ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS
(Choice Based Credit System)

R20

Electrical Electronics Engineering

For

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for batches admitted from 2020-2021)

SWARNANDHRA
COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

SEETHARAMAPURAM, NARSAPUR-534 280, W.G.DT., A.P.

ACADEMIC REGULATIONS

1. INTRODUCTION

Swarnandhra College of Engineering & Technology (**Subsequently referred to as SCET**) will be followed the norms of Jawaharlal Nehru Technological University Kakinada and Govt. of Andhra Pradesh.

All Academic Programme rules and regulations are approved by the Academic Council, which is the highest Academic body of the Institute. It is applicable for all Bachelor of Technology (B. Tech) degree programme from academic year 2020-21.

2. ADMISSIONS

2.1 Regular Admission

(Join in first year B. Tech Programme)

Admissions in the Institution are classified into **CATEGORY – A,** through convener, EAMCET and **CATEGORY- B** filled by the college management.

2.2 Lateral Entry Admission

(Join in the Second year/third semester of B. Tech Programme)

Eligibility: Diploma in Engineering /B.Sc Degree with Mathematics as one course .

Based on the rank secured by the candidate at Engineering Common Entrance Test (ECET) conducted by APSCHE, Government of Andhra Pradesh.

2.3 Advance standing Admission

(Transfer from other Colleges/ Re-admission due to dis-continuation)

These may arise in the following cases:

a) When a student seeks transfer from other colleges to SCET and desirous to pursue the study at SCET in an eligible branch of study.
b) When students of SCET get transferred from one regulation to another regulation.

In all such cases, approval is mandatory from the statutory bodies

3. UNDER GRADUATE (UG) PROGRAMMES OFFERED

The College is offering the following programmers:

- Computer Science and Engineering (CSE)
- Electronics and communication Engineering (ECE)
- Electrical and Electronics Engineering (EEE)
- Information Technology (IT)
- Mechanical Engineering (ME)
- Civil Engineering (CE)
- Artificial Intelligence and Machine Learning (AI&ML)
- Robotics (ROBO)

3.1 Structure of the Programme:

i) **Preamble:**

It is emphasized in UGC Guidelines on Choice Based Credit System (CBCS), that the important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters. It is adopted grading system in place of conventional system of marks and percentages.

CBCS provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The students can register any course of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach through open electives.

Key words CBCS, such as Course, credit, credit point, CGPA, SGPA, Grade Point, Letter Grades as given in the UGC guidelines are used the same definitions.

Each Programme consists of:

- Foundation courses in Basic Sciences, Engineering Sciences, Humanities and social science including management courses.
- Professional core Courses to impart broad knowledge.
- Professional Elective Courses from the discipline or interdisciplinary areas / industry related opted by the student based on their interest in specialization.
- Open Elective Courses from the interdisciplinary areas opted by the students based on their interest in specialization.
- Mandatory Courses, Internship, Seminar, Project work.
- Skill Oriented Courses to upskilling the graduates on the skills relevant to the need and demands of the industry.

Each Programme designed to have 35-40 theory courses, 20-25 laboratory courses and 05 Skill Oriented Courses. The categories of courses are indicated in the following table.

Athree-weekinductionprogramismandatoryforallfirstyear UGstudentsandshallbeconductedasper AICTE/UGC/APSCHE guidelines.

TABLE-1 CATEGORY OF COURSES

S.No	Category	Code
1	Humanitiesandsocialscienceincluding Managementcourses	HSMC
2	BasicSciencecourses	BSC
3	Engineeringcoursesscience	ESC
4	ProfessionalcoreCourses	PCC
5	OpenElectiveCourses	OEC
6	ProfessionalElective Courses	PEC
7	Internship,seminar,projectwork	PROJ
8	SkillOrientedCourses	SC
9	LaboratoryCourses	LC
10	Mandatorycourses	MC

Note: All components prescribed in the curriculum will be conducted and evaluated.

MOOCS: A student shall be permitted to pursue up to a maximum of two elective courses under MOOCs during the Programme. Each of the courses must be of minimum 12 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to pursue and acquire a certificate for a MOOC course only from the organizations/agencies approved by the BoS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester.

ii) **Contact hours:** Depending on the complexity and volume of the course, the number of contact hours per week will be determined.

iii) **Credits:**

TABLE-2 CREDITS BASED ON CONTACT HOURS

Course type	No. of Contact Hours	No. of Credits
Theory	1	1
Practical	2	1

TABLE-3 CREDITS FOR DIFFERENT COURSES

Course type	Lecture method			Credits
	L	T	P	C
Theory/Elective	2	1	0	3
	3	0	0	3
	2	0	2	3
	2	0	0	2
Laboratory	0	0	2	1
	0	0	3	1.5
	0	0	4	2
Skill Oriented Courses	1	0	2	2

3.2 Curriculum for each Programme:

- All Four-year B. Tech Programme of study is formulated based on the guidelines mentioned in 3.1 and recommended by the concerned Board of Studies(BoS) and approved by the Academic Council(AC).
- The same curriculum will be applicable for lateral entry students from 3rd semester onwards.
- For advance standing admission, the equivalent curriculum will be prepared by BoS and approved by AC.

4 DURATION OF THE PROGRAMME:

The duration of the B. Tech. Programme is four academic years consisting of eight semesters. Students, who fail to fulfill all the academic requirements for the award of the degree within the prescribed duration as per article 4.1, will forfeit their admission in B. Tech.

4.1 Maximum duration of study.

Maximum duration permitted for completion of the B. Tech. Programme of study will be:

Regular Admission: Eight academic years in sequence from the year of admission for a student admitted into first year of any Programme.

