYSTEM ANALYSIS**	L	T	P
Credits: 3		3	-	-

Prerequisites: DC Machines & Transformers, AC Machines, Power Transmission Systems.
Course Objective
- To model the power system under steady state operating condition
- To understand and apply iterative techniques for power flow analysis
- To model and carry out short circuit studies on power system
- To model and analyze stability problems in power system

MODULE I   POWER SYSTEM   9 Periods
Power system components – Representation - Single line diagram - per unit quantities - p.u. impedance diagram - p.u. reactance diagram - Network graph, Bus incidence matrix, Primitive parameters, Bus admittance matrix from primitive parameters - Representation of off nominal transformer - Formation of bus admittance matrix of large power network.

MODULE II   POWER FLOW ANALYSIS   9 Periods
Bus classification - Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method - Handling of Voltage controlled buses - Power Flow Solution by Newton Raphson method.

MODULE III   SYMMETRICAL FAULT ANALYSIS   9 Periods
Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin's theorem - Bus Impedance matrix building algorithm (without mutual coupling) - Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level – Current limiting reactors.

MODULE IV   UNSYMMETRICAL FAULT ANALYSIS   9 Periods
Symmetrical components - Sequence impedances - Sequence networks - Analysis of unsymmetrical faults at generator terminals: LG, LL and LLG - unsymmetrical fault occurring at any point in a power system - computation of post fault currents in symmetrical component and phasor domains.

MODULE V   STABILITY ANALYSIS   9 Periods
Classification of power system stability – Rotor angle stability - Swing equation – Swing curve - Power-Angle equation - Equal area criterion - Critical clearing angle and time - Classical step-by-step solution of the swing equation – modified Euler method.

TEXT BOOKS:

1. John J. Grainger, William D. Stevenson, Jr, 'Power System Analysis', Mc Graw Hill Education (India) Private Limited, New Delhi, 2015.
2. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
3. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.

REFERENCES

1. Pai M A, 'Computer Techniques in Power System Analysis', Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007.
2. J. Duncan Glover, Mulukutla S.Sarma, Thomas J. Overbye, 'Power System Analysis & Design', Cengage Learning, Fifth Edition, 2012.
3. Gupta B.R., 'Power System - Analysis and Design', S. Chand Publishing, 2001.
4. Kundur P., 'Power System Stability and Control', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

E- Resources
   1. https://nptel.ac.in/courses/108/105/108105067/
   2. https://nptel.ac.in/content/storage2/courses/108104051/chapter_9/9_1.html

Course Outcomes
At the end of the course, students will be able to
   1. Formulate the incidence, network matrices and model the power system components
   2. Understand and apply iterative techniques for power flow analysis
   3. Analyze a power system network under Symmetrical Conditions
   4. Understand Positive Sequence, Negative & zero sequence system and fault analysis.
   5. Analyze power system operation and stability control.

<table>
<tr><td colspan="16" align="center">CO-PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COS</td><td colspan="15" align="center">Programme Outcomes (POs)</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO2</td><td>PSO3</td></tr>
<tr><td>CO1</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>3</td><td></td><td></td></tr>
<tr><td>CO2</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>3</td><td></td><td></td></tr>
<tr><td>CO3</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>3</td><td></td><td></td></tr>
<tr><td>CO4</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>3</td><td></td><td></td></tr>
<tr><td>CO5</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>3</td><td></td><td></td></tr>
</table>

Prerequisites: DC Machines & Transformers, AC Machines, Power Generation and Distribution.

Course Objectives:

This course deals with different kinds of circuit breakers and relays for protection of generators, transformers and feeder bus bars from over voltages and other hazards. It also emphasis on Neutral grounding for overall protection.

MODULE I   Circuit Breakers   13 Periods

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages - Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications- Construction and Operation of Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers-Numerical problems.

MODULE II   Relays   13 Periods

Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays. Relays Classification: Instantaneous, DMT and IDMT types.

Application of relays: Over current/ under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays.

Universal torque equation, Distance relays: Impedance, Reactance and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison.

Static Relays: Static Relays versus Electromagnetic Relays.

MODULE III   System Protection   13 Periods

A: Protection of Generators: Stator fault protection, Rotor fault protection, Restricted Earth fault and Inter-turn fault Protection, Numerical Problems on % Winding Unprotected.

Protection of Transformers: Percentage Differential Protection, Numerical Problems on Design of CT Ratio, Buchholtz relay Protection.

B: Protection of Feeders: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relay, Translay Relay.**Protection of Bus bars:** Differential protection.

MODULE IV   Neutral Grounding   12 Periods

Grounded and Ungrounded Neutral Systems- Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

MODULE V   Protection Against Over Voltages   13 Periods

Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination -BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

Text Books
1. Sunil S. Rao, "Switchgear and Protection and Power System", 13th Edition, Khanna Publishers, New Delhi, 2008.
2. Soni, M.L., Gupta, P.V., Bhatnagar, U.S. and Chakrabarti, **"A Text Book on Power Systems Engineering"**, Dhanpat Rai & Sons Company Limited, New Delhi, 2nd Edition, 2003.

References
1. Badari Ram, D.N Viswakarma, **"Power System Protection and Switchgear"** Tata McGraw Hill, 2nd Edition, 2010.
2. C.L.Wadhwa, **"Electrical Power Systems"**, New Age international (P) Limited, 4th edition, 2006.
3. Paithankar and S.R.Bhide , **"Fundamentals of Power System Protection"**, Prentice Hall of India, 2nd Edition 2003.
4. B. Ravindranath, and M. Chander, **"Power System Protection & Switchgear"**, 2nd Edition, New Age International, 2005.
5. S. L. Uppal, **"Electrical Power"**, 13th Edition, Khanna Publishers, New Delhi, 2006.

E - Resources
1. https://www.electrical4u.com/electrical-switchgear-protection/
2. http://www.electricity-today.com/
3. http://nptel.ac.in/downloads/108101039/

Course Outcomes
At the end of the course, students should be able to
1. Analyze the operation of various types of circuit breakers.
2. Identify Characteristics of Relay for specific applications of protection.
3. Design the feasible protection systems for generators, transformers, feeders and bus bars.
4. Emphasis on Grounding practices in real time.
5. Investigate the fundamentals of protection against over voltages.

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. VI Semester	
Code: A0414	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P
Credits: 3		3	-	-

Prerequisites: Digital Electronics.

Course Objectives:
- To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.
- To design and develop Microprocessor/ microcontroller based systems for real time applications using low level language like ALP.
- To understand the basics of microprocessors and microcontrollers architectures and its functionalities

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   9 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 Microprocessors and Peripherals**, Tata McGraw-Hill, 3rd Edition
3. Mazidi, Mazidi & McKinlay, **The 8051 Microcontroller and Embedded Systems using Assembly and C**, 2nd Edition, PHI.

References:

1. D. V Hall, **Microprocessors and Interfacing,** TMH, 2nd Edition, 2006.
2. N.K. Srinath, **8085Microprocessor Programming & Interfacing**, PHI ,1st Edition, 2005.
3. K. Uday Kumar, B.S. Umashankar, **The 8085 Microprocessor: Architecture, programming and Interfacing,** Pearson, 2008.
4. Liu and Gibson, **Micro Computer System 8086/8088 Family Architecture, Programming and Design** PHI, 2nd Edition.
5. Rajkamal, **Microcontrollers: Architecture, Programming, Interfacing and System Design**, Pearson Education.
6. Ajay. V. Deshmukh, **Microcontrollers and Application,** TMGH, 2005.
7. Kenneth. J. Ayala, **The 8051 Microcontroller,** Cengage Learning, 3rd Edition, 2004.
8. Manish K Patel , **The 8051 Microcontroller Based Embedded Systems,** McGraw Hill Education , 1st Edition (1 July 2017).

Course Outcome: After Completion of this course the student will able to
1. Analyze organization of popular 8085/8086 microprocessors
2. program the 8085 microprocessor.
3. program the 8086 microprocessor
4. Understand Microcontroller 8051 its architecture, its instruction set,
5. Analyze and program the 8051 Counter/timer and interrupts and serial communication, interfacing 8051 with devices.

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

Prerequisites: DC Machines & Transformers, AC Machines and Power Electronics.

Course Objectives: To expose the students about the basic idea of electric drives and its characteristics by various power converter topologies. To familiar with the control of DC & AC motors with different techniques.

MODULE I   Electric Drives   10 Periods

Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

Control of DC motors by Single phase Converters:

Introduction to thyristor controlled drives, single phase semi and fully controlled converters connected to D.C separately excited and D.C series motors – continuous current operation – output voltage and current waveforms – Speed and torque expressions – Speed–Torque characteristics - Problems on converter fed D.C motors.

MODULE II   Control of DC Motors by Three Phase Converters   9 Periods

Three phase semi and fully controlled converters connected to D.C separately excited and D.C series motors – Output voltage and current wave forms – Speed and Torque expressions – Speed – Torque characteristics – Problems.

MODULE III   Four Quadrant Operations of DC Drives   10 Periods

A: Introduction to Four quadrant operation – Motoring operations. Electric Braking – Plugging, dynamic and regenerative braking operations. Four quadrant operation of D.C motors by dual converters.

B: Control of DC motors by Choppers:

Single quadrant, Two quadrant and four quadrant chopper fed D.C separately excited and series excited motors – Continuous current operation – Output voltage and current wave forms – Speed torque expressions – Speed torque characteristics – Problems on chopper fed D.C Motors.

MODULE IV   Control of Induction Motor through Stator Voltage   10 Periods
**   and Stator Frequency**

Variable voltage characteristics - Control of Induction Motor by AC voltage controllers – Waveforms – Speed torque characteristics.

Variable frequency characteristics - Control of induction motor by voltage source inverter and current source inverter - Cyclo converters - PWM control – Introduction to CSI and VSI – Comparison of VSI and CSI operations – Speed torque characteristics – Numerical problems on induction motor drives.

MODULE V   Control of Induction Motor through Rotor &   9 Periods
**   Synchronous Motors**

Static rotor resistance control – Slip power recovery – Static Scherbius drive – Static Kramer drive – their performance and speed torque characteristics – advantages - applications – Problems. Separate control & self control of synchronous motors – Operation of self controlled synchronous motors by VSI.

Text Books

1. G.K. Dubey, **"Fundamentals of Electric Drives"**, Narosa Publications, 5th Edition, reprint, 2005.
2. B.K.Bose, **"Modern Power Electronics and AC Drives"**, Prentice Hall Inc., 2002.

References

1. MD Singh and K B Khanchandani, **"Power Electronics"**, Tata McGraw Hill Publishing Company, 1998.
2. Vedam Subramanyam, **"Thyristor Control of Electric Drives",** Tata McGraw Hill Publilcations, Reprint 2001.
3. SK Pillai, **"A First Course on Electrical Drives"**, New Age International (P) Ltd., Reprint 2009.
4. R. Krishnan, **"Electric Motor & Drives Modeling, Analysis and Control"**, Prentice Hall of India, 1st Edition, 2001.
5. P.C.Sen, **"Thyristor DC Drives"**, John Wiley & Sons, New York, 2008.

E - Resources

1. https://www.eeweb.com/electromechanical

2. https://www.electrical4u.com/electrical-drives/

3. http://nptel.ac.in/courses/108108077/

Course Outcomes

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

1. To paraphrase the characteristics of electric drives and control of D.C motors.
2. Analyze the control of D.C motor by three phase converter.
3. Describe the various braking operations of D.C motors by dual converter and choppers.
4. Express the control of induction motor by various converter topologies.
5. Analyze the control of induction motor through rotor side & control of synchronous motors by VSI.

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE	B.Tech. VI Semester		
Code: A0228	**ELECTRICAL MACHINE DESIGN**	**L**	**T**	**P**
Credits: 3	(Professional Elective - II)	3	-	-

Prerequisite: DC Machines and Transformers and AC Machines.

Course Objectives: To expose the students about the mmf calculations and thermal ratings of various types of electrical machines. To design the main dimension of DC machines, AC machines and transformer based on power ratings and cooling system of electrical machines.

