ACADEMIC REGULATIONS,

COURSE STRUCTURE

and

DETAILED SYLLABUS

CHOICE BASED CREDIT SYSTEM

R21

B.Tech – Electrical & Electronics Engineering

B.Tech - Regular Four Year Degree Programme
(For batches admitted from the academic year 2021 - 2022)

Holy Mary Institute of Technology & Science
Bogaram (V), Keesara (M), Medchal (Dist) - 501 301

FOREWORD

The autonomy is conferred on Holy Mary Institute of Technology & Science by UGC, based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like UGC and AICTE. It reflects the confidence of the UGC in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own **curriculum, examination system and monitoring mechanism**, independent of the affiliating University but under its observance.

Holy Mary Institute of Technology & Science is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a two decades in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the College and recommendations of the JNTU Hyderabad to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the college in order to produce quality engineering graduates to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications, if needed, are to be sought, at appropriate time with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The Cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

PRINCIPAL

ACADEMIC REGULATIONS

B. Tech. - Regular Four Year Degree Programme (For batches admitted from the academic year 2021-22) & B. Tech. - Lateral Entry Scheme (For batches admitted from the academic year 2022-23)

For pursuing four year Under Graduate Degree Programme of study in Engineering & Technology (UGP in E&T) offered by Holy Mary Institute of Technology & Science under Autonomous status is herein referred to as HITS (Autonomous):

All the rules specified herein approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2021-22 onwards. Any reference to "Institute" or "College" in these rules and regulations shall stand for Holy Mary Institute of Technology & Science (Autonomous).

All the rules and regulations, specified hereafter shall be read as a whole for the purpose of interpretation as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, Holy Mary Institute of Technology & Science shall be the chairman Academic Council.

1. ADMISSION

1.1. **Admission into first year of four year B. Tech. degree programmes of study in Engineering**

1.1.1. **Eligibility:**

A candidate seeking admission into the first year of four year B. Tech. degree Programmes should have:

(i) Passed either Intermediate Public Examination (I.P.E) conducted by the Board of Intermediate Education, Telangana, with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination recognized by Board of Intermediate Education, Telangana or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Telangana or equivalent Diploma recognized by Board of Technical Education for admission as per guidelines defined by the Regulatory bodies of Telangana State Council for Higher Education (TSCHE) and AICTE.

(ii) Secured a rank in the EAMCET examination conducted by TSCHE for allotment of a seat by the Convener, EAMCET, for admission.

1.1.2. **Admission Procedure:**

Admissions are made into the first year of four year B. Tech. Degree Programmes as per the stipulations of the TSCHE.

(a) Category 'A' seats are filled by the Convener, TSEAMCET.

(b) Category 'B' seats are filled by the Management.

1.2 Admission into the second year of four year B. Tech. degree Program in Engineering

1.2.1 **Eligibility**:

A candidate seeking admission under lateral entry into the II year I Semester B. Tech. degree Programmes should have passed the qualifying exam (B.Sc. Mathematics or Diploma in concerned course) and based on the rank secured by the candidate at Engineering Common Entrance Test ECET (FDH) in accordance with the instructions received from the Convener, ECET and Government of Telangana.

1.2.2 **Admission Procedure**:

Admissions are made into the II year of four year B. Tech. degree Programmes through Convener, ECET (FDH) against the sanctioned strength in each Programmes of study as lateral entry students.

2. PROGRAMMES OFFERED

Holy Mary Institute of Technology & Science, an autonomous college affiliated to JNTUH, offers the following B.Tech Programmes of study leading to the award of B. Tech degree under the autonomous scheme.

1) B.Tech. - Civil Engineering
2) B.Tech. - Computer Science and Engineering
3) B.Tech. – Computer Science and Engineering (Artificial Intelligence & Machine Learning)
4) B.Tech – Computer Science and Engineering (Data Science)
5) B.Tech – Computer Science and Engineering (IoT)
6) B.Tech – Computer Engineering (Software Engineering)
7) B.Tech. - Electronics and Communication Engineering
8) B.Tech - Electrical & Electronics Engineering
9) B.Tech. - Mechanical Engineering

The medium of instructions for the entire under graduate programme in Engineering & Technology will be English only.

3. DURATION OF THE PROGRAMMES

3.1 Normal Duration

3.1.1 B. Tech. degree programme extends over a period of four academic years leading to the Degree of Bachelor of Technology (B.Tech.) of the Jawaharlal Nehru Technological University Hyderabad.

3.1.2 For students admitted under lateral entry scheme, B. Tech. degree programme extends over a period of three academic years leading to the Degree of Bachelor of Technology (B. Tech.) of the Jawaharlal Nehru Technological University Hyderabad.

3.2 Maximum Duration

3.2.1 The maximum period within which a student must complete a full-time academic programme is 8 years for B. Tech. If a student fails to complete the academic programme within the maximum duration as specified above, he shall forfeit the seat in B.Tech and his admission shall stand cancelled.

3.2.2 For students admitted under lateral entry scheme in B. Tech. degree programme, the maximum period within which a student must complete a full-time academic programme is 6 years. If a student fails to complete the academic programme within the maximum duration as specified above, he shall forfeit the seat in B.Tech and his admission shall stand cancelled.

3.2.3 The period is reckoned from the academic year in which the student is admitted first time into the degree Programme.

4. AWARD OF B.Tech DEGREE

A student will be declared eligible for the award of the B.Tech degree if he/she fulfils the following academic regulations:

4.1 The candidate shall pursue a course of study as specified in section 3.1 and 3.2.

4.2 The candidate shall register for 160 credits and secure 160 credits (Excluding Mandatory Courses).

5. PROGRAMME STRUCTURE

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

Semester Scheme:

Each UGP is of 4 Academic Years (8 Semesters), each year divided into two Semesters of 22 weeks (≥90 working days), each Semester having - 'Continuous Internal Evaluation (CIE)' and

'Semester End Examination (SEE)'under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC, and Curriculum/Course Structure as suggested by AICTE are followed.

5.1.1 The B.Tech. Programme of Holy Mary Institute of Technology & Science is Semester pattern, with 8 Semesters constituting 4 Academic Years, each Academic Year having TWO Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 16-18 Weeks duration with a minimum of 90 Instructional Days per Semester.

5.1.2 Credit Courses:

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

- One Credit - for One hour / Week / Semester for Theory / Lecture(L) / Tutorial)T) Courses; and
- One Credit - for Two hours/Week/Semester for Laboratory/Practical (P) Courses, Mini Project...
- Mandatory Courses Credits shall not be counted for credit requirements for award of degree. However all the mandatory courses have to be passed by the student.

5.1.3 **Course Classification:**

All Courses offered for the UGP are broadly classified as:

- **Basic Science Courses (BSC):** Includes Mathematics, Physics, Chemistry, Biology etc.
- **Engineering Science Courses (ESC):** Courses include Materials, Workshop, Basics of Electrical/Electronics/ Mechanical/Computer Science & Engineering, Engineering Graphics, Instrumentation, Engineering Mechanics, Instrumentation etc.
- **Humanities and Social Science including Management Courses (HSMC):** Courses include English, Communication skills, Management etc.
- **Professional Core Courses (PCC):** Relevant to the chosen specialization/branch.
- **Professional Elective Courses (PEC):** Relevant to the chosen specialization/ branch offered as electives.
- **Open Elective Courses (OEC):** Other technical and/or emerging subject areas offered in the College by the Departments of Engineering, Science and Humanities.
- **Mandatory Course:** Course work on peripheral subjects in a programme, wherein familiarity considered mandatory. To be included as non-Credit, Mandatory Courses, with only a pass in each required to qualify for the award of degree from the concerned institution.
- **Project Work:** and/or internship in industry or elsewhere, seminar.
- **MOOCS –** Massive Open Online Courses in a variety of disciplines available at both introductory and advanced levels, accessible from e-resources in India and abroad.

5.1.4 **Course Nomenclature:**

The Curriculum Nomenclature or Course-Structure Grouping for the each of the UGP E&T (B.Tech Degree Programme), is as listed below.

S. No	Broad Course Classification	Course Group/ Category	Course Description	Credits
1)	BSC,ESC & HSMC	BSC – Basic Sciences Courses	Includes - Mathematics, Physics and Chemistry Subjects	25
2)		ESC - Engineering Sciences Courses	Includes fundamental engineering subjects.	24
3)		HSMC – Humanities and Social Sciences including Management	Includes subjects related to Humanities, Social Sciences and Management.	12
4)	PCC	PCC – Professional Core Courses	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg.	57

5)	PEC	PEC– Professional Elective Courses	Includes Elective subjects related to the Parent Discipline / Department / Branch of Engg.	18
6)	OEC	OEC – Open Elective Courses	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department / Branch of Engg.	09
7)	PWC	Project Work	Major Project.	15
8)		Industrial Training/ Mini- Project	Industrial Training/ Internship/ Mini-Project.	
9)		Seminar	Seminar / Colloquium based on core contents related to Parent Discipline/ Department/ Branch of Engg.	
10)	MC	Mandatory Courses	Mandatory Courses (non-credit)	--
Total Credits for UGP (B. Tech.)Programme				**160**

- Minor variations as per AICTE / UGC guidelines

6. COURSE REGISTRATION

6.1 A 'Faculty Advisor or Counsellor' shall be assigned to each student, who advises him/her about the UGP, its Course Structure and Curriculum, Choice/Option for Subjects/Courses, based on his/her competence, progress, pre-requisites and interest.

6.2 Academic Section of the College invites 'Registration Forms' from students prior (before the beginning of the Semester), ensuring 'DATE and TIME Stamping'. The Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

6.3 A Student can apply for Registration, which includes approval from his faculty advisor, and then should be submitted to the College Academic Section through the Head of Department (a copy of the same being retained with Head of Department, Faculty Advisor and the Student).

6.4 A student may be permitted to register for his/her course of CHOICE with a Total of prescribed credits per Semester (permitted deviation being±12%), based on his PROGRESS and SGPA/CGPA, and completion of the 'PRE-REQUISITES' as indicated for various courses in the Department Course Structure and Syllabus contents.

6.5 Choice for 'additional Courses' must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/Counsellor.

6.6 If the Student submits ambiguous choices or multiple options or erroneous (incorrect) entries during Registration for the Course(s) under a given/specified Course Group/ Category as listed in the Course Structure, only the first mentioned Course in that Category will be taken into consideration.

6.7 Dropping of Courses or changing of options may be permitted, ONLY AFTER obtaining prior approval from the Faculty Advisor, 'within 15 Days of Time' from the commencement of that Semester. Course Options exercised through Registration are final and CAN NOT be changed, and CAN NOT be inter-changed; further, alternate choices will also not be considered. However, if the 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 Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

7. COURSES TO BE OFFERED

7.1 A typical section (or class) strength for each semester shall be 60.

7.2 Courses may be offered to the Students, only if minimum of 20 students ($1/3^{rd}$ of the section strength) opt for it.

7.3 More than ONE TEACHER may offer the SAME SUBJECT (Lab/Practical's may be included with the corresponding Theory Subject in the same Semester) in any Semester. However, selection choice for students will be based on - 'CGPA Basis Criterion' (i.e., the first focus shall be on early Registration in that Semester, and the second focus, if needed, will be on CGPA of the student).

7.4 If more entries for Registration of a Subject come into picture, then the concerned Head of the Department shall take necessary decision, whether to offer such a Subject/Course for TWO (or multiple) SECTIONS or NOT.

7.5 OPEN ELECTIVES will be offered by a department to the students of other departments.

8. B.Tech (Honours) DEGREE

A new academic programme B.Tech (Hons.) is introduced in order to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area.

8.1 B.Tech students in regular stream can opt for B.Tech (Hons.), provided they have a CGPA of 8.0 and above up to the end of IV-Semester without any history of arrears and attempting of betterment.

8.2 For B. Tech (Honors), a student needs to earn additional 20 credits (over and above the required 160 credits for B. Tech degree). Student to opt for the courses from NPTEL/SWAYAM/Coursera/other MOOC platform as recommended by concern BOS relevant to her/his discipline through MOOCs as recommended by the BOS.

8.3 If the credits of NPTEL/ SWAYAM/ Coursera /other MOOC platform courses do not match with the existing subject the BOS will take appropriate decision.

8.4 After registering for the B.Tech (Honours) programme, if a student fails in any course he/she will not be eligible for B.Tech (Honours).

8.5 Students who have obtained "C grade" or "reappear" or "Repeat Course" / "Re Admitted" or "Detained" category in any course, including the MOOCs courses, are not eligible for B.Tech (Hons.) degree. Up to 8 semesters without any history of arrears and attempting of betterment is not eligible to get B.Tech (Hons.).

8.6 Those who opted for B. Tech (Honours) but unable to earn the required additional credits in 8 semesters or whose final CGPA is less than 8 shall automatically fall back to the B.Tech programme. However, additional course credits and the grades thus far earned by them will be shown in the grade card but not included for the CGPA.

8.7 The students have to pay the requisite fee for the additional courses.

Table: Assigned Credits

Hour/Week	Online Course Duration	Assigned Credits
2 hours / week	04 Weeks	01 Credit
3 hours / week	08 Weeks	03 Credits
3 hours / week	12 Weeks	04 Credits

9. B.Tech (Minor) DEGREE

This concept is introduced in the curriculum of all conventional B. Tech. programmes offering a major degree. The main objective of Minor in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B. Tech. programme. In order to earn a Minor in a discipline a student has to earn 20 extra credits by studying any five theory subjects from the programme core & professional elective courses of the minor discipline or equivalent MOOC courses available under SWAYAM platform. The list of courses to be studied either in MOOCs or conventional type will be decided by the department at the time of registration for Minor degree.

a. B.Tech students in regular stream can opt for B.Tech (Minor.), provided they have a CGPA of 8.0 and above up to the end of IV-Semester without any history of arrears and attempting of betterment.
b. Students aspiring for a Minor must register from **V**-Semester onwards and must opt for a Minor in a discipline other than the discipline he/she is registered in. However, Minor discipline registrations are not allowed before V-Semester and after VI-Semester.
c. Students will not be allowed to register and pursue more than extra two subjects in any semester.
d. Completion of a Minor discipline programme requires no addition of time to the regular Four year Bachelors' programme. i.e. Minor discipline programme should be completed by the end of final year B. Tech. program along with the major discipline.
e. A student registered for Minor in a discipline shall pass in all subjects that constitute the requirement for the Minor degree programme. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Minor degree programme.

10. ATTENDANCE REQUIREMENTS

a. A student will be eligible to appear for the End Semester Examinations, if he acquires a minimum of 75% of attendance in aggregate of all the Subjects/Courses (excluding Mandatory or Non-Credit Courses) for that Semester.
b. Condoning of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each Semester may be granted by the College Academic Committee on genuine and valid grounds, based on the student's representation with supporting evidence by following the govt. rules in vogue.
c. A stipulated fee shall be payable towards condoning of shortage of attendance.
d. Shortage of Attendance below 65% in aggregate shall in No case be condoned.
e. A student shall not be promoted to the next Semester unless he/she satisfies the attendance requirements of the current Semester. The student may seek readmission for the Semester when offered next. He / She shall not be allowed to register for the subjects of the Semester while he/she is in detention. A student detained due to shortage of attendance, will have to repeat that Semester when offered next. The academic regulations under which the student has been readmitted shall be applicable.
f. Students whose attendance is less than 75% are not entitled to get the scholarship / fee reimbursement in any case as per the TS Govt. Rules in force.

11. ACADEMIC REQUIREMENTS FOR PROMOTION/COMPLETION OF REGULAR B.TECH PROGRAMME COURSE STUDY.

11.1 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Course, if he secures not less than 35% marks in the End Semester Examination, and a minimum of 40% of marks in the sum Total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades, this implies securing P Grade or above in that Course.

11.2 A Student will not be promoted from I Year to II Year, unless he/she fulfils the Attendance and Academic Requirements and secure a Total 40% of Credits up to I Year II Semester from all the relevant regular and supplementary examinations.

11.3 A Student will not be promoted from II Year to III Year, unless he/she fulfils the Attendance and Academic Requirements and secure a Total 50% of Credits up to II Year II Semester from all the relevant regular and supplementary examinations.

11.4 A Student will not be promoted from III Year to IV Year, unless he/she fulfils the attendance and Academic Requirements and secure a Total 60% of Credits up to III Year II Semester, from all the regular and supplementary examinations.

11.5 After securing the necessary 160 Credits as specified for the successful completion of the entire UGP, resulting in 160 Credits for UGP performance evaluation, i.e., the performance of the Student in these 160 Credits shall alone be taken into account for the calculation of the final CGPA.

If a Student registers for some more 'extra courses' (in the parent Department or other Departments/Branches of Engg.) other than those listed courses Totalling to 160 Credits as specified in the Course Structure of his/her Department, the performances in those 'extra courses' (although evaluated and graded using the same procedure as that of the required 160 Credits) will not be taken into account while calculating the SGPA and CGPA. For such 'extra courses' registered, % marks and 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 8 and 9.1-9.5.

11.6 Students who fail to earn minimum of 160 Credits as per the Course Structure, and as indicated above, within 8 Academic Years from the Date of Commencement of their I Year shall forfeit their seats in B.Tech Programme and their admissions shall stand cancelled.

When a Student is detained due to shortage of attendance/lack of credits in any Semester, he may be re-admitted into that Semester, as and when offered. However the regulations at the time of admissions hold good.

12. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

12.1 The performance of a student in each Semester shall be evaluated Course-wise (irrespective of Credits assigned) with a maximum of 100 marks for Theory. The B.Tech Project Work (Major Project) will be evaluated for 100 marks in Phase-I and 100 Marks in Phase-II.

12.2 For all Theory Courses as mentioned above, the distribution shall be 30 marks for CIE, and 70 marks for the SEE.

12.3

a) For Theory Subjects (inclusive of Minor Courses), during the semester, there shall be two Continues Internal Evaluations (CIE) examinations for **30 marks** each. Each CIE examination consists of one subjective paper for **25 marks**, and assignment for **5 marks** for each subject. Question paper contains Two Parts (Part-A &Part-B) the distribution of marks for PART-A and PART-B will be 10 marks & 15 marks respectively for UG programme. Average of two CIE examinations will be taken as part of external assessment.

Pattern of the question paper is as follows:

PART–A

Consists of **one compulsory question** with five sub questions each carrying two mark. For the I-Mid examinations the sub question would be from first 2 ½ units and for the II-Mid examination the sub question would be from the remaining 2 ½ units.

PART-B

Consists of five questions (out of which students have to answer three questions) carrying five marks each. Each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer any one question). The questions can consist of sub questions also.

b) 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.

c) First Assignment should be submitted before the commencement of the first mid-term examinations, and the Second Assignment should be submitted before the commencement of the second mid-term examinations. The assignments shall be specified/given by the concerned subject teacher.

d) If any candidate is absent for the CIE examinations or those who want to improve their internal marks in any subject can opt for improvement exam as and when offered. The improvement exam is a 45 minutes duration and consisting of 30 objective questions from the entire syllabus of the subject. Best marks are considered as final marks from the average of two mid examinations or improvement examination marks. The improvement can be taken after the payment of prescribed fee. There is no Internal Improvement for the courses Machine Drawing, Production Drawing, Engineering Drawing, Engineering Graphics and practical, mandatory courses.

12.4 For Practical Courses, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 internal marks, and 70 marks are assigned for Lab/Practical End Semester Examination (SEE). Out of the 30 marks for internals, day-to-day work in the laboratory shall be evaluated for 20 marks; and for the remaining 10 marks - two internal practical tests (each of 10 marks) shall be conducted by the concerned laboratory teacher and the average of the two tests is taken into account. The SEE for Practical's shall be conducted at the end of the Semester by Two Examiners appointed by the Chief Controller of Examinations in consultation with the Head of the Department.

12.5 For the Subjects having Design and/or Drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing, Production Drawing Practice, and Estimation), the distribution shall be 30 marks for CIE (10 marks for day-to-day work and 20 marks for internal tests) and 70 marks for SEE. There shall be two internal tests in a semester and the average of the two shall be considered for the award of marks for internal tests.

12.6 Open Elective Course**:** Students can choose one open elective course (OE-I) during III-B.Tech I-semester, one (OE-II) during III-B.Tech II-semester, one (OE-III) in IV-B.Tech I-semester, and one (OE-IV) in IV-B.Tech II-semester from the list of open elective courses given. However, students cannot opt for an open elective courses offered by their own (parent) department, if it is already listed under any category of the subjects offered by parent department in any Semester.

12.7 There shall be an Industrial Oriented Mini Project/Summer Internship, in collaboration with an industry of their specialization. Students will register for this immediately after II year II semester examinations and pursue it during summer vacation. Industrial Oriented Mini Project/Summer Internship shall be submitted in a report form and presented before the committee in III year I semester. It shall be evaluated for 100 external marks. The committee consists of an external examiner, Head of the Department, Supervisor of the Industrial Orientated Mini Project/Summer Internship and a senior faculty member of the department. There shall be no internal marks for Industrial Orientated Mini Project/Summer Internship.

12.8 There shall be a Comprehensive Viva (Independent Study) in III-B.Tech II-Semester and will be conducted SEE through a test or a committee consisting of One External Examiner, Head of the Department and two senior faculty members of the Department. The independent study is intended

to assess the student's understanding of the subjects he/she studied during the B.Tech course of study and evaluated for 100 marks. There shall be no CIE for Comprehensive Viva.

12.9.

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

b) For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall evaluate the project work and project supervisor shall evaluate for 100 marks. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) secures less than 40% marks in the total of the CIE.

A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

c) For Project Stage – II, the external examiner shall evaluate the project work for 70 marks and the project supervisor shall evaluate it for 30 marks. The topics for industrial oriented mini project and Project Stage – I shall be different from one another. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the external examiner as per schedule, or (ii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

For conducting viva-voce of project stage – II, Chief Controller of Examinations selects an external examiner from the list of experts in the relevant branch submitted by the department HODs of the College.

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.

12.10. **Semester End Examination:**

a) Question paper contains 2 Parts (Part-A and Part-B) having the questions distributed equally among all units.

b) The distribution of marks for i) PART-A for 20 marks ii) PART-B for 50 marks. Pattern of the question paper is as follows:

PART–A

Consists of one question which is compulsory. The question consists of ten sub-questions one from each unit and carry 2 marks each.

PART-B

Consists of 5 questions carrying 10 marks each. Each of these questions is from one unit and may contain sub questions. Each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer any one question).

12.11. For Mandatory Non-Credit Courses offered in a Semester, after securing ≥ 65% attendance and has secured not less than 35% marks in the SEE, and a minimum of 40% of marks in the sum Total of the CIE and SEE taken together in such a course, then the student is **PASS** and will be qualified for

the award of the degree. No marks or Letter Grade shall be allotted for this courses/activities. However, for non-credit courses '**Satisfactory'** or "**Unsatisfactory'** shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

12.12. SWAYAM: College intends to encourage the students to do a minimum of one MOOC in discipline and open elective during third year. The respective departments shall give a list of standard MOOCs providers including SWAYAM whose credentials are endorsed by the BoS. In general, MOOCs providers provide the result in percentage. In such case, specified by the college shall follow the grade table mentioned in 14.2. The Credits for MOOC(s) shall be transferred same as given for the respective discipline or open electives. In case a student fails to complete the MOOCs he/she shall re-register for the same with any of the providers from the list provided by the department. The equivalence of the courses shall be established by the department committee. Still if a student fails to clear the course/s, or in case a provider fails to offer a MOOC in any semester, then in all such cases the college shall conduct the end semester examinations for the same as per the college end semester examination pattern. The syllabi for the supplementary examinations shall be same as that of MOOCs. There shall be no internal assessment however the marks obtained out of 70 shall be scaled up to 100 marks and the respective letter grade shall be allotted. The details of MOOC(s) shall be displayed in Memorandum of Grades of a student, provided he/she submits the proof of completion of it or them to the examination branch through the Coordinator/Mentor, before the end semester examination of the particular semester.

13. AWARD OF DEGREE

After a student has satisfied the requirement prescribed for the completion of the Programme and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes Shown in Table.

Table: **Declaration of Class based on CGPA (Cumulative Grade Point Average)**

Class Awarded	Grade to be Secured
First Class with Distinction	**CGPA ≥ 8.00**
First Class	≥ 6.50 to < 8.00 CGPA
Second Class	≥ 5.50 to < 6.50 CGPA
Pass Class	≥ 5.00 to < 5.50 CGPA
FAIL	CGPA < 5

14. LETTER GRADE AND GRADE POINT

14.1 Marks will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practical's, or Seminar, or Project, or Internship*/Mini-Project, Minor Course etc., based on the %marks obtained in CIE+SEE (Continuous Internal Evaluation + Semester End Examination, both taken together), and a corresponding Letter Grade shall be given.

14.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed...

% of Marks Secured (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
90% and above (≥ 90% , ≤ 100%)	O (Outstanding)	10
Below 90% but not less than 80% (≥ 80% , < 90%)	A^+ (Excellent)	9
Below 80% but not less than 70% (≥ 70% , < 80%)	A (Very Good)	8
Below 70% but not less than 60% (≥ 60% , < 70%)	B^+ (Good)	7
Below 60% but not less than 50% (≥ 50% , < 60%)	B (above Average)	6
Below 50% but not less than 40% (≥ 40% , < 50%)	C (Average)	5
Below 40% (< 40%)	F (FAIL)	0
Absent	AB	0

14.3 A student obtaining F Grade in any Subject shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the End Semester Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier.

14.4 A Letter Grade does not imply any specific % of Marks.

14.5 In general, a student shall not be permitted to repeat any Subject/Course (s) only for the sake of 'Grade Improvement' or 'SGPA/CGPA Improvement'. However, he has to repeat all the Subjects/Courses pertaining to that Semester, when he is detained.

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

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

14.7 The Student passes the Subject/Course only when he gets GP ≥ 4 (P Grade or above).

14.8 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects/Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

SGPA = $\{\sum_{i=1}^{N} C_i G_i\} / \{\sum_{i=1}^{N} C_i\}$ …. For each Semester,

where 'i' is the Subject indicator index (takes into account all Subjects in a Semester), 'N' is the no. of Subjects 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department), C_i is the no. of Credits allotted to that ix Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i Subject.

Illustration of Computation of SGPA Computation

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course1	3	A	8	3 x 8 = 24
Course2	4	B+	7	4 x 7 = 28
Course3	3	B	6	3 x 6 = 18
Course4	3	O	10	3 x10= 30
Course5	3	C	5	3 x 5 = 15
Course6	4	B	6	4 x 6 = 24

Thus, **SGPA =139/20 =6.95**

14.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

$$\textbf{CGPA} = \{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \} \text{ … for all S Semesters registered}$$

(i.e., up to and inclusive of S Semesters, S ≥ 2),

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the 1st Semester onwards up to and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), C_j is the no. of Credits allotted to the jth Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that jth Subject. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

For CGPA Computation

Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
Credits : 19.5 SGPA : 6.9	Credits : 20.5 SGPA : 7.8	Credits : 18.0 SGPA : 5.6	Credits : 19.0 SGPA : 6.0	Credits : 21.5 SGPA : 6.3	Credits : 21.5 SGPA : 8.0	Credits : 23 SGPA : 8.0	Credits : 17 SGPA : 8.0

Thus, **CGPA =** $\dfrac{19.5x6.9+20.5x7.8+18.0x5.6+19.0x6.0+21.5x6.3+21.5x8.0+23x8.0+17x8.0}{160} = 7.10$

14.10 For Merit Ranking or Comparison Purposes or any other listing, ONLY the 'ROUNDED OFF' values of the CGPAs will be used.

14.11 For Calculations listed in Item 12.6–12.10, performance in failed Subjects/Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/Courses will also be included in the multiplications and summations. However, Mandatory Courses will not be taken into consideration.

14.12 Conversion formula for the conversion of GPA into indicative percentage is

% of marks scored = (final CGPA -0.50) x 10

15. DECLARATION OF RESULTS

Computation of SGPA and CGPA are done using the procedure listed in 12.6– 12.10.

No SGPA/CGPA is declared, if a candidate is failed in any one of the courses of a given Semester.

16. WITH HOLDING OF RESULTS

If the student has not paid fees to College at any stage, or has pending dues against his name due to any reason what so ever, or if any case of indiscipline is pending against him, the result of such student may be withheld, and he 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.

17. REVALUATION

Students shall be permitted for revaluation after the declaration of end Semester examination results within due dates by paying prescribed fee. After revaluation if there is any betterment in the grade, then improved grade will be considered. Otherwise old grade shall be retained.

18. SUPPLEMENTARY EXAMINATIONS

Supplementary examinations for the odd Semester shall be conducted with the regular examinations of even Semester and vice versa, for those who appeared and failed or absent in regular examinations. Such candidates writing supplementary examinations may have to write sometimes one or two examinations per day.

ADVANCED SUPPLEMENTARY EXAMINATION

Advanced supplementary examinations will be conducted for IV year II Semester after announcement of regular results.

19. TRANSCRIPTS

After successful completion of prerequisite credits for the award of degree a Transcript containing performance of all academic years will be issued as a final record. Duplicate PC, CMM & Transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

20. RULES OF DISCIPLINE

20.1 Any attempt by any student to influence the teachers, Examiners, faculty and staff of controller of Examination for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.

20.2 When the student absents himself, he is treated as to have appeared and obtained zero marks in that course(s) and grading is done accordingly.

20.3 When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject(s).

20.4 When the student's answer book is confiscated for any kind of attempted or suspected malpractice the decision of the Examiner is final.