Lateral Entry Admission: Six academic years in sequence from the year of admission for a student admitted into second year of any Programme.

Advanced standing Admission: The maximum time for completion of Programme of study, will be twice the period in terms of academic years in sequence, with prescribed curriculum.

TABLE- 4 MAXIMUM DURATION OF STUDY

Admitted year of study	Maximum duration
First year	8 Academic years in sequence
Second year (Lateral entry)	6 Academic years in sequence
Advanced standing	Twice the period in terms of academic years in sequence

4.2 Cancellation of Admission :

In case candidate fails the above conditions for the award of degree, admission stands cancelled.

5 MEDIUM OF INSTRUCTION :

The medium of instruction and examinations are in English.

6 MINIMUM INSTRUCTION DAYS: Each semester will consist of 22 weeks duration with minimum of 110 working days which includes instruction days, internal tests and End examinations.

7 TRANSITORY REGULATIONS (Admitted under advance standing)**:**

The following regulations will be followed the operandi. At the time of such admission, based on the Programme pursued (case by case)

- Discontinued or detained candidates are eligible for re-admission in subsequent years in the same semester.
- The re-admitted candidate will be governed by the rules & regulations under which the candidate has been admitted.

In case of transferred students from other colleges, credits shall be transferred to SCET as per the academic regulations and course structure of SCET.

8 DISTRIBUTION AND WEIGHTAGE OF MARKS:

Each semester consists of 4/5/6 theory courses and 4/3/2 Laboratory courses. However, in the 8th semester there will be only project work / internship in industry.

(a). **Theory Courses:**

- Each course consists of five units.
- All courses will be evaluated with a maximum of 100 marks.
- Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination.

- The internal evaluation of 30 marks consists of Two Mids for 20 marks and Five class tests for 10 marks.
- Mid Examination: Each mid examination will be conducted for 20 marks with the duration of 75 Minutes. Internal test paper consists of three questions (8M+8M+4M) from two and half units and all are to be answered.
- **Weighted average of two Mids**performance will be considered, weightage of 80% for the best Mid marks and 20% for the second.
- **Class tests for 10 marks calculation**: There will be one class test conducted in each unit. Average of **Best three** will be considered.
- The **end semester** examination will be conducted for 70 marks which covers full syllabus. In end examination pattern, **Part – A** consists of five short questions from all units (Brainstorming/Thought provoking/Case study) for 10 marks. **Part – B** has **5 questions** with internal choice from each unit and valued for 60 marks.
- Internal Marks will be considered for three academic years only if the candidates will not completed the concern course because of less than 12 internal marks. Thereafter the candidate writes external examination for 70 which will be converted to 100 but the candidate must get minimum 40 %.

(b). **Practical Courses:**

- All courses will be evaluated with a maximum of 100 marks.
- Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination.
- End practical examination will be conducted by the internal and external examiner appointed by COE.
- Internal evaluation will be a continuous assessment during the semester for 30 marks with 15 marks for day-to-day work, including record valuation and 15 marks for internal test.

(c). **Design or Engineering Drawing Marks Distribution:**For the courses of design or drawing such as Engineering Graphics, etc., the distributionwill be 30 marks for internal evaluation with 10 marks for day-to-day work, and 20 marks from two internal test (80% of first best + 20% of second best). End examinationwill be conducted for 70 marks.

(d) **SummerInternship:**It can be carried out with a minimum of Six weeks and maximum Eight weeks duration at end of 4^{th} semester and 6^{th} semester. The internship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs. It will be evaluatedinternally by an internal evaluation committee comprising of Head of the Department and two faculty of the department. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee. The report and the oral presentation shall carry 40% and 60% weightage respectively. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits

(e) **Full Internship and Project Work:** The 8th Semester Project Work with full internship will be evaluated for 200 Marks. The project work is evaluated for internal assessment of 60 and external Examination for 140. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

i) Internal Assessment: Internal Assessment will be monitored by Project Review Committee consists of Head of the Department, Supervisor and Senior faculty member on the basis of two seminars and the internal marks will be awarded by Project Supervisor with recommendation of PRC.

ii) External Examination: External Examination will be conducted by Project external examination committee consists of Head of the Department, Supervisor and External examiner appointed by CoE , through presentation / viva - voce by the student.

9. Community Service Project (Experiential Learning through Community Engagement):

Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development. Community Service Project is meant to link the community with the college for mutual benefit. Community Service Project is an integral part of the curriculum with 4 Credits and evaluated internally for 100 marks.

Objectives:

- To sensitize the students to the living conditions of the people who are around them,
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project:

1. Every student should put in a minimum of 180 hours for the Community Service Project during the summer/ Semester vacation.
2. Each class/section should be assigned with a mentor
3. Specific Departments could concentrate on their major areas of concern.
4. A log book has to be maintained by each of the student, where the activities undertaken / involved to be recorded.
5. The log book has to be countersigned by the concerned mentor/faculty incharge.
6. Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
7. The final evaluation to be reflected in the grade memo of the student.
8. The Community Service Project should be different from the regular programmes of NSS / NCC / Green Corps / Red Ribbon Club, etc.

9. Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
10. The Project Log-, Project Implementation, Project report and Presentation shall carry 20%, 30%, 25% and 25% weightage respectively. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

TABLE- 5 MARKS ALLOCATION

Course type	Marks Allocation			
	Internal		End Semester	Total
	Internal test	Class Test/ Day to day work		
Theory course	20	10	70	100
Laboratory course	15	15	70	100
Design or Drawing course	20	10	70	100
Skill Oriented Courses	15	15	70	100
Summer Internship	50		-	50
Community Service Project	100		-	100
Project Work	60		140	200

(f) **Mandatory Courses**:
These courses are compulsory with zero credits. Only internal examination will be conducted and student has to secure minimum 40% of the marks in the evaluation for passing the course. The minimum attendance requirement is 75 %.