MODULE I   INTRODUCTION   10 Periods

Major considerations in Electrical Machine Design - Electrical Engineering Materials – Space factor – Choice of Specific Electrical and Magnetic loadings - Thermal considerations - Heat flow – Temperature rise and Insulating Materials - Rating of machines – Standard specifications.

MODULE II   DC MACHINES   9 Periods

Output Equations – Main Dimensions – Choice of Specific Electric and Magnetic Loading – Maganetic Circuits Calculations - Carter's Coefficient - Net length of Iron –Real & Apparent flux densities – Selection of number of poles – Design of Armature – Design of commutator and brushes – performance prediction using design values.

MODULE III   INDUCTION MOTORS   10 Periods

A: Output equation of Induction motor – Main dimensions – Choice of Average flux density – Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Design of end rings.

B: Design of wound rotor – Magnetic leakage calculations – Leakage reactance of polyphase machines- Magnetizing current - Short circuit current – Operating characteristics- Losses and Efficiency.

MODULE IV   SYNCHRONOUS MACHINES   10 Periods

Output equations – choice of Electrical and Magnetic Loading – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field mmf – Design of field winding – Design of turbo alternators – Rotor design.

MODULE V   TRANSFORMERS   9 Periods

Constructional details of core and shell type transformers – output rating of single phase and three phase transformers – optimum design of transformers – design of core, yoke and windings for core and shell type transformers – equivalent circuit parameters from designed data – losses and efficiency calculations – design of tank and cooling tubes of transformers.

Text Books

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.
2. M.V.Deshpande "Design and Testing of Electrical Machine Design" Wheeler Publications, 2010.

References

1. A.Shanmuga Sundaram, G.Gangadharan, R.Palani 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint, 2007.
2. R.K.Agarwal " Principles of Electrical Machine Design" Esskay Publications, Delhi, 2002.
3. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

E - Resources

1. http://www.motor-engineer.net/engineering-center/learn/tutorial-electric-machine-design-hendershot/

2. http://nptel.ac.in/courses/108106023/

3. https://www.youtube.com/watch?v=krNH7-wDnZk

Course Outcomes:

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

1. Calculate the magnetic circuit parameters of electrical machines.
2. Design main dimension of DC machines, AC machines and transformer based on power ratings
3. Design the internal dimensions of various electrical machines.
4. Evaluate the thermal ratings of electrical machines
5. Design the cooling system of electrical machines.

COS	Programme Outcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3								3	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		

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

2020-21 Onwards (MR-20)	**MALLA REDDY ENGINEERING COLLEGE**		**B.Tech. VI Semester**	
Code: A0229	**ELECTRICAL ESTIMATION AND COSTING** (Professional Elective – II)	**L**	**T**	**P**
Credits: 3		**3**	**-**	**-**

Prerequisite: Nil

Course Objectives: To expose the subject highlights on elements of estimation and costing, budgeting of service connections and also about contracting, maintenance.

MODULE I	ELEMENTS OF ESTIMATING & COSTING OF DOMESTIC AND INDUSTRIAL WIRING	9 Periods

Definition of ―Estimation, Types of estimation and estimation tools, Overhead and service charges, Purchase procedure. Layout and wiring diagram for residential building and industrial wiring, Selection of number of circuit for project as per IE rules, Estimation for residential wiring and industrial wiring, I.E. rules observed for above wiring.

MODULE II	ESTIMATING & COSTING OF SERVICE CONNECTIONS	9 Periods

Survey work for domestic and industrial service connection, Lay out/ wiring diagram of service connection (given project work), List of materials and accessories along with specifications required for given project work, Estimation of service connection for domestic and industrial (1phase and 3phase) service connections, I.E. rules pertaining to above wiring.

MODULE III	ESTIMATION OF OVER HEAD AND UNDERGROUND DISTRIBUTION LINE	10 Periods

A: Survey work for estimation of overhead and underground distribution system, Planning and layout of project, List of materials and accessories required for the given project.

B: Procedure for preparing estimate for 440 V, 3 phase, 4 wire or 3 wire overhead and underground distribution system, Necessary drawing/ sketches of overhead and underground service connection, I.E. rules pertaining to above project.

MODULE IV	ESTIMATING & COSTING OF ELECTRICAL PRODUCT	10 Periods

Market survey for cost of given product like D.O.L. starter, small motor, monoblock pump, automatic electric iron, table/ceiling fan, ICDP/ICTP switch etc, Preparation of detailed drawing work of the product, Preparation of material quantity sheet for the product, Market survey for availability of required materials, their cost and other requirements, Preparation of cost schedule of product, Find out cost of product considering material cost, labour cost and overhead charges, Validation of cost schedule, Financial arrangement for the product.

MODULE V   ESTIMATING & COSTING OF REPAIR &   10 Periods
**   MAINTENANCE OF ELECTRICAL DEVICES**
**   AND EQUIPMENT & CONTRACTING**

Location of fault, Materials required and their cost for remedial measure of fault, Estimation of repairing cost.

Estimation of maintenance, servicing and testing cost including labour cost(service charge), Tools used for repairs & maintenance work, Detailed estimation and preparation of cost schedule for repair and maintenance of electric fan, automatic electric iron, single phase transformer, mixy, D.O.L.starter etc.

Principles of contracting :Terms, conditions, and types of contract system,Tender,tendering procedure and preparation of simple tender, Terms and conditions of tender, procedure for inviting and scrutinizing of tender, Importance of Earnest Money Deposit, Security Deposit and S.O.R

Text Books
1.   S.L. Uppal, **"Electrical Wiring, Estimating and Costing"**, Khanna Publisher
2.   S.K. Bhattacharya **,"TTTI",** Chandigarh.

References
1.   M.N. Bajpai, **" Electrical estimating and costing" ,** Saroj publication.
2.   S.O.Rs of P.W.D. Govt. departments.
3.   I.E. rules gadget.
4.   Electrical costing, estimating and contracting.

E - Resources
1.   http://www.navodayaengg.in/study-material/eee/semester-viii/estimation-and-costing/
2.   http://arieseee.blogspot.in/2013/04/electrical-installation-and-estimation.html
3.   http://www.cercind.gov.in/ElectSupplyAct1948.pdf

Course Outcomes
At the end of the course, students should be able to
1.   Understand elements of estimating & costing of domestic and industrial wiring.
2.   Comprehend the estimation of service connection for domestic and industrial service connections.
3.   Analyze the estimation of over head and underground distribution line.
4.   Estimate and prepare the cost schedule for a given electrical product.
5.   Understand the maintenance of electrical devices and principles of contracting.

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

Prerequisites: Power Electronics

Course Objectives: This course deals with the Modern power electronic converters and its applications in electric power utility. Resonant converters and UPS

MODULE I   BASIC CONVERTER CIRCUITS   9 Periods

Linear regulator Vs. Switching regulator – Topologies of SMPS – isolated and non isolated topologies – Buck – Boost – Buck boost – Cuk – Polarity inverting topologies – Push pull and forward converters half bridge and full bridge – Fly back converters Voltage fed and current fed topologies. EMI issues.

MODULE II   SWITCHED MODE POWER CONVERTERS   9 Periods

Analysis and state space modeling of fly back, Forward, Push pull, Luo, Half bridge and full bridge converters- control circuits and PWM techniques.

MODULE III   RESONANT CONVERTERS   10 Periods

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS , Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control.

MODULE IV   DESIGN CONSIDERATIONS   10 Periods

Selection of output filter capacitor, Selection of energy storage inductor, Design of High Frequency Inductor and High frequency Transformer, Selection of switches. Snubber circuit design, Design of driver circuits.

MODULE V   POWER CONDITIONERS, UPS & FILTERS   10 Periods

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters – Design of inductor and transformer for PE applications – Selection of capacitors.

Text Books

1. Simon Ang, Alejandro Oliva," Power-Switching Converters", Third Edition, CRC Press, 2010.
2. KjeldThorborg, "Power Electronics – In theory and Practice", Overseas Press, First Indian Edition 2005.
3. M.H. Rashid – Power Electronics handbook, Elsevier Publication, 2001.

References

3. Philip T Krein, " Elements of Power Electronics", Oxford University Press
4. Ned Mohan, Tore.M.Undeland, William.P.Robbins, Power Electronics converters, Applications and design- Third Edition- John Wiley and Sons- 2006
5. M.H. Rashid – Power Electronics circuits, devices and applications- third edition Prentice Hall of India New Delhi, 2007.
6. Erickson, Robert W, "Fundamentals of Power Electronics", Springer, second edition, 2010.

E- Resources

1. https://nptel.ac.in/courses/108/108/108108036/
2. https://www.coursera.org/specializations/power-electronics
3. https://nptel.ac.in/content/storage2/courses/108105066/PDF/L 33(DP)(PE)%20((EE)NPTEL).pdf

Course Outcomes

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

1. Analyze various modes of operation of Dc-Dc converter
2. Acquire knowledge on switched mode power converters.
3. Understand the importance of Resonant Converters.
4. Design various components of dc-dc converter

5. Acquire knowledge on filters and UPS

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

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

2020-21 Onwards (MR-20)	MALLAREDDY ENGINEERINGCOLLEGE		B.Tech. VI Semester	
Code: A0231	**BIOMEDICAL INSTRUMENTATION** (Professional Elective– II)	**L**	**T**	**P**
Credits: 3		**3**	**-**	**-**

Prerequisites: Basic Electronics, Instrumentation

Course Objectives:

- To Introduce Fundamentals of Biomedical Engineering
- To study the communication mechanics in a biomedical system with fewexamples
- To study measurement of certain important electrical and non-electricalparameters
- To understand the basic principles in imaging techniques
- To have a basic knowledge in life assisting and therapeutic devices

MODULE I   Fundamentals of Biomedical Engineering   9 periods

Cell and its structure ― Resting and Action Potential ― Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems-Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers - Transducers ― selection criteria ― Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors

MODULE II   Non Electrical Parameters Measurement and Diagnostic Procedures
9 periods

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO_2, pO_2, finger-tip oxymeter - ESR, GSR measurements

MODULE III   Electrical Parameters Acquisition and Analysis   9 periods

Electrodes – Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipment.

MODULE IV   Imaging Modalities and Analysis   9 periods

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems

MODULE V   Life Assisting, Therapeutic and Robotic Devices   9 periods

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery –Orthopedic prostheses fixation

E- Resources

https://www.biomedicalinstrumentationsystems.com/the-introduction-to-biomedical-instrumentation/

https://www.medicalnewstoday.com/articles/cardiovascular-system#anatomy

https://www.ncbi.nlm.nih.gov/books/NBK279251/

http://www.nitjsr.ac.in/course_assignment/Biomedical%20Engineering_1.pdf

https://www.youtube.com/watch?v=0d_P5kXkAvE

Course Outcomes:

At the end of the course students will have the

1. Understand the philosophy of the heart, lung, blood circulation and respiration system.
2. Measure and analyze the non electrical biomedical and physiological information
3. Understand and explain the working and concepts of ECG,EMG,EEG and ERG
4. Explain and analyze the modern methods of imaging techniques.
5. Explain the medical assistance/techniques, robotic and therapeutic equipments.

TEXT BOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New
   Delhi, 2007.
2. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi,2nd
   edition, 2003
3. Joseph J Carr and John M.Brown, Introduction to Biomedical Equipment Technology, John Wiley and sons, New York, 4th edition, 2012

REFERENCES

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
2. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.

4. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
5. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: A0232	ELECTRICAL POWER QUALITY (Professional Elective- III)	L	T	P
Credits: 3		3	-	-

Prerequisites: Power System Analysis and Control, Power Electronics

Course Objectives: This subject deals with power quality issues and solutions. It also discussed some of the power quality issues like interruptions and voltage sag with their reliability evaluation.