21. MALPRACTICE PREVENTION COMMITTEE

A malpractice prevention committee shall be constituted to examine and punish the students who involve in malpractice / indiscipline in examinations. The committee shall consist of:

a) Controller of examinations - Chairman
b) Addl. Controller of examinations.- Member Convenor
c) Subject expert - member
d) Head of the department of which the student belongs to. - Member
e) The invigilator concerned - member

The committee shall conduct the meeting after taking explanation of the student and punishment will be awarded by following the malpractice rules meticulously.

Any action on the part of candidate at the examination like trying to get undue advantage in the performance at examinations or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents relating to the examinations, in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and will be recommended for appropriate punishment after thorough enquiry.

22. TRANSITORY REGULATIONS

Student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed after having undergone the Degree Programme, may be considered eligible for readmission to the same Subjects/Courses (or equivalent Subjects/Courses, as the case may be), and same Professional Electives/Open Electives (or from set/category of Electives or equivalents suggested, as the case may be) as and when they are offered (within the time-frame of 8 years from the Date of Commencement of his I Year I Semester).

23. AMENDMENTS TO REGULATIONS

The Academic Council of Holy Mary Institute of Technology & Science reserves the right to revise, amend, or change the regulations, scheme of examinations, and / or syllabi or any other policy relevant to the needs of the society or industrial requirements etc., without prior notice.

There shall be no Branch transfers after the completion of Admission Process. Transfer of student is permitted subjected to the rules and regulations of TSCHE (TE Department) and JNTUH in vogue.

The College shall have its own Annual Graduation Day for the award of Degrees issued by the College/University.

Institute will award Medals to the outstanding students who complete the entire course in the first attempt within the stipulated time.

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

Academic Regulations for B. Tech. (Lateral Entry Scheme) (Effective for the students getting admitted into II year from the Academic Year 2022-2023 on wards)

1. The Students have to acquire 120 credits from II to IV year of B.Tech Programme (Regular) for the award of the degree.
2. Students, who fail to fulfil the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.
3. The same attendance regulations are to be adopted as that of B. Tech. (Regular)

Promotion Rule:

A Student will not be promoted from III Year to IV Year, unless he/she fulfils the Attendance and Academic Requirements and (i) secures a Total of 60% Credits up to III Year II Semester, from all the regular and supplementary examinations.

Award of Class:

After the student has satisfied the requirements prescribed for the completion of the programme and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes: The marks obtained for 120 credits will be considered for the calculation of CGPA and award of class shall be shown separately.

Table: Declaration of Class based on CGPA (Cumulative Grade Point Average)

Class Awarded	Grade to be Secured
First Class with Distinction	CGPA ≥ 8.00
First Class	≥ 6.50 to < 8.00 CGPA
Second Class	≥ 5.50 to < 6.50 CGPA
Pass Class	≥ 5.00 to < 5.50 CGPA
FAIL	CGPA < 5

All other regulations as applicable for B. Tech. Four-year degree programme (Regular) will hold good for B.Tech (Lateral Entry Scheme).

MALPRACTICES RULES - DISCIPLINARY ACTION FOR /IMPROPER CONDUCT IN EXAMINATIONS

S. No	Nature of Malpractices / Improper Conduct	Punishment
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 he 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 subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate 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 subject only of all the candidates 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 the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Principal.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that Semester/year. The candidate is also debarred for two consecutive Semesters from class work and all examinations. The continuation of the course 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 subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive Semesters from class work and all examinations. The continuation of the course 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 subject.
6	Refuses to obey the orders of the Addl. Controller of examinations / 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 addl. Controller of examinations or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the addl. Controller of examinations, 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.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive Semesters from class work and all examinations. The continuation of the course by the candidate 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 subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. 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 subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that Semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the principal for further action to award suitable punishment.	

COURSE STRUCTURE

Dept. of Electrical & Electronics Engineering

I B.Tech.- I-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A1MA101BS	Linear Algebra and Calculus	BSC	3	1	-	4	30	70	100
A1CH103BS	Engineering Chemistry	BSC	3	1	-	4	30	70	100
A1CS106ES	Programming for Problem Solving	ESC	3	-	-	3	30	70	100
A1EN105HS	English for Effective Communication	HSMC	2	-	-	2	30	70	100
A1CS114ES	Programming for Problem Solving Lab	ESC	-	-	4	2	30	70	100
A1CH110BS	Engineering Chemistry Lab	BSC	-	-	3	1.5	30	70	100
A1EN113HS	English Language Communication Skills Lab	HSMC	-	-	3	1.5	30	70	100
A1EE117ES	Social Innovation	ESC	-	-	3	1.5	30	70	100
Total			**11**	**2**	**13**	**19.5**	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
A1EE101MC	Technical Seminar-I	MC	-	-	2	-	100	-	100

I B.Tech.- II-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A1MA201BS	Ordinary Differential Equations and Advanced Calculus	BSC	3	1	-	4	30	70	100
A1AP204BS	Applied Physics	BSC	3	1	-	4	30	70	100
A1EE203ES	Basic Electrical Engineering	ESC	3	1	-	4	30	70	100
A1ME208ES	Engineering Graphics	ESC	1	-	4	3	30	70	100
A1AP212BS	Applied Physics Lab	BSC	-	-	3	1.5	30	70	100
A1EE204ES	Basic Electrical Engineering Lab	ESC	-	-	3	1.5	30	70	100
A1ME216ES	Workshop Manufacturing Practice	ESC	-	-	3	1.5	30	70	100
A1EE201PW	Engineering Exploration	PWC	-	-	2	1	30	70	100
Total			**10**	**3**	**15**	**20.5**	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
A1EE202MC	Technical Seminar-II	MC	-	-	2	-	100	-	100

II B.Tech.- I-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A1EE301PC	Network Theory	PCC	3	-	-	3	30	70	100
A1EC301ES	Electronic Devices and Circuits	ESC	3	-	-	3	30	70	100
A1EE302PC	DC Machines & Transformers	PCC	3	-	-	3	30	70	100
A1EE303PC	Electromagnetic Theory	PCC	3	-	-	3	30	70	100
A1EC303ES	Digital Electronics	ESC	3	-	-	3	30	70	100
A1EC302ES	Electronic Devices and Circuits Lab	ESC	-	-	2	1	30	70	100
A1EE304PC	DC Machines & Transformers Lab	PCC	-	-	3	1.5	30	70	100
A1EE305PC	Networks Lab	PCC	-	-	2	1	30	70	100
Total			**15**	**-**	**7**	**18.5**	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
A1EE303MC	Gender Sensitization	MC	-	-	2	-	100	-	100

II B.Tech.- II-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A1EE406PC	AC Machines	PCC	3	-	-	3	30	70	100
A1EE407PC	Generation & Transmission of Electric Power	PCC	3	-	-	3	30	70	100
A1EE408PC	Control System Analysis	PCC	3	-	-	3	30	70	100
A1MA401BS	Complex Variables and Transforms	BSC	3	1	-	4	30	70	100
A1EE409PC	Electrical Measurements & Instrumentation	PCC	3	-	-	3	30	70	100
A1EE410PC	AC Machines Lab	PCC	-	-	3	1.5	30	70	100
A1EE411PC	Control System Analysis Lab	PCC	-	-	2	1	30	70	100
Total			**15**	**1**	**5**	**18.5**	**210**	**490**	**700**
Mandatory Course (Non-Credit)									
A1EE404MC	Environmental Studies	MC	2	-	-	-	100	-	100
A1EE405MC	Human Values & Professional Ethics	MC	3	-	-	-	100	-	100

III B.Tech.- I-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A1EE512PC	Power Electronics	PCC	3	-	-	3	30	70	100
A1EE513PC	Power System analysis	PCC	3	-	-	3	30	70	100
A1EC501PC	Signals & Systems	PCC	3	-	-	3	30	70	100
	Professional Elective –I	PEC	3	-	-	3	30	70	100
A1EE504HS	Business Economics & Financial Analysis	HSMC	3	-	-	3	30	70	100
A1EE514PC	Power Electronics & Drives Lab	PCC	-	-	3	1.5	30	70	100
A1EE515PC	Power Systems Lab	PCC	-	-	3	1.5	30	70	100
A1EE516PC	Electrical Measurements & Instrumentation-Lab	PCC	-	-	3	1.5	30	70	100
A1EE501PW	Internship/Mini Projects	PWC	-	-	-	1	-	100	100
	MOOCs (for B.Tech Hons. Degree)*								
Total			**15**	**-**	**9**	**21.5**	**240**	**660**	**900**
Mandatory Course (Non-Credit)									
A1EE506MC	Essence of Indian Traditional Knowledge	MC	2	-	-	-	100	-	100

III B.Tech.- II-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A1EC602PC	Microprocessors and Microcontrollers	PCC	3	-	-	3	30	70	100
A1EE617PC	Distribution & Utilization of Electric Power	PCC	3	-	-	3	30	70	100
A1EE618PC	Power System Operation and Control	PCC	3	-	-	3	30	70	100
A1EE619PC	Special Electrical Machines	PCC	3	-	-	3	30	70	100
	Professional Elective –II	PEC	3	-	-	3	30	70	100
	Open Elective – I	OEC	3	-	-	3	30	70	100
A1EN604HS	Advanced English Communication Skills lab	HSMC	-	-	2	1	30	70	100
A1EC603PC	Microprocessors and Microcontrollers Lab	PCC	-	-	3	1.5	30	70	100
A1EE602PW	Comprehensive viva	PWC	-	-	-	1	--	100	100
	MOOCs (for B.Tech Hons. Degree)*								
Total			**18**	**-**	**5**	**21.5**	**240**	**660**	**900**
Mandatory Course (Non-Credit)									
A1EE607MC	Constitution of India	MC	2	-	-	-	100	-	100

IV B.Tech.- I-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A1EE720PC	Industrial Automation	PCC	3	-	-	3	30	70	100
A1EE721PC	Advanced Control of Electric Drives	PCC	3	-	-	3	30	70	100
	Professional Elective – III	PEC	3	1	-	4	30	70	100
	Professional Elective – IV	PEC	3	1	-	4	30	70	100
	Open Elective – II	OEC	3	-	-	3	30	70	100
A1EE722PC	Electrical & Electronics Design-Lab	PCC	-	-	4	2	30	70	100
A1EE703PW	Project Phase-I	PWC	-	-	8	4	100	-	100
	MOOCs (for B.Tech Hons. Degree)*								
Total			**15**	**2**	**12**	**23**	**280**	**420**	**700**

IV B.Tech.- II-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A1EE823PC	AI Techniques in Electrical Engineering	PCC	3	-	-	3	30	70	100
	Professional Elective -V	PEC	3	-	-	3	30	70	100
	Open Elective-III	OEC	3	-	-	3	30	70	100
A1EE804PW	Project Phase-II	PWC	-	-	16	8	30	70	200
	MOOCs (for B.Tech Hons. Degree)*								
Total			**9**	**-**	**16**	**17**	**120**	**280**	**400**

Total Credits – 160

PROFESSIONAL ELECTIVES			
PE-I		**PE-II**	
A1EE501PE	Electrical Machine Design	A1EE604PE	Wind and Solar Energy Systems
A1EE502PE	Modelling and Analysis of Electrical Machines	A1EE605PE	Switch Gear and Protection
A1EE503PE	High Voltage Engineering	A1EE606PE	Electrical Distribution Systems
PE-III		**PE-IV**	
A1EE707PE	Solid State Drives	A1EE710PE	Digital Signal Processing
A1EE708PE	Line - Commutated and Active PWMRectifiers	A1EE711PE	Control System Design
A1EE709PE	Industrial Electrical Systems	A1EE712PE	Digital Control Systems
PE-V			
A1EE813PE	Electrical & Hybrid Vehicles		
A1EE814PE	HVDC Transmission Systems		
A1EE815PE	Power Quality& FACTS		

OPEN ELECTIVES			
OE-I		**OE-II**	
A1EE601OE	Energy Storage Systems	A1EE703OE	Electrical Safety Practices for Industry
A1EE602OE	Renewable Energy Sources	A1EE704OE	Basics of Power Plant Engineering
OE-III			
A1EE805OE	Modern Trends in Electrical Energy		
A1EE806OE	Energy from Waste		

MANDATORY COURSE (Non-Credit)			
A1EE101MC	Technical Seminar-I	A1EE405MC	Human Values & Professional Ethics
A1EE202MC	Technical Seminar-II	A1EE506MC	Essence of Indian Traditional Knowledge
A1EE303MC	Gender Sensitization	A1EE607MC	Constitution of India
A1EE404MC	Environmental Studies		

OPEN ELECTIVES				
S. No.	**Name of the Department Offering Open Electives**	**Open Elective – I (Semester – VI)**	**Open Elective – II (Semester – VII)**	**Open Elective – III (Semester – VIII)**
1	Civil Engg.	**A1CE601OE**	**A1CE703OE**	**A1CE805OE**
		Engineering Materials For Sustainability	Environmental Engineering	Green Building Technologies
		A1CE602OE	**A1CE704OE**	**A1CE806OE**
		Disaster Preparedness & Planning Management	Construction Engineering And Management	Air Pollution and Control
2	Computer Science and Engg.	**A1CS601OE**	**A1CS703OE**	**A1CS805OE**
		Java Programming	Operating Systems	Linux Programming
		A1CS602OE	**A1CS704OE**	**A1CS806OE**
		Database Management Systems	Cyber Security	R Programming
3	Electrical and Electronics Engg.	**A1EE601OE**	**A1EE703OE**	**A1EE805OE**
		Energy Storage Systems	Electrical Safety Practices for Industry	Modern Trends in Electrical Energy
		A1EE602OE	**A1EE704OE**	**A1EE806OE**
		Renewable Energy Sources	Basics of Power Plant Engineering	Energy from Waste
4	Electronics and Communication Engg.	**A1EC601OE**	**A1EC703OE**	**A1EC805OE**
		Principles of Communications	Fiber Optic Communications	Embedded Networking
		A1EC602OE	**A1EC704OE**	**A1EC806OE**
		Electronic Measuring Instruments	Mobile Communication and Networks	Satellite Communication
5	Mechanical Engg.	**A1ME601OE**	**A1ME703OE**	**A1ME805OE**
		Mechatronics	Composite Materials	Total Quality Management
		A1ME602OE	**A1ME704OE**	**A1ME806OE**
		Additive Manufacturing	Industrial Robotics	Renewable Energy Sources
6	CSE(Artificial Intelligence and Machine Learning)	**AIAM601OE**	**A1AM703OE**	**A1AM805OE**
		Computational Complexity	Introduction To Machine Learning	Cognitive Computing
		AIAM602OE	**A1AM704OE**	**A1AM806OE**
		Computer Networks	Green Computing	Software Process and Project Management
7	CSE(Data Science)	**A1DS601OE**	**A1DS703OE**	**A1DS805OE**
		Data Warehousing and Data Mining	Python Programming	Image Analytics
		A1DS602OE	**A1DS704OE**	**A1DS806OE**
		Artificial Intelligence	Text Analytics and Natural Language Processing	Data Science Ethics

8	CSE(IoT)	**A1IO601OE**	**A1IO703OE**	**A1IO805OE**
		Sensor and Devices	IoT for Architects	IoT System Design
		A1IO602OE	**A1IO704OE**	**A1IO806OE**
		IoT Sensor and Technologies	Python for IoT	Internet of Medical Things
9	CSE(Software Engineering) Civil Engg.	**A1SE601OE**	**A1SE703OE**	**A1SE805OE**
		Introduction to C++	JAVA Programming	Scripting Language
		A1SE602OE	**A1SE704OE**	**A1SE806OE**
		Principles of Software Engineering	Software Testing Methodology	Software Quality Management

***Open Elective –** Students should take Open Electives from List of Open Electives Offered by Other Departments / Branches Only

Ex: - A Student of Electrical & Electronics Engineering can take Open Electives from all other departments/branches except Open Electives offered by Electrical & Electronics Engineering Dept.

DETAILED SYLLABUS

I-YEAR (I-SEMESTER)

LINEAR ALGEBRA AND CALCULUS

I B.Tech-I Semester **L T P C**
Course Code: A1MA101BS **3 1 - 4**

COURSE OBJECTIVES:

To learn

1. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
2. Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
3. Methods of solving the differential equations of first order.
4. Evaluation of improper integrals using Beta and Gamma functions.
5. Partial differentiation and finding maxima and minima of function of two and three variables.

COURSE OUTCOMES:

Upon the successful completion of this course, the students will be able to:

1. Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations.
2. Find the Eigen values and Eigen vectors and reduce the quadratic form to canonical form using orthogonal transformations.
3. Identify whether the given differential equation of first order is exact or not.
4. Solve the applications on the mean value theorems and evaluate the improper integrals using Beta and Gamma functions.
5. Find the extreme values of functions of two variables with/ without constraints.

UNIT-I MATRICES

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-singularmatrices by Gauss-Jordan method; System of linear equations; Solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method; Gauss Seidel Iteration Method.

UNIT –II EIGEN VALUES AND EIGEN VECTORS

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

UNIT-III FIRST ORDER ORDINARY DIFFERENTIAL EQUATION

Exact, linear and Bernoulli's equations: Orthogonal Trajectories (in Cartesian and polar coordinates) Newton's law of cooling, Law of natural growth and decay, Equations not of first degree: Equations solvable for p, Equations solvable for y, Equations solvable for x and Clairaut's type.

UNIT –IV CALCULUS

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 . Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT-V MULTIVARIABLE CALCULUS

Definitions of Limit and continuity. Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

ENGINEERING CHEMISTRY

I B.Tech-I Semester **L T P C**
Course Code: A1CH103BS **3 1 - 4**

COURSE OBJECTIVES:

1. To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand & remember the technology based on them.
2. Able to understand the concepts of hardness & analyze hardness of water.
3. To acquire the knowledge of electrochemistry & corrosion
4. To acquire the skills pertaining to spectroscopy and able to evaluate the structure of organic compounds.
5. To impart the knowledge of stereochemistry and synthesis of Aspirin & Paracetamol

COURSE OUTCOMES: Student must be able to

1. Evaluate the MOELD of N_2, O_2 & F_2.
2. Analyze hardness of water.
3. Apply electrochemistry concepts to solve the problem of corrosion.
4. Evaluate the structure of Organic compounds by using spectroscopy.
5. Synthesize Organic medicines like Paracetamol & Aspirin & predict the structure based on stereochemistry.

UNIT - I: MOLECULAR STRUCTURE AND THEORIES OF BONDING

Atomic and Molecular orbitals, Linear Combination of Atomic orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams (MOELD) of N2, O2 and F2 molecules. Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d-orbitals in Tetrahedral, Octahedral and square planar geometries, Band structure of solids and effect of doping on conductance.

UNIT - II: WATER AND ITS TREATMENT

Introduction – Hardness of water Causes of hardness - Types of hardness: temporary and permanent, expression and units of hardness .Estimation of hardness of water by complex metric method, Potable water and its specifications, Steps involved in treatment of water – Disinfection of water by chlorination and ozonisation.
Boiler Troubles-Priming and Foaming, Caustic Embrittlement, Boiler Corrosion, Sludge and Scale formation
Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning, External treatment of water – Ion exchange process, Desalination of water – Reverse osmosis, Numerical problems.

UNIT - III: ELECTROCHEMISTRY AND CORROSION

Electro chemical cells – electrode potential, standard electrode potential, Types of electrodes – Calomel, Quinhydrone and glass electrode, Determination of pH of a solution by using quinhydrone and glass electrode.
Measurement of emf of a cell (solution), Electro chemical series and its applications. Numerical problems. Potentiometric titrations, Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery, Lithium ion battery) &Fuel cells-Hydrogen-Oxygen fuel cell. Corrosion: Causes and effects of corrosion
Theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion. Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application. Electroless plating of Nickel.

UNIT - IV: STEREOCHEMISTRY, REACTION MECHANISM AND SYNTHESIS OF DRUG MOLECULES

Introduction to representation of 3-dimensional structures, Structural and stereoisomers, configurations, symmetry and chirality. Enantiomers, diastereomers, optical activity and Absolute configuration. Conformation analysis of n-butane. Organic reactions: Types of Fissions, Types of reagents &types of reactions Substitution reactions: Nucleophilic substitution reactions: Mechanism of SN1, SN2 reactions. Addition reactions: Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's

additions.Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkyl halides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using KMnO4 and chromic acid. Reduction reactions: Reduction of carbonyl compounds using LiAlH4 & NaBH4. Hydroboration of olefins. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

UNIT - V: INTRODUCTION OF SPECTROSCOPY, SPECTROSCOPIC TECHNIQUES AND APPLICATIONS

Principles of spectroscopy, Classification of spectra (UV-VIS,IR,NMR, Raman spectra, etc), Selection rules and applications of electronic spectroscopy. Vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift. Introduction to Magnetic resonance imaging.

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TEXT BOOKS:

1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry by P.C.Jain & M.Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
4. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E.Schore, 5th Edition.
5. University Chemistry, by B.M. Mahan, Pearson IV Edition.
6. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan

REFERENCE BOOKS:

1. Organic chemistry by Morryson and Boyd
2. Organinc Chemistry by Y.R. Sharma.

PROGRAMMING FOR PROBLEM SOLVING

I B. TECH- I SEMESTER **L T P C**
Course Code: A1CS106ES **3 - - 3**

COURSE OBJECTIVES

1. To impart knowledge about problem solving and algorithmic thinking.
2. To familiarize with the syntax and semantics of C programming language.
3. To learn the usage of structured programming approach in solving problems.
4. To use arrays, pointers, strings and structures in solving problems.
5. To understand how to solve problems related to matrices, Searching and sorting.

COURSE OUTCOMES

1. At the end of the course, student will be able to:
2. Apply algorithmic thinking to understand, define and solve problems
3. Develop computer programs using programing constructs and control structures
4. Decompose a problem into functions to develop modular reusable code.
5. Use arrays, pointers, strings and structures to formulate algorithms and programs.
6. Use files to perform read and write operations.

UNIT – I: INTRODUCTION - PROBLEM SOLVING AND ALGORITHMIC THINKING

Introduction to Computer System, Types of memories, Application and System Software, Problem Solving and Algorithmic Thinking Overview – Problem Definition, logical reasoning, Algorithm definition, practical examples, properties, representation, flowchart, algorithms vs programs.
Algorithmic Thinking – Constituents of algorithms - Sequence, Selection and Repetition, input- output; Computation – expressions, logic; Problem Understanding and Analysis – problem definition,
variables, name binding, data organization: lists, arrays etc. algorithms to programs.

UNIT – II: OPERATORS, EXPRESSIONS AND CONTROL STRUCTURES

Introduction to C language: Structure of C programs, C tokens, data types, data inputs, output statements, Operators, precedence and associativity, evaluation of expressions, type conversions in expressions.
Control structures: Decision statements; if and switch statement; Loop control statements: while, for and do while loops, jump statements, break, continue, goto statements.

UNIT - III: ARRAYS AND FUNCTIONS

Arrays: Concepts, one dimensional array, declaration and initialization of one-dimensional arrays, two dimensional arrays, initialization and accessing, multi-dimensional arrays, Basic Searching Algorithms: Linear and Binary search
Functions: User defined and built-in Functions, storage classes, Parameter passing in functions, call by value, call by reference, passing arrays to functions, Recursion as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Towers of Hanoi etc.

UNIT - IV: STRINGS AND POINTERS

Strings: Arrays of characters, variable length character strings, inputting character strings, character library functions, string handling functions.
Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, functions returning pointers, Dynamic memory allocation.

UNIT – V: STRUCTURES AND FILE HANDLING

Structures and unions: Structure definition, initialization, accessing structures, nested structures, arrays of structures, structures and functions, self-referential structures, unions, typedef, enumerations.
File handling: command line arguments, File modes, basic file operations read, write and append, example programs.

TEXT BOOKS:

1. Riley DD, Hunt K.A. Computational Thinking for the Modern Problem Solver. CRC press, 2014 Mar 27.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)
3. Byron Gottfried, “Programming with C”, Schaum's Outlines Series, McGraw Hill Education, 3rdedition, 2017.

REFERENCE BOOKS:

1. W. Kernighan Brian, Dennis M. Ritchie, “The C Programming Language”, PHI Learning, 2nd Edition, 1988.
2. Yashavant Kanetkar, “Exploring C”, BPB Publishers, 2nd Edition, 2003.
3. Schildt Herbert, “C: The Complete Reference”, Tata McGraw Hill Education, 4th Edition, 2014.
4. R. S. Bichkar, “Programming with C”, Universities Press, 2nd Edition, 2012.
5. Dey Pradeep, Manas Ghosh, “Computer Fundamentals and Programming in C”, Oxford University Press, 2nd Edition, 2006.
6. Stephen G. Kochan, “Programming in C”, Addison-Wesley Professional, 4th Edition, 2014.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Computational_thinking
2. https://nptel.ac.in/courses/106/104/106104128/
3. https://en.cppreference.com/w/c/language
4. https://www.learn-c.org/

E-TEXT BOOKS:

1. https://slidelegend.com/queue/computational-thinking-for-the-modern-problem-solver_59d6f01e1723ddb0c7a0df47.html
2. http://flowgorithm.altervista.org/#elf_l1_Lw
3. http://www.freebookcentre.net/Language/Free-C-Programming-Books-Download.htm

MOOC COURSE:

1. https://www.coursera.org/learn/computational-thinking-problem-solving
2. https://onlinecourses.nptel.ac.in/noc18_cs33/preview
3. https://www.alison.com/courses/Introduction-to-Programming-in-c
4. http://www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s096-effective- programming-in-c-and-c-january-iap-2014/index.htm

ENGLISH FOR EFFECTIVE COMMUNICATION

I B.Tech-I Semester **L T P C**
Course Code: A1EN105HS **2 - - 2**

INTRODUCTION:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students. In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.

COURSE OBJECTIVES:

1. Improve language proficiency with emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Apply the theoretical and practical components of English syllabus to study academic subjects more effectively and critically.
3. Analyze a variety of texts and interpret them to demonstrate in writing or speech.
4. Write clearly and creatively, and adjust writing style appropriately to the content, the context, and nature of the subject.
5. Develop language components to communicate effectively in formal and informal situations.

COURSE OUTCOMES: Students should be able to:

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
5. Generate dialogues for various situations.

UNIT –I: 'THE RAMAN EFFECT' FROM THE PRESCRIBED TEXTBOOK 'ENGLISH FOR ENGINEERS' PUBLISHED BY CAMBRIDGE UNIVERSITY PRESS.

Vocabulary: The Concept of Word Formation --The Use of Prefixes and Suffixes.
Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.
Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – Paragraph writing – Types, Structures and Features of a Paragraph – Creating Coherence-Organizing Principles of Paragraphs in documents.

UNIT –II: 'ANCIENT ARCHITECTURE IN INDIA' FROM THE PRESCRIBED TEXTBOOK 'ENGLISH FOR ENGINEERS' PUBLISHED BY CAMBRIDGE UNIVERSITY PRESS.

Vocabulary: Synonyms and Antonyms.
Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading: Improving Comprehension Skills – Techniques for Good Comprehension
Writing: Format of a Formal Letter-Writing Formal Letters, E.g. Letter of Complaint, Letter of Requisition, and Job Application with Resume.

UNIT –III: 'ENERGY: ALTERNATIVE SOURCES' FROM THE PRESCRIBED TEXT BOOK 'ENGLISH FOR ENGINEERS AND TECHNOLOGISTS' TEXT BOOK- ORIENT BLACK SWAN.

Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives- Words from Foreign Languages and their Use in English
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.
Reading: Sub-skills of Reading-Skimming and Scanning
Writing: Nature and Style of Sensible Writing- Defining- Describing Objects, Places and Events – Classifying- Providing Examples or Evidence.

UNIT –IV: 'WHAT SHOULD YOU BE EATING' FROM THE PRESCRIBED TEXTBOOK 'ENGLISH FOR ENGINEERS' PUBLISHED BY CAMBRIDGE UNIVERSITY PRESS.

Vocabulary: Standard Abbreviations in English
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Comprehension- Intensive Reading and Extensive Reading
Writing: Writing Practices--Writing Introduction and Conclusion - Essay Writing-Précis Writing.

UNIT –V: 'GOOD MANNERS' BY J C HILLS FROM FLUENCY IN ENGLISH – A COURSE BOOK FOR ENGINEERING STUDENTS

Vocabulary: Technical Vocabulary and their usage
Grammar: Common Errors in English
Reading: Reading Comprehension-Exercises for Practice.
Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports -Writing a Report.

TEXT BOOKS:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers Cambridge University Press
2. Department of Humanities and Sciences, (2016) – Anna University - English for Engineers and Technologists –Orient BlackSwan
3. J.C.Hill, (2016) Fluency in English- A Course book for Engineering students- Orient BlackSwan

REFERENCE BOOKS:

1. Swan, M. (2016). Practical English Usage Oxford University Press
2. Kumar, S and Lata, P.(2018). Communication Skills Oxford University Press
3. Wood, F.T. (2007).Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well Harper Resource Book
5. Hamp-Lyons, L. (2006).Study Writing. Cambridge University Press
6. Exercises in Spoken English. Parts I –III CIEFL, Hyderabad. Oxford University Press

PROGRAMMING FOR PROBLEM SOLVING LAB

I B.Tech-I Semester **L T P C**
Course Code: A1CS114ES **- - 4 2**

COURSE OBJECTIVES

1. To be familiarize with flowgorithm to solve simple problems
2. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
3. To develop modular, reusable and readable C Programs using the concepts like functions, arrays, strings pointers and structures.