(g) **Open Electives:** Students are to choose Open Elective – I during 5th Semester, Open Elective–II during 6th Semester and Open Elective – III and IV during 7th Semester from the list of Open Electives given in the Course Structure. However, students cannot opt for an Open Elective Subject offered by their own (parent) Department, if it is already listed under any category of the courses offered by the parent Department in any Semester.

(h) **Skill Oriented Courses:**

i) A pool of interdisciplinary and job-oriented mandatory skill courses which are relevant to the industry are integrated into the curriculum of concerned branch of engineering.

ii) For these courses, one theory and two practical hours may be allotted as approved by the concerned BOS.

iii) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies as approved by the concerned BoS.

iv) Every year the concerned BoS review the skill-oriented courses based on industrial demand which are offered by the eligible external agencies and college.

v) Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination. End examination will be conducted by the internal and external examiner appointed by COE. Internal evaluation will be a continuous assessment during the semester for 30 marks with 15 marks for day-to-day work, including record valuation and 15 marks for internal test.

vi) If a student chooses a Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded depends on the Course Completion Certificate.

vii) College academic committee evaluates the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.

viii) Therearefive(05)skill-oriented coursesshallbeofferedduring IIIto VIIsemesters.

ix) Out of the five skill courses two shall be skill-oriented courses from the same domainand shall be completed in second year. Of the remaining 3 skill courses, one shall benecessarily be a soft skill course and the remaining 2 shall be skill-advanced courseseither from the same domain or Job oriented skill courses, which can be of interdisciplinary nature.

10. ATTENDANCE REQUIREMENTS

(i) A student will be eligible to appear for end semester examinations, if he/she acquired a minimum of 75% of attendance in aggregate of all the courses.

(ii) Condonation of shortage of attendance in aggregate up to 10% on medical grounds (Above 65% and below 75%) in any semester may be granted by the College Academic Committee.

(iii) Shortage of Attendance below 65% in aggregate shall not be condoned.

(iv) Students with less than 65% of attendance in any semester are not eligible to take up their end examination of that particular semester and their registration for previous semesters examinations shall be allowed.

(v) Attendance may also be condoned for those who participate in Inter Collegiate/university sports, co- and extracurricular activities provided their attendance is in the minimum prescribed range for the purpose (>65%) and recommended by the concerned authority. He/ She shall pay the prescribed Condonation fee.

(vi) Prescribed Condonation fee shall be payable by the student to appear for the end examination.

(vii) A Student will not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester as applicable. They may seek re-admission for that semester as and when offered consecutively.

(viii) A student will be condoned only four times for regular student and three times for lateral entry students during entire course of study.

(ix) Forinductionprogrammeattendanceshall bemaintainedasperAICTEnorms.

TABLE-7 ATTENDANCE REQUIREMENT

Attendance Percentage	Condonation fee	Appear End Exams
Above 75 %	Nil	Eligible
65 % -75%	Yes (on medical grounds)	Eligible
Below 65 %	Nil	Not Eligible (Seek re-admission to that semester when offered)

11. MINIMUM ACADEMIC REQUIREMENTS:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in **S.No.9.**

(i) A student will be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical or design or drawing subject or project if he/she secures not less than a minimum of 35% of marks exclusively in the end semester examinations in each of the courses, for which the candidate had appeared. However, the candidate should have secured a minimum of 40% marks in both external and internal components put together to declare eligible for pass..

(ii) A student will be promoted from first semester to second semester, second semester to third and third to fourth semester, if he/she satisfies the minimum attendance requirement.

(iii) A student will be promoted from 4^{th} to 5^{th} Semester (2^{nd} year to 3^{rd} year), if he/she fulfills the academic requirements of 40% of the credits up toeither 3^{rd} or 4^{th} Semester from all the examinations (Regular and supplementary) whether or not the candidate takes the examinations.

(iv) A student will be promoted from 6^{th} to 7^{th} Semester (3^{rd} year to 4^{th} year), only if he/she fulfills the academic requirements of 40% of the credits up toeither 5^{th} or6^{th} Semester from, all the examinations (regular and supply) whether or not the candidate takes the examinations.

(v) When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into thesame semester/year in which he has been detained. However, the academic regulations under whichhewasfirstadmitted shall continueto beapplicabletohim.

TABLE-8 PROMOTION IN TO NEXT HIGHER CLASS

Promotion		Promotion Criteria
From	To	
1^{ST} Semester	2^{nd} Semester	Minimum Attendance requirement
2^{nd} Semester	3^{rd} Semester	
3^{rd} Semester	4^{th} Semester	
4^{th} Semester	5^{th} Semester	Minimum Attendance requirement & 40% of credits up to either 3^{rd} or 4^{th} semester from all exams
5^{th} Semester	6^{th} Semester	Minimum Attendance requirement
6^{th} Semester	7^{th} Semester	Minimum Attendance requirement & 40% of credits up to either 5^{th} or 6^{th} semester from all exams
7^{th} Semester	8^{th} Semester	Minimum Attendance requirement

12. GAP YEAR CONCEPT

Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year study, after the 4th Semester with the due recommendations of the GAP committee and approved by the principal. This may be extended to two years at the most which period is not counted for the maximum time for graduation.

13. AWARD OF B.TECHDEGREE:

A student shall be eligible for award of the B.Tech. Degree if he/she fulfills all the following conditions:

(i) Pursue the programme of study for a stipulated period of four years and not more than eight years.

(ii) Register for 160 credits and secure the same.