MODULE I   Introduction to Power Quality   10 Periods

Terms and definitions & Sources – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustained interruption - Sags and swells - Voltage sag - Voltage swell - Voltage imbalance – Voltage fluctuations - Power frequency variations - International standards of power quality – Computer Business Equipment Manufacturers Associations (CBEMA) curve

MODULE II   Voltage Sag and Interruptions   10 Periods

Sources of sags and interruptions -Estimating voltage sag performance - Thevenin′s equivalent source - Analysis and calculation of various faulted condition - Estimation of the sag severity - Mitigation of voltage sag, Static transfer switches and fast transfer switches.
Interruptions-definition-difference between failure, outage, interruptions-causes of   long interruptions origin of interruptions- costs of interruption

MODULE III   Over Voltages   9 Periods

Sources of over voltages - Capacitor switching – lightning - ferro resonance. Mitigation of voltage swells - surge arresters - low pass filters - power conditioners. Lightning protection – shielding – line arresters - protection of transformers and cables.

MODULE IV   Harmonics   10 Periods

Harmonic sources from commercial and industrial loads - Locating harmonic sources – Power system response characteristics - Harmonics Vs transients. Effect of harmonics – Harmonic distortion - Voltage and current distortions - Harmonic indices - Inter harmonics –devices for controlling harmonic distortion - passive and active filters -Harmonic distortion evaluation, IEEE and IEC standards.

MODULE V   Power Quality Monitoring   9 Periods

Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems - Quality measurement equipment - Harmonic / spectrum analyzer – Flicker meters Disturbance analyzer - Applications of expert systems for power quality monitoring.

Text Books
1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, **"Electrical Power Systems Quality"**, McGraw Hill, 2003.
2. J. Arrillaga, N.R. Watson, S. Chen, "Power System Quality Assessment", (New York : Wiley),2000.
3. Bhim Singh, Ambrish Chandra, Kamal Al-Haddad," Power Quality Problems & Mitigation Techniques" Wiley, 2015.

References

1. G.T. Heydt, "Electric Power Quality", 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994.
2. M.H.J Bollen, "Understanding Power Quality Problems: Voltage Sags and Interruptions", (New York: IEEE Press), 2000.
3. C. Sankaran, **"Power Quality"**, CRC press, Taylor & Francis group, 2002.
4. Ewald F. Fuchs, Mohammad A. S. Masoum, **"Power Quality in Power Systems and Electrical Machines"**, Academic Press, 2nd Edition, 2011.
5. Angelo Baggiri, **"Handbook of Power Quality"**, John Wiley & Sons, 1st Edition, 2008.
6. Francisco C. De La Rosa, **"Harmonics and Power Systems"**, CRC Press, 1st Edition, 2006.
7. R.S.Vedam, M.S.Sarma, **"Power Quality – VAR Compensation in Power Systems"**, CRC Press, 2013.

E - Resources

1. http://www.elec.uow.edu.au/apqrc/links
2. http://technav.ieee.org/tag/1354/power-quality#concepts
3. http://nptel.ac.in/courses/108106025/

Course Outcomes

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

1. Understand various sources, causes and effects of power quality issues, electrical systems and their measures and mitigation.
2. Analyze the Causes of voltage sag and its characteristics for single phase and three phase system.
3. Understand the concepts about Voltage and current distortions, harmonics.
4. Analyze and design the passive filters
5. Monitoring and diagnostic techniques for various power quality

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

Prerequisites: DC Machines and Transformers, AC Machines.

Course Objectives: The course deals with the special electrical machines such as induction generator, brushless DC machines, stepper motors which are used in different applications.

MODULE I   Induction Generators   10 Periods

Self excitation requirements, steady state analysis, voltage regulation, different methods of voltage control. Doubly fed induction machines: control via static converter, power flow, voltage/frequency control (generation mode), application to grid connected wind and mini/micro hydel systems.

MODULE II   Brushless DC Machines   9 Periods

Brushless DC Machines: Construction, operation, performance, control and applications.

Micro Machines: Principle of operation of various types. Sensors for control, e.g. Position sensor.

MODULE III   Linear Machines   10 Periods

A: Linear Induction Machines and Linear Synchronous Machines. Construction, operation, performance, control and applications.

B: PMDC and PM Synchronous Machine, control and applications. Recent developments in electrical machines.

MODULE IV   Stepper Motors   10 Periods

Various types, principle of operation, operating characteristics, applications. Servo Motors, Servo amplifier and control. Special types of permanent magnet motors for servo application. Switched Reluctance Motor: Construction, operation, performance, control and applications.

MODULE V   Synchronous and Special Machines   9 Periods

Construction of synchronous machines - Types - Induced emf - Voltage regulation - EMF and MMF methods. Brushless alternators - Reluctance motor - Hysteresis motor – Axial flux machine – Construction and working principle. Flux Reversal Machine – Construction and working principle - Applications.

Text Books

1. P.C. Sen, "**Principles of Electrical Machines and Power Electronics"**, Wisley Edition, 2nd Edition, 1997.

2. Gopal K Dubey, **"Fundamentals of Electrical Drives",** Narosa Publications, 2nd Edition, 2008.

References

1. Bimal K. Bose, **"Modern Power Electronics and AC Drives"**, Low Price Edition, 1st Edition, 2002.
2. R.K. Rajput, **"Electrical Machines"**, Laxmi Publications Pvt., Ltd, 5th Edition, 2005.
3. E.G. Janardanan, **"Special Electrical Machines"**, PHI Learning Pvt. Ltd., 2014.
4. K.Venkataratnam, **"Special Electrical Machines"**, Universities Press, 1st Edition, 2008.
5. Simmi P. Burman, **"Special Electrical Machines"**, S.K. Kataria & Sons, 2013.

E - Resources
1. http://nptel.ac.in/courses/108105063/pdf/L-32(SS)(IAC)%20((EE)NPTEL).pdf
2. https://www.eeweb.com/electromechanical
3. https://www.youtube.com/watch?v=Qy6mA4TEpyI

Course Outcomes

At the end of the course, students will be able to
1. Understand the operation of induction generator.
2. Know the Construction and operating principle of Brushless DC motor and sensor used to control the speed of the motors.
3. Understands the Principle of operation of Linear Induction and Synchronous machines.
4. Comprehend the principle of operation of stepper motors, Permanent magnet motors and switched reluctance motors.
5. Understands the construction, operation and application of brushless alternators, reluctance motors, hysteresis motors and axial flux machines.

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. VI Semester	
Code: A0234	SUPERVISORY CONTROL AND DATA ACQUISITION (Professional Elective-III)	L	T	P
Credits: 3		3	-	-

Prerequisites: Power Generation and Distribution, Power System Analysis and Control and Digital Electronics.

Course Objectives: To develop architecture of SCADA to explain each unit in detail. To apply knowledge gained about SCADA systems to identify few real-life industrial applications.

MODULE I   Introduction to SCADA   10 Periods

Need of SCADA system, Distributed control Systems (DCS), General definition and SCADA components. Hardware architecture, software architecture, protocol detail, discrete control and analog control, application & benefits, PLCs Vs RTUs.

MODULE II   Remote Terminal Units (RTU)   10 Periods

General features, Functions and Applications, Benefits, Configurations of SCADA, RTU (Remote Terminal Units) connections. RTU Block diagram, MTU communication interface, Future trends, Internet based SCADA display system, Components of control systems in SCADA.

MODULE III   SCADA in Power Systems   9 Periods

A: Main task in power systems- Planning, operation, accounting, tasks of national control centre, regional control centre, Generating station control room, AGC-SCADA,
 B: SCADA in generation, SCADA in Power Distribution, SCADA in Power Grid.

MODULE IV   Supervisory Power Management   10 Periods

Energy Management System, power system operation states, security analysis, computer programmes-generating planning, transmission planning, system studies, energy audit, state estimation, load forecasting.

Utility distribution system design, regulation, distribution automation, DMS, design, layout and construction and commissioning of substations, Substation Automation and Equipment condition monitoring

MODULE V   Automatic mapping and facility management   9 Periods

Introduction to Automatic mapping and facility management, Distribution system design, Facility mapping, tracking, facility inventory, system and equipment maintenance, trouble call management, Customer level intelligent automation system, computer level monitoring and control of distribution transformers, Substation and feeder level automation.

Text Books
1. Stuart A. Boyer , **"SCADA"** , IAS 1999.
2. J. Parikh, B. Reddy & R. Benerjee **"Planning for demand side management in the electric sector",** TMH**.**
3. Terson , **"Power system Control Technology"** , Prentice Hall New Delhi

References
1. Elliot L. Gruenberg, **"Hand book of Telemetry of Remote control"** , MGH New Delhi
2. Roddy & Coolen, **"Electronics Communication"**
3. S.S. Rao, **" Switch Gear & Protection"** , Khanna Publication, New Delhi
4. S.L. Uppal, **"Electric Power system"**
5. S K Gupta, **"Power System Engineering"** , Umesh Publication

E - Resources
1. http://nptel.ac.in/courses/108106022/8

2. http://v5.books.elsevier.com/bookscat/samples/9780750669498/9780750669498.PDF

Course Outcomes
At the end of the course, students will be able to
1. Know Need of SCADA, discrete and analog control, basic architecture of SCADA.
2. Understand the Basic concepts of Remote terminal units.
3. Comprehend the application of SCADA in generator control room, in power distribution and in power grid.
4. Estimate the power system operation states, energy audit discussion and substation automation and condition monitoring.
5. Analyze Intelligent automation control, equipment maintenance and feeder level automation for power system applications.

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

Prerequisites: Utilization of Electric Energy

Course Objectives: This course deals with the new concepts invarious electrical system components,residential and commercial electrical systems, illumination systems and industrial electrical systems

MODULE I   Electrical System Components   9 Periods

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB,inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices

MODULE II   Residential and Commercial Electrical Systems   9 Periods

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

MODULE III   Illumination Systems   10Periods

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premise, flood lighting.

MODULE IV   Industrial Electrical Systems – I   10 Periods

HT connect ion, industrial substation, Transformer select ion, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

MODULE V   Industrial Electrical Systems – II   10 Periods

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Text Books

1. S. L. Uppal and G. C. Garg, "Electrical Wiring, Estimating & costing", Khanna publishers, 2008.

2. K. B. Raina, "Electrical Design, Estimating & Costing", New age International, 2007.

References
1. S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.

2. H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.

E- Resources
1. safetyrisk.net/15-safety-precautions-when-working-with-electricity/
2. *https://www.homequestionsanswered.com/what-is-flood-lighting.htm*
3. *https://lightning.org/lightning-protection-overview*

Course Outcomes

At the end of the course, students will be able to
1. Understand various components of industrial electrical systems and representing the systems with standard symbols

2. Understand electric shock and electrical safety practices

3. Applying electrical wiring systems for residential, commercial and industrial consumers

4. Analyze various illumination systems

5. Evaluate various electrical industrial systems.

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

Prerequisites: Linear and Digital IC Applications

Course Objectives: This course deals with the various wearable systems,smart sensors and vital parameters,wearable computers,wireless body area networks and electronic textiles

MODULE I   INTRODUCTION   9 Periods

Drawbacks of Conventional Systems for Wearable Monitoring, Applications of Wearable Systems, Recent developments – Global and Indian Scenario, Types of Wearable Systems, Components of wearable Systems, Physiological Parameters commonly monitored in wearable applications, Smart textiles, & textiles sensors, Wearable Systems for Disaster management, Home Health care, Astronauts, Soldiers in battle field, athletes, SIDS, Sleep Apnea Monitoring

MODULE II   SMART SENSORS AND VITAL PARAMETERS   9 Periods

Vital parameters monitored and their significance, Bio-potential signal recordings (ECG, EEG, EMG), Dry Electrodes design and fabrication methods, Smart Sensors – textile electrodes, polymer electrodes, non-contact electrodes, MEMS and Nano Electrode Arrays, Cuff-less Blood Pressure Measurement, PPG, Galvanic Skin Response (GSR), Body Temperature Measurements, Activity Monitoring for Energy Expenditure, Respiratory parameters.

MODULE III   WEARABLE COMPUTERS   10Periods

Flexible Electronics, Signal Processors, Signal Conditioning circuits design, Power Requirements, Wearable Systems Packaging, Batteries and charging, Wireless Communication Technologies and Protocols, Receiver Systems, Mobile Applications based devices. Data processing and validation – Signal Processing Algorithms in wearable Applications

MODULE IV   WIRELESS BODY AREA NETWORKS   10 Periods

Wireless Body Area Networks – Introduction, Personal Area Networks (PAN), Application in Vital Physiological Parameter monitoring, Design of Sensor & Sink Nodes, Architecture, Communication &Routing Protocols, Security, Power and Energy Harvesting.