COURSE OUTCOMES

1. At the end of the course, student will be able to
2. Solve simple mathematical problems using Flowgorithm.
3. Correct syntax errors as reported by the compilers and logical errors encountered at run time
4. Develop programs by using decision making and looping constructs.
5. Implement real time applications using the concept of array, pointers, functions and structures.
6. Solve real world problems using matrices, searching and sorting

WEEK – 1:

a) Installation and working of Flowgorithm Software.
b) Write and implement basic arithmetic operations using Flowgorithm – sum, average, product, difference, quotient and remainder of given numbers etc.

WEEK – 2:

a) Draw a flowchart to calculate area of Shapes (Square, Rectangle, Circle and Triangle).
b) Draw a flowchart to find the sum of individual digits of a 3 digit number.
c) Draw a flowchart to convert days into years, weeks and days.
d) Draw a flowchart to read input name, marks of 5 subjects of a student and display the name of the student, the total marks scored, percentage scored.

WEEK – 3:

a) Draw a flowchart to find roots of a quadratic equation.
b) Draw a flowchart to find the largest and smallest among three entered numbers and also display whether the identified largest/smallest number is even or odd
c) Draw a flowchart to check whether the triangle is equilateral, isosceles or scalene triangle

WEEK – 4:

a) Write a C program to swap values of two variables with and without using third variable.
b) Write a C program to enter temperature in Celsius and convert it into Fahrenheit.
c) Write a C program to calculate Simple and Compound Interest.
d) Write a C program to calculate s = ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).

WEEK – 5:

a) Write a C program to find largest and smallest of given numbers.
b) Write a C program which takes two integer operands and one operator form the user(+,-,*,/,% use switch)
c) Write a program to compute grade of students using if else adder. The grades are assigned as followed:

marks<50	F
50≤marks< 60	C
60≤marks<70	B

70≤marks	B+
80≤marks<90	A
90≤mars≤ 100	A+

WEEK – 6:

a) Write a C program to find Sum of individual digits of given integer
b) Write a C program to generate first n terms of Fibonacci series
c) Write a C program to generate prime numbers between 1 and n
d) Write a C Program to find the Sum of Series SUM=1-x2/2! +x4/4!-x6/6!+x8/8!-x10/10!
e) Write a C program to generate Pascal's triangle.
f) Write a C program to generate pyramid of numbers.

```
1
1       3       1
1       3       5       3       1
```

WEEK – 7:

a) Write a C Program to implement following searching methods
   I. Binary Search
   II. Linear Search

b) Write a C program to find largest and smallest number in a list of integers

c) Write a C program
   I. To add two matrices
   II. To multiply two matrices

d) Write a C program to find Transpose of a given matrix

WEEK – 8:

a) Write a C program to find the factorial of a given integer using functions
b) Write a C program to find GCD of given integers using functions
c) Write a C Program to find the power of a given number using functions

WEEK – 9:

a) Write a C Program to find binary equivalent of a given decimal number using recursive functions.
b) Write a C Program to print Fibonacci sequence using recursive functions.
c) Write a C Program to find LCM of 3 given numbers using recursive functions

WEEK – 10:

a) Write a C program using functions to
b) Insert a sub string into a given main string from a given position
c) Delete n characters from a given position in a string
d) Write a C program to determine if given string is palindrome or not

WEEK – 11:

a) Write a C program to print 2-D array using pointers
b) Write a C program to allocate memory dynamically using memory allocation functions (malloc, calloc, realloc, free)

WEEK – 12:

I. Write a C Program using functions to
   a) Reading a complex number
   b) Writing a complex number
   c) Add two complex numbers
   d) Multiply two complex numbers
   e) Note: represent complex number using structure

II. Write a C program to read employee details employee number, employee name, basic salary, hra and da of n employees using structures and print employee number, employee name and gross salary of n employees.

TEXT BOOKS:

1. Riley DD, Hunt K.A. Computational Thinking for the Modern Problem Solver. CRC press, 2014 Mar 27.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)
3. Yashavant Kanetkar, "Let Us C", BPB Publications, New Delhi, 13th Edition, 2012.

REFERENCE BOOKS:

1. Ferragina P, Luccio F. Computational Thinking: First Algorithms, Then Code. Springer; 2018
2. King KN, "C Programming: A Modern Approach", Atlantic Publishers, 2nd Edition, 2015.
3. Kochan Stephen G, "Programming in C: A Complete Introduction to the C Programming Language", Sam's Publishers, 3rd Edition, 2004.
4. Linden Peter V, "Expert C Programming: Deep C Secrets", Pearson India, 1st Edition, 1994.

WEB REFERENCES:

1. http://www.flowgorithm.org/documentation/
2. http://www.sanfoundry.com/c-programming-examples
3. http://www.geeksforgeeks.org/c
4. http://www.cprogramming.com/tutorial/c

ENGINEERING CHEMISTRY LAB

I B.Tech-I Semester **L T P C**
Course Code: A1CH110BS **- - 3 1.5**

COURSE OBJECTIVES:

The course consists of experiments related to the principles of chemistry required for engineering student.
The student will learn:

1. Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
2. To determine the rate of corrosion of different metals
3. The measurement of physical properties like adsorption and viscosity.
4. To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.
5. To determine the acid content by Potentiometry.

COURSE OUTCOMES: The experiments will make the student must able to:

1. Analyze the hardness and chloride content in water.
2. Estimate rate corrosion of different metals.
3. Determine physical properties like adsorption and viscosity.
4. Calculate Rf values of some organic molecules by TLC technique.
5. Determine the acid content in the given sample by using potentiometer.

LIST OF EXPERIMENTS:

I. Conductometry

1. Estimation of an HCl by Conductometric titrations
2. Estimation of Acetic acid by Conductometric titrations

II. Potentiometry:

3. Estimation of HCl by Potentiometric titrations
4. Estimation of Fe2+ by Potentiometry using KMnO4

III. Complexometry:

5. Determination of total hardness of water by complexometric method using EDTA

IV. Argentometry:

6. Determination of chloride content of water by Argentometry

V. Rate of corrosion:

7. Measurement of rate of acid corrosion of different metals

VI. Water Quality Parameters (Analytical Chemistry):

8. Determination of BOD & COD

VII. Saponification

9. Determination of acid value of coconut oil

VIII. Partition Coefficient:

10. Determination of partition coefficient of acetic acid between n-butanol and water.

IX. Chromatography

11. Thin layer chromatography calculation of Rf values. egseparation of ortho and para nitro phenols

X. Colligative properties

12. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
13. Determination of surface tension of a give liquid using stalagnometer.

XI. Synthesis

14. Synthesis of Aspirin and Paracetamol.

REFERENCE BOOKS:

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
3. Vogel's text book of practical organic chemistry 5th edition
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara

ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

I B.Tech-I Semester **L T P C**
Course Code: A1EN113HS **- - 3 1.5**

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 both in formal and informal contexts.

COURSE OBJECTIVES:

1. Facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
2. Enhance English language skills, communication skills and to practice soft skills.
3. Improve fluency and pronunciation intelligibility by providing an opportunity for practice in speaking.
4. Train students in different interview and public speaking skills such as JAM, debate, role play, group discussion etc.
5. Instill confidence and make them competent enough to express fluently and neutralize their mother tongue influence.

COURSE OUTCOMES: Students will be able to

1. Recognize differences among various accents and speak with neutralized accent.
2. Neutralization of accent for intelligibility
3. Take part in group activities.
4. Speaking skills with clarity and confidence which in turn enhances their employability
5. Generate dialogues for various situations.

English Language and Communication Skills Lab (ELCS) shall have two parts:
a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

LISTENING SKILLS

Objectives

1. To enable students develop their listening skills 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 and find the distinction between different sounds, to be able to mark 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 involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts

- Oral practice: Just A Minute (JAM) Sessions
- Describing objects/situations/people
- Role play – Individual/Group activities

Exercise – I

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.
Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab:

Understand: Communication at Work Place- Spoken vs. Written language.
Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II

CALL Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab:

Understand: Features of Good Conversation – Non-verbal Communication.
Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise - III

CALL Lab:

Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).
Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab:

Understand: How to make Formal Presentations.
Practice: Formal Presentations.

Exercise – IV

CALL Lab:

Understand: Listening for General Details.
Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks.
Practice: Making a Short Speech – Extempore.

Exercise – V

CALL Lab:

Understand: Listening for Specific Details.
Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Interview Skills.
Practice: Mock Interviews.

SOCIAL INNOVATION

I B.Tech-I Semester **L T P C**
Course Code: A1EE117ES **- - 3 1.5**

COURSE DESCRIPTION:

Course Overview:

Social Innovation is an open-ended course to develop social connectedness in engineering students through social awareness and social consciousness. This can be done through live field exposure along with faculty led conceptual presentations, real case reviews, self-study assignments, literature and field survey. Through this course, the students are expected to use their engineering knowledge to provide innovative solutions to existing social problems. This course also develops critical thinking ability among the students to develop sustainable solutions.

COURSE OUTCOMES:

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

1. Develop awareness on social issues faced by local regions.
2. Identify the mind set of human Race and interpret the societal issues as simple, complicated, and complex problems.
3. Identify the need statement along with its main causes and effects.
4. Develop an innovative and sustainable solution for social issues by thinking critically and creatively.

MODULE-1

Introduction to Social Innovation: Core definitions, core elements and common features of social innovation, a typology of social innovation, awakening social consciousness.

MODULE-2

Create Mind sets and Wicked Problems: Seven mind sets – Empathy, Optimism, Iteration, Creative confidence, making it, embracing ambiguity, learning from failures. Distinguish between simple, complicated, and complex problems; describe the characteristics of wicked problems, breakdown a given problem by unpacking its complexity.

MODULE-3

Critical and Creative Thinking for Social Innovation: Definition, engineering thinking and learning, distinguish between creativity and innovation. Models of Creative thinking. [Appreciative Inquiry (AI), Asset Based Community Development (ABCD) and Concept of Bricolage.]

MODULE-4

Process of Social Innovation: Community study, develop questionnaire, identifying the causes of a particular problem.

MODULE-5

Process of Social Innovation: Identify needs, record your learning's.

MODULE-6

Process of Social Innovation: Generate ideas, select promising ideas, prototyping, and testing.

MODULE-7

Social Innovation across Four Sectors - The non-profit sector, public sector, the private sector, the informal sector, links between and cross sectors.

MODULE-8

Stages of Innovation: Social organizations and enterprises, social movements, social software and open source methods, common patterns of success and failure.

TEXT BOOKS:

1. Robin Murray, Julie Caulier-Grice, Geoff Mulgan, "The open book of social innovation: Ways to Design, Develop and Grow Social Innovation", The Young Foundation, 2010.
2. Julie Caulier-Grice, Anna Davies, Robert Patrick & Will Norman, The Young Foundation (2012) Social Innovation Overview: A deliverable of the project: "The theoretical, empirical and policy foundations for building social innovation in Europe" (TEPSIE), European Commission – 7th Framework Programme, Brussels: European Commission, DG Research.

REFERENCE BOOKS:

1. Geoff Mulgan, "Social Innovation: What it is, Why it matters and How it can be accelerated", The Young Foundation, 2007.
2. Asset Based Community Development (ABCD) Model – http://www.nurturedevelopment.org/asset-based-community-development/
3. Diana Whitney & Amanda Trosten-Bloom, "The Power of Appreciative inquiry – A Practical Guide to Positive Change", 2nd Edition, Berrett-Koehler Publishers, Inc, 2010.

I-YEAR (II-SEMESTER)

ORDINARY DIFFERENTIAL EQUATIONS & ADVANCED CALCULUS

I B.Tech-II Semester **L T P C**
Course Code: A1MA201BS **3 1 - 4**

COURSE OBJECTIVES:

The students would be able to learn

1. Different methods of solving the differential equations of higher order.
2. Concept, properties of Laplace transforms and solving ordinary differential equations using Laplace transforms techniques.
3. Evaluation of multiple integrals and their applications.
4. The physical quantities involved in engineering field related to vector valued functions.
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals.

COURSE OUTCOMES:

Upon the successful completion of this course, the students will be able to:

1. Solve higher differential equation and apply the concept of differential equation to real world problems.
2. Use the Laplace Transform techniques for solving ODE's.
3. Evaluate the multiple integrals and apply the concept to find areas, volumes.
4. Evaluate the line, surface and volume integrals and converting them from one to another.
5. Apply Green, Gauss, and Stokes theorem to the integrals.

UNIT –I ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sin ax, cos ax, polynomials in x, (x) and x (x); method of Variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation .Application to Electrical circuits.

UNIT –II LAPLACE TRANSFORMS

Laplace Transform of standard functions; first shifting theorem, Second shifting theorem: Laplace transforms of functions when they are multiplied and divided by t. Laplace transforms of derivatives and integrals of function; Evaluation of integrals by Laplace transforms; Laplace transforms of Specific functions (Unit step function, Unit impulsive function); Laplace transform of Periodic functions.

Inverse Laplace transform by different methods, Convolution theorem (without Proof), Solving ODEs by Laplace Transform method.

UNIT –III MULTIVARIABLE CALCULUS (INTEGRATION)

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

Applications: Areas (by double integrals) and Volumes (by double integrals and triple integrals).

UNIT –IV VECTOR DIFFERENTIATION

Vector point functions and Scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors.

UNIT-V VECTOR INTEGRATION

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes theorems (statement &their verification)

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
3. Advance engineering mathematics by RK Jain & S.R.K.Iyengar 3rd edition Narosa publishing house Delhi.

APPLIED PHYSICS

I B.Tech-II Semester **L T P C**
Course Code: A1AP204BS **3 1 - 4**

COURSE OBJECTIVES:

1. To impart the knowledge of quantum mechanics to explore the behavior of subatomic particles.
2. To extend the competency and understanding of the concepts of Semiconductor physics.
3. To acquire the knowledge of Optoelectronics and able to apply it to various systems like communications, solar cell, photo cells and so on.
4. To differentiate the properties of laser with the ordinary light and describe the principle and propagation of light through optical fibers.
5. To understand the concepts of electromagnetism and study the properties of magnetic materials and its various applications.

COURSE OUTCOMES: Upon graduation, the students will be able to:

1. Explain the concepts of the quantum mechanics and point out the shortcomings of classical mechanics.
2. Acquire the knowledge of Semiconductor physics and apply it to day to day issues.
3. Compare the working of several day-to-day optoelectronic devices.
4. Study and characterize the properties of Lasers and optical fibers and prepare new models for various engineering applications.
5. Evaluate the different parameters of magnetic materials and their applications, and analyze the fundamentals of Electromagnetic theory.

UNIT-I: QUANTUM MECHANICS

Introduction to quantum physics, Black body radiation, Planck's law, Photoelectric effect, Compton effect (qualitative treatment), de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, G.P. Thompson Experiment, Heisenberg's Uncertainty principle and its applications ,Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

UNIT-II: BAND THEORY AND SEMICONDUCTOR PHYSICS

Bloch theorem, Band theory of solids, Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p-n junction diode, Energy level diagram of p-n junction diode,ZenerdiodeandtheirV-ICharacteristics,BipolarJunctionTransistor(BJT):Construction,Principleofoperation.

UNIT-III: OPTOELECTRONICS

Radiative and non-radiative recombination mechanisms in semiconductors, LED and semiconductor lasers: Device structure, Materials, Characteristics and figures of merit, Semiconductor photo detectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.

UNIT-IV: LASERS AND FIBRE OPTICS

Lasers: Introduction to interaction of radiation with matter, Coherence, Characteristics of LASER, Principle and working of Laser, Einstein coefficients, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO_2) laser, He-Ne laser, Nd-Yag laser, Applications of laser. Fibre Optics: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres.

UNIT-V: ELECTROMAGNETISM AND MAGNETIC PROPERTIES OF MATERIALS

Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations, Polarization, Permittivity and Dielectric constant, Internal fields in a solid, Clausius-Mossotti equation(qualitative treatment),Ferroelectrics and Piezoelectrics. Magnetisation, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and ferromagnetic domains, Hysteresis, Applications of magnetic materials.

TEXT BOOKS:

1. Engineering Physics, B.K.Pandey, S.Chaturvedi- Cengage Learning.
2. Halliday and Resnick, Physics-Wiley.
3. AtextbookofEngineeringPhysics,Dr.M.N.Avadhanulu,Dr.P.G.Kshirsagar -S.Chand
4. Solid state physics by Dr. M.Arumugam

REFERENCE BOOKS:

1. RichardRobinett,Quantum Mechanics
2. J. Singh,SemiconductorOptoelectronics:PhysicsandTechnology,McGraw-Hillinc.(1995).
3. Solid state physics by A. J. Dekker.
4. https://nptel.ac.in/courses/113/106/113106065/

BASIC ELECTRICAL ENGINEERING

I B.Tech-II Semester **L T P C**
Course Code: A1EE203ES **3 1 - 4**

COURSE OBJECTIVES

The course should enable the students:

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.

COURSE OUTCOMES:

Upon graduation:

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines

UNIT I D.C. CIRCUITS

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.
Time-domain analysis of first-order RL and RC circuits.

UNIT II A.C. CIRCUITS

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real ower, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R- L-C circuit.
Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III TRANSFORMERS

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT IV ELECTRICAL MACHINES

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor.
Construction and working of synchronous generators.

UNIT V ELECTRICAL INSTALLATIONS

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS:

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill,2009.
3. L.S. Bobrow, Fundamentals of Electrical Engineering”, Oxford University Press,2011

REFERENCE BOOKS:

1. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 201
2. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India,1989.

WEB REFERENCE:

1. https://newhorizonindia.edu/nhengineering/basic-electrical-engineering-laboratory

E-TEXT BOOK:

1. https://books.google.co.in/books/about/A_Textbook_Of_basic electrical engineering-.html?id=tizVedH4SA0C

MOOCS COURSE:

1. https://www.corseera.org/learn/machine-learning
2. https://www.coursera.org/learn/power-electronics

ENGINEERING GRAPHICS

I B.Tech-II Semester **L T P C**
Course Code: A1ME208ES **1 - 4 3**

COURSE OBJECTIVES:

The course should enable the students:

1. To provide basic concepts in engineering drawing.
2. To impart knowledge about standard principles of orthographic projection of objects.
3. To draw sectional views and pictorial views of solids.

COURSE OUTCOMES

1. At the end of the course the student should be able to:
2. Preparing working drawings to communicate the ideas and information.
3. Read, understand and interpret engineering drawings.

UNIT I INTRODUCTION TO ENGINEERING DRAWING

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Scales – Plain & Diagonal.

UNIT II ORTHOGRAPHIC PROJECTION

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.—Auxiliary Planes.

UNIT III PROJECTION OF REGULAR SOLIDS

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere

UNIT IV DEVELOPMENT OF SURFACES/ SOLIDS

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Intersection of Solids: Intersection of – Prism vs Prism- Cylinder Vs Cylinder

UNIT V ISOMETRIC PROJECTIONS

Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions.

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt /Charotar
2. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford

REFERENCE BOOKS:

1. Engineering Drawing / Basant Agrawal and McAgrawal/ McGraw Hill
2. Engineering Drawing/ M. B. Shah, B.C. Rane /Pearson.
3. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Graphic_design
2. https://www.d.umn.edu/itss/training/online/webdesign/books.html

APPLIED PHYSICS LAB

I B.Tech-II Semester **L T P C**
Course Code: A1AP202BS **- - 3 1.5**

COURSE OBJECTIVES:

1. To discuss the energy gap (Eg) of a semiconductor diode and the fill factor of solar cell using the V-I characteristics.
2. To explain the electrical resonance by using the LCR circuit and calculate the time constant by using RC circuit.
3. To develop skills to impart practical knowledge in real time solution of various optoelectronic devices like LED and LASER.
4. To understand the bending losses and numerical aperture of an optical fiber cable.
5. To impart the practical knowledge on the concept of photo electric effect and Hall Effect and compare the results with theoretical calculations.

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

1. Analyze various properties of the semi-conductor devices and determine the energy gap of semiconductors.
2. Discuss the working of various electronic components like inductor, capacitor, resister and built the circuits by selecting the appropriate components.
3. Explain the working and characteristics of the various optoelectronic devices and develop the skills of practical knowledge in real time solution.
4. Compare the bending losses of optical fibers at various working areas and recall the applications of optical fibers.
5. Understand the properties of magnetic materials and determine the related parameters of magnetic fields..

LIST OF EXPERIMENTS:

1. **Energy gap of P-N junction diode:** To determine the energy gap of a semiconductor diode.

2. **Solar Cell:** To study the V-I Characteristics of solar cell.

3. **R-C Circuit:** To determine the time constant of R-C circuit.

4. **LCR Circuit:** To determine the Quality factor of LCR Circuit.

5. **Light emitting diode:** Plot V-I and P-I characteristics of light emitting diode.

6. **LASER:** To study the characteristics of LASER sources.

7. **Optical fibre:** To determine the bending losses of Optical fibres.

8. **Photoelectric effect:** To determine work function of a given material.

9. **Stewart – Gee's experiment:** Determination of magnetic field along the axis of a current carrying coil.

10. **Hall effect:** To determine Hall co-efficient of a given semiconductor.

Note: Any 8 experiments are to be performed

REFERENCE BOOKS:

1. Engineering Physics Lab Manual by Dr.Y. Aparna&Dr.K.Venkateswarao (V.G.S.Book links).
2. Physics practical manual, Lorven Publications.

BASIC ELECTRICAL ENGINEERING LAB

I B.Tech-II Semester **L T P C**
Course Code: A1EE204ES **- - 3 1.5**

COURSE OBJECTIVES:

The course should enable the students:

1. To analyze a given network by applying various electrical laws and network theorems
2. To know the response of electrical circuits for different excitations
3. To calculate, measure and know the relation between basic electrical parameters.
4. To analyze the performance characteristics of DC and AC electrical machines

COURSE OUTCOMES:

By the end of the course students will be able:

1. Get an exposure to basic electrical laws.
2. Understand the response of different types of electrical circuits to different excitations.
3. Understand the measurement, calculation and relation between the basic electrical parameters
4. Understand the basic characteristics of transformers and electrical machines.

LIST OF EXPERIMENTS

Experiment-1 Verification of Ohms Law
Experiment-2 Verification of KVL and KCL
Experiment-3 Transient Response of Series RL and RC circuits using DC excitation
Experiment-4 Transient Response of RLC Series circuit using DC excitation
Experiment-5 Resonance in series RLC circuit
Experiment-6 Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
Experiment-7 Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
Experiment-8 Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
Experiment-9 Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
Experiment-10 Measurement of Active and Reactive Power in a balanced Three-phase circuit
Experiment-11 Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
Experiment-12 Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
Experiment-13 Performance Characteristics of a Three-phase Induction Motor
Experiment-14 Torque-Speed Characteristics of a Three-phase Induction Motor
Experiment-15 No-Load Characteristics of a Three-phase Alternator

REFERENCE BOOKS:

1. Basic electrical engineering by cl wadhwa
2. Basic electrical engineering by vk Mehta

WEB REFERENCE:

1. https://newhorizonindia.edu/nhengineering/basic-electrical-engineering-laboratory/

WORKSHOP MANUFACTURING PRACTICE

I B.Tech-II Semester **L T P C**
Course Code: A1ME216ES **- - 3 1.5**

COURSE OBJECTIVES:

The course should enable the students:

1. To Study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipment and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at work place.
5. It explains the construction, function, use and application of different working tools, equipment and machines.
6. To study commonly used carpentry joints.
7. To have practical exposure to various welding and joining processes.
8. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

COURSE OUTCOMES:

By the end of the course students will be able:

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
4. Apply basic electrical engineering knowledge for house wiring practice.

LIST OF EXPERIMENTS

I. TRADES FOREXERCISES:

At least two exercises from each trade:

Experiment-1 Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
Experiment-2 Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
Experiment-3 Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
Experiment-4 Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
Experiment-5 Welding Practice – (Arc Welding & Gas Welding)
Experiment-6 House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
Experiment-7 Black Smithy – (Round to Square, Fan Hook and S-Hook)

II. TRADES FOR DEMONSTRATION &EXPOSURE:

Experiment-1 Plumbing, Machine Shop, Metal Cutting
Experiment-2 Power tools in construction and Wood Working

REFERENCE BOOKS:

1. Workshop Practice /B. L. Juneja /Cengage
2. Workshop Manual / K. Venugopal /Anuradha.
3. Work shop Manual - P. Kannaiah/ K. L. Narayana/SciTech
4. Workshop Manual / Venkat Reddy/BSP

ENGINEERING EXPLORATION

I B.Tech-II Semester **L T P C**
Course Code: A1EE201PW **- - 2 1**

COURSE DESCRIPTION:

Course Overview:

This Course provides an opportunity for freshman students to learn in new ecosystem and is one of the unique outcomes of innovative education ecosystem in digital era of our nation. The focus of this course is on Engineering Design Process, Problem Solving, and Multi-disciplinary skills, Ethics and Data Acquisition and Analysis. This course is co-designed and co-taught by faculty members drawn from multiple engineering disciplines; it follows Project Based Learning (PBL) pedagogy with need statements covering broad themes of environmental, educational, smart appliances, smart agriculture, industrial needs etc. are used by students to carve out problem definitions by linking Sustainable Development Goals defined by United Nation. Students work in teams to solve identified problems and serves as a platform for peer learning and push students in Multi-disciplinary design thinking in first year itself.

COURSE OUTCOMES:

By the end of the course students will be able to:

1. Compare and contrast the contributions of different types of engineers in the development of a product, process, or system.
2. Apply the common engineering design process to solve complex problems and arrive at viable solution.
3. Explore various contemporary software and hardware tools to provide solutions for the problems.
4. Apply skills needed for successful teamwork including the basics of project management and written and oral communication.
5. Identify the key elements of professional codes of ethics as well as the ethical and societal issues related to the disciplines and their impact on society and the world.

LIST OF ACTIVITIES

WEEK-1

Introduction to Engineering and Engineering Study: Difference between science and engineering, scientist and engineer needs and wants, various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer and Graduate Attributes.

WEEK-2

Engineering Design Process: Design Cycle, Multidisciplinary facet of design, Importance of analysis in engineering design, general analysis procedure, generation of multiple solution, decision matrix, Concepts of reverse engineering and general mechatronics system.

WEEK-3

Introduction to Open-source platforms: Open-source hardware & software tools, Development (Arduino) of Programming (Tinker CAD Tools) and its Essentials, Introduction to Sensors, Transducers and Actuators and its interfacing with Open-Source H/W & S/W tools.

WEEK-4

Engineering Ethics: Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers.

WEEK-5

Sustainability: Introduction to sustainability, Sustainability leadership, Life cycle assessment.

WEEK-6

Project Management& Tools: Introduction, Significance of teamwork, Importance of communication in engineering profession, Checklist, Timeline, Gantt Chart, Significance of documentation.

LABORATORY EQUIPMENT/SOFTWARE/TOOLS REQUIRED

1. Open-source Hardware: Microchip ATmega328P (UNO/NANO/MEGA).
2. I/O Peripherals: LCD, Keypad, DC/Servo Motor, Switch, 7-Segment LED modules, GSM, GPS etc.
3. Sensor Tool Kit: Digital RED/WHITE/GREEN/BLUE Light Module, IR, Analog Sound, Soil Moisture, LM35 Analog Linear Temperature, MQ7 Analog Carbon Monoxide etc.
4. Open-source Software: Arduino IDE Version 1.8.5.

TEXT BOOKS:

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, Exploring Engineering: An Introduction to Engineering and Design, Academic Press, 3rd edition, 2012.
2. Byron Francis, Arduino: The Complete Beginner's Guide, Create space Independent Publishers, 2016.

REFERENCE BOOKS:

1. Neerparaj Rai, Arduino Projects for Engineers, 1st edition, BPB Publications, 2016.
2. Simon Monk, Programming Arduino: Getting Started with Sketches, 2nd Edition, McGraw-Hill Education, 2016.
3. W. Richard Bowen, Engineering Ethics – Outline of an aspirational approach, Springer London.

II-YEAR (I-SEMESTER)

NETWORK THEORY

II B.Tech-I Semester **L T P C**
Course Code: A1EE301PC **3 - - 3**

COURSE OBJECTIVES:

Learn

1. To understand Magnetic Circuits, Network Topology and Three phase circuits.
2. To analyze transients in Electrical systems.
3. To evaluate Network parameters of given Electrical network
4. To design basic filter configurations

COURSE OUTCOMES:

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

1. Apply network theorems for the analysis of electrical circuits.
2. Obtain the transient and steady-state response of electrical circuits.
3. Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
4. Analyze two port circuit behaviour.

UNIT I NETWORK THEOREMS

Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources. Node and Mesh Analysis. Concept of duality and dual networks.

UNIT II SOLUTION OF FIRST AND SECOND ORDER NETWORKS

Solution of first and second order differential equations for Series and parallel R-L, R-C, RL-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response for DC and AC Excitations.

UNIT III SINUSOIDAL STEADY STATE ANALYSIS

Representation of sine function as rotating phasor , phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits.

UNIT IV ELECTRICAL CIRCUIT ANALYSIS USING LAPLACE TRANSFORMS

Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions, series and parallel resonances

UNIT V TWO PORT NETWORK AND NETWORK FUNCTIONS

Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks

TEXT BOOKS:

1. M. E. Van Valkenburg, “Network Analysis”, Prentice Hall, 2006.
2. D. Roy Choudhury, “Networks and Systems”, New Age International Publications, 1998.

REFERENCE BOOKS:

1. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, McGraw Hill Education, 2013.
2. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education, 2004.
3. K. V. V. Murthy and M. S. Kamath, “Basic Circuit Analysis”, Jaico Publishers, 1999.