(iii) Registered and successfully completed all the components prescribed in the programme of study in which he/she is admitted.

(iv) All mandatory courses must be completed with satisfactory.

(vi) Obtained CGPA greater than or equal to 5.0 (minimum requirements for pass).

(vii) A student shall be eligible for the award of B.Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

(viii) All students shall register for NCC/NSS activities and will be required to participate in anactivity specified by NSS officer during first two years. Grade shall be awarded asSatisfactoryorUnsatisfactoryinthemarksheetonthebasisofparticipation,attendance,performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat theaboveactivityinthesubsequent years,in ordertocomplete the degreerequirements.

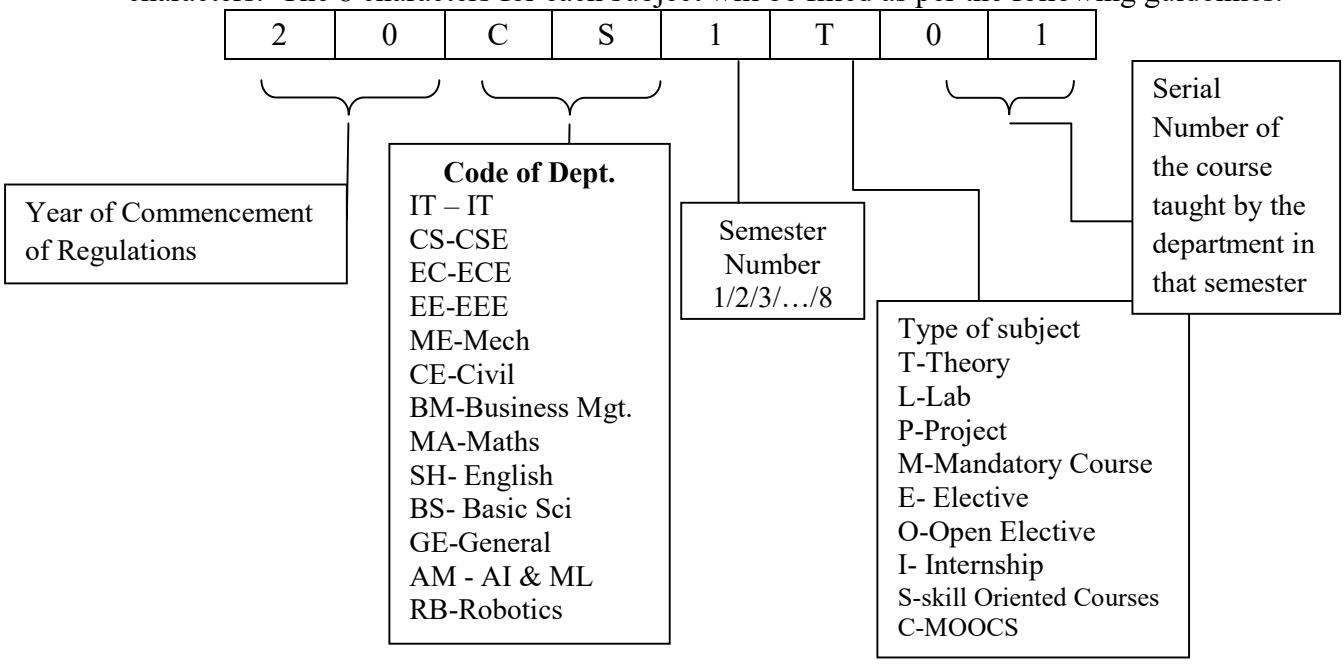
(ix) Courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

14. AWARD OF B. TECH. (HONOR)/B. TECH. (MINOR):

B. Tech. with Honors or a B. Tech. with a Minor will be awarded if the student earns 20 additional credits are acquired as per the regulations/guidelines. Registering for Honors/Minor is optional.(Refer Sl.No 23 & 24)

15. COURSE CODE & COURSE NUMBERING SCHEME:

The subject codes will be given by the department teaching the subject. Each subject code contains 8 characters. The 8 characters for each subject will be filled as per the following guidelines.



16. GRADING SYSTEM:

16.1 Award of Grade:

(i) Semester Grade Point Average (SGPA):

a) The Semester Grade Point Average (SGPA) will be calculated according to the formula

$$\text{SGPA (Si)} = \frac{\sum C_i G_i}{\sum C_i}$$

Where C_i = number of credits for the subject i

G_i = grade points obtained by the student in the subject.

b) To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student's performance in all the courses taken in all the semesters completed up to the particular point of time.

$$\text{CGPA} = \frac{\sum C_i S_i}{\sum C_i}$$

where 'Si' is the SGPA of the ith semester and Ci is the total number ofcredits in that semester

i. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported inthe transcripts.

ii. Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

iii. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, E and F.

iv. Equivalent Percentage = (CGPA – 0.75) x 10

(ii) After a student satisfy the requirements prescribed for the award of B.TechProgramme he/she shall be placed in one of the following four grades. The award of the degree is based on CGPA on a grade point scale of 10 and given in Table 9.

Table -9

CGPA	Award of Division
≥7.75	First Class with Distinction (Withoutanysupplementaryappearance)
≥ 6.75 <7.75	First Class
≥ 5.75 <6.75	Second Class
≥ 5.00<5.75	Pass Class

16.2 Award of Grade in Each Semester:

(i) Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester for each subject. The letter grades and the corresponding grade points are as given in the Table 10.