MODULE V   ELECTRONIC TEXTILES   10 Periods

Concepts and development of electronic textile. Conductive Polymers and Fibers - Textile Fibres Used for Wearable Electronic Applications. Interfacing Circuits and Garments - Designing of Wearable fabrics integrated with Electronic materials and circuits. Design of Heat-Generating Circuit for Nichrome Fabric, Design of Communication Circuit for Copper Core Conductive Fabric. Design of Signal-Transferring Circuit form Optical Core Conductive Fabric. Design of Bullet Wound Intimation Circuit for Tele-intimation Fabric.

Text Books
1. Micheal R Neuman, Edward Sazonov, "Wearable Sensors: Fundamentals, Implementation

and Applications",1st Edition, Elseiver, USA, 2014

2. Xiao ming Tao, "Wearable Electronics and Photonics", 1st Edition, CRC press, Manchester, 2005.

References

1. Kate Hartman, "Wearable Electronics: Design, Prototype and wear your own interactive garments, Maker Media", 1 st Edition, Maker Media, Inc, USA, 2014.

2. Elijah Hunter, "Wearable Technology", 1st Edition, Kindle Edition, USA, 2015.

3. Guang Zhong Yang, "Body Sensor Networks", 1st Edition, Springer, UK, 2014.

4. Xiaoming Tao, "Wearable Electronics and Photonic Wearable Electronics and Photonics, The Textile Institutes",1st Edition, CRC Press, Manchester, 2005.

E- Resources
1. https://www.vtec-ls.nl/solutions/components
2. https://www.energy.gov/sites/prod/files
3. https://www.technicaltextile.net/articles/electrotextiles-concepts

Course Outcomes

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

1. Understandvarious wearable systems

2. Understand smart sensors and bio-potential signal recordings

3. Evaluatewearable computers and signal processing algorithms in wearable applications

4. Apply wireless body area networks and power & energy harvesting.

5. Analyze concepts and development of electronic textile

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3								3	2		3
CO2	3	3	3	3								3	2		3
CO3	3	3	3	3								3	2		3
CO4	3	3	3	3								3	2		3
CO5	3	3	3	3								3	2		3

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code:	**OPEN ELECTIVE - II**	**L**	**T**	**P**
Credits: 3		3	-	-

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B. Tech. VI Semester	
Code: A0H03	**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 , Non verbal communication -eye contact, voice characters, posture, gestures, do's and don'ts, Role play and Simulation- Learners assuming the roles of characters and participating in Group discussion, analysis, or prediction with strictly defined goals.

Module – IV: Interview Skills & Office Etiquette

Preparing for the interview, types of interviews, interview session, importance of non verbal communication during the interview, do's and don'ts of interview, follow up and thanking letter. FAQ's. Formal Conversation, office attire- do's and don'ts, greetings and meetings, speaking to seniors and handshakes, offering and taking visiting cards, Asking questions and Seeking Clarifications.

Module – V: Career Progression
Job Hunt Process-SWOT analysis, correspondence and browsing the internet to search for a suitable job(s), job application-cover letter drafting, drafting a winning resume', types of resume's -electronic, video and printed resume's
- Instruction: Students are required to prepare their video resume which will be assessed by the faculty member.

Reference Books
1. Chrissie: **Handbook of Practical Communication Skills**: Jaico Publishing house, 1999.
2. Daniels, Aubrey: **Bringing Out the Best in People**: Tata McGraw-Hill: New York, 2003.
3. Wright, Goulstone, Mark: **Just Listen: Discover the Secret to getting through to absolutely anything** : American Management Association, 2010.
4. Leslie. T. Giblin: **Skill with people** Publication details not known
5. Lewis, Norman: **Word Power Made Easy**: Goyal Publications: New Delhi, 2009.
6. Murthy, A.G, Krishna,: **Ten Much** : Tata McGraw-Hill :New Delhi, 2010.

E- Resources
1. http://www.mindtools.com/pages/article/newTMC_05.htm
2. http://www.kent.ac.uk/careers/intervw.htm
3. http://www.wikihow.com/Write-a-Report

Course Outcomes
At the end of the course, students will be able to:
1. Give Oral Presentations Confidently.
2. Draft appropriate Resume in accordance with the context.
3. Participate and present their view and ideas logically and confidently.
4. Understand the importance of communication in various settings.
5. Utilize the technology for career advancement.

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					1					2		2			
CO2										1		2			
CO3		1		1						2		2			
CO4					1	1			1	2		2			
CO5				1	1				1	2		2			

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

2020-21 Onwards (MR-20)	MALLAREDDY ENGINEERINGCOLLEGE		B.Tech. VI Semester	
Code: A0218	**ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB**	L	T	P
Credits:1		-	-	2

To impart the basic knowledge of measuring instruments. To train the students to have the solid foundation in measuring the basic electrical elements like resistance, inductance, capacitance and measurement of power and energy.

List of Experiments:
1. Calibration and Testing of single phase energyMeter.
2. Calibration of dynamometer power factormeter.
3. Calibration of LVDT.
4. Measurement of Resistance using Kelvin's Double Bridge.
5. Measurement of Capacitance using Schering Bridge & De-Sauty Bridge.
6. Measurement of Inductance using AndersonBridge & Maxwell's Bridge.
7. Measurement of 3 phases reactive power with singlewattmeter.
8. Measurement of choke coil parameters using 3 voltmeter and 3 ammeter method.
9. Calibration of LPF wattmeter by PhantomLoading.
10. Measurement of 3 phases power with single wattmeter and Two Watt Meter method.
11. Calibration of single phase energyMeter by PhantomLoading.
12. Measurement of Strain by using Resistance strain gauge.

Course Outcomes
At the end of the course, students should be able to
1. Calibrate the single phase energy meter, power factor meter and LVDT.
2. Measure resistance by using various bridges.
3. Determine the inductance, capacitance by using various bridges.
4. Calibrate the energy meters by phantom loading.
5. Measure the three phase power by different methods.

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech. VI Semester		
Code: A0219	**POWER ELECTRONICS LAB**		**L**	**T**	**P**
Credits: 1			-	-	2

Course Objectives: Apply the concepts of power electronic converters for efficient conversion/control of power from source to load. Design the power converter with suitable switches meeting a specific load requirement.

List of Experiments:
1. Study of Characteristics of SCR, MOSFET & IGBT.
2. Gate firing circuits for SCR.
3. Single Phase AC Voltage Controller with R and RL Loads.
4. Single Phase fully controlled bridge converter with R and RL loads.
5. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E).
6. DC Jones chopper with R and RL Loads.
7. Single Phase Parallel, inverter with R and RL loads.
8. Single Phase Cycloconverter with R and RL loads.
9. Single Phase Half controlled converter with R load.
10. Three Phase half controlled bridge converter with R-load.
11. Single Phase dual converter with RL loads.
12. PSPICE simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE loads and also of resonant pulse commutation circuit and Buck chopper.

Course Outcomes
At the end of the course, students will be able to
1. Analyze the AC voltage controller with R and RL Loads.
2. Analyze the different commutation circuits.
3. Understand the operating principles of various power electronic converters.
4. Use power electronic simulation packages& hardware to develop the power converters.
5. Analyze and choose the appropriate converters for various applications.

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

Module – I   **8 Periods**

Quants: Number System (NS)

- **Number Systems-** *Factors and Multiples: The H.C.F. of two or more than two numbers; Factorization Method Division Method; Finding the H.C.F. of more than two numbers; product of two numbers = Product of their H.C.F. and L.C.M.; Co-primes; H.C.F. and L.C.M. of Fractions:Comparison of Fractions.*

Verbal: Articles, Para Jumbles

- **Articles-** *Types of articles, Countable nouns, Uncountable nouns, Usage of articles, Omission of articles.*
- **Para Jumbles**- *Para Jumbles, Types of Para Jumbles, Strategies to answer questions on Jumbled Paragraphs.*

Logical: Data Arrangements, Blood Relation
- **Data Arrangements-** *Linear Arrangement, Circular Arrangement, Multi-Dimensional Arrangement.*
- **Blood Relations-** *Classification of blood relations, Pointing a person, Equation related problems.*

Module – II   **6 Periods**

Quants: Time and Distance, Pipes

- **Time & Distance-***;Km/hr to m/sec conversion; m/sec to km/hr conversion***;** *man covers a certain distance at x km/hr and an equal distance at y km/hr*

Verbal: Sentence Completion, Prepositions
- **Sentence Completion-** *Formats of Question; Strategies to solve sentence completion questions- Proactive and reactive solving, Identifying clues- Signposts, Types of signposts, Root words, Sentence structure clues.*
- **Prepositions-** *Definition, Types of prepositions, Preposition of Place, Preposition of Time, Preposition of Direction, Compound Prepositions, Prepositional Phrases.*

Logical: Coding and Decoding

- **Coding and Decoding-***Number Series, Alphabet Series, Analogy, Odd Man Out, Visual Reasoning.*

Module–III   **6 Periods**

Quants: Ages, Progression, Logarithms

- **Ages, Progression-**;*Arithmetic progression; Arithmetic mean; Geometric progression and mean*

- **Logarithms-***Why logarithms: Properties of Logarithms: Laws of logarithm: Characteristic of logarithm:*

Verbal: Vocabulary
- **Vocabulary-***Etymology, Root Words, Prefixes and Suffixes; Synonyms and Antonyms, Tips to solve questions on Synonyms and Antonyms; Word Analogy, Patterns of questions on Word Analogy; Miscellaneous Vocabulary.*

Logical: Data Interpretation and Data Sufficiency
- **Data Interpretation-** *Tables, Pie charts, Bar Graphs, Line graphs*
- **Data Sufficiency-***Strategies to solve.*

Module – IV   **6 Periods**

Quants: Permutations and Combinations, Probability

- **Permutations-***Factorial Notation:The different arrangements; Number of Permutations: number of all permutations of n things, taken all at a time; n subjects of which p_1 are alike of one kind; p_2 are alike of another kind; p_3 are alike of third kind; Number of Combinations: The number of all combinations of n things, taken r at a time.*

Verbal: Sentence Correction
- **Sentence Correction-** *Subject-Verb Agreement; Modifiers; Parallelism; Pronoun-Antecedent Agreement; Verb Time Sequence; Comparisons; Determiners; Exercise Questions.*

Logical: Clocks and Calendars

- **Clocks:***Introduction, Derivation of angles, Angles between hands of the clock, Hands together, Hands at angular distance, Gain & Loss problems.*
- **Calendars:** *- Leap year-Non leap year, Odd days, Finding the day from date, Repeated years.*

Module - V: **[6]**

Quants: Areas and Volumes (Mensuration)
- **Areas & Volumes-***Pythagoras Theorem Results on Quadrilaterals Perimeter; Area of a circle Circumference Length of an arc Area of a sector; Area of a triangle.*

Verbal: Reading Comprehension, Critical Reasoning
- **Reading Comprehension-** *Speed reading strategies; Reading Comprehension - types of questions, tackling strategies; Critical Reasoning.*

Logical: Directions, Cubes, Syllogisms

- **Directions -***Introduction, Direction based questions, Shadow based problems.*
- **Cubes-** *Cube & cuboid concepts, 3-2-1-0 faced problems.*
- **Syllogisms-** *Statements and Conclusion, Syllogisms using Venn Diagrams.*

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE		B.Tech. VI Semester		
Code: A00M5	**INTRODUCTION TO CYBER SECURITY** (Common for CE, EEE, ME, ECE, MiE)		**L**	**T**	**P**
Credits: Nil			1	1	-

Prerequisites: NIL

Course objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes: The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.

Module - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defence, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

Module - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

Module - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Module - IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

Module - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy indifferent domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B. Tech. VII Semester		
Code:A0H09	**MANAGEMENT FUNDAMENTALS** (Common for EEE, ECE, CSE and IT)		L	T	P
Credits: 3			3	-	-

Prerequisites: Nil

Course Objectives:

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

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.

References

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.