WEB REFERENCES:

1. https://www.khanacademy.org/science/electrical-engineering/ee-circuit-analysis-topic/circuit-elements/a/ee-circuit-terminology?modal=1
2. http://www.ece.ubc.ca/~shahriar/eece251_notes/eece251_set1_2up.pdf
3. https://web.iitd.ac.in/~shouri/ell112/references.php
4. http://users.metu.edu.tr/ccandan/EE201/EE201_Fall201819/

E-TEXT BOOK:

1. https://en.wikibooks.org/wiki/Circuit_Theory/All_Chapters

MOOCS COURSE:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/

ELECTRONIC DEVICES AND CIRCUITS

II B.Tech-I Semester **L T P C**
Course Code: A1EC301ES **3 - - 3**

COURSE OBJECTIVES:

Learn

1. To introduce components such as diodes, BJTs and FETs their switching characteristics applications
2. Learn the concepts of high frequency analysis of transistors
3. To give understanding of various types of basic and feedback amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers
4. To introduce the basic building blocks of linear integrated circuits.
5. To introduce the concepts of waveform generation and introduce some special function ICs

COURSE OUTCOMES:

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

1. Know the characteristics, utilization of various components.
2. Understand the biasing techniques
3. Design and analyze various rectifiers, small signal amplifier circuits.
4. Design sinusoidal and non-sinusoidal
5. A thorough understanding, functioning of OP-AMP, design OP-AMP based circuits with linear integrated circuits

UNIT I DIODE CIRCUITS

P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, clamping and clipping circuits. Input output characteristics of BJT in CB, CE, CC configurations, biasing circuits, Load line analysis, common-emitter, common-base and common collector amplifiers; Small signal equivalent circuits.

UNIT II MOSFET CIRCUITS

MOSFET structure and I-V characteristics. MOSFET as a switch. small signal equivalent circuits - gain, input and output impedances, small-signal model and common-source, common-gate and common-drain amplifiers, trans conductance, high frequency equivalent circuit.

UNIT III MULTI-STAGE AND POWER AMPLIFIERS

Direct coupled and RC Coupled multi-stage amplifiers; Differential Amplifiers, Power amplifiers - Class A, Class B, Class C.

UNIT IV FEEDBACK AMPLIFIERS AND OSCILLATORS

Feedback Amplifiers: Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators.

UNIT V OPERATIONAL AMPLIFIERS

Ideal op-amp, Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product, Inverting and non-inverting amplifier, Differentiator, integrator, Square-wave and triangular-wave generators

TEXT BOOK:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education, 2nd edition 2010
Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003

REFERENCE BOOKS:

1. Electronic Devices Conventional and current version -Thomas L. Floyd 2015, Pearson.
2. J. Millman and A. Grabel, “Microelectronics”, McGraw Hill Education, 1988.
3. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1989.
4. P. R. Gray, R. G. Meyer and S. Lewis, “Analysis and Design of Analog Integrated Circuits”, John Wiley & Sons, 2001

WEB REFERENCES:

1. https://inderjitsingh87.weebly.com/electronic-devices-and-circuits-1.html
2. https://www.sanfoundry.com/best-reference-books-electronic-devices-circuits/

E-TEXT BOOKS:

1. https://www.sciencedirect.com/book/9780408054300/electronics-engineers-reference-book
2. https://ieeexplore.ieee.org/document/7113204?arnumber=7113204
3. https://www.entcengg.com/electronic-devices-circuits-reference/

MOOCS COURSE:

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/
2. https://nptel.ac.in/courses/108/108/108108112/

DC MACHINES AND TRANSFORMERS

II B.Tech-I Semester **L T P C**
Course Code: A1EE302PC **3 - - 3**

COURSE OBJECTIVES:

Learn

1. To study and understand different types of DC generators, Motors and Transformers, their construction, operation and applications.
2. To analyze performance aspects of various testing methods

COURSE OUTCOMES:

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

1. Identify different parts of a DC machine & understand its operation
2. Carry out different testing methods to predetermine the efficiency of DC machines
3. Understand different excitation and starting methods of DC machines
4. Control the voltage and speed of a DC machines
5. Analyze single phase and three phase transformers circuits

UNIT I DC GENERATORS

Principle of operation – Action of commutator – constructional features – armature windings – lap and wave windings – simplex and multiplex windings – use of laminated armature – E.M.F Equation. Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation. Methods of Excitation – separately excited and self-excited generators – build-up of E.M.F - critical field resistance and critical speed - causes for failure to self-excite and remedial measures. Load characteristics of shunt, series and compound generators

UNIT II DC MOTORS

Principle of operation – Back E.M.F. - Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation. Speed control of D.C. Motors - Armature voltage and field flux control methods. Motor starters (3-point and 4-point starters) Testing of D.C. machines - Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency.

UNIT III TESTING OF DC MACHINES

Methods of Testing – direct, indirect, and regenerative testing – Brake test Swinburne's test – Hopkinson's test – Field's test - separation of stray losses in a d.c. motor test

UNIT IV SINGLE PHASE TRANSFORMERS

Types - constructional details-minimization of hysteresis and eddy current losses- EMF equation - operation on no load and on load - phasor diagrams Equivalent circuit - losses and efficiency – regulation - All day efficiency - effect of variations of frequency & supply voltage on iron losses

UNIT V TESTING OF TRANSFORMERS AND POLY-PHASE TRANSFORMERS

OC and SC tests - Sumpner's test - predetermination of efficiency and regulation-separation of losses test-parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers. Poly-phase transformers – Poly-phase connections - Y/Y, Y/delta, delta/Y,delta/delta and open delta

TEXT BOOKS:

1. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education,2013
2. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.

REFERENCE BOOKS:

1. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
2. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
3. J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education,2010

WEB REFERENCES:

1. https://nptel.ac.in/courses/108/105/108105017/
2. https://www.jntufastupdates.com/jntuk-r19-2-1-electrical-machines-i-material/

E-TEXT BOOKS:

1. https://books.askvenkat.org/electrical-machines-1-textbook-pdf-free-download/
2. https://www.routledge.com/Electrical-Machines-Fundamentals-of-Electromechanical-Energy-Conversion/Gieras/p/book/9780367736941
3. https://www.sanfoundry.com/best-reference-books-electrical-machines-quality-power-utilization/

MOOCS COURSE:

1. https://nptel.ac.in/courses/108/105/108105017/
2. https://onlinecourses.nptel.ac.in/noc20_ee60/preview

ELECTROMAGNETIC THEORY

II B.Tech-I Semester **L T P C**
Course Code: A1EE303PC **3 - - 3**

COURSE OBJECTIVES:

Learn

1. To introduce the concepts of electric field and magnetic field.
2. Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines

COURSE OUTCOMES:

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

1. To understand the basic laws of electromagnetism.
2. To obtain the electric and magnetic fields for simple configurations under static conditions.
3. To analyze time varying electric and magnetic fields.
4. To understand Maxwell's equation in different forms and different media.
5. To understand the propagation of EM waves.

UNIT I STATIC ELECTRIC FIELD

Review of conversion of a vector from one coordinate system to another coordinate system, Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density

UNIT II CONDUCTORS, DIELECTRICS AND CAPACITANCE

Current and current density, Ohms Law in Point form, Continuity equation, Boundary conditions of conductors and dielectric materials. Capacitance , Capacitance of a two-wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation.

UNIT III STATIC MAGNETIC FIELDS AND MAGNETIC FORCES

Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors. Force on a moving charge, Force on a differential current element, Force between differential current elements, Magnetic boundary conditions, Magnetic circuits, Self-inductances and mutual inductances

UNIT IV TIME VARYING FIELDS AND MAXWELL'S EQUATIONS

Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces

UNIT V ELECTROMAGNETIC WAVES

Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane wave in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors. Poynting theorem

TEXT BOOKS:

1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.
2. W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012

REFERENCE BOOKS:

1. Pramanik, “Electromagnetism-Problems with solution”, Prentice Hall India, 2012.
2. G. W. Carter, “The electromagnetic field in its engineering aspects”, Longmans, 1954.
3. W. J. Duffin, “Electricity and Magnetism”, McGraw Hill Publication, 1980.
4. W. J. Duffin, “Advanced Electricity and Magnetism”, McGraw Hill, 1968.
5. E. G. Cullwick, “The Fundamentals of Electromagnetism”, Cambridge University Press, 1966.
6. D. Popovic, “Introductory Engineering Electromagnetics”, Addison-Wesley Educational Publishers, International Edition,1971
7. Pramanik, “Electromagnetism - Theory and applications”, PHI Learning Pvt. Ltd, New Delhi, 2009

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc19_ph08/preview
2. https://gcebargur.ac.in/electromagnetic-theory

E-TEXT BOOKS:

1. https://ocw.mit.edu/resources/res-6-002-electromagnetic-field-theory-a-problem-solving-approach-spring-2008/textbook-contents/
2. https://www.researchgate.net/publication/258221118_Electromagnetic_Field_Theory

MOOCS COURSE:

1. https://nptel.ac.in/courses/108/104/108104087/

DIGITAL ELECTRONICS

II B.Tech-I Semester **L T P C**
Course Code: A1EC303ES **3 - - 3**

COURSE OBJECTIVES:

1. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
3. To implement simple logical operations using combinational logic circuits
4. To design combinational logic circuits, sequential logic circuits.
5. To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
6. To implement synchronous state machines using flip-flops.

COURSE OUTCOMES:

1. Understand working of logic families and logic gates.
2. Design and implement Combinational and Sequential logic circuits.
3. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
4. Be able to use PLDs to implement the given logical problem.

UNIT I

Fundamentals of Digital Systems and Logic Families: Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tristate logic.

UNIT II

Combinational Digital Circuits: Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Sub tractors, BCD arithmetic, carry look ahead adder, serial ladder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT III

Sequential Circuits and Systems: A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J, K, T and D types flip-flops, applications of flip-flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

UNIT IV

A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs

UNIT V

Semiconductor Memories and Programmable Logic Devices: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

TEXT BOOKS:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

REFERENCE BOOK:

1. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Digital_electronics
2. https://web.iitd.ac.in/~shouri/eel201/references.php
3. https://onlinelibrary.wiley.com/doi/book/10.1002/9780470510520

E-TEXT BOOKS:

1. https://www.allaboutcircuits.com/textbook/digital/
2. https://www.researchgate.net/publication/264005171_Digital_Electronics
3. https://www.circuitstoday.com/4-books-to-study-digital-electronics

MOOCS COURSE:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in

ELECTRONIC DEVICES AND CIRCUITS LAB

II B.Tech-I Semester **L T P C**
Course Code: A1EC302ES **- - 2 1**

COURSE OBJECTIVES:

Learn

1. To introduce components such as diodes, BJTs and FETs their switching characteristics, applications
2. Learn the concepts of high frequency analysis of transistors
3. To give understanding of various types of basic and feedback amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers
4. To introduce the basic building blocks of linear integrated circuits.
5. To introduce the concepts of waveform generation and introduce some special function ICs

COURSE OUTCOMES:

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

1. Know the characteristics, utilization of various components.
2. Understand the biasing techniques
3. Design and analyze various rectifiers, small signal amplifier circuits.
4. Design sinusoidal and non-sinusoidal oscillators.
5. A thorough understanding, functioning of OP-AMP, design OP-AMP based circuits with linear integrated circuits.

LIST OF EXPERIMENTS

Experiment-1 PN Junction diode characteristics A) Forward bias B) Reverse bias
Experiment-2 Full Wave Rectifier with & without filters
Experiment-3 Common Emitter Amplifier Characteristics
Experiment-4 Common Base Amplifier Characteristics
Experiment-5 Common Source amplifier Characteristics
Experiment-6 Measurement of h-parameters of transistor in CB, CE, CC configurations
Experiment-7 Inverting and Non-inverting Amplifiers using Op Amps
Experiment-8 Adder and Subtract or using Op Amp
Experiment-9 Integrator Circuit using IC 741.
Experiment-10 Differentiator circuit using Op Amp.
Experiment-11 Current Shunt Feedback amplifier
Experiment-12 RC Phase shift Oscillator
Experiment-13 Hartley and Colpitt's Oscillators
Experiment-14 Class A power amplifier

TEXT BOOK:

1. http://www.aurora.ac.in/images/pdf/departments/ece-downloads/academic-manuals/lab-manual-2014-15-1sem/2ece-eee-edc-lab-manuals-17-06-14.pdf

REFERENCE BOOKS:

1. https://www.sircrrengg.ac.in/images/Others/ECE/EDCLAB.pdf"
2. http://www2.ece.ohio-state.edu/ee327/
3. https://www.sanfoundry.com/best-reference-books-electronic-devices-circuits/

WEB REFERENCES:

1. http://www.crectirupati.com/sites/default/files/lecture_notes/EDC Lab Manual.pdf
2. https://electricvlab.com/anna-circuits-and-devices-lab-ec6211/
3. https://inderjitsingh87.weebly.com/electronic-devices-and-circuits-1.html

DC MACHINES & TRANSFORMERS LAB

II B.Tech-I Semester **L T P C**
Course Code: A1EE304PC **- - 3 1.5**

COURSE OBJECTIVES:

Learn

1. To expose the students to the operation of DC Generator
2. To expose the students to the operation of DC Motor.
3. To examine the self-excitation in DC generators

COURSE OUTCOMES:

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

1. Start and control the Different DC Machines.
2. Assess the performance of different machines using different testing methods
3. Identify different conditions required to be satisfied for self - excitation of DC Generators
4. Separate iron losses of DC machines into different components

LIST OF EXPERIMENTS

Experiment-1 Magnetization characteristics of DC shunt generator
Experiment-2 Load test on DC shunt generator (Determination of characteristics)
Experiment-3 Load test on DC series generator (Determination of characteristics)
Experiment-4 Load test on DC compound generator (Determination of characteristics
Experiment-5 Hopkinson's test on DC shunt machines (Predetermination of efficiency)
Experiment-6 Fields test on DC series machines (Determination of efficiency)
Experiment-7 Swinburne's test and speed control of DC shunt motor
(Predetermination of efficiencies)
Experiment-8 Brake test on DC compound motor (Determination of performance curves)
Experiment-9 Brake test on DC shunt motor (Determination of performance curves)
Experiment-10 Retardation test on DC shunt motor
(Determination of losses at rated speed)
Experiment-11 Separation of losses in DC shunt motor.
Experiment-12 Magnetization characteristics of DC shunt generator
Experiment-13 Load test on DC shunt generator (Determination of characteristics)
Experiment-14 Load test on DC series generator (Determination of characteristics)

TEXT BOOKS:

1. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004

REFERENCE BOOKS:

1. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
3. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010

WEB REFERENCES:

1. https://nptel.ac.in/courses/108/105/108105017/
2. https://www.springer.com/gp/book/9783319727295

NETWORKS LAB

II B.Tech-I Semester **L T P C**
Course Code: A1EE305PC **- - 2 1**

COURSE OBJECTIVES:

Learn

1. To design electrical systems
2. To analyze a given network by applying various Network Theorems
3. To measure three phase Active and Reactive power.
4. To understand the locus diagrams.

COURSE OUTCOMES:

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

1. Analyze complex DC and AC linear circuits
2. Apply concepts of electrical circuits across engineering
3. Evaluate response in a given network by using theorems

LIST OF EXPERIMENTS

Experiment-1 Verification of Thevenin's and Norton's Theorems
Experiment-2 Verification of Superposition, Reciprocity and Maximum Power Transfer theorems
Experiment-3 Locus Diagrams of RL and RC Series Circuits
Experiment-4 Series and Parallel Resonance
Experiment-5 Time response of first order RC / RL network for periodic non – sinusoidal inputs – Time constant and Steady state error determination
Experiment-6 Two port network parameters – Z – Y parameters, Analytical verification.
Experiment-7 Two port network parameters – A, B, C, D & Hybrid parameters, Analytical verification
Experiment-8 Separation of Self and Mutual inductance in a Coupled Circuit. Determination of Co-efficient of Coupling
Experiment-9 Verification of compensation & Milliman's theorems
Experiment-10 Harmonic Analysis of non-sinusoidal waveform signals using Harmonic Analyzer and plotting frequency spectrum
Experiment-11 Determination of form factor for non-sinusoidal waveform
Experiment-12 Measurement of Active Power for Star and Delta connected balanced loads
Experiment-13 Measurement of Reactive Power for Star and Delta connected balanced loads
Experiment-14 Verification of Thevenin's and Norton's Theorems

TEXT BOOKS:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2. D. Roy Choudhury, "Networks and Systems", New Age International Publications,1998

REFERENCE BOOKS:

1. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.
2. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
3. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.

WEB REFERENCES:

1. https://www.asti.edu.in/images/pdf/departments/eee-downloads/academic-manuals/lab-manual/ecsl/electrical-circuit -simulation-lab.pdf
2. http://www.crectirupati.com/sites/default/files/lab1/EC%26S LAB 2-1.pdf
3. https://www.seas.upenn.edu/~ese206/

GENDER SENSITIZATION

II-B.Tech I-Semester **L T P C**
Course Code: A1EE303MC **- - 2 -**

COURSE OBJECTIVES:

The course should enable the students to learn:

1. To provide a critical perspective on the socialization of men and women.
2. 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.
3. To help students reflect critically on gender violence.
4. To expose students to more egalitarian interactions between men and women.

COURSE OUTCOMES:

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

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. 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.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together asequals.

UNIT – I UNDERSTANDING GENDER

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1) **Socialization:** Making Women, Making Men (*Towards a World of Equals*: Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT – II GENDER AND BIOLOGY

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4) Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10) Two or Many? Struggles with Discrimination.

UNIT – III GENDER AND LABOUR

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

Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions ofWork.

UNIT – IV ISSUES OF VIOLENCE

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading:"*Chupulu".*

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading:New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11) Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT – V GENDER: CO – EXISTENCE

Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)

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

TEXT BOOKS:

1. ***"Towards a World of Equals: A Bilingual Textbook onGender"***, A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote,Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi,**
   Hyderabad,Telangana State,**2015**.

REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "*I Fought For My Life…and Won*."Available online at:
   http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

WEB REFERENCE:

1. http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

II-YEAR (II-SEMESTER)

AC MACHINES

II B.Tech-II Semester **L T P C**
Course Code: A1EE406PC **3 - - 3**

COURSE OBJECTIVES:

Learn

1. To deal with the detailed analysis of poly-phase induction motors &Alternators.
2. To understand operation, construction and types of single phase motors and their applications in house hold appliances and control systems.
3. To introduce the concept of parallel operation of alternators
4. To introduce the concept of regulation and its calculations

COURSE OUTCOMES:

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

1. Understand the concepts of rotating magnetic fields.
2. Understand the operation of ac machines.
3. Analyze performance characteristics of ac machines.

UNIT I SINGLE PHASE & SPECIAL MACHINES

Single phase induction motor – Constructional features-Double revolving field theory – split-phase motors – shaded pole motor.

UNIT II POLY-PHASE INDUCTION MACHINES

Constructional details of cage and wound rotor machines- production of a rotating magnetic field –
Principle of operation - rotor EMF and rotor frequency - rotor reactance, rotor current and Power factor at standstill and during operation.

UNIT III CHARACTERISTICS OF INDUCTION MACHINES

Rotor power input, rotor copper loss and mechanical power developed and their inter relation-torque equation-deduction from torque equation - expressions for maximum torque and starting torque - torque slip characteristic - equivalent circuit - phasor diagram - crawling and cogging -.No-load Test and Blocked rotor test –Predetermination of performance- Methods of starting and starting current and Torque calculations.
Speed Control Methods: Change of voltage, change of frequency, voltage/frequency, injection of an EMF into rotor circuit (qualitative treatment only)-induction generator-principle of operation.

UNIT IV SYNCHRONOUS MACHINES

Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics. Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction analysis – experimental determination of Xd and Xq (Slip test) Phasor diagrams – Regulation of salient pole alternator.

UNIT V PARALLEL OPERATION OF SYNCHRONOUS MACHINES

Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactance's.

Synchronous Motors: Theory of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed .- hunting and its suppression – Methods of starting – synchronous induction motor.

TEXT BOOKS:

1. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers,2002

REFERENCE BOOKS:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
4. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

WEB REFERENCES:

1. https://www.cet.edu.in/noticefiles/226_ELECTRICAL_MACHINE-II.pdf
2. https://onlinecourses.nptel.ac.in/noc20_ee38/preview
3. https://www.darshan.ac.in/DIET/EE/SubjectDetail/3150910

E-TEXT BOOK:

1. https://eg4.nic.in/govpoly/DFILES/EBOOKS/IR/ebookElectMachine-2.pdf

MOOCS COURSE:

3. https://swayam.gov.in/
4. https://onlinecourses.nptel.ac.in/

GENERATION & TRANSMISSION OF ELECTRIC POWER

II B.Tech-II Semester **L T P C**
Course Code: A1EE407PC **3 - - 3**

COURSE OBJECTIVES:

Learn

1. To understand the different types of power generating stations.
2. To examine A.C. and D.C. distribution systems.
3. To understand and compare overhead line insulators and Insulated cables.
4. To illustrate the economic aspects of power generation and tariff methods.
5. To evaluate the transmission line parameters calculations

COURSE OUTCOMES:

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

1. Understand the concepts of power systems.
2. Understand the operation of conventional generating stations and renewable sources of electrical power
3. Evaluate the power tariff methods.
4. Determine the electrical circuit parameters of transmission lines
5. Understand the layout of substation and underground cables and corona

UNIT I CONVENTIONAL SOURCES (QUALITATIVE)

Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine Plant. Non-Conventional Sources (Qualitative): Ocean Energy, Tidal Energy, Wave Energy, wind Energy, Fuel Cells, and Solar Energy, Cogeneration and energy conservation and storage.

UNIT II ECONOMICS OF GENERATION

Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer.

UNIT III OVERHEAD LINE INSULATORS & INSULATED CABLES

Introduction, types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators. Introduction, insulation, insulating materials, Extra high voltage cables, grading of cables, insulation resistance of a cable, Capacitance of a single core and three core cables, Overhead lines versus underground cables, types of cables**.**

UNIT IV CALCULATIONS OF TRANSMISSION LINES

Line conductors' inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, Composite conductors-transposition, bundled conductors, and effect of earth on capacitance.

UNIT V CORONA

Introduction, disruptive critical voltage, corona loss, Factors affecting corona loss and methods of reducing corona loss, Disadvantages of corona, interference between power and Communication lines.

TEXT BOOKS:

1. W.D.Stevenson –Elements of Power System Analysis, Fourth Edition, McGraw Hill,1984
2. C.L. Wadhwa –Generation, Distribution and Utilization of Electrical Energy, Second Edition, New Age International,2009

REFERENCE BOOKS:

1. C.L. Wadhwa –Electrical Power Systems, Fifth Edition, New Age International, 2009
2. M.V. Deshpande –Elements of Electrical Power Station Design, Third Edition, Wheeler Pub. 1998
3. H.Cotton&H. Barber-The Transmission and Distribution of Electrical Energy, Third "V.K Mehta and Rohit Mehta", "Principles of Power Systems", S. Chand& Company Ltd, New Delhi, 2004.

WEB REFERENCES:

1. https://www.darshan.ac.in/DIET/EE/SubjectDetail/3140914
2. https://onlinecourses.nptel.ac.in/noc20_ee39/preview

E-TEXT BOOKS:

1. https://onlinelibrary.wiley.com/doi/book/10.1002/9780470411377
2. https://easyengineering.net/power-systems-books/

MOOCS COURSE:

1. https://www.openlearning.com/courses/power-system-analysis
2. https://onlinecourses.nptel.ac.in/

CONTROL SYSTEM ANALYSIS

II B.Tech-II Semester **L T P C**
Course Code: A1EE408PC **3 - - 3**

COURSE OBJECTIVES:

Learn

1. To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
2. To assess the system performance using time domain analysis and methods for improving it.
3. To assess the system performance using frequency domain analysis and techniques for improving the performance
4. To design various controllers and compensators to improve system performance

COURSE OUTCOMES:

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

1. Understand the modelling of linear-time-invariant systems using transfer function and state- spacer presentations
2. Understand the concept of stability and its assessment for linear-time invariant systems
3. Design simple feedback controllers

UNIT I INTRODUCTION

Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.

UNIT II TIME RESPONSE ANALYSIS OF STANDARD TEST SIGNALS

Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer.

UNIT III FREQUENCY-RESPONSE ANALYSIS

Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response**.**

UNIT IV CONTROLLER DESIGN

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

UNIT V STATE VARIABLE ANALYSIS AND CONCEPTS OF STATE VARIABLES

State space model. Diagonalization of State Matrix. Solution of state equations. Eigen values and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete- time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.

TEXT BOOKS:

1. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997.
2. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.

REFERENCE BOOKS:

1. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
2. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International,2009

WEB REFERENCES:

1. https://www.sanfoundry.com/best-reference- books-control-systems/
2. https://www.tutorialspoint.com/control_systems/control_systems_introduction.htm

E-TEXT BOOKS:

1. https://easyengineering.net/control-systems-books/
2. https://www3.nd.edu/~pantsakl/Publications/348A-EEHandbook05.pdf
3. https://www.sanfoundry.com/best-reference-books-control-systems/

MOOCS COURSE:

1. https://onlinecourses.nptel.ac.in/noc19_de04/preview
2. https://www.mooc-list.com/tags/control-systems
3. https://www.mooc-list.com/tags/control-system

COMPLEX VARIABLES AND TRANSFORMS

II B.Tech-II Semester **L T P C**
Course Code: A1MA401BS **3 1 - 4**

PRE-REQUISITES: Mathematics courses of first year of study

COURSE OBJECTIVES: To learn
1. Differentiation and integration of complex valued functions.
2. Evaluation of integrals using Cauchy's integral formula, Cauchy's residue theorem and Expansion of complex functions using Taylor's and Laurent's series.
3. Express a periodic function by Fourier series.
4. Express a non-periodic function by Fourier Transforms.
5. Understand different solution techniques of Z -Transform in problem solving.

COURSE OUTCOMES: After learning the contents of this paper the student must be able to
1. Analyze the complex function with reference to their analyticity.
2. Evaluate integration using Cauchy's integral , residue theorems and Taylor's and Laurent's series expansions of complex function.
3. Express any periodic function interm of sines and cosines.
4. Express a non periodic function as integral representation.
5. Solve finite difference equations using z-transforms.

UNIT - I: COMPLEX VARIABLES (DIFFERENTIATION)

Limit, Continuity and Differentiation of Complex functions, Analytic function ,Cauchy -Riemann equations (without proof), Harmonic function, Milne- Thomson method, Finding harmonic conjugate; Elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT - II: COMPLEX VARIABLES (INTEGRATION)

Line integrals, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem (without proof). Types of real integrals a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (poles are not on real axes) b) $\int_{c}^{c+2\pi} f(cos\theta, sin\theta)\, d\theta$.

UNIT - III: FOURIER SERIES

Introduction, Periodic functions, Fourier series of periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half range sine and cosine series.

UNIT – IV FOURIER TRANSFORMS

Fourier integral theorem (without proof), Fourier sine and cosine integrals, sine and cosine, transforms, properties, Inverse transforms, Finite Fourier transforms.

UNIT – V Z -TRANSFORMS

Z-Transform, Inverse Z-Transform, Properties, Damping rule-Shifting rule, Initial and final value theorems. Convolution theorem-Solution of difference equation by Z-Transform.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. J.W.Brown and R.V. Churchil,complex variables and applications,7th addition MC Graw Hill 2004
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010

REFERENCE BOOKS:

1. M. K. Jain, SRK Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations , New Age International publishers.
2. Complex variables theory and applications H.S.Kasana, Eastern economy Edition, PHI 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

ELECTRICAL MEASUREMENTS & INSTRUMENTATION

II B.Tech-II Semester **L T P C**
Course Code: A1EE409PC **3 - - 3**

COURSE OBJECTIVES

Learn

1. To introduce the basic principles of all measuring instruments
2. To deal with the measurement of voltage, current, Power factor, power, energy and magnetic measurements.
3. To understand the basic concepts of smart and digital metering.

COURSE OUTCOMES

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

1. Understand different types of measuring instruments, their construction, operation and characteristics
2. Identify the instruments suitable for typical measurements
3. Apply the knowledge about transducers and instrument transformers to use them effectively.
4. Apply the knowledge of smart and digital metering for industrial applications

UNIT I INTRODUCTION TO MEASURING INSTRUMENTS

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters- electrometer type and attracted disc type – extension of range of E.S. Voltmeters.

UNIT II POTENTIOMETERS & INSTRUMENT TRANSFORMERS

Principle and operation of D.C. Crompton's potentiometer–standardization–Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate type's standardization – applications. CT and PT – Ratio and phase angle errors.

UNIT III MEASUREMENT OF POWER & ENERGY

Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems. Single phase induction type energy meter – driving and braking torques – errors and compensations–testing by phantom loading using R.S.S. meter. Three phase energy meter–tri-vector meter, maximum demand meters.

UNIT IV DC & AC BRIDGES

Method of measuring low, medium and high resistance – sensitivity of Wheat-stone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance
–loss of charge method.
Measurement of inductance- Maxwell's bridge, Hay's bridge, Anderson's bridge - Owen's bridge. Measurement of capacitance and loss angle – Desaunty's Bridge - Wien's bridge – Schering Bridge.

UNIT V TRANSDUCERS

Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermo couples, Piezo electric transducers, photovoltaic, photo conductive cells, and photo diodes.
Introduction to Smart and Digital Metering: Digital Multi-meter, True RMS meters, Clamp-on meters, Digital Storage Oscilloscope.

TEXT BOOKS:

1. G. K. Banerjee, “Electrical and Electronic Measurements”, PHI Learning Pvt. Ltd., 2nd Edition, 2016
2. S. C. Bhargava, “Electrical Measuring Instruments and Measurements”, BS Publications, 2012.