Table -10

Percentage of Marks Scored	Letter Grade	Level	Grade Points
>=90	A+	Outstanding	10
80 - 89	A	Excellent	9
70-79	B	Very Good	8
60-69	C	Good	7
50-59	D	Fair	6
40-49	E	Satisfactory	5
<40	F	Fail	0
	Ab	Absent	0

(ii) A student earns a minimum of 5 grade points in a subject is declared to have successfully completed the subject, and is deemed to have earned the credits assigned to that subject. However, it should be noted that a pass in any subject/Internship/project/ shall be governed by the rules mentioned in **S.No. 13**.

(iii) Grade Sheet: A grade sheet (memorandum) will be issued to each student indicating his/her performance in all courses taken in that semester and also indicating the grades.

(iv) Transcripts: After successful completion of the programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued up to any point of study to the student on request and by paying stipulated fee in force.

(v) Candidates shall be permitted to apply for revaluation within the stipulated period with payment of prescribed fee.

(vi) The Academic Council has to approve and recommend to the JNTUK, Kakinada for the award of a degree to any student.

17. ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME):

i. The students have to acquire 121 credits from 3rd Semester to 8th Semester of Program (regular) for the award of the degree.

ii. Students, who fail to fulfill the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.

iii. The same attendance regulations are to be adopted as per the rules mentioned in item No.9.

iv. **Rules for Promotion in to Next Higher Class:** (6th Semester to 7th Semester): A student shall be promoted from 6th Semester to 7th Semester only if he/she fulfills the academic requirements of 40% credits up to either 5th or 6th Semester.

18. SUPPLEMENTARY EXAMINATIONS:

In addition to the Regular Final Examinations held at the end of each semester, a Supplementary Examination will be conducted. A student can appear for any number courses of supplementary examinations till he/she clears the courses. However the maximum stipulated period of programme cannot be relaxed under any circumstance.

19. ADVANCED SUPPLEMENTARY EXAMINATIONS:

Candidate who fails the courses in 7th and 8th Semester can appear for Advanced Supplementary Examinations.

20. ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME):

i. The students have to acquire 121 credits from 3rd Semester to 8th Semester of B. Tech Programme for the award of the degree.

ii. All mandatory courses must be completed with satisfactory for award of degree.

iii. Obtained CGPA greater than or equal to 4.5 (minimum requirements for pass).

iv. The same attendance regulations are to be adopted as per the rules mentioned in item No.09.

v. **Rules for Promotion from 6th Semester to 7th Semester**: A student shall be promoted from 6th Semester to 7th Semester only if he/she fulfills the academic requirements of 40% credits up to 6th Semester.

vi. Students, who fail to fulfill the requirement for the award of the degree in six consecutive academic years from the year of admission, shall forfeit their seat.

21. CONDUCT AND DISCIPLINE:

Students admitted in SCET are to be followed the conduct and discipline of the college and which will be updated from time to time.

22. MALPRACTICES:

If any malpractices held in internal assessment tests or Semester-End Examinations, Principal constitute a Malpractice Enquiry Committee to enquire the case. The principal shall take necessary action based on the recommendations of the committee as per stipulated norms.

23. WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the institution or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

24. HONORS PROGRAMME:

a) Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

b) A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 7.75 CGPA upto the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 CGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

c) Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

d) In addition to fulfilling all the requisites of a Regular B.TechProgramme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

e) Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.

f) It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

g) The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

h) Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component.

i) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a “pass (P)” grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Honors will be shown in the transcript. None of the courses done under the dropped Honors will be shown in the transcript.

j) In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will

receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

k) Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

25. MINOR PROGRAMME:

a) **i)** Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme; he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering

ii) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

b) The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE,CE,ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, VLSI etc.

c) The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

d) A student shall be permitted to register for Minors program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 7.75 CGPA (Cumulative Grade Point Average) upto the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 7.75 CGPA upto 3rd semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An CGPA of 7.75 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

e) A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

f) Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

g) In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to

earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.

h) Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

i) College Academic committee evaluates the grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

j) If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

k) In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

l) Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

26. <u>GENERAL:</u>

a) Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
b) The academic regulation should be read as a whole for the purpose of any interpretation.
c) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final and which is to be ratified by the Chairman of the Governing Body.
d) The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

Institution- Vision Mission

Vision

"To produce global competent, ethical and dynamic professionals by creating Centre of Excellence in Technical Education for societal empowerment."

Mission

- To provide quality education with knowledge and skills for rural and urban students.
- To collaborate the industries with academia for empowering the students to meet global standards.
- To induce highly ethical entrepreneurship in young minds with good leadership quality for the society.
- To enhance the institution in Research and Development by human intellectual capability.

Vision and Mission of the Department

Vision

To evolve as center of excellence in electrical and electronics engineering to produce graduates Contributing to state and national development

Mission

M1: To provide quality education through innovative curriculum.

M2: To inculcate research culture, entrepreneurial attitude through industry interaction

M3: To develop leadership skills and ethical values among students.

Programme Educational Objectives (PEOs)

PEO-I : To pursue career or higher studies in electrical and electronics engineering or related disciplines and in aligned fields.

PEO-II : To analyze real time problems and provide economically feasible solutions PEO-III: To exhibit team works, professionalism in their profession and engage in lifelong Learning.

Programme Specific Outcomes (PSOs)

- Ability to apply appropriate techniques and modern computing tools in power systems to engage in life- long learning and to successfully adapt in multi disciplinary environments.
- Ability to analyze, designs, and provide an engineering solution in the areas related to power electronics.