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

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

2020-21 Onwards (MR-20)	MALLAREDDY ENGINEERINGCOLLEGE		B.Tech. VII Semester	
Code: A0220	POWER SYSTEM OPERATION AND CONTROL	L	T	P
Credits:3		3	-	-

Prerequisites: Electrical Power Generation System, AC Machines.

Course Objectives: This subject deals with Economic operation of Power Systems, Hydrothermal scheduling and modeling of governors, turbines and generators. It emphasizes on single area and two area load frequency control and reactive power control.

MODULE I   Unit Commitment and Economic Dispatch   10 Periods

Statement of economic dispatch problem – cost of generation – heat rate Curve - incremental cost curve co-ordination equations without loss and with loss, solution by direct method and λ-iteration method. (No derivation of loss coefficients). Statement of Unit Commitment problem – constraints; spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints.

MODULE II   Modeling of Turbine, Generator and speed governing mechanism

9 Periods

Modelling of Turbine: First order Turbine model,   Block Diagram representation of Steam Turbines. Modelling of Generator (Steady State and Transient Models): Description of Simplified Network Model of a Synchronous Machine (Classical Model), Modeling of Governor : Mathematical Modeling of Speed Governing System.

MODULE III   Real Power and Frequency Control   10 Periods

Single Area Load Frequency Control : Necessity of keeping frequency constant. Definitions of Control area – Single area control – Block diagram representation of an isolated power system - Steady state analysis – Dynamic response – Uncontrolled case and Controlled Case.

Two-Area Load Frequency Control: Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias control.

MODULE IV   Reactive Power and Voltage Control   10 Periods

Basics of reactive power control. Excitation systems – modeling. Static anddynamic   analysis   - stability compensation - generation and absorption of reactive power. Methods of voltage control- - tap-changing transformer. System level control using generator voltage magnitude setting of OLTC transformer and MVAR injection of switched capacitors to maintain acceptable voltage profile and to minimize transmission loss.

MODULE V   Computer Control of Power System   9 Periods

Need of computer control of power systems. Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and   control. System hardware configuration – SCADA and EMS functions. Network topology - state estimation -

security analysis and control. Various operating states (Normal, alert, emergency, in-extremis and restorative). State transition diagram showing various state transitions and control strategies.

Text Books:
1. Abhijit Chakrabarthi, Sunita Halder,"Power system analysis operation and control", PHI Learning Pvt. Ltd., 3rd Edition.
2. I.J.Nagrath & D.P.Kothari, "Modern Power System Analysis", Tata M Graw – Hill Publishing Company Ltd, 2nd Edition.
3. C.L.Wadhwa, "Electrical Power Systems", Newage International, 3rd Edition,

References:
1. T.J.E. Miller,―Reactive power control in electric systems", John wiley & sons.
2. J.Duncan Glover and M.S.Sarma,―Power System Analysis and Design", THOMPSON, 3 rd Edition.
3. O.I.Elgerd, "Electric Energy systems Theory", Tata Mc Graw-hill Publishing Company Ltd., Second edition.

E-Resources:
1. https://nptel.ac.in/courses/108/101/108101040/
2. https://www.youtube.com/watch?v=zkN13OmgGOs

Course Outcomes

At the end of the course, students will be able to
1. **Calculate** economic load dispatch of generators.
2. **Develop** the mathematical model of Turbine, Generator and speed governing mechanism
3. Describe the real power and frequency control in power system operation
4. Describe reactive power control of a power system
5. **Understand** SCADA system for power system operation and control

<table>
<tr><td colspan="15">CO-PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COS</td><td colspan="14">Programme Outcomes (POs)</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO2</td></tr>
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<tr><td>CO5</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>3</td><td></td></tr>
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Note: The table also includes a PSO3 column (empty for all rows).

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE	B.Tech. VII Semester		
Code: A0232	**Non- Conventional Energy Sources** Professional Elective - III	**L**	**T**	**P**
Credits:3		**3**	**-**	**-**

Prerequisites: Nil

Course Objectives:
The objective of this subject is to provide knowledge about different non-conventional energy sources.

MODULE I   PRINCIPLES OF SOLAR RADIATION   10 Periods

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

MODULE II   SOLAR ENERGY COLLECTORS   10 Periods

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

MODULE III   SOLAR ENERGY STORAGE AND APPLICATIONS   9   Periods

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications-solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

MODULE IV   WIND ENERGY & BIOMASS   10 Periods

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

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 V   GEOTHERMAL ENERGY & OCEAN ENERGY   10 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.

TEXT BOOKS :
1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy Sources /G.D. Rai

REFERENCES:

1.Renewable Energy Sources / Twidell & Weir

2.Solar Energy /Sukhame

3. Solar Power Engineering / B.S Magal Frank Kreith & J.F Kreith.

4. Principles of Solar Energy / Frank Krieth & John F Kreider.

E-Resources

1. https://nptel.ac.in/courses/121/106/121106014/

2. https://nptel.ac.in/courses/103/103/103103206/

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.

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0233	**ELECTRICAL HYBRID VEHICLES** (Professional Elective – III)	**L**	**T**	**P**
Credits: 3		3	-	-

Prerequisites: DC Machines and Transformers and AC Machines.
Course Objectives: To present a comprehensive overview of Electric and Hybrid Electric Vehicles

MODULE I   Introduction to Hybrid Electric Vehicles   10 Periods
History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance.

MODULE II   Hybrid Electric Drive-trains   10 Periods
Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

MODULE III   Electric Propulsion unit & Energy Storage   10 Periods

A: Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives
B:Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices.

MODULE IV   Sizing the drive system   9 Periods

 Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power
MODULE V   Communications, supporting subsystems   9 Periods

Communications, supporting subsystems: In vehicle networks- CAN, Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies

Text Book:
1. Iqbal Hussein, **Electric and Hybrid Vehicles: Design Fundamentals**, CRC Press, 2003

References:
1. James Larminie, John Lowry, **Electric Vehicle Technology Explained**, Wiley, 2003.

2. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, **Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design,** CRC Press, 2004.

E - Resources:

1. https://en.wikipedia.org/wiki/Digital_library
2. https://ieeexplore.ieee.org/document/4168013/
3. www.ieahev.org/
4. web.mit.edu/evt/links.html

Course Outcomes:

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

1. Choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources
2. Design and develop basic schemes of electric vehicles and hybrid electric vehicles.
3. Choose proper energy storage systems for vehicle applications
4. Identify various communication protocols and technologies used in vehicle networks
5. Develop new technologies to generate electrical energy

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0234	DIGITAL SIGNAL PROCESSING	L	T	P
Credits: 3	(Professional Elective - III)	3	-	-

Prerequisites: Signals & Systems.

Course Objective:

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.

References

1. Shalivahana, Vallava Raju, Gnana Priya, **"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. https://www.youtube.com/watch?v=6dFnpz_AEyA
7. 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.

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

Prerequisites: Power Electronics, Electrical Drives

Course Objectives: This course deals with the Modern power electronic converters and its applications in electric power utility. Resonant converters and UPS

MODULE I SWITCHED MODE POWER SUPPLIES (SMPS) 9 Periods

DC Power supplies and Classification; Switched mode dc power supplies - with and without isolation, single and multiple outputs; Closed loop control and regulation; Design examples on converter and closed loop performance.

MODULE II AC-DC CONVERTERS 10 Periods

Switched mode AC-DC converters. synchronous rectification - single and three phase topologies - switching techniques - high input power factor . reduced input current harmonic distortion. improved efficiency. with and without input-output isolation. performance indices design examples

MODULE III DC-AC CONVERTERS 9 Periods

Multi-level Inversion - concept, classification of multilevel inverters, Principle of operation, main features and analysis of Diode clamped, Flying capacitor and cascaded multilevel inverters; Modulation schemes.

MODULE IV AC-AC CONVERTERS WITH AND WITHOUT DC LINK 10 Periods

Matrix converters. Basic topology of matrix converter; Commutation – current path; Modulation techniques - scalar modulation, indirect modulation; Matrix converter as onlyAC-DC converter; AC-AC converter with DC link - topologies and operation - with and without resonance link - converter with dc link converter; Performance comparison with matrix converter with DC link converters.

MODULE V SOFT-SWITCHING POWER CONVERTERS 9 Periods

Soft switching techniques. ZVS, ZCS, quasi resonance operation; Performance comparison hard switched and soft switched converters.AC-DC converter, DC-DC converter, DC-AC converter.; Resonant DC power supplies .

Text Books

1. Power Electronics Handbook, M.H.Rashid, Academic press, New york, 2000.
2. Advanced DC/DC Converters, Fang Lin Luo and Fang Lin Luo, CRC Press, NewYork, 2004.
3. Control in Power Electronics- Selected Problem, Marian P.Kazmierkowski, R.Krishnan and Frede Blaabjerg, Academic Press (Elsevier Science), 2002.

References

1. Philip T Krein, " Elements of Power Electronics", Oxford University Press
2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, Power Electronics converters, Applications and design- Third Edition- John Wiley and Sons- 2006
3. M.H. Rashid – Power Electronics circuits, devices and applications- third edition Prentice Hall of India New Delhi, 2007.
4. Erickson, Robert W, "Fundamentals of Power Electronics", Springer, second edition, 2010.

E- Resources

1. https://nptel.ac.in/courses/108/102/108102157/
2. https://www.coursera.org/specializations/power-electronics
3. https://nptel.ac.in/courses/108/107/108107128/

Course Outcomes

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

6. Analyze the state space model for DC – DC converters
7. Acquire knowledge on switched mode power converters.
8. Understand the importance of Resonant Converters.
9. Analyze the PWM techniques for DC-AC converters

10. Acquire knowledge on filters and UPS

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech VII Semester		
Code:A0236	**POWER SYSTEMS TRANSIENTS**	**L**	**T**	**P**
Credits: 3	(Professional Elective– III)	3	-	-

Prerequisites: Power Systems

COURSE OBJECTIVES:

To impart knowledge about the following topics:

- Generation of switching transients and their control using circuit – theoretical concept.
- Mechanism of lighting strokes and the production of lighting surges.
- Propagation, reflection and refraction of travelling waves.
- Voltage transients caused by faults, circuit breaker action, load rejection on integratedpower system.

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MODULE- I: INTRODUCTION AND SURVEY 10 Periods

Review and importance of the study of transients - causes for transients. RL circuit transient with sine wave excitation - double frequency transients - basic transforms of the RLC circuit transients. Different types of power system transients - effect of transients on power systems – role of the study of transients in system planning.

MODULE-II: SWITCHING TRANSIENTS 10 Periods

Over voltages due to switching transients - resistance switching and the equivalent circuit for interrupting the resistor current - load switching and equivalent circuit - waveforms for transient voltage across the load and the switch - normal and abnormal switching transients. Current suppression - current chopping - effective equivalent circuit. Capacitance switching - effect of source regulation - capacitance switching with a restrike, with multiple restrikes. Illustration for multiple restriking transients - ferro resonance.

MODULE-III: LIGHTNING TRANSIENTS 10 Periods

A-Review of the theories in the formation of clouds and charge formation - rate of charging of thunder clouds – mechanism of lightning discharges and characteristics of lightning strokes

B-model for lightning stroke - factors contributing to good line design - protection using ground wires - tower footing resistance - Interaction between lightning and power system.

MODULE-IV TRAVELING WAVES ON TRANSMISSION LINE COMPUTATION OF TRANSIENTS 10 Periods

Computation of transients - transient response of systems with series and shunt lumped parameters and distributed lines. Traveling wave concept - step response - Bewely's lattice diagram - standing waves and natural frequencies - reflection and refraction of travelling waves.

MODULE-V TRANSIENTS IN INTEGRATED POWER SYSTEM 11 Periods

The short line and kilometric fault - distribution of voltages in a power system - Line dropping and load rejection - voltage transients on closing and reclosing lines – over voltage induced by faults -switching surges on integrated system Qualitative application of EMTP for transient computation.