REFERENCE BOOKS:

1. K. Sawhney, “Electrical & Electronic Measurement & Instruments”, Dhanpat Rai & Co. Publications, 2005.
2. R. K. Rajput, “Electrical & Electronic Measurement & Instrumentation”, S. Chand and Company Ltd., 2007.
3. Buckingham and Price, “Electrical Measurements”, Prentice – Hall, 1988.
4. Reissland, M. U, “Electrical Measurements: Fundamentals, Concepts, Applications”, New Age International (P) Limited Publishers, 1st Edition2010.
5. E.W. Golding and F. C. Widdis, “Electrical Measurements and measuring Instruments”, fifth Edition, Wheeler Publishing, 2011.

WEB REFERENCES:

1. https://www.darshan.ac.in/DIET/EE/SubjectDetail/2160908
2. https://onlinelibrary.wiley.com/doi/book/10.1002/0471722901

E-TEXT BOOK:

1. https://www.studynama.com/community/threads/power-systems-2-quick-revision-pdf-notes-book-ebook-for-electrical-engineering-free-download.347/

MOOCS COURSE:

1. https://onlinecourses.nptel.ac.in/noc19_ee44/preview.

AC MACHINES LAB

II B.Tech-II Semester **L T P C**
Course Code: A1EE410PC **- - 3 1.5**

COURSE OBJECTIVES:

Learn

1. To understand the operation of synchronous machines
2. To understand the analysis of power angle curve of a synchronous machine.
3. To understand the equivalent circuit of a single phase transformer and single phase induction motor
4. To understand the circle diagram of an induction motor by conducting a blocked rotor test.

COURSE OUTCOMES:

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

1. Assess the performance of different machines using different testing methods
2. Convert the Phase from three phase to two phase and vice versa
3. Compensate the changes in terminal voltages of synchronous generator after estimating the change by different methods
4. Control the active and reactive power flows in synchronous machines
5. Operate different machines and control the speed and power factor

LIST OF EXPERIMENTS

Experiment-1 O.C. & S.C. Tests on Single phase Transformer
Experiment-2 Sumpner's test on a pair of single phase transformers
Experiment-3 No-load & Blocked rotor tests on three phase Induction motor
Experiment-4 Regulation of a three –phase alternator by synchronous impedance & m.m.f. methods
Experiment-5 V and Inverted V curves of a three—phase synchronous motor.
Experiment-6 Equivalent Circuit of a single phase induction motor
Experiment-7 Determination of Xd and Xq of a salient pole synchronous machine
Experiment-8 Load test on three phase Induction Motor
Experiment-9 Separation of core losses of a single phase transformer
Experiment-10 Efficiency of a three-phase alternator
Experiment-11 Parallel operation of Single phase Transformers
Experiment-12 Regulation of three-phase alternator by Z.P.F. and A.S. Amethods
Experiment-13 Heat run test on a bank of 3 Nos. of single phase Delta connected transformers
Experiment-14 Measurement of sequence impedance of a three-phase alternator.

TEXT BOOKS:

1. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers,2002

REFERENCE BOOKS:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
4. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007

WEB REFERENCES:

1. https://www.ee.iitb.ac.in/course/~emlab/lab-manual.html
2. https://www3.unisa.ac.za/front-porch-upe/viewtopic.php?93e11d=electrical-machines-2-lab-manual-2017-regulation

CONTROL SYSTEM ANALYSIS LAB

II B.Tech-II Semester **L T P C**
Course Code: A1EE411PC **- - 2 1**

COURSE OBJECTIVES:

Learn

1. To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
2. To assess the system performance using time domain analysis and methods for improving it
3. To assess the system performance using frequency domain analysis and techniques for improving the performance
4. To design various controllers and compensators to improve system performance

COURSE OUTCOMES:

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

1. How to improve the system performance by selecting a suitable controller and/or a compensator for a specific application
2. Apply various time domain and frequency domain techniques to assess the system performance
3. Apply various control strategies to different applications(example: Power systems, electrical drives etc)
4. Test system controllability and observability using state space representation and applications of state space representation to various systems

LIST OF EXPERIMENTS

Experiment-1 Time response of Second order system
Experiment-2 Characteristics of Synchros
Experiment-3 Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions, and application of speed control of motor
Experiment-4 Effect of feedback on DC servo motor
Experiment-5 Transfer function of DC motor
Experiment-6 Transfer function of DC generator
Experiment-7 Temperature controller using PID
Experiment-8 Characteristics of AC servo motor
Experiment-9 Effect of P, PD, PI, PID Controller on a second order systems
Experiment-10 Lag and lead compensation – Magnitude and phase plot
Experiment-11 (a) Simulation of P, PI, PID Controller.
(b) Linear system analysis (Time domain analysis, Error analysis) using suitable software
Experiment-12 Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using suitable software
Experiment-13 State space model for classical transfer function using suitable Software -Verification.

TEXT BOOKS:

1. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education,1997
2. B. C. Kuo, “Automatic Control System”, Prentice Hall,1995

REFERENCE BOOKS:

1. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
2. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009.

WEB REFERENCES:

1. http://mist.ac.in/pdfs/LabManuals/EEE/ControlSytemLab.pdf
2. http://www.kfupm.edu.sa/departments/se/SiteCollectionDocuments/CISE-302-Linear-Control- Systems-LabManual.pdf
3. https://www.iitk.ac.in/ee/data/Teaching_labs/Control_System/EE380_labmanual.pdf

ENVIRONMENTAL STUDIES

II B.Tech-II Semester **L T P C**
Course Code: A1EE404MC **2 - - -**

COURSE OBJECTIVES:

1. Understanding the importance of ecological balance for sustainable development.
2. Acquire the knowledge of importance of natural resources & apply conservation techniques.
3. Analyzing the importance of Biodiversity.
4. Estimate the impacts of Environmental pollution, developmental activities and mitigation measures.
5. Evaluation of the environmental policies and regulations.

COURSE OUTCOMES:

1. Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles.
2. Able to apply the conservation methods of natural resources.
3. Able to analyze the conservation techniques of biodiversity.
4. Able to apply pollution control methods.
5. Able **to** understand and apply environmental regulations which in turn helps in sustainable development.

UNIT-I: ECOSYSTEMS

Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio-magnification.

UNIT-II: NATURAL RESOURCES: CLASSIFICATION OF RESOURCES

Living and Non-Living 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, Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III: BIODIVERSITY AND BIOTIC RESOURCES

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES

Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Concepts of bioremediation.

Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion andOzone depleting substances (ODS).Deforestation and desertification. International conventions /Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT-V ENVIRONMENTAL POLICY, LEGISLATION & EIA

Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. Overview on Impacts of air, water, biological and Socio-economical aspects.Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building,

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

HUMAN VALUES & PROFESSIONAL ETHICS

II-B.Tech II-Semester **L T P C**

Course Code: A1EE405MC **3 - - -**

COURSE OBJECTIVES:

The course should enable the students to learn:

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

COURSE OUTCOMES:

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

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
4. Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
5. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

UNIT – I INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT – II UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

UNIT – III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN-HUMAN RELATIONSHIP

Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between

intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!

UNIT – IV UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS CO- EXISTENCE

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT – V IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations..

TEXT BOOKS

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

REFERENCE BOOKS:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.

WEB REFERENCES:

1. https://www.uhv.ac.in
2. Story of Stuff, http://www.storyofstuff.com

III-YEAR (I-SEMESTER)

POWER ELECTRONICS

III B.Tech-I Semester **L T P C**
Course Code: A1EE512PC **3 - - 3**

COURSE OBJECTIVES

Learn

1. To Design/develop suitable power converter for efficient control or conversion of power in drive applications
2. To Design / develop suitable power converter for efficient transmission and utilization of power in power system applications.

COURSE OUTCOMES

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

1. Understand the differences between signal level and power level devices.
2. Analyze controlled rectifier circuits.
3. Analyze the operation of DC-DC choppers.
4. Analyze the operation of voltage source inverters.

UNIT I POWER SWITCHING DEVICES

Concept of power electronics, scope and applications, types of power converters; Power semiconductor switches and their V-I characteristics - Power Diodes, Power BJT, SCR, Power MOSFET, Power IGBT; Thyristor ratings and protection, methods of SCR commutation, UJT as a trigger source, gate drive circuits for BJT and MOSFETs

UNIT II AC-DC CONVERTERS (PHASE CONTROLLED RECTIFIERS)

Principles of single-phase fully-controlled converter with R, RL, and RLE load, Principles of single-phase half-controlled converter with RL and RLE load, Principles of three-phase fully-controlled converter operation with RLE load, Effect of load and source inductances, General idea of gating circuits, Single phase and Three phase dual converters

UNIT III DC-DC CONVERTERS (CHOPPER/SMPS)

Introduction, elementary chopper with an active switch and diode, concepts of duty ratio, average inductor voltage, average capacitor current. Buck converter - Power circuit, analysis and wave forms at steady state, duty ratio control of output voltage. Boost converter - Power circuit, analysis and wave forms at steady state, relation between duty ratio and average output voltage. Buck-Boost converter - Power circuit, analysis and wave forms at steady state, relation between duty ratio and average output voltage.

UNIT IV DC-AC CONVERTERS (INVERTERS)

Introduction, principle of operation, performance parameters, single phase bridge inverters with R, RL loads, 3-phase bridge inverters - 120- and 180-degrees mode of operation, Voltage control of single-phase inverters–single pulse width modulation, multiple pulse width modulation, sinusoidal pulse width modulation.

UNIT V AC-AC CONVERTERS

Phase Controller (AC Voltage Regulator)-Introduction, principle of operation of single-phase voltage controllers for R, R-L loads and its applications. Cyclo-converter-Principle of operation of single phase cyclo-converters, relevant wave forms, circulating current mode of operation, Advantages and disadvantages.

TEXT BOOKS:

1. M. H. Rashid, “Power electronics: circuits, devices, and applications”, Pearson Education India, 2009.
2. N. Mohanand T.M.Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons, 2007.

REFERENCE BOOKS:

1. R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science & Business Media, 2007.
2. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.

WEB REFERENCES:

1. https://www.freebookcentre.net/Electronics/Power-Electronics-Books.html
2. http://site.iugaza.edu.ps/malramlawi/files/RASHID_Power_Electronics_Handbook.pdf
3. https://nptel.ac.in/courses/108/102/108102145/

E-TEXT BOOK:

1. http://site.iugaza.edu.ps/malramlawi/files/RASHID_Power_Electronics_Handbook.pdf

MOOCS COURSE:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/

POWER SYSTEM ANALYSIS

III B.Tech-I Semester **L T P C**
Course Code: A1EE513PC **3 - - 3**

COURSE OBJECTIVES

Learn

1. To analyze the performance of transmission lines.
2. To understand the voltage control and compensation methods.
3. To understand the per unit representation of power systems.
4. To examine the performance of travelling waves.
5. ToknowthemethodsofovervoltageprotectionandInsulationcoordinationoftransmissionlines

COURSE OUTCOMES

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

1. Analyze transmission line performance.
2. Apply load compensation techniques to control reactive power
3. Understand the application of per unit quantities.
4. Design over voltage protection and insulation coordination
5. Determine the fault currents for symmetrical and unbalanced faults

UNIT I PERFORMANCE OF LINES

Representation of lines, short transmission lines, medium length lines, nominal T and PI- representations, long transmission lines. The equivalent circuit representation of a long Line, A, B, C, D constants, Ferranti Effect, Power flow through a transmission line, receiving end power circle diagram.

UNIT II VOLTAGE CONTROL & COMPENSATION IN POWER SYSTEMS

Voltage Control

Introduction – methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers.

Compensation in Power Systems

Introduction - Concepts of Load compensation – Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line with asynchronous load – Compensation of lines.

UNIT III PER UNIT REPRESENTATION

Per Unit Representation of Power Systems:

The one-line diagram, impedance and reactance diagrams, per unit quantities, changing the base of per unit quantities, advantages of per unit system.

Travelling Waves on Transmission Lines:

Production of travelling waves, open circuited line, short circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at T-junction line terminated through a capacitance, capacitor connection at a T-junction, Attenuation of travelling waves.

UNIT IV OVER VOLTAGE PROTECTION AND INSULATION COORDINATION

Over voltage due to arcing ground and Peterson coil, lightning, horn gaps, surge diverters, rod gaps, expulsion type lightning arrester, valve type lightning arrester, ground wires, ground rods, counterpoise, surge absorbers, insulation coordination, volt-time curves.

UNIT V SYMMETRICAL COMPONENTS AND FAULT CALCULATIONS

Significance of positive, negative and zero sequence components, Average 3-phase power in terms of symmetrical components, sequence impedances and sequence networks, fault calculations, sequence network equations, single line to ground fault, line to line fault, double line to ground fault, three phase faults, faults on power systems, faults with fault impedance, reactors and their location, short circuit capacity of a bus.

TEXTBOOKS:

1. John J. Grainger & W.D. Stevenson: Power System Analysis – Mc Graw Hill International1994.
2. C.L. Wadhwa: Electrical Power Systems – New Age International Pub. Co. Third Edition, 2001.

REFERENCE BOOKS:

1. Hadi Scadat: Power System Analysis – Tata Mc Graw Hill Pub. Co.2002
2. W.D. Stevenson: Elements of Power system Analysis – McGraw Hill International Student Edition.
3. D.P. Kothari and I. J. Nagrath, Modern Power System Analysis - Tata Mc Graw Hill Pub. Co., New Delhi, Fourth edition,2011

WEB REFERENCES:

1. https://www.darshan.ac.in/DIET/EE/SubjectDetail/2160908
2. https://onlinelibrary.wiley.com/doi/book/10.1002/0471722901

E-TEXT BOOK:

1. https://www.studynama.com/community/threads/power-systems-2-quick-revision-pdf-notes-book-ebook-for-electrical-engineering-free-download.347/

MOOCS COURSE:

1. https://nptel.ac.in/courses/108/105/108105067/

SIGNALS & SYSTEMS

III B.Tech-I Semester **L T P C**
Course Code: A1EC501PC **3 - - 3**

COURSE OBJECTIVE:

1. This gives the basics of Signals and Systems required for all Electrical Engineering related Courses.
2. To understand the behavior of signal in time and frequency domain
3. To understand the characteristics of LTI systems
4. This gives concepts of Signals and Systems and its analysis using different transform Techniques.

COURSE OUTCOMES:

1. Differentiate various signal functions.
2. Represent any arbitrary signal in time and frequency domain.
3. Understand the characteristics of linear time invariant systems.
4. Analyze the signals with different transform technique

UNIT – I: 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, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT – II: FOURIER SERIES AND FOURIER TRANSFORMS:

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.
Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

UNIT – III: SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS:

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley- Wiener criterion for physical realization, Relationship between Bandwidth and rise time, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT – IV: LAPLACE TRANSFORMS

Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.
Z–Transforms: Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

UNIT – V: SAMPLING THEOREM:

Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.
Correlation: Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parsevals Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation, Detection of Periodic Signals in the presence of Noise by Correlation, Extraction of Signal from Noise by Filtering.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed.

REFERENCE BOOKS:

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH
3. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
4. Signals, Systems and Transforms - C. L. Philips, J. M. Parr and Eve A. Riskin, 3 Ed., 2004, PE.
5. Signals and Systems – K. Deergha Rao, Birkhauser, 2018.

WEB REFERENCES:

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/
2. https://www.entcengg.com/signals-system-reference-books/
3. https://onlinelibrary.wiley.com/doi/book/10.1002/9780470823552

E-TEXT BOOKS:

1. https://mlichouri.files.wordpress.com/2013/10/fundamentals-of-signals-and-systems.pdf
2. https://eng.libretexts.org/Bookshelves/Electrical_Engineering/Signal_Processing_and_Modeling/Book%3A_Signals_and_Systems_(Baraniuk_et_al.)

MOOCS COURSES:

1. https://www.coursera.org/courses?query=signals%20and%20systems
2. https://www.classcentral.com/course/swayam-principles-of-signals-and-systems-9900
3. https://nptel.ac.in/courses/108/104/108104100/

ELECTRICAL MACHINE DESIGN
(Professional Elective - I)

III B.Tech-I Semester **L T P C**
Course Code: A1EE501PE **3 - - 3**

COURSE OBJECTIVES:
The course should enable the students:
1. To know the major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings,
2. To analyze the thermal considerations, heat flow, temperature rise, rating of machines.
3. To understand the design of transformers
4. To study the design of induction motors
5. To know the design of synchronous machines

COURSE OUTCOMES:
1. At the end of the course, student will be able to:
2. Understand the construction and performance characteristics of electrical machines.
3. Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines
4. Understand the principles of electrical machine design and carry out a basic design of an ac machine.
5. Use software tools to do design calculations.

UNIT-I INTRODUCTION
Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

UNIT –II TRANSFORMERS
Sizing of a transformer, main dimensions, kVA output for single-and three-phase transformers, window space factor, over all dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

UNIT –III INDUCTION MOTORS
Sizingofaninductionmotor,maindimensions,lengthofairgap,rulesforselectingrotorslotsofsquirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of poly-phase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

UNIT –IV SYNCHRONOUS MACHINES
Sizing of asynchronous machine, main dimensions, 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

UNIT-V COMPUTER AIDED DESIGN (CAD)
Limitations (assumptions) of traditional designs need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design .Introduction to complex structures of modern machines- PMSMs, BLDCs, SRM and claw-pole machines.

TEXT BOOKS:
1. K. Sawhney, “A Course in Electrical Machine Design”, DhanpatRai and Sons, 1970.
2. M.G. Say, “Theory & Performance & Design of A.C. Machines”, ELBS London.

REFERENCE BOOKS:

1. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006.
2. K. L. Narang, "A Text Book of Electrical Engineering Drawings", Satya Prakashan, 1969.
3. Shanmugasundaram, G.Gangadharan and R.Palani, "Electrical Machine Design Data Book", New Age International, 1979.
4. M. V. Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 2008.
5. Electrical machines and equipment design exercise examples using Ansoft's Maxwell 2D machine design package.

WEB REFERENCES:

1. https://www.oreilly.com/library/view/electricalmachine2nd/9788131760901/25_ref.html
2. https://onlinelibrary.wiley.com/doi/book/10.1002/9780470740095

E TEXT BOOKS:

1. https://www.khajuribazar.com/books/electrical-machine-design-aksawhney-1176/
2. https://www.ebooksread.com/authors-eng/alexander-gray/electrical-machine-design-the-design-and-specification-of-direct-and-alternatin-hci.shtml
3. https://easyengineering.net/ee6604-design-of-electrical-machines-nw/

MOOCS COURSE:

1. https://www.edubull.com/courses/online-engineering-ebooks-courses-list/electrical-engineering-online-courses/electrical-machine-design-courses
2. https://www.coursera.org/courses?query=machine%20design

MODELLING AND ANALYSIS OF ELECTRICAL MACHINES
(Professional Elective - I)

III B.Tech-I Semester **L T P C**
Course Code: A1EE502PE **3 - - 3**

COURSE OBJECTIVES:
The course should enable the students:
1. To comprehend the basic two-pole machine.
2. To identify the methods and assumptions in modeling of machines.
3. To write voltage and torque equations for different machines.
4. To recognize the different frames for modeling of different AC machines.
5. To express the voltage and torque equations in State space form

COURSE OUTCOMES:
At the end of the course, student will be able to:
1. Write the voltage equation and torque equations for different machines like dc machine, induction motor and Synchronous machines.
2. Model different machines using phase and Active transformations.
3. Identify the different reference frames for modeling of machines.

UNIT-I BASIC TWO-POLE DC MACHINE
Primitive 2-axis machine – Voltage and Current relationship – Torque equation.

UNIT –II MATHEMATICAL MODEL OF SEPARATELY EXCITED DC MOTOR AND DC SERIES MOTOR IN STATE VARIABLE FORM
Transfer function of the motor – Numerical problems. Mathematical model of D.C. shunt motor D.C. Compound motor in state variable form – Transfer function of the motor – Numerical Problems

UNIT–III LINER TRANSFORMATION
Phase transformation (a, b, c to α, β, o) – Active transformation (α .β, o to d, q).
Circuit model of a 3 phase Induction motor – Linear transformation – Phase Transformation – Transformation to a Reference frame – Two axis models for induction motor. dq model based DOL starting of Induction Motors.

UNIT –IV VOLTAGE AND CURRENT EQUATIONS IN STATOR REFERENCE FRAME
Equation in Rotor reference frame – equations in a synchronously rotating frame – Torque equation – Equations I state – space form.

UNIT-V CIRCUITS MODEL OF A 3PH SYNCHRONOUS MOTOR
Two axis representation of Syn. Motor. Voltage and current Equations in state – space variable form – Torque equation. dq model based short circuit fault analysis- emphasis on voltage, frequency and recovery time.

TEXT BOOKS:
1. Analysis of electric machinery and Drive systems- Paul C. Krause, Oleg Wasynezuk, Scott D. Sudhoff, third edition, IEEE press
2. Generalized Machine theory P.S. Bimbhra, Khanna Publishers, 2002

REFERENCE BOOK:
1. Thyristor control of Electric Drives – VedamSubramanyam, Tata McGraw-Hill Education, 1988
Power System Stability and Control – PrabhaKundur, EPRI.

WEB REFERENCES:

1. https://books.google.com/books/about/ELECTRICAL_MACHINES_MODELLING_AND_ANALYS.html?id=u3SADAAAQBAJ
2. https://nptel.ac.in/courses/108/106/108106023/

E TEXT BOOKS:

1. https://www.kopykitab.com/Electrical-Machines-Modelling-And-Analysis-by-Mrittunjay-Bhattacharyya
2. https://library.oapen.org/bitstream/handle/20.500.12657/43857/external_content.pdf?sequence=1&isAllowed=y

MOOCS COURSE:

1. https://nptel.ac.in/courses/108/106/108106023/
2. https://www.btechguru.com/courses--nptel----modelling-and-analysis-of-electric-machines-(under-video-lecture--EE--EE10810602.html

HIGH VOLTAGE ENGINEERING
(Professional Elective - I)

III B.Tech-I Semester **L T P C**
Course Code: A1EE503PE **3 - - 3**

COURSE OBJECTIVES:
The course should enable the students:
1. To deal with the detailed analysis of Breakdown occurring in gaseous, liquids and solid dielectrics
2. To inform about generation and measurement of High voltage andcurrent
3. To introduce High voltage testing methods

COURSE OUTCOMES:
At the end of the course, student will be able to:
1. Acquire knowledge on, basics of high voltage engineering
2. Understand break-down phenomenon in different types of dielectrics
3. Understand generation and measurement of high voltages and currents
4. Understand the phenomenon of over-voltages, concept of insulation co-ordination

UNIT I INTRODUCTION TO HIGH VOLTAGE TECHNOLOGY AND 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.

UNIT II BREAK DOWN IN GASEOUS AND LIQUID DIELECTRICS
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 .

UNIT III GENERATION OF HIGH DIRECT CURRENT VOLTAGES
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.
Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurement.

UNIT IV TESTING OF MATERIAL AND ELECTRICAL APPARATUS
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, and Radio Interference measurements.

UNIT V OVER VOLTAGE PHENOMENON AND INSULATION CO-ORDINATION
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.

TEXT BOOKS:
1. M. S. Naidu and V. Kamaraju, High Voltage Engineering by– TMH Publications, 4th Edition2009.
2. E. Kuffel, W. S. Zaengl, J. Kuffel, High Voltage Engineering: Fundamentals by Elsevier, 2nd Edition 2000.

REFERENCE BOOKS:

1. C. L. Wadhwa, High Voltage Engineering by, New Age Internationals (P) Limited, 1997.
2. Ravindra Arora, Wolfgang Mosch, High Voltage Insulation Engineering by, New Age International (P) Limited, 1995.
3. Mazen Abdel Salam, Hussein Anis, Ahdan El-Morshedy and Roshdy Radwan", High Voltage Engineering, Theory and Practice, CRC Press, 2nd Edition2000.

WEB REFERENCES:

1. https://www.mv.helsinki.fi/home/tpaulin/Text/hveng.pdfhttps://www.mv.helsinki.fi/home/tpaulin/Text/hveng.pdf
2. https://www.elsevier.com/books/high-voltage-engineering/hammond/978-0-08-024212-5

E TEXT BOOKS:

1. https://learnengineering.in/high-voltage-engineering-books/
2. https://www.mv.helsinki.fi/home/tpaulin/Text/hveng.pdf

MOOCS COURCE:

1. https://nptel.ac.in/courses/108/104/108104048/
2. https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

IV B.Tech-I Semester **L T P C**
Course Code: A1EE504HS **3 - - 3**

COURSE OBJECTIVES:

Learn

1. To learn the basic business types, impact of the economy on Business and Firms specifically. Tanalyze the Business from the Financial Perspective

COURSE OUTCOMES:

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

1. Understand the various Forms of Business and the impact of economic variable son the Business.
2. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt.
3. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

UNIT I INTRODUCTION TO BUSINESS AND ECONOMICS

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT II DEMAND AND SUPPLY ANALYSIS

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demanding decision making.

Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function and Law of Supply.

UNIT III PRODUCTION, COST, MARKET STRUCTURES & PRICING

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT IV FINANCIAL ACCOUNTING

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rule for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts

UNIT V FINANCIAL ANALYSIS THROUGH RATIOS

Concept of Ratio Analysis, Importance, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd.2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S.N.Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

WEB REFERENCES:

1. https://www.investopedia.com/terms/f/financial-analysis.asp
2. http://pdfpremiumfree.com/download/managerial-economics-financial-analysis-aryasri-pdf/

MOOCS COURSE:

1. https://onlinecourses.nptel.ac.in/
2. https://www.edx.org/learn/financial-analysis
3. https://www.coursera.org/specializations/finance-quantitative-modeling-analysts
4. https://www.coursera.org/browse/business/finance

POWER ELECTRONICS & DRIVES LAB

III B.Tech-I Semester **L T P C**
Course Code: A1EE514PC **- - 3 1.5**

COURSE OBJECTIVES:

The course should enable the students to:

1. Apply the concepts of power electronic converters for efficient conversion/control of power from source to load.
2. Design the power converter with suitable switches meeting a specific load requirement.

COURSE OUTCOMES:

By the end of the course students will be able:

1. Understand the operating principles of various power electronic converters.
2. Use power electronic simulation packages& hardware to develop the power converters.
3. Analyze and choose the appropriate converters for various applications

LIST OF EXPERIMENTS

Experiment-1 Study of Characteristics of SCR, MOSFET &IGBT.
Experiment-2 Gate firing circuits for SCR's
Experiment-3 Single Phase AC Voltage Controller with R and RL Loads
Experiment-4 Single Phase half controlled &fully controlled bridge converter with R and RL loads
Experiment-5 Forced Commutation circuits (Class A, Class B, Class C, Class D &Class E)
Experiment-6 Single Phase Cyclo-converter with R and RL loads
Experiment-7 Single Phase series& parallel inverter with R and RL loads
Experiment-8 Single Phase Bridge inverter with R and RL loads
Experiment-9 DC Jones chopper with R and RL Loads
Experiment-10 Three Phase half-controlled bridge converter with R-load
Experiment-11 Single Phase dual converter with RL loads
Experiment-12 Simulation of single-phase Inverter with PWM control

REFERENCE BOOKS:

1. M. H. Rashid, Simulation of Electric and Electronic circuits using PSPICE – by M/s PHI Publications
2. User's manual of related software's
3. Rashid, Spice for power electronics and electric power, CRC Press

WEB REFERENCES:

1. https://onlinelibrary.wiley.com/doi/abs/10.1002/cae.21673
2. https://ceme.ece.illinois.edu/files/2014/07/ECE469V25.pdf
3. https://web.ecs.baylor.edu/faculty/grady/Grady_UT_Austin_EE462L_Fall_2010.pdf

POWER SYSTEMS LAB

III B.Tech-I Semester **L T P C**
Course Code: A1EE515PC **- - 3 1.5**

COURSE OBJECTIVES:

1. The testing of CT, PT's and Insulator strings
2. To find sequence impedances of 3-Φ synchronous machine and Transformer
3. To perform fault analysis on Transmission line models and Generators.

COURSE OUTCOMES:

1. Perform various load flow techniques
2. Understand Different protection methods
3. Analyze the experimental data and draw the conclusions.

LIST OF EXPERIMENTS

Group A

Experiment-1 Characteristics of IDMT Over-Current Relay.
Experiment-2 Differential protection of 1-Φ transformer.
Experiment-3 Characteristics of Micro Processor based Over Voltage/Under Voltage relay.
Experiment-4 A,B,C,D constants of a Long Transmission line
Experiment-5 Finding the sequence impedances of 3-Φ synchronous machine.
Experiment-6 Finding the sequence impedances of 3-Φ Transformer

Note:In addition to the above six experiments, at least any four of the experiments from the following list are required to be conducted.

Group B

Experiment-1 Formation of YBUS.
Experiment-2 Load Flow Analysis using Gauss Seidal (GS) Method.
Experiment-3 Load Flow Analysis using Fast Decoupled (FD) Method.
Experiment-4 Formation of ZBUS.
Experiment-5 Simulation of Compensated Line

REFERENCE BOOKS:

1. C.L. Wadhwa: Electrical Power Systems –Third Edition, New Age International Pub. Co., 2001.
2. Hadi Sadat: Power System Analysis –Tata Mc Graw Hill Pub. Co. 2002.