Programme Outcomes (POs)

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

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

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

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

BASIC STRUCTURE

FOR

ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER I (FIRST YEAR)

Sl.No.	CourseCode	Course Title	L	T	P	C	IM	EM	TM
1	20MA1T01	Linear Algebra	3	0	0	3.0	30	70	100
2	20BS1T01	Engineering Physics	3	0	0	3.0	30	70	100
3	20CS1T01	Problem Solving Using C Programming	3	0	0	3.0	30	70	100
4	20ME1T02	Engineering Drawing	2	0	2	3.0	30	70	100
5	20BS1L01	Engineering Physics Lab	0	0	3	1.5	30	70	100
6	20CS1L01	C Programming Lab	0	0	3	1.5	30	70	100
7	20ME1L01	Engineering Workshop	0	0	3	1.5	30	70	100
8	20HS1L01	English Proficiency Lab	0	0	3	1.5	30	70	100
TOTAL CREDITS						**18**	**240**	**560**	**800**

SEMESTER II (FIRST YEAR)

Sl.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20MA2T02	Differential Equations and Numerical Methods	3	0	0	3.0	30	70	100
2	20BS2T02	Engineering Chemistry	3	0	0	3.0	30	70	100
3	20HS2T01	English	3	0	0	3.0	30	70	100
4	20ME2T02	Basics of Civil and Mechanical Engineering	3	0	0	3.0	30	70	100
5	20EE2T02	Electrical Networks	3	0	0	3.0	30	70	100
6	20BS2L02	Engineering Chemistry Lab	0	0	3	1.5	30	70	100
7	20IT2L01	IT Workshop	0	0	3	1.5	30	70	100
8	20ME2L02	Basics of Civil and Mechanical Engineering Lab	0	0	3	1.5	30	70	100
9	20HS2L02	English Communications Lab	0	0	3	1.5	30	70	100
TOTAL CREDITS						**21**	**270**	**630**	**900**

-LECTURE HOURS, **T**- TUTORIAL HOURS, **P**-PRACTICAL HOURS, **C**-CREDITS,
IM- INTERNAL MARKS, **EM**- EXTERNAL MARKS, **TM**- TOTAL MARKS

SEMESTER III (SECOND YEAR)

Sl.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20MA3T04	Transforms Techniques	3	0	0	3	30	70	100
2	20EE3T01	Electrical Circuits & Synthesis	3	0	0	3	30	70	100
3	20EE3T02	Electromagnetic Fields	3	0	0	3	30	70	100
4	20EE3T03	Electrical Machines-I	3	0	0	3	30	70	100
5	20EC3T05	Analog Electronics	3	0	0	3	30	70	100
6	20EC3L04	Analog Electronics Lab	0	0	3	1.5	30	70	100
7	20EE3L01	Electrical Circuits Lab	0	0	3	1.5	30	70	100
8	20EE3L02	Electrical Machines-I Lab	0	0	3	1.5	30	70	100
9	20EE3S01	Design of Electrical Circuits -Matlab/Simulink	0	0	4	2	30	70	100
10	20CE3M01	Environmental Science	2	0	0	0	-	-	-
TOTAL CREDITS						**21.5**	**270**	**630**	**900**

SEMESTER IV (SECOND YEAR)

Sl.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20EE4T01	Electrical Measurements	3	0	0	3	30	70	100
2	20EE4T02	Electrical Machines-II	3	0	0	3	30	70	100
3	20EE4T03	Control Systems	3	0	0	3	30	70	100
4	20EC4T04	Digital Electronics	3	0	0	3	30	70	100
5	20BM4T02	Principles of Economics and Management	3	0	0	3	30	70	100
6	20EE4L01	Electrical Measurements Lab	0	0	3	1.5	30	70	100
7	20EE4L02	Electrical Machines-II Lab	0	0	3	1.5	30	70	100
8	20EE4S01	Industrial Automation –PLC	0	0	4	2	30	70	100
9	20EC4L03	Digital Electronics Lab	0	0	3	1.5	30	70	100
10	20BM4M01	India Constitution	2	0	0	0	0	0	0
TOTAL CREDITS						**21.5**	**270**	**630**	**900**

-LECTURE HOURS, **T**- TUTORIAL HOURS, **P**-PRACTICAL HOURS, **C**-CREDITS,
IM- INTERNAL MARKS, **EM**- EXTERNAL MARKS, **TM**- TOTAL MARKS

SEMESTER V (THIRD YEAR)

Sl.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20EE5T01	Power Generation & Transmission System	3	0	0	3	30	70	100
2	20EE5T02	Power Electronics	3	0	0	3	30	70	100
3	20CS5T04	Python Programming	3	0	0	3	30	70	100
4	-	Professional Elective-I	3	0	0	3	30	70	100
5	-	Open Elective-I / Job Oriented Elective - I	3	0	0	3	30	70	100
6	20EE5L01	Control System& Simulation Lab	0	0	3	1.5	30	70	100
7	20CS5L03	Python Programming Lab	0	0	3	1.5	30	70	100
8	20EE5S01	IoT Applications in Electrical Engineering	0	0	4	2	30	70	100
9	20BM5M01	Essence of Indian Traditional Knowledge	2	0	0	0	-	-	-
10	20EE5I01	Internship-I	**0**	**0**	**0**	1.5			50
TOTAL CREDITS						**21.5**	**240**	**560**	**850**

SEMESTER VI (THIRD YEAR)

Sl.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20EC6T01	Microprocessors and Microcontrollers	3	0	0	3	30	70	100
2	20EE6T01	Power System Analysis	3	0	0	3	30	70	100
3	20EE6T02	Control of Electric Drives	3	0	0	3	30	70	100
4	-	Professional Elective-II	3	0	0	3	30	70	100
5	-	Open Elective-II/ Job Oriented Elective-II	3	0	0	3	30	70	100
6	20EC6L01	Microprocessors and Microcontrollers Lab	0	0	3	1.5	30	70	100
7	20EE6L01	Power System & Simulation Lab	0	0	3	1.5	30	70	100
8	20EE6L02	Power Electronics & Simulation Lab	0	0	3	1.5	30	70	100
9	20HS6S01	Advanced Communications Skills	0	0	4	2	30	70	100
10	20EE6C01	Community Service Project	-	-	-	4	-	-	100
11	20BM6M01	Professional Ethics And Intellectual Property	2	0	0	0	-	-	-
TOTAL CREDITS						**25.5**	**270**	**630**	**1000**