TEXT BOOKS

1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Inter Science, New York, 2nd Edition, 1991.
2. Pritindra Chowdhari, "Electromagnetic transients in Power System", John Wiley and Sons Inc., Second Edition, 2009.
3. C.S. Indulkar, D.P.Kothari, K. Ramalingam, 'Power System Transients – A statistical approach', PHI Learning Private Limited, Second Edition, 2010.

References

1. M.S.Naidu and V.Kamaraju, 'High Voltage Engineering', McGraw Hill, Fifth Edition, 2013.
2. R.D. Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.
3. J.L.Kirtley, "Electric Power Principles, Sources, Conversion, Distribution and use," Wiley, 2012.
4. Akihiro ametani," Power System Transient theory and applications", CRC press,2013.

E - Resources

1. https://www.dsengg.ac.in/eee/08%20POWER%20SYSTEM%20TRANSIENTS(KP).pdf
2. https://easyengineering.net/ee6002-power-system-transients/
3. https://learnengineering.in/ee8010-power-systems-transients/
4. https://www.notesforgeeks.in/2021/08/ee8010-power-systems-transients-syllabus-2017-regulation.html http://nptel.ac.in/courses/108106072/

Course Outcomes

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

1. Understand and analyze switching and lightning transients.
2. Acquire knowledge on generation of switching transients and their control.
3. Analyze the mechanism of lighting strokes.
4. Understand the importance of propagation, reflection and refraction oftravelling waves.
5. Find the voltage transients caused by faults.

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

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

Prerequisites: Power Generation and Distribution System, DC Machines and Transformers & AC Machines.

Course Objectives: This course deals with the fundamentals of illumination, electric heating and welding. It also emphasis on different kinds of electric drives, electric drive vehicles and their application to electrical traction systems.

MODULE I   Electric Heating and Welding   10 Periods

Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating. Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

MODULE II   Illumination   10 Periods

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light. Discharge lamps, MV and SV lamps – Comparison between LED lamps and fluorescent tubes. Basic principles of light control - Types and design of lighting and flood lighting.

MODULE III   Electric Traction – I   10 Periods

A: System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor.
B: Methods of electric braking – Plugging, rheostatic braking and regenerative braking.

MODULE IV   Electric Traction-II   9 Periods

Mechanics of train movement. Speed-time curves for different services – Trapezoidal and quadrilateral speed time curves. Calculations of tractive effort, power, specific energy consumption for given run. Effect of varying acceleration and braking retardation, adhesive weight and braking retardation, adhesive weight and coefficient of adhesion.

MODULE V   Electric Drive Vehicles   9 Periods

Concept of electric drive vehicles and types – Battery electric vehicles, hybrid vehicles, plug-in hybrid electric vehicles and All-Electric vehicles. Benefits of electric drive vehicles.

Text Books

1. M.L. Soni, P.V. Gupta, V.S. Bhatnagar and A. Chakrabarti, **"A Text Book on Power System Engineering"**, Dhanpat Rai & Co., 2nd Edition, 2014.
2. Partab, **"Art & Science of Utilization of Electrical Energy",** Dhanpat Rai & Sons, 3rd Edition, 2006.

References

1. N.V.Suryanarayana, **"Utilization of Electrical Power Including Electric Drives and Electric Traction"**, New Age International (P) Limited, 1996.
2. C.L.Wadhwa, **"Generation, Distribution and Utilization of Electrical Energy",** New Age International (P) Limited, 1997.
3. J.B.Gupta, **"Utilisation Electric Power and Electric Traction"**, S.K.Kataria and Sons, 2000.
4. R.K.Rajput, **"Utilisation of Electric Power"**, Laxmi Publications Private Limited, 2007.
5. E. Openshaw Taylor, **"Utilisation of Electric Energy",** Orient Longman, 1st Edition, 2006.

E - Resources

1. http://www.intelligent-power-today.com/
2. http://www.electricity-today.com/
3. http://nptel.ac.in/syllabus/108103009/

Course Outcomes

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

1. Understand various types of Electrical Heating, Welding.
2. Design various illuminating systems for various applications like domestic, Industry, commercial buildings.
3. Describe the different types of electric breaking and its characteristics.
4. Analyze speed – time characteristics of electric drive.
5. Choose a drive for a particular electrical application.

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

| COS | Programme Outcomes(POs) |

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3								3	1		
CO2	3	3	3	3								3	1		
CO3	3	3	3	3								3	1		
CO4	3	3	3	3								3	1		
CO5	3	3	3	3								3	1		

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0238	**HVDC AND FACTS**	L	T	P
Credits: 3	(Professional Elective-IV)	3	-	-

Prerequisites: Power Generation & Distribution, Power System Analysis and Control and Power Electronics.

Course Objectives: This course deals with the basic concepts of HVDC transmission system, its applications and analysis of HVDC converters with their control circuitry. It also emphasizes on reactive power control in HVDC system using FACTS devices.

MODULE I   **Introduction**   **9 Periods**

Economics & terminal equipment of HVDC transmission systems: Types of HVDC links – Apparatus required for HVDC systems – Comparison of AC & DC transmission, application of DC transmission System – Planning & modern trends in D.C. transmission.

MODULE II   **Analysis of HVDC Converters**   **10 Periods**

Choice of converter configuration – Analysis of Graetz – Characteristics of 6 Pulse & 12 Pulse converters – Cases of two 3 phase converters in star-star mode and their performance.

Converter & HVDC System Control:

Principle of DC link control – Converters control characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system. Starting and stopping of DC link - Power Control.

MODULE III   **Reactive Power Control in HVDC**   **10 Periods**

A: Reactive Power Requirements in steady state - Conventional control strategies - Alternate control strategies - Sources of reactive power - AC Filters – Shunt capacitors - Synchronous condensers.

B: Power Flow Analysis in AC/DC Systems :

Modeling of DC links - DC network - DC converter - Controller equations - Solution of DC load flow – P.U. system for DC quantities - Solution of AC-DC power flow - Simultaneous method - Sequential method.

MODULE IV   **Power Flow and Dynamic Stability**   **10 Periods**

Transmission interconnections, power flow in an AC System, loading capability limits, power flow and dynamic stability considerations, importance of controllable parameters. Opportunities for FACTS, basic types of FACTS controllers, benefits from FACTS controllers. Requirements and characteristics of high power devices – Voltage and current rating, losses and speed of switching, parameter trade - off of devices.

MODULE V   **STATIC SERIES COMPENSATORS**   **9 Periods**

Concept of series capacitive compensation - Improvement of transient stability - Power oscillation damping. Functional requirements of GTO thyristor controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC). Control schemes for GSC, TSSC and TCSC.

Text Books

1. K.R.Padiyar, **"HVDC Power Transmission Systems"**, New Age International Publishers Limited, 3rd Edition, 2015.
2. N.G.Hingorani and L.Guygi, **"Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems"**, John Wiley & Sons, Inc., Reprint, 2012.

References

1. Jos Arrillaga, **"HVDC Transmission"** , The Institution of Electrical Engineers, 2nd Edition, 1998.
2. S.Rao**, "EHVAC and HVDC Transmission Engineering and Practice: Theory, Practice and Solved Problems",** Khanna Publishers, 1990.
3. E.W.Kimbark, **"Direct Current Transmission"**, John Wiley & Sons, Inc., 1971.
4. E.Uhlmann, **"Power Transmission by Direct Current"**, Springer, 1st Edition, 2012.
5. Yong Hua Song and Allan T Johns, **"Flexible AC Transmission Systems (FACTS)",** The Institution of Electrical Engineers, 1999.

E - Resources

1. https://www.electrical4u.com/facts-on-facts-theory-and-applications/
2. https://www.electrical4u.com/high-voltage-direct-current-transmission/
3. http://nptel.ac.in/courses/108104013/

Course Outcomes

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

1. Understand the applications and different types of HVDC links.
2. Analyze the converter configuration & their characteristics.
3. Describe the reactive power requirements in steady state & modeling of DC links.
4. Analyze the power flow in AC system & apply FACTS controllers for dynamic stability.
5. Describe the working principle of static series compensators.

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0240	ELECTRICAL ENERGY CONSERVATION AND AUDITING	L	T	P
Credits: 3	(Professional Elective-IV)	3	-	-

Prerequisites: Nil

Course Objectives: This course deals about the concept of energy conservation, energy management and different approaches of energy conservation in industries, economic aspects of energy conservation project and energy audit in commercial and industrial sector.

MODULE I   Basic Principles of Energy Audit   9 Periods

Energy audit - definitions, concept , types of audit, energy index, cost index , pie charts, Sankey diagrams, load profiles, Energy conservation schemes - Energy audit of industries - Energy saving potential, energy audit of process industry, thermal power station, building energy audit.

MODULE II   Energy Management   9 Periods

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting, Energy manger, Qualities and functions, language, Questionnaire - check list for top management.

MODULE III   Energy Efficient Motors   10 Periods

A: Energy efficient motors, factors affecting efficiency, loss distribution, constructional details.

B: Characteristics - Variable speed, variable duty cycle systems, RMS hp - Voltage variation -Voltage unbalance - Over motoring - Motor energy audit.

MODULE IV   Power Factor Improvement, Lighting & Energy   10
**   Instruments   Periods**

Power Factor Improvement, Lighting: Power factor – Methods of improvement, location of capacitors, Pf with non linear loads, effect of harmonics on power factor. Power factor motor controllers - Good lighting system design and practice, lighting control, lighting energy audit.

Energy Instruments: Watt meter, data loggers, thermocouples, pyrometers, lux meters, tongue testers , application of PLC's.

MODULE V   Economic Aspects and Analysis   10 Periods

Economics Analysis - Depreciation Methods, time value of money, rate of return, present worth method , replacement analysis, life cycle costing analysis - Energy efficient motors, Calculation of simple payback method, net present worth method - Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

Text Books

1. W.R. Murphy and G. Mckay, **"Energy Management",** Butter Worth Publications.
2. John. C. Andreas, **"Energy Efficient Electric Motors",** Marcel Dekker Inc Ltd, 2nd Edition, 1995.

References

1. Paul O' Callaghan, **"Energy Management",** Mc-Graw Hill Book Company, 1st Edition, 1998.
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 will 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.

<table>
<tr><td colspan="15">CO-PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COS</td><td colspan="14">Programme Outcomes(POs)</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO2</td><td>PSO3</td></tr>
<tr><td>CO1</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>3</td><td></td><td></td></tr>
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<tr><td>CO3</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>3</td><td></td><td></td></tr>
<tr><td>CO4</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>3</td><td></td><td></td></tr>
<tr><td>CO5</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>3</td><td></td><td></td></tr>
</table>

Prerequisites: Power System-I, Power System-II, Power System Analysis

Course Objectives:

- To describe the generation system model and recursive relation for capacitive model building
- To explain the equivalent transitional rates, cumulative probability and cumulative frequency
- To develop the understanding of risk, system and load point reliability indices
- To explain the basic and performance reliability indices

MODULE I   Definition of Reliability   9 Periods

Definition of terms used in reliability, Component reliability, Hazard rate, derivation of the reliability function in terms of the hazard rate. Hazard models - Bath tub curve, Effect of preventive maintenance. Measures of reliability: Mean Time to Failure and Mean Time between Failures.

MODULE II   Generating System Reliability Analysis   9 Periods

Generation system model – capacity outage probability tables – Recursive relation for capacitive model building – sequential addition method – unit removal – Evaluation of loss of load and energy indices. Frequency and Duration methods –Evaluation of equivalent transitional rates of identical and non-identical units – Evaluation of cumulative probability and cumulative frequency of non-identical generating units.

MODULE III   Composite Data and Displays   10 Periods

A: Operating Reserve Evaluation: Basic concepts - risk indices – PJM methods – security function approach – rapid start and hot reserve units – Modeling using STPM approach.

B: Bulk Power System Reliability Evaluation: Basic configuration – conditional probability approach – system and load point reliability indices – weather effects on transmission lines – Weighted average rate and Markov model – Common mode failures.

MODULE IV   Distribution System Reliability Analysis   10 Periods

Basic Techniques – Radial networks –Evaluation of Basic reliability indices, performance indices – load point and system reliability indices – customer oriented, loss and energy-oriented indices – Basic concepts of parallel distribution system reliability.