WEB REFERENCES:

1. https://www.ietlucknow.ac.in
2. https://web.fe.up.pt

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB

III B.Tech-I Semester **L T P C**
Course Code: A1EE516PC **- - 3 1.5**

COURSE OBJECTIVES:

The course should enable the students:

1. To calibrate LPF Watt Meter, energy meter, P. F Meter using electro dynamo meter type instrument as the standard instrument
2. To determine unknown Inductance, resistance, capacitance by performing experiments on D.C Bridges & A. C Bridges
3. To determine three phase active & reactive powers using single wattmeter method practically
4. Todeterminetheratioandphaseangleerrorsofcurrenttransformerandpotentialtransformer.

COURSE OUTCOMES:

By the end of the course students will be able:

1. To choose instruments
2. Test any instrument
3. Find the accuracy of any instrument by performing experiment
4. Calibrate PMMC instrument using D.C potentiometer

LIST OF EXPERIMENTS

Experiment-1 Calibration and Testing of single-phase energy meter.
Experiment-2 Calibration of dynamometer power factor meter.
Experiment-3 Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
Experiment-4 Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
Experiment-5 Dielectric oil testing using H.T. testing Kit.
Experiment-6 Schering Bridge & Anderson Bridge.
Experiment-7 Measurement of 3 - Phase reactive power with single-phase wattmeter.
Experiment-8 Measurement of displacement with the help of LVDT.
Experiment-9 Calibration LPF wattmeter – by Phantom testing.
Experiment-10 Measurement of 3-phase power with single watt meter and two CTs.
Experiment-11 C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given CT by Null method.
Experiment-12 PT testing by comparison – V. G. as Null detector – Measurement of % ratio error and phase angle of the given PT

REFERENCE BOOKS:

1. "G. K. Banerjee", "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016
2. "S.C. Bhargava", "Electrical Measuring Instruments and Measurements", BS Publications, 2012.
3. "A. K. Sawhney", "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications, 2005.

WEB REFERENCES:

3. https://www.ietlucknow.ac.in/lab/1414
4. https://web.fe.up.pt/~lim/sample_e-book.pdf
5. https://www.scribd.com/doc/140819941/measurement-and-instrumentation-lab-manual

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

III-B.Tech I-Semester | **L T P C**
Course Code: A1EE506MC | **2 - - -**

COURSE OBJECTIVES:

The course should enable the students to learn:

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

COURSE OUTCOMES:

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

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

UNIT-I

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT-II

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

UNIT-III

Legal frame work and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

UNIT-IV

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT-V

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK. 139

TEXT BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.

REFERENCE BOOKS:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
2. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2

E-RESOURCES:

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

III-YEAR (II-SEMESTER)

MICROPROCESSORS AND MICROCONTROLLERS

III B.Tech-II Semester **L T P C**
Course Code: A1EC602PC **3 - - 3**

COURSE OBJECTIVES

Learn

1. To familiarize the architecture of microprocessors and microcontrollers
2. To provide the knowledge about interfacing techniques of bus &memory.
3. To understand the concepts of ARM architecture
4. To study the basic concepts of Advanced ARM processors

COURSE OUTCOMES

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

1. Understands the internal architecture, organization and assembly language programming of 8086 processors.
2. Understands the internal architecture, organization and assembly language programming of 8051/controllers
3. Understands the interfacing techniques to 8086 and 8051 based systems.
4. Understands the internal architecture of ARM processors and basic concepts of advanced ARM processors.

UNIT I 8086 ARCHITECTURE

8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.
Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations

UNIT II INTRODUCTION TO MICROCONTROLLERS&8051 REAL TIME CONTROL:

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.
8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

UNIT III I/O AND MEMORY INTERFACE& SERIAL COMMUNICATION AND BUS INTERFACE:

I/O and Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.
Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232, USB.

UNIT IV ARM ARCHITECTURE:

ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

UNIT V ADVANCED ARM PROCESSORS:

Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandani, TMH, 2nd Edition 2006.
2. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012.

REFERENCE BOOKS:

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed, 2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications -K. Uma Rao, Andhe Pallavi, Pearson, 2009.
4. Digital Signal Processing and Applications with the OMAP- L138 Experimenter, Donald Reay, WILEY2012.

WEB REFERENCES:

1. https://www.journals.elsevier.com/microprocessors-and-microsystems
2. https://www.microchip.com/en-us/products/microcontrollers-and-microprocessors
3. https://www.the8051microcontroller.com/web-references

E-TEXT BOOKS:

1. https://www.freebookcentre.net/Electronics/MicroProcessors-Books.html
2. https://books.google.co.in/books/about/MICROPROCESSORS_AND_MICROCONTROLLERS.html?id=viEaDAAAQBAJ&redir_esc=y

MOOCS COURSE:

1. https://books.google.co.in/books/about/MICROPROCESSORS_AND_MICROCONTROLLERS.html?id=viEaDAAAQBAJ&redir_esc=y

DISTRIBUTION & UTILIZATION OF ELECTRIC POWER

III B.Tech-II Semester **L T P C**
Course Code: A1EE617PC **3 - - 3**

COURSE OBJECTIVES

Learn

1. To introduce all kinds of circuit breakers and relays for protection of Generators, Transformers and feeder bus bars from Over voltages and other hazards.
2. To describe neutral grounding for overall protection.
3. To understand the phenomenon of Over Voltages and it's classification.

COURSE OUTCOMES

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

1. Compare and contrast electromagnetic, static and microprocessor-based relays
2. Apply technology to protect power system components.
3. Select relay settings of over current and distance relays.
4. Analyze quenching mechanisms used in air, oil and vacuum circuit breakers

UNIT I PROTECTIVE RELAYS

Introduction, Need for power system protection, effects of faults, evolution of protective relays, zones of protection, primary and backup protection, essential qualities of protection, classification of protective relays and schemes, current transformers, potential transformers, basic relay terminology.

Operating Principles and Relay Construction: Electromagnetic relays, thermal relays, static relays, microprocessor based protective relays.

UNIT II OVER-CURRENT PROTECTION

Time-current characteristics, current setting, over current protective schemes, directional relay, protectionofparallelfeeders,protectionofringmains,Phasefaultandearthfaultprotection,Combined earth fault and phase fault protective scheme, Directional earth fault relay.

Distance Protection: Impedance relay, reactance relay, MHO relay, input quantities for various types of distance relays, Effect of arc resistance, Effect of power swings, effect of line length and source impedanceontheperformanceofdistancerelays,selectionofdistancerelays,MHOrelaywithblinders, Reduction of measuring units, switched distance schemes, auto re-closing.

UNIT III PILOT RELAYING SCHEMES

Wire Pilot protection, Carrier current protection.

AC Machines and Bus Zone Protection: Protection of Generators, Protection of transformers, Bus- zone protection, frame leakage protection.

UNIT IV STATIC RELAYS

Amplitude and Phase comparators, Duality between AC and PC, Static amplitude comparator, integrating and instantaneous comparators, static phase comparators, coincidence type of phase comparator, static over current relays, static directional relay, static differential relay, static distance relays, Multi input comparators, concept of Quadrilateral and Elliptical relay characteristics.

Microprocessor Based Relays: Advantages, over current relays, directional relays, distance relays.

UNIT V CIRCUIT BREAKERS

Introduction, arcing in circuit breakers, arc interruption theories, re-striking and recovery voltage, resistance switching, current chopping, interruption of capacitive current, oil circuit breaker, air blast circuit breakers, SF6 circuit breaker, operating mechanism, selection of circuit breakers, high voltage

D.C. breakers, ratings of circuit breakers, testing of circuit breakers.

FUSES: Introduction, fuse characteristics, types of fuses, application of HRC fuses, discrimination.

TEXT BOOKS:

1. Badriram and D.N. Vishwakarma, Power System Protection and Switchgear, TMH2001.
2. U.A.Bakshi, M.V.Bakshi: Switchgear and Protection, Technical Publications, 2009.

REFERENCE BOOKS:

1. C.Russel Mason – "The art and science of protective relaying, Wiley Eastern,1995
2. L.P.Singh "Protective relaying from Electromechanical to Microprocessors", New Age International

WEB REFERENCES:

1. https://ieeexplore.ieee.org/abstract/document/43324
2. https://www.osti.gov/biblio/5960099
3. https://www.worldcat.org/title/generation-distribution-and-utilization-of-electrical-energy/oclc/987876426

E -TEXT BOOKS:

1. https://books.google.co.in/books/about/Generation_Distribution_and_Utilization.html?id=l1NQttrOQioC
2. https://www.engineeringbookspdf.com/tag/generation-distribution-and-utilization-of-electrical-energy-ebook-free-download/

MOOCS COURSE:

1. https://nptel.ac.in/courses/108/102/108102047/

POWER SYSTEM OPERATION AND CONTROL

III B.Tech-II Semester **L T P C**
Course Code: A1EE618PC **3 - - 3**

COURSE OBJECTIVES

Learn

1. To understand real power control and operation
2. To know the importance of frequency control
3. To analyze different methods to control reactive power
4. To understand unit commitment problem and importance of economic load dispatch
5. To understand real time control of power systems

COURSE OUTCOMES

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

1. Understand operation and control of power systems.
2. Analyze various functions of Energy Management System (EMS) functions.
3. Analyze whether the machine is in stable or unstable position.
4. Understand power system deregulation and restructuring

UNIT I LOAD FLOW STUDIES

Introduction, Bus classification -Nodal admittance matrix - Load flow equations - Iterative methods - Gauss and Gauss Seidel Methods, Newton-Raphson Method-Fast Decoupled method-Merits and demerits of the above methods-System data for load flow study

UNIT II ECONOMIC OPERATION OF POWER SYSTEMS

Distribution of load between units within a plant-Transmission loss as a function of plant generation, Calculation of loss coefficients-Distribution of load between plants.

UNIT III LOAD FREQUENCY CONTROL

Introduction, load frequency problem-Megawatt frequency (or P-f) control channel, MVAR voltages (or Q-V) control channel-Dynamic interaction between P-f and Q-V loops. Mathematical model of speed- governing system-Turbine models, division of power system into control areas, P-f control of single control area (the uncontrolled and controlled cases)-P-f control of two area systems (the uncontrolled cases and controlled cases)

UNIT IV POWER SYSTEM STABILITY

The stability problem-Steady state stability, transient stability and Dynamic stability-Swing equation. Equal area criterion of stability-Applications of Equal area criterion, Step by step solution of swing equation-Factors affecting transient stability, Methods to improve steady state and Transient stability, Introduction to voltage stability

UNIT V COMPUTER CONTROL OF POWER SYSTEMS

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 – SCADAandEMSfunctions.Networktopology–ImportanceofLoadForecastingandsimpletechniques of forecasting.

TEXT BOOKS:

1. C.L.Wadhwa, Electrical Power Systems, 3rd Edn, New Age International Publishing Co.,2001.
2. D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, 4th Edn, Tata McGraw Hill Education Private Limited2011.

REFERENCE BOOKS:

1. D. P. Kothari: Modern Power System Analysis-Tata Mc Graw Hill Pub. Co.2003.
2. Hadi Sadat: Power System Analysis –Tata Mc Graw Hill Pub. Co.2002.

WEB REFERENCES:

1. https://www.sciencedirect.com/topics/engineering/power-system-control
2. https://www.researchgate.net/publication/321488759_Power_System_Operation_Control_and_Restructuring
3. https://www.darshan.ac.in/DIET/EE/SubjectDetail/2180909

E -TEXT BOOKS:

1. https://www.engbookspdf.com/download/Power-System/Power-System-Operation-and-Control
2. https://easyengineering.net/operation-and-control-in-power-systems-by-murty/

MOOCS COURSE:

1. https://nptel.ac.in/courses/108/101/108101040/

SPECIAL ELECTRICAL MACHINES

III B.Tech-II Semester **L T P C**
Course Code: A1EE619PC **3 - - 3**

COURSE OBJECTIVES:

1. To impart knowledge on Construction, principle of operation and performance of synchronous reluctance motors.
2. To impart knowledge on the Construction, principle of operation, control and performance of stepping motors.
3. To impart knowledge on the Construction, principle of operation, control and performance of switched reluctance motors.
4. To impart knowledge on the Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors.
5. To impart knowledge on the Construction, principle of operation and performance of permanent magnet synchronous motors.

COURSE OUTCOMES:

1. Ability to model and analyze electrical apparatus and their application to power system

UNIT – I SYNCHRONOUSRELUCTANCE MOTORS:

Constructional features – Types – Axial and Radial flux motors – Operating principles – Variable Reluctance Motors – Voltage and Torque Equations - Phasor diagram - performance characteristics– Applications

UNIT – II STEPPER MOTORS:

Constructional features – Principle of operation – Variable reluctance motor – Hybrid motor –Single and multi-stack configurations–Torque equations –Modes of excitation –Characteristics
–Drive circuits–Microprocessor control of stepper motors –Closed loop control-Concept of lead angle– Applications.

UNIT – III SWITCHED RELUCTANCE MOTORS (SRM):

Constructional features – Rotary and Linear SRM - Principle of operation – Torque production –Steady state performance prediction- Analytical method -Power Converters and their controllers –Methods of Rotor position sensing – Sensor less operation – Characteristics and Closed loop control– Applications.

UNIT – IV PERMANENT MAGNET BRUSHLESS D.C. MOTORS:

Permanent Magnet materials – Minor hysteresis loop and recoil line-Magnetic Characteristics –Performance coefficient -Principle of operation – Types – Magnetic circuit analysis – EMF and torque equations –Commutation - Power Converter Circuits and their controllers – Motor characteristics and control– Applications.

UNIT – V PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM):

Principle of operation – Ideal PMSM – EMF and Torque equations – Armature MMF –Synchronous Reactance – Sine wave motor with practical windings - Phasor diagram –Torque/speed characteristics - Power controllers - Converter Volt-ampere requirements–Applications.
Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

TEXT BOOK:

1. K.Venkataratnam, Special Electrical Machines', Universities Press (India) Private Limited, 2008.
2. T.J.E.Miller, Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.
3. T.Kenjo, Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984.

REFERENCE BOOKS:

1. R.Krishnan,_SwitchedReluctanceMotorDrives–Modeling,Simulation,Analysis,DesignandApplication', CRC Press,New York, 2001.
2. P.P.Aearnley,_SteppingMotors–AGuidetoMotorTheoryandPractice',PeterPerengrinusLondon,1982.
3. T.KenjoandS.Nagamori,_PermanentMagnetandBrushlessDCMotors',ClarendonPress,London,1988.
4. E.G.Janardanan,_Specialelectricalmachines',PHIlearningPrivateLimited,Delhi,2014.

WEB REFERENCES:

1. https://www.routledge.com/Special-Electric-Machines/Venkataratnam/p/book/9781439806463
2. https://www.brainkart.com/subject/Special-Electrical-Machines_185/

E-TEXT BOOKS:

1. https://www.amazon.in/Special-Electrical-Machines-Janardanan-G/dp/812034880X
2. https://www.kopykitab.com/Special-Electrical-Machines-by-E-G-Janardanan

MOOCS COURSES:

1. https://www.classcentral.com/course/swayam-electrical-machines-iitd-14030
2. https://www.iare.ac.in/?q=pages/btech-course-descriptions-iare-r18-1
3. https://onlinecourses.nptel.ac.in/noc20_ee38/preview

WIND AND SOLAR ENERGY SYSTEMS
(Professional Elective –II)

III B.Tech-II Semester **L T P C**
Course Code: A1EE604PE **3 - - 3**

COUESE OBJECTIVE:

1. This course envisages the new and renewable source of energy, available in nature and to expose the students on sources of energy crisis and the alternates available, also stress up on the application of non-conventional energy technologies.

COURSE OUTCOMES

1. Understand the need of energy conversion and the various methods of energy storage
2. Explain the field applications of solar energy
3. Identify Winds energy as alternate form of energy and to know how it can be tapped
4. Explain bio gas generation and its impact on environment
5. Understand the Geothermal &Tidal energy, its mechanism of production and its applications Illustrate the concepts of Direct Energy Conversion systems & their applications

UNIT – I PRINCIPLES OF SOLAR RADIATION

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.

UNIT-II SOLAR ENERGY COLLECTION

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects.Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

UNIT-III SOLAR ENERGY STORAGE AND APPLICATIONS

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.
Ocean Energy: OTEC,Principlesutilization,settingofOTECplants,thermodynamiccycles.Tidaland wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-IV WIND ENERGY

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

UNIT-V 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.
Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

TEXT BOOKS:

1. Non-Conventional Energy Sources /G.D.Rai
2. Renewable Energy Technologies /Ramesh &Kumar/Narosa

REFERENCE BOOKS:

1. Renewable energy resources/ Tiwari andGhosal/Narosa.
2. Non-Conventional Energy / Ashok V Desai /WileyEastern.
3. Non-Conventional Energy Systems / KMittal/Wheeler
4. Solar Energy/Sukhame

WEB REFERENCES:

1. https://www.routledge.com/Wind-and-Solar-Power-Systems-Design-Analysis-and-Operation/Patel-Beik/p/book/9780367476939
2. https://library.uniteddiversity.coop/Energy/Wind/Wind_and_Solar_Power_Systems.pdf
3. https://www.nap.edu/read/11935/chapter/8

E-TEXT BOOKS:

1. https://www.amazon.in/Wind-Solar-Power-Systems-Operation/dp/0849315700
2. https://www.amazon.in/Renewable-Energy-Systems-David-Buchla/dp/9332586829

MOOCS COURSES:

1. https://www.mooc-list.com/tags/wind-energy
2. https://www.mooc-list.com/tags/solar-energy
3. https://platform.europeanmoocs.eu/course_renewable_energy_technologies

SWITCH GEAR AND PROTECTION
(Professional Elective - II)

III B.Tech-IISemester **L T P C**
Course Code: A1EE605PE **3 - - 3**

COURSE OBJECTIVES:

The course should enable the students:

1. To introduce all kinds of circuit breakers and relays for protection of generators, transformers and feeder bus bars from over voltages and other hazards.
2. To describe neutral grounding for overall protection.
3. To understand the phenomenon of over voltages and it's classification.

COURSE OUTCOMES:

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

1. Understand the types of circuit breakers and choice of relays for appropriate protection of power system equipment.
2. Understand various types of protective devices in electrical power systems.
3. Interpret the existing transmission voltage levels and various means to protect the system against over voltages.
4. Understand the importance of neutral grounding, effects of ungrounded neutral grounding on system performance, methods and practices.

UNIT-I INTRODUCTION TO CIRCUIT BREAKERS

Circuit breakers: elementary principles of arc interruption, recovery, restriking voltage and recovery voltages. - restriking phenomenon, average and maximum rrrv, numerical problems - current chopping and resistance switching - cb ratings and specifications: types and numerical problems – auto- reclosures. Minimum oil circuit breakers, air blast circuit breakers, vacuum, and sf6 circuit breakers

UNIT -II ELECTROMAGNETIC AND STATIC RELAYS, DISTANCE RELAYS

Principle of operation and construction of attracted armature, balanced beam, induction disc and induction cup relays. Types of over current relays: instantaneous, dmt and idmt types. Application of relays: over current/ under voltage relays, direction relays, differential relays and percentage differential relays.Impedance, reactance, and mho and off-set mho relays, characteristics of distance relays and comparison. Static relays: static relays verses electromagnetic relays.

UNIT -III PROTECTION OF POWER EQUIPMENT

Protection of generators against stator faults, rotor faults, and abnormal conditions. Restricted earth fault and inter-turn fault protection. Numerical problems on % winding unprotected.

Protection of transformers: percentage differential protection, numerical problem on design of CT ratio, buchholz relay protection.

Protection of lines: over current, carrier current and three-zone distance relay protection using impedance relays. trans lay relay. Protection of bus bars – differential protection.

UNIT -IV NEUTRAL GROUNDING

Grounded and ungrounded neutral systems. - Effects of ungrounded neutral on system performance. Methods of neutral grounding: solid, resistance, reactance arcing grounds and grounding practices.

UNIT-V PROTECTION AGAINST OVER VOLTAGES

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. Badri Ram , D. N Viswakarma, “Power System Protection And Switchgear”, Tmh Publications, 2011
2. Sunil S Rao, “Switchgear and Protection”, Khanna Publishers, 2008.

REFERENCE BOOKS:

1. Paithankar and S. R. Bhide”, “Fundamentals of Power System Protection”, Phi, 2003.
2. “C R Mason”, Art & Science of Protective Relaying – Wiley Eastern Ltd, 1966.
3. “C. L. Wadhwa”, “Electrical Power Systems”, New Age International (P) Limited

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Switchgear
2. https://www.sciencedirect.com/topics/engineering/switchgear

E TEXT BOOKS:

1. https://books.askvenkat.org/switchgear-and-protection-textbook-free-download/
2. https://www.pragationline.com/switchgear-and-protection-chaudhari-chaudhari/

MOOCS COURSE:

1. https://onlinecourses.nptel.ac.in/noc20_ee80/preview
2. https://www.vssut.ac.in/lecture_notes/lecture1425873259.pdf

ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective - II)

III B.Tech-II Semester **L T P C**
Course Code: A1EE606PE **3 - - 3**

COURSE OBJECTIVES:

The course should enable the students:

1. To distinguish between transmission and distribution systems
2. To understand design considerations of feeders
3. To compute voltage drop and power loss in feeders
4. To understand protection of distribution systems
5. To examine the power factor improvement and voltage control

COURSE OUTCOMES:

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

1. Distinguish between transmission and distribution line and design the feeders
2. Compute power loss and voltage drop of the feeders
3. Design protection of distribution systems
4. Understand the importance of voltage control and power factor improvement

UNIT I GENERAL CONCEPTS, DISTRIBUTION FEEDERS

Introduction to distribution system, Distribution system planning, Factors effecting the Distribution system planning, Load modelling and characteristics. Coincidence factor - contribution factor - Loss factor - Relationship between the load factor and loss factor. Load growth, Classification of loads (Residential, commercial, Agricultural and Industrial) and theircharacteristics.

Design Considerations of Distribution Feeders: Radial, loop and network types of primary feeders, Introduction to low voltage distribution systems (LVDS) and High voltage distribution systems (HVDS), voltage levels, Factors effecting the feeder voltage level, feeder loading, Application of general circuit constants (A,B,C,D) to radial feeders, basic design practice of the secondary distribution system, secondary banking, secondary network types, secondary mains.

UNIT II SUBSTATIONS, SYSTEM ANALYSIS

Location of Substations: Rating of distribution substation, service area with ‘n’ primary feeders. Benefits derived through optimal location of substations. Optimal location of Substations (Perpendicular bisector rule and X, Y co-ordinatemethod.

Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines, analysis of non-three phase systems, method to analyze the distribution feeder cost.

UNIT III PROTECTION, COORDINATION

Objectives of distribution system protection, types of common faults and procedure for fault calculations, over current Protective Devices: Principle of operation of Fuses, Auto-Circuit Re closer and Auto-line sectionalizes, and circuit breakers.

Coordination of Protective Devices: Objectives of protection co- ordination, general coordination procedure, Types of protection coordination: Fuse to Fuse, Auto-Re closer to Fuse, Circuit breaker to Fuse, Circuit breaker to Auto-Re closer

UNIT IV COMPENSATION FOR POWER FACTOR IMPROVEMENT

Capacitive compensation for power-factor control - Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), effect of series capacitors, difference between shunt and series capacitors, Calculation of Power factor correction, capacitor allocation - Economic justification of capacitors - Procedure to determine the best capacitor location.

UNIT V VOLTAGE CONTROL: VOLTAGE CONTROL

Importance of voltage control, methods of voltage control, Equipment for voltage control, effect of shunt capacitors, effect of series capacitors, effect of AVB/AVR on voltage control, line drop compensation, voltagefluctuations.

TEXT BOOKS:

1. Turan Gonen, Electric Power Distribution System Engineering, CRC Press, 3rdEdition2014.
2. V. Kamaraju, Electrical Power Distribution Systems, Tata Mc Graw Hill Publishing Company, 2nd edition,2010.

REFERENCE BOOKS:

1. G. Ram Murthy, Electrical Power Distribution hand book, 2nd edition, University press2004.
2. A.S. Pabla, Electric Power Distribution, Tata McGraw Hill Publishing Company, 6thedition,2013.

WEB REFERENCES:

1. https://onlinelibrary.wiley.com/doi/book/10.1002/9780470943854
2. https://ascelibrary.org/doi/10.1061/%28ASCE%29AE.1943-5568.0000125

E TEXT BOOKS:

1. https://www.amazon.in/Electric-Power-Distribution-Engineering-Turan/dp/1482207001
2. https://ieeexplore.ieee.org/book/5732780

MOOCS COURSE:

1. https://www.classcentral.com/course/swayam-electrical-distribution-system-analysis-14029
2. https://www.classcentral.com/course/electric-power-systems-12053

ENERGY STORAGE SYSTEMS
(Open Elective-I)

III B.Tech-II Semester **L T P C**
Course Code: A1EE601OE **3 - - 3**

COURSE OBJECTIVES:

The course should enable the students:

1. To enable the student to understand the need for energy storage, devices

COURSE OUTCOMES:

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

1. Analyze the characteristics of energy from various sources and need for storage
2. Classify various types of energy storage and various devices used for the purpose
3. Identify various real time applications

UNIT-I: ELECTRICAL ENERGY STORAGE TECHNOLOGIES

Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak demand periods, Need for continuous and flexible supply, Long distance between generation and consumption, Congestion in power grids, Transmission by cable

UNIT –II: NEEDS FOR ELECTRICAL ENERGY STORAGE

Emerging needs for EES, More renewable energy ,less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

UNIT –III: FEATURES OF ENERGY STORAGE SYSTEMS

Classification of EES systems , Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES),Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG).

UNIT –IV: TYPES OF ELECTRICAL ENERGY STORAGE SYSTEMS

Electrical storage systems, Double-layer capacitors (DLC), Superconducting magnetic energy storage (SMES), Thermal storage systems, Standards for EES, Technical comparison of EES technologies).

UNIT-V: APPLICATIONS

Present status of applications, Utility use (conventional power generation, grid operation & service) , Consumer use (uninterruptable power supply for large consumers), New trends in applications ,Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles, Management and control hierarchy of storage systems,

TEXT BOOKS:

1. James M. Eyer, Joseph J. Iannucci and Garth P. Corey “, “Energy Storage Benefits and Market Analysis”, Sandia National Laboratories, 2004.
2. The Electrical Energy Storage by IEC Market Strategy Board

WEB REFERENCE:

1. https://onlinecourses.nptel.ac.in/

E-TEXT BOOK:

1. https://onlinecourses.nptel.ac.in/

MOOCS COURSES:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in

RENEWABLE ENERGY SOURCES
(Open Elective – I)

III B.Tech-I Semester **L T P C**
Course Code: A1EE602OE **3 - - 3**

COURSE OBJECTIVES:

1. To recognize the awareness of energy conservation in students
2. To identify the use of renewable energy sources for electrical power generation
3. To collect different energy storage methods
4. To detect about environmental effects of energy conversion

COURSE OUTCOMES:

1. Understand the principles of wind power and solar photovoltaic power generation, fuel cells.
2. Assess the cost of generation for conventional and renewable energy plants
3. Design suitable power controller for wind and solar applications
4. Analyze the issues involved in the integration of renewable energy sources to the grid

UNIT – I INTRODUCTION- WIND POWER PLANTS

Renewable Sources of Energy-Grid-Supplied Electricity-Distributed Generation-Renewable Energy Economics-Calculation of Electricity Generation Costs –Demand side Management Options –Supply side Management Options-Modern Electronic Controls of Power Systems.

Wind Power Plants: Appropriate Location -Evaluation of Wind Intensity -Topography -Purpose of the Energy Generated - GeneralClassificationofWindTurbines-RotorTurbines-Multiple-BladeTurbinesDragTurbines-Lifting Turbines-Generators and Speed Control used in Wind Power Energy Analysis of Small Generating Systems.

UNIT – II PHOTOVOLTAIC POWER PLANTS

Solar Energy-Generation of Electricity by Photovoltaic Effect -Dependence of a PV Cell Characteristic on Temperature-Solar cell Output Characteristics-Equivalent Models and Parameters for Photovoltaic Panels-Photovoltaic Systems-Applications of Photovoltaic Solar Energy-Economical Analysis of Solar Energy.

FuelCells:TheFuelCell-LowandHighTemperatureFuelCells-CommercialandManufacturingIssues Constructional Features of Proton Exchange-Membrane Fuel Cells –Reformers-Electrolyze Systems and Related Precautions-Advantages and Disadvantages of Fuel Cells-Fuel Cell Equivalent Circuit- Practical Determination of the Equivalent Model Parameters -Aspects of Hydrogen as Fuel.

UNIT – III INDUCTION GENERATORS

Principles of Operation-Representation of Steady-State Operation-Power and Losses Generated-Self- Excited Induction Generator-Magnetizing Curves and Self-Excitation Mathematical Description of the Self-Excitation Process-Interconnected and Stand-alone operation -Speed and Voltage Control - Economical Aspects.

UNIT – IV STORAGE SYSTEMS

Energy Storage Parameters-Lead–Acid Batteries-Ultra Capacitors-Flywheels –Superconducting Magnetic Storage System-Pumped Hydroelectric Energy Storage - Compressed Air Energy Storage - Storage Heat - Energy Storage as an Economic Resource

UNIT – V INTEGRATION OF ALTERNATIVE SOURCES OF ENERGY

Principles of Power Injection-Instantaneous Active and Reactive Power Control Approach Integration of Multiple Renewable Energy Sources-Islanding and Interconnection Control-DG Control and Power Injection.

Interconnection of Alternative Energy Sources with the Grid:

Interconnection Technologies - Standards and Codes for Interconnection - Interconnection Considerations - Interconnection Examples for Alternative Energy Sources.

TEXT BOOKS:

1. Felix A. Farret, M. Godoy Simoes, “Integration of Alternative Sources of Energy”, John Wiley& Sons,2006.
2. Solanki: Renewable Energy Technologies: Practical Guide for Beginners, PHI Learning Pvt. Ltd.,2008.