SEMESTER VII (FOURTH YEAR)

Sl.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1		Professional Elective courses	3	0	0	3	30	70	100
2		Professional Elective courses	3	0	0	3	30	70	100
3		Professional Elective courses	3	0	0	3	30	70	100
4		Open Elective-III/ Job Oriented Elective-III	3	0	0	3	30	70	100
5		Open Elective-IV/ Job Oriented Elective-IV	3	0	0	3	30	70	100
6	20HS7T01	1) Universal Human Values 2) Understanding Harmony	3	0	0	3	30	70	100
7	20EE7S01	Renewable Energy Systems	0	0	4	2	30	70	100
8	20EE7I01	Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester	0	0	0	3	50	-	50
TOTAL CREDITS						**23**	**260**	**490**	**750**

SEMESTER VIII (FOURTH YEAR)

Sl.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20EE8P01	Project Work, Seminar and Internship in Industry (6 months internship)	0	0	0	8	60	140	200
TOTAL CREDITS						8	60	140	200

PROFESSIONAL ELECTIVE - I

S.NO	COURSE CODE	COURSE NAME
1	20EE5E01	Utilization of Electrical Energy
2	20EE5E02	Special Electrical Machines
3	20EC5E05	Linear IC Applications
4	20CS5E05	Data structures

OPEN ELECTIVE-I

S. No	Course Code	Course Title	Offering Dept.
1	20EE5O01	Non-conventional Energy sources	EEE
2	20ME5O01	Waste to Energy Conversion	ME
3	20CS5O01	Internet of Things and Applications	CSE
4	20CS5O02	Data Engineering	CSE
5	20BM5O01	Innovations and Entrepreneurship	MBA
6	20BM5O03	Digital Marketing	MBA
7	20BM5O04	Business Environment	MBA

JOB ORIENTED ELECTIVE - I

S. No	Course Code	Course Title	Offering Dept.
1	20IT5J01	Linux Administration	IT
2	20CS5J01	Full Stack with JAVA	CSE

PROFESSIONAL ELECTIVE - II

S.NO	COURSE CODE	COURSE NAME
1	20EE6E01	Power System Protection
2	20EE6E02	AI Applications to Electrical Engineering
3	20EC6E05	Signals and System
4	20CS6E05	Object Oriented Programming Using Java

OPEN ELECTIVE - II

S. No	Course Code	Course Title	Offering Dept.
1	20CE6O01	Environmental Pollution and Control	CE
2	20CE6O02	Disaster Management	CE
3	20EE6O01	Fundamentals of Electrical Vehicle	EEE
4	20EC6O01	Mobile Communication and its Applications	ECE
5	20ME6O01	Basics of 3D Printing	MECH
6	20ME6O02	Farm Machinery	MECH
7	20CS6O01	Fundamentals of Software Engineering	CSE
8	20CS6O02	Fundamentals of Computer Networks	CSE
9	20BM6O01	Stress and Work Life Management	MBA
10	20BM6O02	Banking and Insurance	MBA
11	20MA6O01	Operation Research	S&H
12	20IT6O01	Introduction to Cloud Computing	IT
13	20IT6O02	E-Commerce	IT
14	20CE6O01	Environmental Pollution and Control	CE

JOB ORIENTED ELECTIVE - II

S. No	Course Code	Course Title	Offering Dept.
1	20CS6J01	AWS Cloud Practitioner	CSE
2	20CS6J02	Software Testing Tools	CSE
3	20IT6J01	Full Stack Development	IT
4	20IT6J02	Block Chain Technology	IT

PROFESSIONAL ELECTIVE – III

S.NO	COURSE CODE	COURSE NAME
1	20EE7E01	Power System Operation and Control
2	20EE7E02	High Voltage Engineering
3	20EC7E13	Digital Signal Processing
4	20CS7E10	Software Engineering

PROFESSIONAL ELECTIVE – IV

S.NO	COURSE CODE	COURSE NAME
1	20EE7E03	Flexible Alternating Current Transmission Systems
2	20EE7E04	Electrical Power Quality
3	20EC7E14	VLSI Design
4	20CS7E11	Data Base Management Systems

PROFESSIONAL ELECTIVE – V

S.NO	COURSE CODE	COURSE NAME
1	20EE7E05	Hybrid Electric Vehicles
2	20EE7E06	Electrical Distributed system
3	20EC7E06	Embedded Systems
4	20CS7E12	Cloud Computing

OPEN ELECTIVE – III

S. No	Course Code	Course Title	Offering Dept.
1	20CE7O01	Solid Waste Management	CIVIL
2	20CE7O02	Building Planning and Drawing	CIVIL
3	20EE7O01	Energy Auditing, Conservation and Management	EEE
4	20EC7O01	Introduction to Global Positioning Systems	ECE
5	20BM7O01	Industrial Sociology and Psychology	MBA
6	20ME7O01	Bio-Mechanical Engineering	MECH
7	20CS7O01	Full-Stack Development	CSE

OPEN ELECTIVE – IV

S. No	Course Code	Course Title	Offering Dept.
1	20CE7O03	Introduction to Watershed Management	CIVIL
2	20EE7O02	Introduction to Programmable Logic Controller	EEE
3	20BM7O02	Business Skill Development	MBA
4	20EC7O02	Remote Sensing	ECE
5	20ME7O02	Green Engineering System	MECH
6	20CS7O02	Software Testing Techniques	CSE
7	20IT7O01	Introduction to Software Project Management	IT