MODULE V   Substations and Switching Stations   10 Periods

Effects of short-circuits - breaker operation – Open and Short circuit failures – Active and Passive failures – switching after faults – circuit breaker model – preventive maintenance – exponential maintenance times.

Text Books

1. Reliability Evaluation of Power systems by R. Billinton, R.N. Allan, BS Publications, 2007.
2. Reliability Modeling in Electric Power Systems by J. Endrenyi, John Wiley and Sons, 1978.

References

7. Reliability Engineering: Theory and Practice by Alessandro Birolini, Springer Publications.

An Introduction to Reliability and Maintainability Engineering by Charles Ebeling, TMH Publications.

E- Resources

1. https://www.youtube.com/watch?v=hoFKwT9nTwE
2. https://www.youtube.com/watch?v=PqhZRRvq0pk
3. https://www.youtube.com/watch?v=W4xlegKqj0g

Course Outcomes

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

11. Analyze the hazard rate and Measures of Reliability.
12. Develop Generating System models and Reliability Analysis.
13. Identify composite data for display and evaluate Power System Reliability for bulk power.
14. Analyze reliability performance indices for Radial and parallel distribution system.
15. Analyze breaker operation failures in Substations and Switching Stations.

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

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

Prerequisites: Nil

Course Objectives: To impart knowledge on Mode of operation and programming of a Programmable Logic Controller (PLC), to impart knowledge on Characteristics of a PLC (synchronous, asynchronous), Analysis of the process schematic, analog PLC and PID controllers.

MODULE I INTRODUCTION TO PLC 9 Periods

PLC Basics, Block diagram of PLC system, I/O modules, interfacing, PLC-CPU, PLC processor, programming equipment, programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

MODULE II PLC PROGRAMMING 10 Periods

PLC programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation. Digital logical gates programming in the Boolean algebra SYSTEM, CONVERSION EXAMPLES-Ladder diagrams for process control – Ladder diagrams for sequence listings – ladder diagram construction and flow chart for spray process system.

MODULE III REGISTERS AND COUNTERS 10 Periods

A: PLC Registers: Characteristics of registers – module addressing – holding registers – output registers – PLC functions – Timer functions and industrial application.

B: counters – counter function industrial application – Arithmetic functions – number function comparison functions.- number conversion functions.

MODULE IV DATA HANDLING FUCNTIONS AND SEQUENCE FUCNTIONS 10 Periods

Data handling functions: SKIP, Master control relay – Jump Move FIFO, FAL, ONS, CLR and sweep functions and their applications.

Bit pattern and changing a bit shift register, sequence functions and applications – controlling of two axes and three axis Robots with PLC, Matrix functions.

MODULE V ANALOG PLC 9 Periods

Analog PLC operation: Analog modules and systems – Analog signal processing, multi-bit data processing, analog output application examples, PID principles, position indicator with PID control, PID modules, PID tuning, PID functions.

Text Books

1. W. Bolton, **"Programmable Logic Controllers"** , 5th Edition, Elsevier, 2009.

2. J R Hackworth and F D Hackworth Jr, "**Programmable Logic Controllers – Programming methods and Applications**" 5th Edition,Pearson Publications, 2004.

References

1. John W Webb and Ronald A Reiss, **"Programmable Logic Controllers – Principles and Applications"**, 5th Edition, Prentice Hall of India, 1998.
2. **RAJESH MEHRA AND VIKRANT VIJ,** "PLCs & SCADA: THEORY AND PRACTICE", 1ST EDITION, LAXMI PUBLICATIONS, 2016.

E- Resources:
1. https://www.amci.com/industrial-automation-resources/plc-automation-tutorials/what-plc/
2. http://library.automationdirect.com/understanding-ladder-logic/
3. nptel.ac.in/courses/112102011/11

Course Outcomes

At the end of the course, students will be able to
1. Understand the basic concepts of PLC and construct the PLC ladder diagrams.
2. Programming the PLC and Analyze the process schematic.
3. Understand the characteristics of PLC registers and Architecture functions.
4. Analyze the data handling functions and sequence functions.
5. Understand the Analog PLC operation & analog signal processing.

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

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. VII Semester	
Code: A0248	**WIND AND SOLAR ENERGY SYSTEMS** (Professional Elective –VI)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objectives: Renewable energy is clean, affordable, domestic, and effectively infinite. It produces no emissions and results in cleaner air and water for all. This Course discusses prefeasibility analysis, optimum sizing, modeling, control aspects and reliability issues.

MODULE I   Constant Speed Wind Power Plants   10 Periods

Type-A WPP(Wind Power Plants): Working Principle , Different topologies, Starting methods and Maintenance procedure.

Type-B WPP: Working Principle, Different Types, Maintenance procedure. Compare the major differences in the maintenance of Type-A and Type-B WPPs.

MODULE II   Variable Speed Wind Power Plants   10 Periods

Type-C WPP: Working principle, Working Principle Back- to-Back control and Maintenance procedure of Type-C WPPs.

Type-D Geared WPP: Working principle, Maintenance procedure of Type-D Geared WPPs

Type-D direct-drive WPP: Working principle, Maintenance procedure of Type-D Geared WPPs.Need for direct drive WPPs.

MODULE III   Solar Power Plant Performance   10 Periods

A: Solar Thermal Power Plants: Working of a typical Concentrated Solar Power (CSP) plant, Maintenance procedure of CSP systems

B: Solar photovoltaic (PV) Power Plants: Working of a typical Solar PV Power plant. Types of Batteries for solar PV system. Maintenance procedure of typical Solar PV Power plant.

MODULE IV   Wind and Solar Power Quality   9 Periods

Local impact of wind power on the grid. System wide impact of wind power on the grid. Power Quality of solar PV systems Power quality of CSP solar plant. Power quality of solar PV power plant .

MODULE V   Grid Connection of Wind and Solar Power Plants   9 Periods

Grid interface issues of wind power. Grid operational issues of wind power.

Grid connection of CSP plants. Grid connection of solar PV power plants Wind- solar hybrid systems. Maintenance of solar PV and wind solar Hybrid system

Text Books
1. Earnest , Joshua , **"Wind Power Technology"** PHI Learning, New Delhi, 2014
2. Solanki, Chetan Singh, **"Solar Photovoltaic: Fundamentals, Technologies and Application"** PHI Learning, New Delhi, 2009
3. S.P. Sukhatme, J.K.Nayak **"Solar Energy "** Tata McGraw, New Delhi, 2010.

References
1. Solanki, Chetan Singh, Arora, Brij M., Vasi Juzer, Patil, Mahesh B. "**Solar Photovoltaic: A Lab Training Module "** Cambridge University Press, New Delhi, 2009.

E - Resources

1. http://www.awea.org/Resources/Content.aspx?ItemNumber=900

2. http://www.windpowerwiki.dk/

3. http://www.fao.org/docrep/010/ah810e/AH810E11.htm

4. http://www.renewables-made-in-germany.com/en/renewables-made-in-germany-start/solar-energy/solar-thermal-energy/overview.html

5. http://www.renewables-made-in-germany.com/en/renewables-made-in-germany-start/solar-energy/solar-thermal-power-plants/overview.html

6. 4. http://www.eai.in/ref/ae/sol/technology_options.html

COURSE OUTCOMES:

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

1. Comprehend constant speed wind power plants.

2. Compare the operation of variable speed wind power plants.

3. Analyze the operation of concentrated solar power (CSP) and solar photovoltaic (PV) power plants

4. Analyze the grid compatibility of the power from wind and solar power plants.

5. Resolve the grid integration issues of wind and solar power plants

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0249	**ELECTRIC SMART GRID** (Professional Elective-VI)	**L**	**T**	**P**
Credits: 3		3	-	-

Prerequisites: Power System Analysis and Control.

Course Objectives: This course is introduced to provide an overview of the smart grid and to understand the various aspects of the smart grid, including Technologies, Components, Architectures and Applications.

MODULE I   Introduction to Smart Grid   10 Periods
Review Basic Elements of Electrical Power Systems: The Origins of the Power Grid - How the Grid Grew - A Primer on Today's Electrical Utilities - Desirable Traits of a Modern Grid – Principal Characteristics of the Smart Grid - Government and Industry Standardization – Standards and Electricity Markets.

MODULE II   Smart Grid Communications   10 Periods

Two - way Digital Communications Paradigm, Network Architectures, IP-based Systems, Power Line Communications, Advanced Metering Infrastructure. **Measurements:** Sensor Networks, Phasor Measurement Units, Communications Infrastructure, Fault Detection and Self-Healing Systems, Applications and Challenges.

MODULE III   Distribution System Management   10 Periods
A: Data sources and associated external systems, Modeling and analysis tools, applications.
B: Demand Response: Definition, Applications, and State-of-the Art, Pricing and Energy Consumption, Scheduling, Controllable Load Models, Dynamics, and Challenges, Electric Vehicles and Vehicle-to-Grid Systems, Demand Side Ancillary Services.

MODULE IV   Economics and Market Operations   9 Periods
Energy and reserve markets, market power, generation firms, locational marginal prices, financial transmission rights.

MODULE V   Security and Privacy   9 Periods
Cyber Security Challenges in Smart Grid, Load Altering Attacks, False Data Injection Attacks, Defense Mechanisms, Privacy Challenges.

Text Books
1. James Momoh, **"Smart Grid Fundamentals of Design and Analysis"**, IEEE Press, 2012.
2. Janaka Ekanayake, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama and Nick Jenkins, **"Smart Grid Technology and Applications"**, IEEE Press, 2012.

References
1. Aranya Chakraborthy and Marija D llic, **"Control and Optimization Methods for Electric Smart Grids"**, Editor, Springer Publications.

2. Lars T. Berger, Krzysztof Iniewski, **"Smart Grid applications, Communications and Security"**, John Wiley Publishers Ltd., 2012.
3. Yang Xiao, **"Communication and Networking in Smart Grids"**, CRC Press, Taylor and Francis Group, 2012.
4. Caitlin G. Elsworth, **"The Smart Grid and Electric Power Transmission"**, Nova Science Publishers, 2010.
5. Krzysztof Iniewski **, "Smart Grid Infrastructure & Networking",** McGraw Hill Education, 2012.

E - Resources
1. http://www.ee.ucr.edu/~hamed/Smart_Grid_Topic_2_Smart_Grid.pdf
2. http://www.ee.ucr.edu/~hamed/Smart_Grid_Topic_3_Communications.pdf
3. https://www.eeweb.com/power-management

Course Outcomes

At the end of the course, students will be able to
1. Describe the characteristics of smart grid.
2. Describe the concepts & principles of communications technologies for smart grid.
3. Analyze the demand response and energy consumption.
4. Analyze the market operations & financial transmission rights.
5. Describe the security challenges in smart grid.

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. VII Semester	
Code: A2050	AI APPLICATIONS IN ELECTRICAL ENGINEERING	L	T	P
Credits: 3	(Professional Elective - VI)	3	-	-

Prerequisites: Nil

Course Objectives:

To cater the knowledge of soft computing techniques, such as genetic Algorithms, Fuzzy logic and artificial neural networks.

MODULE I: Genetic Algorithms   **10 Periods**

Introduction – Encoding –Fitness Function – Reproduction operator – Genetic Modeling – Genetic operators – Crossover-Single – site crossover-Two point crossover – Multi point crossover – Uniform crossover – Matrix crossover – Crossover Rate – Inversion & Deletion – Mutation operator – Mutation – Mutation Rate – Bit-wise operators – convergence of Genetic Algorithm.

MODULE II: Fuzzy Logic   **10 Periods**

Introduction – Fuzzy versus crisp – Fuzzy sets – Membership function – Basic Fuzzy set operations – Properties of Fuzzy sets – Fuzzy Cartesian Product – Operations on Fuzzy relations – Fuzzy Quantifiers –Fuzzy Inference – Fuzzy Rule based system – Defuzzification methods.

MODULE III: Artificial Neural Networks   **10 Periods**

A: Introduction – Models of Neural Network – Architectures – Knowledge representation – Artificial Intelligence and Neural networks.
B: Learning process – Error correction learning – Hebbian learning –Competitive learning – Supervised learning – Unsupervised learning– Reinforcement learning- learning tasks.