REFERENCE BOOKS:

1. D. Mukherjee: Fundamentals of Renewable Energy Systems, New Age International publishers,2007.
2. Remus Teodorescu, Marco Liserre, Pedro Rodríguez: Grid Converters for Photovoltaic and Wind Power Systems, John Wiley & Sons,2011.
3. GilbertM.Masters: Renewable and Efficient Electric PowerSystems,JohnWiley&Sons,2004.

WEB REFERENCES:

1. https://www.eia.gov/energyexplained/renewable-sources/
2. https://www.tandfonline.com/doi/full/10.1080/23311916.2016.1167990
3. https://www.journals.elsevier.com/renewable-energy

E-TEXT BOOKS:

1. https://www.vssut.ac.in/lecture_notes/lecture1428910296.pdf
2. https://www.amazon.in/Renewable-Energy-Sources-Professional-Publications/dp/B00PUAROWW

MOOCS COURSES:

1. https://www.coursera.org/courses?query=renewable%20energy
2. https://online-learning.tudelft.nl/courses/sustainable-energy-design-a-renewable-future/

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

III B. Tech-II Semester **L T P C**
Course Code: A1EN604HS **- - 2 1**

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context. The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

COURSE OBJECTIVES:

1. To provide students with a wide range of vocabulary to enable them to take language tests for higher education and employment
2. To assist students acquire effective and adequate presentation skills
3. To improve communication skills of students by making them participate in different language activities
4. To prepare students for facing interviews self-assuredly.
5. To help students to develop an awareness in studies about the significance of silent reading and comprehension.

COURSE OUTCOMES:

1. State meanings, synonyms, antonyms, analogies, idioms, phrases, one-word substitutes, word roots, prefixes and suffixes for words in general.
2. Present and interpret data on select topics using pre-existing slides.
3. Collect data extensively on a social issue and make it public for the sake of enlightening populace.
4. Contribute proactively and extrapolate in group discussions.
5. Make impromptu speeches.

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary -** Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.

3. **Activities on Writing Skills** – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing.

4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ emails/assignments etc.

5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2 nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCE BOOKS:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008. 6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
6. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
7. Job Hunting by Colm Downes, Cambridge University Press 2008.
8. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

MICROPROCESSORS AND MICROCONTROLLERS LAB

III B.Tech-II Semester **L T P C**
Course Code: A1EC603PC **- - 3 1.5**

LIST OF EXPERIMENTS

Experiment-1 Assembly Language Programs to 8086 to Perform:
Arithmetic, Logical, String Operations on 16 Bit and 32-BitData.
Experiment-2 Bit level Logical Operations, Rotate, Shift, Swap and Branch Operations.
Experiment-3 Introduction to IDE: Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
Experiment-4 Time delay Generation Using Timers of8051.
Experiment-5 Serial Communication from / to 8051 to / from I/O devices.
Experiment-6 Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 Using Timer08051in8bitAutoreloadModeandConnecta1HZPulsetoINT1pinandDisplay on Port 0. Assume Crystal Frequency as 11.0592MHZ
Experiment-7 7 Segment Display to8051.
Experiment-8 Matrix Keypad to8051.
Experiment-9 Sequence Generator Using Serial Interface in8051.
Experiment-10 8 bit ADC Interface to8051.
Experiment-11 Triangular Wave Generator through DAC interfaces to8051.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals by A K Ray, Tata McGraw-Hill Education,2006
2. The 8051 *Microcontrollers*: Architecture, Programming & Applications by Dr. K. Uma Rao, Andhe Pallavi, Pearson, 2009.

REFERENCE BOOKS:

1. https://slideplayer.com/slide/7936231/
2. https://www.sanfoundry.com/best-reference-books-microprocessors/

CONSTITUTION OF INDIA

III-B.Tech II-Semester | **L T P C**
Course Code: A1EE607MC | **2 - - -**

COURSE OBJECTIVES:

The course should enable the students to learn:

1. Understand the need for constitution
2. Appreciate the fundamental duties and rights of the citizens of India.
3. Explain the role and amendments of constitution in a democratic society.
4. Describe the directive principles of state policy and their significance.
5. List the key features of the constitution, union government and state government.

COURSE OUTCOMES:

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

1. Create awareness about the constitutional values and objectives written in the Indian constitution.
2. List fundamental rights and fundamental duties of Indian citizens.
3. Identify the division of legislative, executive and financial powers between the union and state governments.
4. Understand the working of Indian democracy, its institutions and processes at the local, state and union levels.
5. Explain the functions and responsibilities of election commission of India and union public service commission.

UNIT – I

History of Making of the Indian Constitution: Introduction to the constitution of India, the making of the constitution and salient features of the constitution.

UNIT – II

Philosophy of the Indian Constitution: Preamble Salient Features, Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties, Amendment of the constitutional powers and procedures.

UNIT – III

Union Government: Union Government, Union Legislature (Parliament), Lok Sabha and Rajya Sabha (with powers and functions), president of India (with powers and functions), Prime minister of India (With powers and functions), Union judiciary (Supreme Court), Jurisdiction of the Supreme Court.

UNIT – IV

State Government: State Government, State legislature (Legislative Assembly/ Vidhan Sabha, Legislative council/ Vidhan parishad), powers and functions of the state legislature, State executive, Governor of the state (with powers and functions), the chief Minister of the state (with powers and functions), State Judiciary (High courts)

UNIT – V

Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

TEXT BOOKS:

1. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd. New Delhi
2. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012
3. The constitution of India, P.M.Bakshi, Universal Law Publishing Co.,
4. The Constitution of India, 1950 (Bare Act), Government Publication.

Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

REFERENCE BOOKS:

1. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
2. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.
3. Indian constitution at work, NCERT
4. SubashKashyap, Indian Constitution, National Book Trust
5. J.A. Siwach, Dynamics of Indian Government & Politics
6. D.C. Gupta, Indian Government and Politics
7. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
8. J.C. Johari, Indian Government and Politics Hans

J. Raj Indian Government and Politics.

E- RESOURCES:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

IV-YEAR (I-SEMESTER)

INDUSTRIAL AUTOMATION

IV B.Tech-I Semester **L T P C**
Course Code: A1EE720PC **3 - - 3**

COURSE OBJECTIVES:

1. Automation is one of the most simple and robust technologies in the world.
2. Learning it takes a bit of effort, as knowledge in Automation needs to polished time to time with latest updates. SMEC labs itself being Automation company offers you all the latest advancements from time to time.
3. An Automation Engineer is the one who has skills not just in programming but also has remarkable skills in the following:

COURSE OUTCOMES:

1. After learning the course the students should be able to:
2. Understand various automation components and systems
3. Draw block diagram of industrial automation and control system
4. Explain architecture of industrial automation system
5. Measure industrial parameters like temperature, pressure, force, displacement, speed, flow, level, humidity and pH.
6. Explain fundamentals of process control
7. List basic devices used in automated systems
8. Use programmable logic controllers for industrial automation
9. Draw block diagram of supervisory control and data acquisition (SCADA).
10. Integrate SCADA with PLC systems
11. Know use of robot for industrial applications

UNIT I: INTRODUCTION:

Automation overview, Requirement of automation systems, Architecture of Industrial Automation system, Introduction of PLC and supervisory control and data acquisition (SCADA). Industrial bus systems: Modbus & profibus

UNIT II: AUTOMATION COMPONENTS:

Sensors for temperature, pressure, force, displacement, speed, flow, level, humidity and pH measurement. Actuators, process control valves, power electronics devices DIAC, TRIAC, power MOSFET and IGBT. Introduction of DC and AC servo drives for motion control.

UNIT III: COMPUTER AIDED MEASUREMENT AND CONTROL SYSTEMS:

Role of computers in measurement and control, Elements of computer aided measurement and control, man-machine interface, computer aided process control hardware, process related interfaces, Communication and networking, Industrial communication systems, Data transfer techniques, Computer aided process control software, Computer based data acquisition system, Internet of things (IoT) for plant automation

UNIT IV: PROGRAMMABLE LOGIC CONTROLLERS:

Programmable controllers, Programmable logic controllers, Analog digital input and output modules, PLC programming, Ladder diagram, Sequential flow chart, PLC Communication and networking, PLC selection, PLC Installation, Advantage of using PLC for Industrial automation, Application of PLC to process control industries.

UNIT V: DISTRIBUTEDCONTROLSYSTEM:

Overview of DCS, DCS software configuration, DCS communication, DCS Supervisory Computer Tasks, DCS integration with PLC and Computers, Features of DCS, Advantages of DCS

TEXT BOOK:

1. Industrial Automation: Hands On by Frank Lamb

REFERENCE BOOKS:

1. Industrial Instrumentation and Control By S.K.Singh The McGraw Hill Companies
2. Process Control Instrumentation Technology By C.D. Johnson
3. PHI [3] Industrial control handbook,Parr, Newnem
4. Programm able logic controller, Dunning, Delmar

WEB REFERENCE:

1. https://www.br-automation.com/en-in/industries/metalworking/references/

E-TEXT BOOKS:

1. https://www.accessengineeringlibrary.com/browse/industrial-automation-hands-on
2. https://www.amazon.in/Industrial-Automation-Process-Control-Stenerson/dp/0130330302

MOOCS COURSES:

1. https://onlinecourses.nptel.ac.in/noc20_me39/preview
2. https://www.googleadservices.com/pagead/aclk?sa=L&ai=DChcSEwiogvKZh5D0AhUEVGAKHYe9BKAYABACGgJ0bQ&ohost=www.google.com&cid=CAESQeD2KTJQ5hTN5bcgVWch45kTd9FtgC9Rtdz9JqpLkQIDmVlImnJKxorpLvFMZ0i9jtsLBlgLrmupx41q2Rpmrd6Y&sig=AOD64_00VCBb2AbgMstrJ36NjJWSNSvkQg&q&adurl&ved=2ahUKEwjH3emZh5D0AhXVBd4KHQOvDkAQ0Qx6BAgGEAE

ADVANCED CONTROL OF ELECTRIC DRIVES

IV B.Tech-I Semester **L T P C**
Course Code: A1EE721PC **3 - - 3**

COURSE OBJECTIVE:

1. The main objective of this course is to train the students to meet the industrial needs.

COURSEOUTCOMES:

1. At the end of this course ,students will demo
2. Understand the basic concepts of electromagnetics.
3. Understand computational techniques for computing fields
4. Apply the techniques to simple real life problems.

UNIT-1: POWER CONVERTERS FOR AC DRIVES:

PWM control of inverter, selected harmonic lamination, space vector modulation, current control of VSI, three level inverter, Different topologies, SVM for 3 level inverter, Diode rectifier with boost chopper, PWM converter as line side rectifier, current fed inverters with self- commutated devices. Control of CSI, H bridge as a 4–Q drive.

UNIT-2: INDUCTION MOTORDRIVES:

Different transformations and reference frame theory, modelling of induction machines, voltage fed inverter control-v/f control, vector control, direct torque and flux control (DTC).

UNIT-3: SYNCHRONOUS MOTOR DRIVES

Modeling of synchronous machines, open loop v/f control, vector control, direct torque control, CSI fed synchronous motor drives.

UNIT-4: PERMANENT MAGNET MOTOR DRIVES

Introduction to various PM motors, BLDC and PMSM drive configuration, comparison, block diagrams, Speed and torque control in BLDC and PMSM.

UNIT-5: SWITCHED RELUCTANCE MOTOR DRIVES

Evolution of switched reluctance motors, various topologies for SRM drives, comparison, closed loop speed and torque control of SRM. DSP based motion controls Use of DSPs in motion control, various DSPs available, realization of some basic blocks in DSP for implementation of DSP based motion control.

TEXT BOOKS:

1. B. K.Bose, ―Modern Power Electronics and AC Drives‖, Pearson Education, Asia, 2003.
2. P.C.Krause, O. Wasynczuk and S.D.Sudhoff,―Analysis of Electric Machinery and Drive Systems‖,John Wiley&Sons, 2013.

REFERENCE BOOKS:

1. H. A. Taliyat and S. G. Campbell, ―DSP based Electromechanical Motion Control‖, CRC press, 2003.
2. R.Krishnan,―PermanentMagnetSynchronousandBrushlessDCmotorDrives‖,CRCPress, 2009

WEB REFERENCES:

1. https://onlinelibrary.wiley.com/doi/book/10.1002/9781118910962
2. https://www.wiley.com/en-gb/Advanced+Electric+Drives%3A+Analysis%2C+Control%2C+and+Modeling+Using+MATLAB+Simulink-p-9781118485484
3. https://www.springer.com/gp/book/9783030489762

E-TEXT BOOKS:

1. https://www.amazon.in/Advanced-Electric-Drives-Analysis-Modeling-ebook/dp/B00M2VRG6Q
2. https://www.amazon.in/Advanced-Electrical-Electronic-Converters-Decision-ebook/dp/B01LYD8XMV

MOOCS COURSES:

1. https://nptel.ac.in/courses/108/104/108104011/
2. https://www.uvpce.ac.in/sites/uvpce.gnu.ac.in/files/syllabus/Electric%20Drives.pdf

SOLID STATE DRIVES
(Professional Elective - III)

IV B.Tech-I Semester **L T P C**
Course Code: A1EE707PE **3 1 - 4**

COURSE OBJECTIVES:

The course should enable the students to:

1. Steady state operation and transient dynamics of a motor load system
2. Analyse the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively.
3. Operation and performance of ac motor drives.
4. Analyse and design the current and sped controllers for a closed lop solid state dc motor drive.

COURSE OUTCOMES:

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

1. Ability to understand and suggest a converter for solid state drive.
2. Ability to select suitability drive for the given application.
3. Ability to study about the steady state operation and transient dynamics of a motor load System.
4. Ability to analyze the operation of the converter/chopper fed dc drive.
5. Ability to analyze the operation and performance of ac motor drives.
6. Ability to analyze and design the current and speed controllers for a closed loop solid state dc motor drive.

UNIT-I DRIVE CHARACTERISTICS

Electric drive – equations governing motor load dynamics – steady state stability – multi quadrant dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – selection of motor.

UNIT-II CONVERTER /CHOPPER FED DC MOTOR DRIVE

Steady state analysis of the single and three phase converter fed separately excited dc motor drive– continuous conduction – time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive-applications.

UNIT-III INDUCTION MOTOR DRIVES

Stator voltage control–v/f control– rotor resistance control-qualitative treatment of slip power recovery drives-closed lop control– vector control- applications

UNIT-IV SYNCHRONOUS MOTOR DRIVES

V/f control and self-control of synchronous motor: margin angle control and power factor control- three phase voltage/current source fed synchronous motor- applications.

UNIT-V DESIGN OF CONTROLLERS FOR DRIVES

Transfer function for dc motor /load and converter – closed lop control with current and sped feedback– armature voltage control and field weakening mode – design of controllers; current controller and sped controller- converter selection and characteristics.

TEXT BOOKS:

1. Gopal K.Dubey, Fundamentals of Electrical Drives, Narosa Publishing House, 1992.
2. Bimal K.Bose. Modern Power Electronics and Ac Drives, Pearson Education, 2002.
3. R.Krishnan, Electric Motor & Drives: Modelling, Analysis and Control, Pearson, 2001.

REFERENCE BOOKS:

1. Vedam Subramanyam, " Electric Drives Concepts And Applications ", 2nd Ed, Mcgraw Hill,2016
2. Shaahin Felizadeh, "Electric Machines and Drives", Crc Press (Taylor and Francis Group), 2013.
3. John Hindmarsh and Alasdain Renfrew, "Electrical Machines and Drives System," Elsevier 2012.
4. Theodore Wildi, " Electrical Machines ,Drives And Power Systems ,6th Edition, Pearson Education, 2015
5. N.K. De., P.K. Sen" Electric Drives" Phi, 2012.

WEB REFERENCES:

1. https://www.efunda.com/math/math_home/math.cfm
2. https://www.ocw.mit.edu/resources/#mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E-TEXT BOOKS:

1. https://www.e-booksdirectory.com/details.php?ebook=10166

MOOCS COURSE:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/

LINE - COMMUTATED AND ACTIVE PWM RECTIFIERS
(Professional Elective –III)

IV B.Tech-I Semester **L T P C**
Course Code: A1EE708PE **3 1 - 4**

COURSE OBJECTIVES:
The course should enable the students to:
1. Learn controlled rectifier circuits.
2. Understand the operation of line -commutated rectifiers – 6 pulse and multi-pulse configurations.
3. Understand the operation of PWM rectifiers – operation in rectification and regeneration modes and lagging, leading and unity power factor mode.

COURSE OUTCOMES:
At the end of the course, student will be able to:
1. Examine the output voltage control of rectifier using PWM control
2. Evaluate various performance parameters of DC to AC converter and understand their working
3. Apply the concept of basic DC to Dc converter in working of isolated DC power supplies

UNIT I DIODE RECTIFIERS WITH PASSIVE FILTERING
Half-wave diode rectifier with RL and RC loads; 1-phase full-wave diode rectifier with L, C and LC filter; 3-phase diode rectifier with L, C and LC filter; continuous and discontinuous conduction, input current wave shape, effect of source inductance; commutation overlap.

UNIT II THYRISTOR RECTIFIERS WITH PASSIVE FILTERING
Half-wave thyristor rectifier with RL and RC loads; 1-phase thyristor rectifier with L and LC filter; 3-phase thyristor rectifier with L and LC filter; continuous and discontinuous conduction, input current wave shape.

UNIT III MULTI-PULSE CONVERTER
Review of transformer phase shifting, generation of 6-phase ac voltage from 3-phase ac, 6- pulse converter and 12-pulse converters with inductive loads, steady state analysis, commutation overlap, notches during commutation.

UNIT IV SINGLE-PHASE AC-DC SINGLE-SWITCH BOOST CONVERTER
Review of dc-dc boost converter, power circuit of single-switch ac-dc converter, steady state analysis, unity power factor operation, closed-loop control structure.

UNIT V AC-DC BIDIRECTIONAL BOOST CONVERTER
Review of 1-phase inverter and 3-phase inverter, power circuits of 1-phase and 3-phase ac-dc boost converter, steady state analysis, operation at leading, lagging and unity power factors. Rectification and regenerating modes. Phasor diagrams, closed-loop control structure.

TEXT BOOKS:
1. G. De, “Principles of Thyristorised Converters”, Oxford & IBH Publishing Co, 1988.
2. J.G. Kassakian, M. F. Schlecht and G. C. Verghese, “Principles of Power Electronics”, Addison-Wesley, 1991.

REFERENCE BOOKS:

1. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.
2. N. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons, 2007.
3. R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science & Business Media, 2001.

WEB REFERENCES:

1. https://www.scribd.com/document/385637635/Line-Commutated-and-Active-PWM
2. https://jcboseust.ac.in/electrical/images/lesson/ug_5th_lcpwm.pdf

E-TEXT BOOKS:

1. https://jcboseust.ac.in/electrical/images/lesson/ug_5th_lcpwm.pdf
2. https://cds.cern.ch/record/987551/files/p133.pdf

MOOCS COURSE:

1. http://niu.edu.in/set/EE-ECE/SYLL_19_EE.pdf
2. http://www.hnbgu.ac.in/sites/default/files/2020-10/Syllabus%20Update%20with%20MOOCs_Electrical%20and%20Instrumentation%20Engineering_2018-19%20Batch%20onwards.pdf

(Professional Elective –III)

IV B.Tech-I Semester **L T P C**
Course Code: A1EE709PE **3 1 - 4**

COURSE OBJECTIVES:

1. To discuss about electrical industrial circuit breakers.
2. To demonstrate the usage of electrical protection devices to residential applications
3. To analyze and discuss the different industrial electrical machines.

COURSE OUTCOMES:

1. At the end of this course, students will demonstrate the ability to
2. Understand the electrical wiring systems for residential, commercial and industrialconsumers, representing the systems with standard symbols and drawings, SLD
3. Understand various components of industrial electrical systems.
4. Analyze and select the proper size of various electrical system components

UNIT I ELECTRICAL SYSTEM COMPONENTS

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

UNIT II RESIDENTIAL AND COMMERCIAL ELECTRICAL SYSTEMS

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 andnumber of lamps, earthing of commercial installation, selection and sizing of components.

UNIT III ILLUMINATION SYSTEMS

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 premises, flood lighting.

UNIT IV INDUSTRIAL ELECTRICAL SYSTEMS I

HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factorcorrection – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

UNIT V INDUSTRIAL ELECTRICAL SYSTEMS II

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Industrial Electrical System Automation Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

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.

REFERENCE BOOKS:

1. S. Singh and R. D. Singh, –Electrical estimating and costing‖, Dhanpat Rai and Co., 1997.
2. Web site for IS Standards. 6. H. Joshi, –Residential Commercial and Industrial Systems‖, McGraw Hill Education, 2008.

WEB REFERENCES:

1. https://www.journals.elsevier.com
2. https://www.elsevier.com/journals/
3. https://www.informit.com/articles/article.aspx?p=1650107&seqNum=9

E-TEXT BOOKS:

1. https://jcboseust.ac.in/electrical/images/lesson/ug_5th_lcpwm.pdf
2. https://cds.cern.ch/record/987551/files/p133.pdf

MOOCS COURSE:

1. http://niu.edu.in/set/EE-ECE/SYLL_19_EE.pdf
2. http://www.hnbgu.ac.in/sites/default/files/2020-10/Syllabus%20Update%20with%20MOOCs_Electrical%20and%20Instrumentation%20Engineering_2018-19%20Batch%20onwards.pdf

DIGITAL SIGNAL PROCESSING

(Professional Elective - IV)

IV B.Tech-I Semester **L T P C**
Course Code: A1EE710PE **3 1 - 4**

COURSE OBJECTIVES:

The course should enable the students:

1. To provide background and fundamental material for the analysis and processing of digitalsignals.
2. To familiarize the relationships between continuous-time and discrete time signals andsystems.
3. To study fundamentals of time, frequency and Z-plane analysis and to discuss the inter-relationships of these analyticmethod.

COURSE OUTCOMES:

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

1. Perform time, frequency, and Z -transform analysis on signals andsystems.
2. Understand the inter-relationship between DFT and varioustransforms.
3. Understand the significance of various filter structures and effects of round offerrors.
4. Design a digital filter for a givenspecification.
5. Understand the fast computation of DFT and appreciate the FFTprocessing.
6. Understand the trade-offs between normal and multi rate DSP techniques and finite length wordeffects.

UNIT I INTRODUCTION, REALIZATION OF DIGITAL FILTERS

Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems

Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel.

UNIT II DISCRETE FOURIER TRANSFORMS, FAST FOURIER TRANSFORMS

Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform

Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT, and FFT with GeneralRadix-N.

UNIT III IIR DIGITAL FILTERS

Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT IV FIR DIGITAL FILTERS

Characteristics of FIR Digital Filters, Frequency Response, Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

UNIT V MULTI RATE DIGITAL SIGNAL PROCESSING

Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion, Conversion of Band Pass Signals, Concept of Resampling, Applications of Multi Rate Signal Processing.
Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round off Noise, Methods to Prevent Overflow, Tradeoff between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI,2007.
2. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI,2009

REFERENCE BOOKS:

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier,2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson,2007
3. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor andBarrie
4. W. Jervis, 2nd Edition, Pearson Education, 2009

WEB REFERENCES:

1. https://www.journals.elsevier.com/digital-signal-processing
2. https://www.elsevier.com/journals/digital-signal-processing/1051-2004?generatepdf=true
3. https://www.informit.com/articles/article.aspx?p=1650107&seqNum=9

E TEXT BOOKS:

1. https://users.dimi.uniud.it/~antonio.dangelo/MMS/materials/Guide_to_Digital_Signal_Process.pdf
2. http://fmipa.umri.ac.id/wp-content/uploads/2016/03/Andreas-Intoniou-Digital-signal-processing.9780071454247.31527.pdf

MOOCS COURSE:

1. https://www.classcentral.com/course/dsp-423
2. https://www.coursera.org/learn/dsp1

CONTROL SYSTEM DESIGN

(Professional Elective - IV)

IV B.Tech-I Semester **L T P C**
Course Code: A1EE711PE **3 1 - 4**

COURSE OBJECTIVES:

The course should enable the students to:

1. Understand state space representation of continuous and discrete time control systems.
2. Analyze continuous and discrete time systems in state space.
3. Knowledge of basic concepts of digital control systems.

COURSE OUT COMES:

At the end of the course:

1. Student will able to analyze nonlinear system.
2. Student will able identify state space representation of continuous & discrete system.
3. Student will able to analyze stability of discrete system.
4. Student will able to design discrete time control system

UNIT-I NONLINEAR SYSTEMS

Types of non – linearity, analysis by describing functions method, phase plane method, construction of trajectories by isocline method.

UNIT-II STATE SPACE REPRESENTATIONS OF CONTINUOUS TIME SYSTEM

Definitions of state variable, state, state vector, state space, state trajectory. Multi input –multi output system state model and block diagram. siso system state model & block diagram. Obtaining transfer function from state-space model. Determination of state transition matrix, properties of state transition matrix. Solution of homogeneous and non-homogeneous state equations. Concepts of controllability and observability.

UNIT-III DESIGN OF CONTINUOUS –TIME SYSTEM IN STATE- SPACE

Introduction, pole placement, solving pole-placement problems, ackerman's Formula, state observers, observer design.

UNIT-IV DISCRETE –TIME CONTROL SYSTEM STABILITY OF DISCRETE – TIME SYSTEM

Introduction of discrete time system. Review of z-transform, z- plane analysis of discreet time control system. Pulse transfer function, impulse sampling, Laplace transform of impulse sampled single starred Laplace transform of signal involving both ordinary and starred Laplace transforms, block diagram analysis, introduction, equivalence between 'z' domain and s- domain. Stability analysis by jury test and bilinear transformation with Routh criterion

UNIT-V STATE-SPACE REPRESENTATION

Introduction, state space representation of discrete time control system. Solving discrete time- state space equations by recursion method & z-transform method. State transition matrix by z-transform and Cayley Hamilton method. Realization of pulse transfer function by direct programming method. Controllability, observability, kalman's test for controllability and observability. Design via pole placement and observer.

TEXT BOOKS:

1. Modern Control Engineering – K. Ogata, Phi Publication.
2. Discrete –Time Control Systems - K. Ogata , Fourth Edition 2002

REFERENCE BOOKS:

1. K. Ogata, Modern Control Engineering, Prentice Hall Of India, 4th Edition, 2002
2. M. Gopal, Control Systems Principles And Design, Tmh, New Delhi, 2nd Edition,2002
3. Control Systems Engineering – R. Anandnatarajan / P.Rameshbabu.(Scientech) Modern Control System Theory – M. Gopal

WEB REFERENCES:

1. https://www.efunda.com/math/math_home/math.cfm
2. https://www.ocw.mit.edu/resources/#mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E-TEXT BOOK:

1. https://www.e-booksdirectory.com/details.php?ebook=10166

MOOCS COURSES:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/

DIGITAL CONTROL SYSTEMS

(Professional Elective - IV)

IV B. Tech-I Semester **L T P C**
Course Code: A1EE712PE **3 1 - 4**

COURSE OBJECTIVES:

The course should enable the students:

1. To understand the fundamentals of digital control systems, z-transforms
2. To understand state space representation of the control systems, concepts of controllability and observability
3. To study the estimation of stability in different domains
4. To understand the design of discrete time control systems, compensators, state feedback controllers, state observers through various transformations

COURSE OUTCOMES:

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

1. Carry map s-plane and z-plane, do state-space analysis
2. Carry stability analysis in s-domain and z-domains
3. Carry stability analysis through bilinear transformation and r-h criteria
4. Design of discrete-time control systems, design of lag, lead, lead-lag compensators
5. Design of pid controllers and design of state feedback controllers and observers
6. Apply the above concepts to real-world electrical and electronics problems and applications.

UNIT-I: INTRODUCTION TO DIGITAL CONTROL SYSTEMS & Z TRANSFORMS

Introduction - Merits And Demerits Of Digital Control Systems - Practical Aspects Of The Choice Of Sampling Rate And Multimate Sampling - Basic Discrete Time Signals - Quantization – Sampling Theorem - Data Conversions And Quantization - Sampling Process - Mathematical Modeling - Data Reconstruction And Filtering Of Sampled Signals - Zero - Order Hold (Zoh).

Transform And Inverse Z-Transform, Relationship Between S - Plane And Z - Plane - Difference Equation - Solution By Recursion And Z-Transform - Pulse Transfer Functions Of The Zoh And Relationship Between G(S) And G(Z) - Bilinear Transformation.

UNIT –II INPUT/OUTPUT ANALYSIS OF DIGITAL CONTROL SYSTEMS

Pulse Transfer Function - Z Transform Analysis Of Open Loop, Closed Loop Systems - Modified Z Transform - Transfer Function - Stability Of Linear Digital Control Systems - Stability Tests – Jury Stability Test.Root Loci - Frequency Domain Analysis - Bode Plots - Gain Margin And Phase Margin.

UNIT –III DESIGN OF CONTROLLERS FOR I/O MODEL DIGITAL CONTROL SYSTEMS

Cascade And Feedback Compensation By Continuous Data Controllers - Digital Controllers - Design Using Bilinear Transformation - Realization Of Digital Pid Controllers, Design Of Digital Control Systems Based On Root Locus Technique.

UNIT -IV STATE SPACE ANALYSIS

State Equations of Discrete Data Systems, Solution Of Discrete State Equations, State Transition Matrix: Computation Methods For State Transition Matrix: Z - Transform Method - Relation Between State Equations And Pulse Transfer Functions.