MODULE IV: ANN Paradigms   **9 Periods**

Multi – layer perceptron using Back propagation Algorithm-Self – organizing Map – Radial Basis Function Network – Functional link, network – Hopfield Network.

MODULE V: Applications of AI Techniques   **9 Periods**

Load forecasting – Load flow studies – Economic load dispatch – Load frequency control – Single area system and two area system –Reactive power control – speed control of DC and AC Motors.

TEXT BOOKS
1. S.Rajasekaran and G.A.V.Pai, **"Neural Networks, Fuzzy Logic & Genetic Algorithms"**, PHI, New Delhi, 2003.

REFERENCES
1. P.D.Wasserman, Van Nostrand Reinhold, **"Neural Computing Theory & Practice",** New York, 1989.
2. Bart Kosko, **"Neural Network & Fuzzy System",** Prentice Hall, 1992.
3. G.J.Klir and T.A.Folger, **"Fuzzy Sets,Uncertainty and Information",** PHI, Pvt.Ltd,1994.

4. D.E.Goldberg, Addison Wesley, **"Genetic Algorithms",** 1999.

E-RESOURCES
1. https://aitopics.org/
2. ieeexplore.ieee.org/document/10029/
3. www.nptelvideos.in/2012/11/artificial-intelligence-prof-p-dasgupta.html

Course Outcomes

At the end of the course, students will be able to
1. Apply the genetic modeling, fitness function reproduction operators.
2. Apply the concept of fuzzy based system, analogy between fuzzy and crisp sets, basic fuzzy set operations, rule based systems, Defuzzification methods.
3. Recognize artificial neuron models, architectures, learning process, and learning techniques of artificial neuron models.
4. Apply algorithms like back propagation algorithm, self organizing map, radial networks.
5. Apply the Intelligence techniques to real Power Systems.

<table>
<tr><td colspan="16">CO-PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COs</td><td colspan="12">Program Outcomes (POs)</td><td colspan="3">PSOs</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO2</td><td>PSO3</td></tr>
<tr><td>CO1</td><td>2</td><td>1</td><td></td><td>3</td><td>2</td><td>1</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>1</td><td>1</td></tr>
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<tr><td>CO3</td><td>3</td><td>2</td><td>1</td><td>3</td><td>2</td><td>1</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>1</td><td>1</td></tr>
<tr><td>CO4</td><td>3</td><td>3</td><td>2</td><td>2</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td>CO5</td><td>3</td><td>2</td><td>3</td><td>3</td><td>2</td><td>3</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>1</td><td>2</td></tr>
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2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0251	NEURAL NETWORKS AND FUZZY LOGIC	L	T	P
Credits: 3	(Professional Elective-VI)	3	-	-

Prerequisites: Nil

Course Objectives: This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks. Also deals with Associative Memories and introduces Fuzzy sets and Fuzzy Logic system components. The Neural Network and Fuzzy Network system application to Electrical Engineering is also presented.

MODULE I   Introduction to Neural Networks   10 Periods

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate and Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch- Pitts Model, Historical Developments.

Essentials of Artificial Neural Networks:

Model of an Artificial Neuron, Types of Activation Functions, ANN Architectures, Classification Taxonomy of ANN, Connectivity: Vertices, Edges and Digraph, Learning Methods (Supervised, Unsupervised, Reinforced), Learning Rules, Types of Application.

MODULE II   Single Layer Feed Forward Neural Networks   10 Periods

Introduction, Perceptron Models: Simple Perceptron Model and Multilayer feed forward perceptron model, Training Algorithms, Limitations of the Perceptron Model, Applications.

Multilayer Feed Forward Neural Networks:

Credit Assignment Problem, Generalized Delta Rule, and Back propagation (BP) Training algorithm.

MODULE III   Associative Memories   10 Periods

A: Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory(Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory).

B: Bidirectional Associative Memory (BAM):

Architecture, BAM Training Algorithms: Storage and Recall Algorithm. Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

MODULE IV   Classical & Fuzzy Sets   9 Periods

Introduction to classical set theory - Operations on Crisp sets, Properties of Crisp sets and Crisp Relations. Fuzzy sets, Uncertainty, Membership function, Properties, Fuzzy relations.

**MODULE V   Fuzzy Logic System Components and Fuzzy   9 Periods
                Logic Applications**

Fuzzy logic, Fuzzy Quantifiers, Fuzzy Inference, Fuzzification, Fuzzy rule based system, Defuzzification, Defuzzification methods, Fuzzy logic applications.

Text Books

1 Bart Kosko, **"Neural Networks and Fuzzy Logic System"**, Prentice Hall of India,

1991.

2   S.Rajasekaran and G.A.V.Pai, **"Neural Networks, Fuzzy Logic & Genetic Algorithms"**, Prentice Hall of India, New Delhi, 2003.

References

1. James A Freeman and Davis Skapura, **"Neural Networks"**, Pearson Education, 2002.
2. Simon Haykin, **"Neural Networks and Learning Machines"**, Pearson Education, 3rd Edition, 2009.
3. C.Eliasmith and CH.Anderson, **"Neural Engineering"** 1st Edition, Prentice Hall of India, 2009.
4. Jacek M. Zurada, **"Introduction to Artificial Neural Systems"**, 1st Edition, Jaico Publishing House, 2006.
5. Rober J. Schalkoff, **"Artificial Neural Networks"**, Tata McGraw Hill Edition, 2011.

E - Resources

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_neural_networks.htm
2. http://uni-obuda.hu/users/fuller.robert/nfs.html
3. http://nptel.ac.in/courses/108104049/

Course Outcomes:

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

1. Comprehend the concept of neural networks.
2. Analyze various feed forward networks.
3. Understand the importance of Associative memories.
4. Comprehend classical, fuzzy set theories and the components of fuzzy logic systems.
5. Analyze the application of fuzzy logic control to real time systems.

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

Prerequisites:Control systems and Instrumentation

Course Objectives: This course deals with the Current trends in modern automobiles,basic electrical components in an automobile,embedded systems in typical modern automobile,electronics control units and automotive networking protocols.

MODULE I   INTRODUCTION   9 Periods

Current trends in modern automobiles – – Drive by wire Systems -Vehicle functional domains and their requirements - Components of an Automobile Electronic system and their functions: Sensors, Actuators, Control Units and Software structure of Control units.

MODULE II   AUTOMOBILE ELECTRICALS AND ELECTRONICS   9 Periods

Basic Electrical Components in an automobile - Starting system (Battery, Ignition Switch, Solenoid, Starter, Neutral Safety Switch), Charging system (Alternator Drive Belt, Alternator, Voltage Regulator), Fuses. Overview of Vehicle Electronic system - Driver - Vehicle - Environment system (Control and monitoring systems, Electronic systems of the vehicle and the environment) -General instrumentation block diagram - Typical instrumentation cluster lay out.

MODULE III   EMBEDDED SYSTEM IN AUTOMOTIVE CONTEXT   10Periods

Embedded systems in typical modern automobile - Distributed systems,Embedded components - - Engine Management system - Diesel / Gasoline system, Components, System architecture

(H/W, S/W) - Body electronics systems, - Infotainment systems – Navigation, Car radio.

MODULE IV   ELECTRONICS CONTROL UNITS (ECUS)   10 Periods

ECUs and vehicle subsystems - Electronic systems of Power train subsystem, Electronic systems of Chassis subsystem, Electronic systems of Body subsystems (Comfort and Passive safety), Multimedia subsystems. Automobile sensors and actuators, Engine management system, Vehicle safety systems, Environmental legislation (Pollution Norms - Euro / Bharat standards)

MODULE V   DIAGNOSTICS AND AUTOMOTIVE NETWORKING PROTOCOLS   10 Periods

Diagnostics procedure: Introduction – Diagnostics theory – on board and off board diagnostics – Diagnostics Link Connector (DLC) - CAN bus topology – Data transmission – CAN protocol – Over view of CAN controller - LIN bus: overview – Data transmission system - LIN protocol.

Text Books

1. Tom Denton, "Automobile Electrical and Electronics systems", Routledge Taylor & Francis Group, London & New York, 2002.

2. Nicolas Navet and Francoise Simonot-Lion, "Automotive Embedded Systems Handbook",

CRC Press, USA, 2013.

References

1. Michel Parent &FurnioHarshima, Ljubo vlacic, "Intelligent Vehicle Technologies: Theory and Applications", 1st Edition, Butterworth-Heinemann publications, New Delhi, 2001.

2. Ronald k.J, "Automotive Electronics Handbook", 2 nd Edition, McGraw Hill Publications, Columbus, 2009.

3. Norman P. Mansour, William Ribbens, "Understanding of Automotive Electronics", 5th Edition, Butterworth- Heinemann, United Kingdom, 2014.

4. Robert Bosch , "Automotive Electrics Automotive Electronics", 5th Edition, Springer, Germany, 2010

E- Resources

1. www.epicflow.com/blog/5-latest-trends-in-the-automotive-industry/
2. https://www.gcoeara.ac.in/learning_material/auto
3. https://copperhilltech.com/blog/controller-area-network-can-bus

Course Outcomes

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

1. Understand current trends in modern automobiles

2. Understand components of an automobile electronic system

3. Applying embedded systems in typical modern automobile

4. Analyzeelectronics control units in vehicles

5. Evaluate automotive networking protocols

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

<table>
<tr><td colspan="16" align="center">CO-PO Mapping
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<tr><td rowspan="2">COS</td><td colspan="15" align="center">Programme Outcomes (POs)</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO2</td><td>PSO3</td></tr>
<tr><td>CO1</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td>3</td></tr>
<tr><td>CO2</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td>3</td></tr>
<tr><td>CO3</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td>3</td></tr>
<tr><td>CO4</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td>3</td></tr>
<tr><td>CO5</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td>3</td></tr>
</table>

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:		**L**	**T**	**P**
Credits: 3	**OPEN ELECTIVE - III**	**3**	**-**	**-**

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A00P1	MINI PROJECT / INTERNSHIP - III	L	T	P
Credits: 3		3	-	-

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A0221	POWER SYSTEMS LAB	L	T	P
Credits: 1		-	-	2

Course Objectives: To provide better understanding of power system analysis using simulation and to recognize and analyse the operation of power system protection.

List of Experiments:
1. Computation of Parameters and Modeling of Transmission Lines.
2. Formation of Bus Admittance and Impedance Matrices.
3. Load Flow Analysis using Gauss-Seidel Method
4. Short Circuit Analysis for Single Line to Ground fault (L-G).
5. Short Circuit Analysis for Line to Line fault (L-L).
6. Short Circuit Analysis for Double Line to Ground fault (L-L-G).
7. Characteristics of Over Current Relays.
8. Characteristics of Percentage Biased Differential Relay.
9. Performance and Testing of Transformer Protection System.
10. Performance and Testing of Transmission Line Model.
11. Characteristics of Over Voltage Relay.
12. Characteristics of Under Voltage Relay.

Course Outcomes

At the end of the course, students will be able to
1. Simulate and analyze the load flow of power system network.
2. Simulate and analyze the faults of power system network.
3. Emphasis the performance of transformer.
4. Emphasis the performance of transmission line model.
5. Analyse the performance of power system protection devices

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3					3			2	2		
CO2	3	3	3	3					3			2	2		
CO3	3	3	3	3					3			2	2		
CO4	3	3	3	3					3			2	2		
CO5	3	3	3	3					3			2	2		

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE	B.Tech. VI Semester		
Code: A0422	**MICROPROCESSORS AND MICROCONTROLLERS LAB**	**L**	**T**	**P**
Credits: 1		-	-	2

Course Objectives:

To introduce programming skills related to microcontrollers.

List of 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

Course Outcomes:

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

1. Understand the 8085 processor instructions
2. Develop 8085 programming skills
3. Able to understand 8086 processor instructions
4. Interface different input &output devices to Microcontroller
5. Establish serial communication for interfacing devices

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

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

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A00P2	MAJOR PROJECT	L	T	P
Credits: 3		3	-	-

2020-21 Onwards (MR-20)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: A00P3		L	T	P
Credits: 3	SEMINAR	3	-	-