Concepts on Controllability And Observability - Pole Placement Design By State Feedback.

UNIT-V DIGITAL STATE OBSERVER AND STABILITY ANALYSIS

Design Of The Full Order And Reduced Order State Observer, Design Of Dead Beat Controller - Some Case Studies - Stability Analysis Of Discrete Time Systems Based On Lyapunov Approach.

TEXT BOOKS:

1. K. Ogata, Discrete Time Control Systems, Phi/Addison - Wesley Longman Pte. Ltd., India, Delhi, 1995.
2. BC Kuo, Digital Control Systems, 2nd Edition, Oxford University Press, Inc., 1992.

REFERENCE BOOKS:

1. F. Franklin, J.D. Powell, And M.L. Workman, Digital Control Of Dynamic Systems, Addison - Wesley Longman, Inc., Menlo Park, Ca , 1998.
2. M. Gopal, Digital Control and State Variable Methods, Tata Mcgraw Hill, India, 1997.
3. C. H. Houpis and G.B. Lamont, Digital Control Systems, Mcgraw Hill, 1985.
4. John S. Baey, Fundamentals Of Linear State Space Systems, Mcgraw Hill, 1st Edition 1999
5. Bernard Fried Land, Control System Design, Mcgraw Hill, 1st Edition 1986.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Digital_control
2. https://www.sciencedirect.com/topics/engineering/digital-control-system

E TEXT BOOKS:

1. https://www.springer.com/gp/book/9783642864193
2. https://www.quora.com/What-are-the-best-books-to-learn-Digital-Control-Systems

MOOCS COURSE:

1. https://onlinecourses.nptel.ac.in/noc19_de04/preview
2. https://nptel.ac.in/courses/108103008/

ELECTRICAL SAFETY PRACTICES FOR INDUSTRY

(Open Elective-II)

IV B.Tech-I Semester **L T P C**
Course Code: A1EE703OE **3 - - 3**

COURSE OBJECTIVES:

The course should enable the students:

1. To inculcate general safety rules for engineers regarding the handling of electricity
2. To indicate various types of electrical emergency situations arising in industries
3. To discuss the electrical hazards faced by specific work group
4. To learn safety practices when handling renewable energy sources
5. To train on safety audit procedure

COURSEOUTCOMES:

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

1. Identify potential electrical dangers in industries.(1,2)
2. Choose electrical emergencies and act accordingly(2)
3. Differentiate specific work group for electrical safety.(3)
4. Select equipment and personnel during renewable power installation.(1,3)
5. Appraise safety audit at domestic and industrial level(1,2)

UNIT-I: GENERAL ELECTRICAL SAFETY

Electrical current – shock – step and touch potential – power arcs NPFA 70E boundary conditions – electrical accidents in an industry–basic safety rules – OSHA rules -standard safe work practices – classification, selection and use of fire extinguishers for electrical fires

UNIT –II: ELECTRICAL EMERGENCIES IN INDUSTRIES

Electrical Emergencies – Electrical Accidents – Rescue Techniques – Working on or near energized conductors – safety requirements to meet electrical emergencies in industries

UNIT –III: ELECTRICAL HAZARDS ENCOUNTERED BY SPECIFIC WORK GROUP

Welding – Heavy electrical equipment – excavators – emergency generators – battery banks – ups - electrical furnaces - bus bars- conveyers – paper and steel industries.

UNIT –IV: ELECTRICAL SAFETY WHEN USING RENEWABLE SOURCE

Electrical safety in solar photovoltaic installation – panel wiring safety – controller safety – energy storage – off grid safety procedure – on grid system safety procedures – study of wind energy system electrical system – safety in generator – safety rules when connecting to on grid and off grid of a WES

UNIT-V: ELECTRICAL SAFETY TIPS AND AUDITING

Electrical Power Tool Safety- Safety tips- Hazard/Risk Evaluation Procedure – personnel selection and training - Safety audit procedure and report preparation – corrective actions

TEXT BOOK:

1. Ralph H. Lee, "Electrical Safety in Industrial Plants". E. I DuPont de Nemours & Company 1991

REFERENCE BOOKS:

1. Ralph H. Lee, "The Other Hazard Electric Arc Blast Burns" Lee Electrical Engineering, Inc.

2. Ralph H. Lee, "Pressures Developed By Arcs" (©1986, IEEE), Lee Electrical Engineering, Inc.
3. Occupational Safety & Health Administration Standards 29 CFR 1910.331 -1910.335
4. NFPA® 70E, "Electrical Safety Requirements for Employee Workplaces" 2000 Edition
5. National Electric Code, 1991
6. Electrical Protection Handbook , 1990
7. OSHA, Electrical Safety Related Work Practices, 29 CFR Part 1910

WEB REFERENCE:

1. https://onlinecourses.nptel.ac.in/

E-TEXTBOOK:

1. https://swayam.gov.in/

MOOCS COURSE:

1. https://onlinecourses.nptel.ac.in/
2. https://swayam.gov.in/

BASICS OF POWER PLANT ENGINEERING

(Open Elective - II)

IV B.Tech-I Semester **L T P C**
Course Code: A1EE704OE **3 - - 3**

COURSE OBJECTIVES:

To provide an overview of power plants and the associated energy conversion issues

COURSE OUTCOMES:

Upon completion of the course, the students can understand the principles of operation for different power plants and their economics

UNIT - I

Coal Based Thermal Power Plants: Basic Rankine cycle and its modifications, layout of modern coal power plant, super critical boilers, FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration systems.

UNIT - II

Gas Turbine and Combined Cycle Power Plants: Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.

UNIT - III

Basics of Nuclear Energy Conversion: Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.

UNIT - IV

Hydroelectric Power Plants: Classification, typical layout and components, principles of wind, tidal, solar PV and solar thermal, geothermal, biogas and fuel cell power systems

UNIT - V

Energy, Economic and Environmental Issues: Power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.

TEXT BOOKS:

1. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
2. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010.

REFERENCE BOOK:

1. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Power_plant_engineering
2. http://www.gammaexplorer.com/wp-content/uploads/2014/03/Power-Plant-Engineering.pdf
3. https://www.intechopen.com/subjects/803

E-TEXT BOOKS:

1. https://easyengineering.net/power-plant-engineering-books/
2. https://learnengineering.in/power-plant-engineering-by-a-k-raja/
3. https://learnengineering.in/power-plant-engineering-books/

MOOCS COURSES:

1. https://www.classcentral.com/course/swayam-power-plant-engineering-17735
2. https://onlinecourses.nptel.ac.in/noc20_me10/preview
3. https://www.coursera.org/lecture/electricity/power-plants-gAZ4H

ELECTRICAL & ELECTRONICS DESIGN LAB

IV B. Tech-I Semester **L T P C**
Course Code: A1EE722PC **- - 4 2**

COURSE OBJECTIVES:

The course should enable the students:

1. To enhance practical knowledge related to different subjects
2. To develop hardware skills such as soldering, winding etc.
3. To develop debugging skills.
4. To increase ability for analysis and testing of circuits.
5. To give an exposure to market survey for available components

COURSE OUTCOMES:

After completion of this lab, the student will be able to:

1. Get practical knowledge related to electrical
2. Fabricate basic electrical circuit elements/networks
3. Trouble shoot the electrical circuits
4. Design filter circuit for application
5. Get hardware skills such as soldering, winding etc.

LIST OF EXPERIMENTS

Group A

Experiment- 1 Design and fabrication of reactor/ electromagnet for different inductance values.
Experiment-2 Design and fabrication of single phase Induction/three phase motor stator.
Experiment-3 Start delta starter wiring for automatic and manual operation.
Experiment-4 Wiring of distribution box with MCB, ELCB, RCCB and MCCB.
Experiment-5 Wiring of 40 W tube, T-5, LED, Metal Halide lamps and available latest luminaries.
Experiment-6 Assembly of various types of contactors with wiring.

Group B: This group consists of electronic circuits which must be assembled and tested on general purpose PCB or bread boards.
Experiment-7 Design and development of 5 V regulated power supply.
Experiment-8 Design and development of precision rectifier.
Experiment-9 Design and development of first order/ second order low pass/high pass filters with an application
Experiment-10 Microcontroller Interface circuit for temperature /level /speed/ current/ Voltage measurement
Experiment-11 Peak detector using op-amplifiers
Experiment-12 Zero crossing detector using op-amplifiers

TEXT BOOKS:

1. https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/2018/18EES101J-basic-electrical-engineering-eee.pdf
2. https://lecturenotes.in/practicals/23812-lab-manuals-for-basic-electrical-and-electronics-engineering-beee-by-nagendababu-vasa
3. https://www.sanfoundry.com/best-reference-books-electronic-devices-circuits/

REFERENCE BOOK:

1. https://lendi.org/EEE/labmanuals/II/BASIC%20ELECTRICAL%20_%20ELECTRONIC%2LAB%20MANUAL.pdf
2. https://www.dbit.ac.in/applied-sciences/syllabus/basic-electrical-engineering-lab.pdf

IV-YEAR (II-SEMESTER)

AI TECHNIQUES IN ELECTRICAL ENGINEERING

IV B.Tech-II Semester **L T P C**
Course Code: A1EE823PC **3 - - 3**

COURSE OBJECTIVES:

1. To learn the distinction between optimal reasoning Vs. human like reasoning
2. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
3. To learn different knowledge representation techniques.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

COURSE OUTCOMES:

1. Ability to formulate an efficient problem space for a problem expressed in natural language.
2. Select a search algorithm for a problem and estimate its time and space complexities.
3. Possess the skill for representing knowledge using the appropriate technique for a given problem.
4. Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

UNIT – I PROBLEM SOLVING

PROBLEM SOLVING by Search-I: Introduction to AI, Intelligent Agents
ProblemSolvingbySearch–II:Problem-SolvingAgents,SearchingforSolutions,UninformedSearch Strategies:Breadth-firstsearch,Uniformcostsearch,Depth-firstsearch,IterativedeepeningDepth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching wih Partial Observations, Online Search Agents and Unknown Environment.

UNIT – II PROBLEM SOLVING BY SEARCH-II

Problem Solving by Search-II and Propositional Logic
Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.
Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT – III LOGIC AND KNOWLEDGE REPRESENTATION

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.
Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution
Knowledge Representation: Onto logical Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

UNIT –IV PLANNING

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.
Planning and Acting in the Real World: Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT – V UNCERTAIN KNOWLEDGE AND LEARNING

Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in BayesianNetworks,RelationalandFirst-OrderProbability,OtherApproachestoUncertainReasoning; Dempster-Shafer theory.

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

TEXT BOOK:

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edn, E.Rich and K.Knight(TMH).
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, PearsonEducation.
3. Artificial Intelligence, Shivani Goel, PearsonEducation.
4. Artificial Intelligence and Expert systems – Patterson, PearsonEducation.

WEB REFERENCES:

1. https://walker.cs.grinnell.edu/talks/ai/ai-references.html

E-TEXT BOOKS:

1. https://www.amazon.in/Artificial-Intelligence-Books/b?ie=UTF8&node=4149453031
2. https://bigdata-madesimple.com/20-free-books-to-get-started-with-artificial-intelligence/
3. http://www.freebookcentre.net/CompuScience/Free-Artificial-Intelligence-Books-Download.html

MOOCS COURSES:

1. https://www.my-mooc.com/en/categorie/artificial-intelligence
2. https://www.coursera.org/courses?query=artificial%20intelligence

ELECTRICAL & HYBRID VEHICLES
(Professional Elective-V)

IV-B.Tech-II Semester **L T P C**
Course Code: A1EE813PE **3 - - 3**

COURSE OBJECTIVES

The course should enable the students:

1. To understand the fundamental concepts, principles, analysis and design of hybrid and electricvehicles.
2. To know the various aspects of hybrid and electric drive train such as their configuration, types of electric machines that can be used energy storage devices,etc.

COURSE OUTCOMES

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

1. Understand the different possible ways of energystorage.
2. Understand the different strategies related to energy storagesystems.
3. Understand the models to describe hybrid vehicles and theirperformance

UNIT-I INTRODUCTION

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance

UNIT-II INTRODUCTION TO HYBRID ELECTRIC VEHICLES, HYBRID ELECTRIC DRIVE-TRAINS

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiencyanalysis.

UNIT-III ELECTRIC TRAINS, ELECTRIC PROPULSION UNIT

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.

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV ENERGY STORAGE

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, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supportingsubsystems

UNIT-V ENERGY MANAGEMENT STRATEGIES

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, implementation issues of energy management strategies

TEXT BOOKS:

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons,2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer,2015.

REFERENCE BOOKS:

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press,2004.
2. T. Denton, "Electric and Hybrid Vehicles", Routledge,2016.

WEBSITE REFERENCES:

1. http://www.ieahev.org/assets/1/7/IA-HEV_2010_annual_report_6MB.pdf
2. https://www.researchgate.net/publication/317889386_Hybrid_Electric_Vehicles
3. https://www.govinfo.gov/content/pkg/GOVPUB-C13-5b831467adb48f2bfe6aa8895c1f05b5/pdf/GOVPUB-C13-5b831467adb48f2bfe6aa8895c1f05b5.pdf

E-TEXT BOOKS:

1. https://www.routledge.com/rsc/downloads/CRC_Hybrid_Vehicles_Freebook.pdf
2. http://ceb.ac.in/knowledge-center/E-BOOKS/Modern%20Electric ,%20Hybrid%20Electric% 20&%20Fuel%20 Cell%20Vehicles%20-%20Mehrdad%20Ehsani.pdf

MOOCS COURSES:

1. https://nptel.ac.in/courses/108/103/108103009/
2. https://www.edx.org/learn/hybrid-vehicles

HVDC TRANSMISSION SYSTEMS
(Professional Elective - V)

IV B.Tech-II Semester **L T P C**
Course Code: A1EE814PE **3 - - 3**

COURSE OBJECTIVES:
The course should enable the students:
1. To compare EHV ac and HVDC systems
2. To analyse graetz circuit and also explain 6 and 12 pulse converters
3. To control hvdc systems with various methods and to perform power flow analysis in ac/dc systems
4. To describe various protection methods for hvdc systems and harmonics

COURSE OUTCOMES:
At the end of the course, student will be able to:
1. Compare EHV ac and hvdc system and to describe various types of dc links
2. Analyze graetz circuit for rectifier and inverter mode of operation
3. Describe various methods for the control of hvdc systems and to perform power flow analysis in ac/dc systems
4. Describe various protection methods for hvdc systems and classify harmonics and design different types of filters

UNIT-I BASIC CONCEPTS, ANALYSIS OF HVDC CONVERTERS
Necessity of HVDC systems, economics and terminal equipment of hvdc transmission systems, types of hvdc links, apparatus required for hvdc systems, comparison of ac and dc transmission, application of dc transmission system, planning and modern trends in d.c. transmission.
Choice of converter configuration, analysis of graetz circuit, characteristics of 6 pulse and 12 pulse converters, cases of two 3 phase converters in y/y mode – their performance.

UNIT -II CONVERTER AND HVDC SYSTEM CONTROL, REACTIVE POWER CONTROL IN HVDC
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. Introduction, reactive power requirements in steady state, sources of reactive power- static var compensators, reactive power control during transients

UNIT -III POWER FLOW ANALYSIS IN AC/DC SYSTEMS
Modelling 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.

UNIT -IV CONVERTER FAULTS AND PROTECTION
converter faults, protection against over current and over voltage in converter station, surge arresters, smoothing reactors, dc breakers, audible noise, space charge field, corona effects on dc lines, radio interference.

UNIT-V HARMONICS, FILTERS
Generation of harmonics, characteristics harmonics, calculation of ac harmonics, non- characteristics harmonics, adverse effects of harmonics, calculation of voltage and current harmonics, effect of pulse number on harmonicstypes of ac filters, design of single tuned filters –design of high pass filters.

TEXT BOOKS:

1. "K. R. Padiyar", Hvdc Power Transmission Systems: Technology And System Interactions, New Age International (P) Limited, And Publishers, 1990.
2. "S K Kamakshaiah, V Kamaraju", Hvdc Transmission, Tmh Publishers, 2011

REFERENCE BOOKS:

1. "Jos Arrillaga", Hvdc Transmission, the Institution of Electrical Engineers, IEE Power & Energy Series 29, 2nd Edition 1998.
2. "E. W. Kimbark", Direct Current Transmission, John Wiley and Sons, Volume 1, 1971.
3. "E. Uhlmann", Power Transmission By Direct Current, B. S. Publications, 2009
4. "S. Rao", Ehvac and Hvdc Transmission Engineering and Practice, Khanna Publications, 3rd Edition 1999.

WEB REFERENCES:

1. https://www.sanfoundry.com/best-reference-books-hvdc-transmission/
2. https://easyengineering.net/hvdc-power-transmission-systems-by-padiyar/

E TEXT BOOKS:

1. https://easyengineering.net/hvdc-power-transmission-systems-by-padiyar/
2. https://books.google.co.in/books/about/HVDC_Power_Transmission_Systems.html?id=gSoDaumDrjC

MOOCS COURSE:

1. https://www.coursebuffet.com/sub/electrical-engineering/488/high-voltage-dc-transmission
2. https://www.classcentral.com/course/swayam-dc-power-transmission-systems-17562

POWER QUALITY& FACTS
(Professional Elective - V)

IV B.Tech-II Semester **L T P C**
Course Code: A1EE815PE **3 - - 3**

COURSE OBJECTIVES:

The course should enable the students to:

1. Know different terms of power quality.
2. Illustrate power quality issues for short and long interruptions.
3. Construct study of characterization of voltage sag magnitude and three phase unbalanced Voltage sag.
4. To understand the fundamentals of FACTS Controllers
5. To know the importance of controllable parameters and types of FACTS controllers & their benefits

COURSE OUTCOMES:

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

1. Choose proper controller for the specific application based on system requirements
2. Understand various systems thoroughly and their requirements
3. Know the severity of power quality problems in distribution system;
4. Understand the concept of voltage sag transformation from up-stream (higher voltages) to
5. Down-stream (lower voltage)

UNIT-I INTRODUCTION

introduction of the power quality (pq) problem: terms used in pq - voltage, sag, swell, surges, harmonics, over voltages, spikes, voltage fluctuations, transients, interruption, overview of power quality phenomenon, remedies to improve power quality, power quality monitoring.

UNIT-II LONG & SHORT INTERRUPTIONS

interruptions – definition – difference between failures, outage, interruptions – causes of long interruptions – origin of interruptions – limits for the interruption frequency – limits for the interruption duration – costs of interruption – overview of reliability evaluation to power quality, comparison of observations and reliability evaluation.

short interruptions: definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. multiple events, single phase tripping – voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

UNIT-III FACTS CONCEPTS

Transmission interconnections power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters, basic types of FACTS controllers, and benefits from FACTS controllers

UNIT–IV VOLTAGE SOURCE CONVERTERS

Single phase, three phase full wave bridge converters transformer connections for 12 pulse operation.

Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, and comparison of current source converters with voltage source converters

UNIT –V STATIC SHUNT COMPENSATION

Objectives of shunt compensation, midpoint voltage regulation, voltage instability prevention, improvement of transient stability, Power oscillation damping, Methods of controllable var generation, variable impedance type static var generators, switching converter type var generators and hybrid var generators

TEXT BOOKS:

1. Math H J Bollen "Understanding Power Quality Problems", IEEE Press.
2. R.C. Dugan, M.F. Mcgranaghan and H.W. Beaty, "Electric Power Systems Quality." New York: Mcgraw-Hill.1996
3. "N.G. Hingorani and L. Guygi", Understanding FACTS Devices, IEEE Press Publications2000.
4. "Yong- Hua Song, Allan Johns", Flexible AC Transmission System, IEE Press1999

REFERENCE BOOKS:

1. G.T. Heydt, 'Electric Power Quality', 2nd Edition. (West Lafayette, In, Stars In A Circle Publications, 1994).
2. Power Quality Var Compensation In Power Systems, R. Sastry Vedam Mulukutla S.Sarma, Crc Press.
3. "KalyanK. Sen and Meylingsen", Introduction to FACTS Controllers, John wiley& sons, Inc., Mohamed E. EI – Hawary Series editor, 2009.

4. "K. R Padiyar, Motilal", FACTS controllers in power transmission and distribution UK Books of India2007.

WEB REFERENCES:

1. https://www.efunda.com/math/math_home/math.cfm
2. https://www.ocw.mit.edu/resources/#mathematics
3. https://en.wikipedia.org/wiki/Flexible_AC_transmission_system
4. https://www.sciencedirect.com/topics/engineering/flexible-ac-transmission-systems

E-TEXT BOOKS:

1. https://www.e-booksdirectory.com/details.php?ebook=10166
2. https://books.google.co.in/books/about/Flexible_Ac_Transmission_Systems_FACTS.html?id=AqPr4JyDWg0C
3. https://www.routledge.com/Flexible-AC-Transmission-Systems-FACTS-Newton-Power-Flow-Modeling-of/Bhowmick/p/book/9781498756198

MOOCS COURSE:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/
3. https://nptel.ac.in/courses/108/107/108107114/
4. https://npti.gov.in/flexible-ac-transmission-system

MODERN TRENDS IN ELECTRICAL ENERGY
(Open Elective - III)

IV B.Tech-II Semester **L T P C**
Course Code: A1EE805OE **3 - - 3**

COURSE OBJECTIVES:

1. To understand methods of illumination
2. To study various scheme of installation
3. To appreciate electrolytic plant
4. To know electric traction

COURSE OUTCOMES:

1. Explain different methods of illumination
2. Design lighting scheme for domestic, industrial and commercial installation
3. Design and select a suitable heating arrangement for a particular job
4. Handle and maintain electrolytic plant
5. Suggest electric drives as per need
6. Maintain electric traction lines and track

UNIT 1 ILLUMINATION:

Nature of light, visibility spectrum curve of relative sensitivity of Human eye and wave length of light.
Definition: Luminous flux, solid angle, intensity, luminous efficiency. Space to height ratio, reflection factor, lux, shadow.
Different types of lamps, construction and working of incandescent and discharge lamps. Fitting required for filament lamp, mercury vapor, sodium lamp, halogen lamp, CFL, LED lamp.
Calculation of number of light points for interior illumination calculation of indoor and outdoor illumination levels at different points.

UNIT II ELECTRIC HEATING AND WELDING

Heating methods
Resistance heating – direct and indirect resistance heating, electric ovens, their temperature range, properties of resistance heating elements, domestic water heaters and other heating appliances, thermostat control circuit
Induction heating; principle of core type and coreless induction furnace, their construction and applications
Electric arc heating; direct and indirect arc heating, construction, working and applications of arc furnace
Dielectric heating, applications in various industrial fields
Electric Welding
Advantages of electric welding, Welding methods, Principles of resistance welding, types – spot, projection, seam and butt welding, welding equipment
Principle of arc production, electric arc welding, characteristics of arc; carbon arc, metal arc, hydrogen arc welding method and their applications.

UNIT III ELECTROLYTIC PROCESSES:

Need of electro-deposition Laws of electrolysis, process of electro-deposition - clearing, operation, deposition of metals, polishing and buffing Equipment and accessories for electroplating, Factors affecting electro-deposition, Principle of galvanizing and its applications, Principles of anodizing and its applications, Electroplating of non-conducting materials Manufacture of chemicals by electrolytic process

UNIT IV: ELECTRIC DRIVES

Advantages of electric drives, Characteristics of different mechanical loads, Types of motors used as electric drive, General idea about the methods of power transfer by direct coupling by using devices like belt drive, gears, chain drives etc.

Examples of selection of motors for different types of domestic loads, Selection of drive for applications such as general workshop, textile mill, paper mill, steel mill, printing press, crane and lift etc. Application of flywheel. Selection of motors for Domestic Appliances

UNIT IV: ELECTRIC TRACTION

Advantages of electric traction, Different systems of electric traction, DC and AC systems, diesel electric system, types of services – urban, sub-urban, and main line and their speed- time curves, Different accessories for track electrification; such as overhead catenary wire, conductor rail system, current collector-pentagraph, Factors affecting scheduled speed Electrical block diagram of an electric locomotive with description of various equipment and accessories used.

Types of motors used for electric traction, Power supply arrangements, Starting and braking of electric locomotives

Introduction to EMU and metro railways, Train Lighting Scheme

TEXT BOOKS:

1. Art and Science of Utilization of Electrical Energy by H Partap, Dhanpat Rai & Sons, Delhi
2. Utilization of Electrical Energy by JB Gupta, Kataria Publications, Ludhiana
3. Utilization of Electrical Energy by Sahdev, Uneek Publication, Jalandhar

REFERENCE BOOKS:

1. A Text Book. of Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi
2. Modern Electric Traction by H Partap,Dhanpat Rai & Sons, Delhi
3. Utilization of Electrical Energy by D.R. Arora, North Publication, Jalandhar
4. Generation, Distribution and Utilization if Electrical Power by CL Wadhwa,Wiley Eastern Ltd., New Delhi

WEB REFERENCES:

1. https://www.nap.edu/read/21712/chapter/10
2. https://www.nap.edu/read/21712/chapter/8

E-TEXT BOOK:

1. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR

MOOCS COURSES:

1. https://www.coursera.org/learn/future-of-energy
2. https://www.mooc.org/

ENERGY FROM WASTE
(Open Elective-III)

IV-B.Tech-II Semester **L T P C**
Course Code: A1EE806OE **3 - - 3**

COURSE OBJECTIVES

The course should enable the students:

1. To classify solid waste sources
2. To identify methods of solid waste disposal
3. To study various energy generation methods
4. To analyse biogas production methods and recycling of e-waste

COURSE OUTCOMES

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

1. Understand technologies for generation of energy from solid waste
2. Compare methods of solid waste disposal
3. Identify sources of energy from bio-chemical conversion
4. Analyze methods for management of e-waste

UNIT-I SOLID WASTE SOURCES

Solid Waste Sources, types, composition, Properties, Global warming, Municipal Solid Waste: Physical, chemical and biological properties , Waste Collection and, Transfer stations, Waste minimization and recycling of municipal waste, Segregation of waste, Size Reduction , Managing Waste. Status of technologies for generation of Energy from Waste Treatment and Disposal Aerobic composting, incineration, Furnace type and design, Medical waste /Pharmaceutical waste treatment Technologies, incineration, Environmental impacts, Measures to mitigate environmental effects due to incineration.

UNIT –II LAND FILL METHOD OF SOLID WASTE DISPOSAL

Land fill classification, Types, methods and Sitting consideration, Layout and preliminary design of landfills: Composition, characteristics, generation, Movement and control of landfill leach ate and gases, Environmental monitoring system for land fill gases.

UNIT –III ENERGY GENERATION FROM WASTE BIO-CHEMICAL CONVERSION

Sources of energy generation, anaerobic digestion of sewage and municipal wastes, direct combustion of MSW-refuse derived solid fuel, Industrial waste, agro residues, Anaerobic Digestion

UNIT -IV BIOGAS PRODUCTION, LAND FILL GAS GENERATION AND UTILIZATION, THERMO-CHEMICAL CONVERSION

Sources of energy generation, Gasification of waste using Gasifiers, Briquetting, Utilization and advantages of briquetting, Environmental benefits of Bio-chemical and Thermo- chemical conversion.

UNIT-V E-WASTE

E-waste in the global context – Growth of Electrical and Electronics Industry in India – Environmental concerns and health hazards – Recycling e-waste: a thriving economy of the unorganized sector – Global trade in hazardous waste – impact of hazardous e-waste in India. Management of e-waste: e-waste legislation, Government regulations on e-waste management – International experience – need for stringent health safeguards and environmental protection laws of India

TEXT BOOKS:

1. Nicholas P. Cheremisin off. Handbook of Solid Waste Management and Waste Minimization Technologies. An Imprint of Elsevier, New Delhi (2003).
2. P. Aarne Vesilind, William A. Worrell and Debra R. Reinhart. Solid Waste Engineering. Thomson Asia Pte Ltd. Singapore (2002)

REFERENCE BOOKS:

1. C Parker and T Roberts (Ed), Energy from Waste – An Evaluation of Conversion Technologies, Elsevier Applied Science, London, 1985
2. KL Shah, Basics of Solid and Hazardous Waste Management Technology, Prentice Hall, 2000 3. M Datta, Waste Disposal in Engineered Landfills, Narosa Publishing House, 1997
3. G Rich et.al, Hazardous Waste Management Technology, Podvan Publishers, 1987
4. M. Dutta , B. P. Parida, B. K. Guha and T. R. Surkrishnan. Industrial Solid Waste Management and Landfilling practice. Narosa Publishing House, New Delhi (1999).
5. "E-waste in India: Research unit, Rajya Sabha Secretariat, New Delhi, June 2011"
6. Amalendu Bagchi. Design, construction and Monitoring of Landfills. John Wiley and Sons. New York. (1994)

WEB REFERENCES:

1. https://energysavingtrust.org.uk/generating-energy-waste-how-it-works/
2. https://www.conserve-energy-future.com/waste-to-energy.php
3. https://www.eia.gov/energyexplained/biomass/waste-to-energy-in-depth.php
4. https://www.eia.gov/energyexplained/biomass/waste-to-energy.php

E -TEXT BOOKS:

1. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/284612/pb14130-energy-waste-201402.pdf
2. https://www.elsevier.com/books/waste-to-energy/rogoff/978-0-12-816079-4

MOOCS COURSE:

1. https://www.coursera.org/lecture/energy-environment-life/energy-from-garbage-iIhxi
2. https://www.coursera.org/lecture/solid-waste-management/4-9-bonus-rapid-assessment-of-waste-to-energy-projects-b5Nc7
3. https://www.mooc-list.com/tags/waste-management