SUBJECTS FOR B. TECH. (MINOR) in ELECTRICAL AND ELECTRONICS ENGINEERING

S.NO	SUBJECT	L-T-P	CREDIT
II B.Tech II Semester			
1	Fundamentals of Electrical Circuits	3-1-0	4
III B.Tech I Semester			
1	Concepts of Electrical Measurements	3-1-0	4
III B.Tech II Semester			
1	Fundamentals of utilization of Electrical Energy	3-1-0	4
IV B.Tech I Semester			
1	Basics of Power System Engineering	3-1-0	4

I SEMESTER	L	T	P	C
	3	-	-	3
20MA1T01: LINEAR ALGEBRA				

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- This courseequips the students with standard concepts and tools an intermediate level to advanced level and to develop the confidence; ability to handle various real-world problems and their applications.

Bridge Course: Limits, continuity, Types of matrices

UNIT-I: Matrix Operations and Solving Systems of Linear Equations

1Ran.
.k of a matrix by Echelon form, Normal form - solving system of homogeneous and non-homogeneous linear equations- Gauss Elimination, Jacobi and Gauss Seidel methods

Learning Outcomes:
At the end of this unit, the student will be able to

- solve system of linear equations. (K2)
- determine the rankof amatrix. (K2)

UNIT II:Eigen values and Eigen vectors
Eigen values and Eigen vectors- and their properties (without proof). Cayley-Hamilton theorem (without proof), Finding inverse and powers of a matrix by Cayley-Hamilton theorem - Reduction of a matrix to diagonal form.

Learning Outcomes:
At the end of this unit, the student will be able to

- findeigen values andeigenvectors of a matrix. (K2)
- find inverse and powers of a matrix by Cayley-Hamilton theorem. (K2)

UNIT III: Quadratic forms
Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation.

Learning Outcomes:
At the end of this unit, the student will be able to

- reduce a matrix to diagonal form and identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics; (K3)

UNIT IV: Multivariable calculus
Expansions of functions: Taylor's and Maclaurin's series- Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes:
At the end of this unit, the student will be able to

- expand the given function as Taylor's and Maclaurin'sseries. (K3)

- find partial derivatives numerically and symbolically and use them to analyze and interpret the way in which a function varies. (K3)
- acquire the knowledge in maxima and minima of functions of several variables (K1)
- utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (K3)

UNIT V: Multiple Integrals

Double Integrals: Change of order of integration, double integrals in polar coordinates, areas enclosed by plane curves.

Triple Integrals:Evaluation of triple integrals, change of variables.

Learning Outcomes:

At the end of this unit, the student will be able to

- evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates. (K3)
- apply double integration techniques in evaluating areas bounded by a region.(K4)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 43/e, Khanna Publishers,2015.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2013.
2. B.V. RAMANA, Higher Engineering Mathematics, Tata McGraw Hill, 2007.

Course Outcomes:

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

1. develop the use of matrix algebra techniques that is needed by engineers for practical applications (K3)
2. familiarize with functions of several variables which is useful in optimization (K3)
3. learn important tools of calculus in higher dimensions. Students will become familiar with double integral(K3)
4. familiarize with triple integral and also learn the utilization of special functions. (K4)

I SEMESTER	L	T	P	C
	3	-	-	3
20BS1T01: ENGINEERING PHYSICS				

COURSE OUTCOMES

After completion of course student able to:

1. Define Basic crystal systems and determination of crystal structures
2. Explicate Magnetic and Dielectric Materials properties
3. Describe Concept of Magnetic Induction and Super Conducting properties
4. Explicate Pure &Doped Semiconductor materials for better utility
5. Define Optical fibers and Optical properties of materials and their applications

SYLLABUS

UNIT –I: CRYSTAL STRUCTURE AND X-RAY DIFFRACTION

CRYSTAL STRUCTURE:
Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC, BCC and FCC.

X-RAY DIFFRACTION:
Directions in crystals- planes in crystals- Miller indices and procedure to find Miller indices- Various planes in crystals- Separation between successive (h k l) planes-Bragg's law-Bragg's Spectrometer.

Learning Outcomes: At the end of this unit, the students will be able to

- **Explicate** the seven crystal systems
- **Interpret** the crystal structure based on Bragg's law

UNIT – II: MAGNETIC AND DIELECTRIC PROPERTIES

MAGNETIC PROPERTIES: Introduction-Magnetic permeability – Magnetization – Relation between three magnetic vectors - Origin of magnetic moment – Classification of Magnetic materials- Dia, Para, Ferro, Anti-Ferro and Ferri-magnetism – Hysteresis-soft and Hard Magnetic materials.

DIELECTRIC PROPERTIES: Introduction-Dielectric constant- Relation between three electric vectors-Electronic and ionic polarizations (Quantitative) –orientationpolarization (Qualitative) - Internal fields in solids-Clausius-Mossotti equation.

Learning Outcomes: At the end of this unit, the students will be able to

- **Classify** the magnetic materials into dia, para, ferro, anti ferro and ferri
- **Explicate** the importance of hysteresis
- **Explicate** the concept of polarization in dielectric materials.
- **Summarize** various types of polarization of dielectrics .
- **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics.

UNIT-III: ELECTROMAGNETIC WAVES AND SUPERCONDUCTIVITY

ELECTROMAGNETIC WAVES: Introduction-Electric flux –magnetic flux- Gauss law in electrostatics- Gauss law in magnetostatics- Ampere's law-B for a Solenoid - Biot-Savart's law-Magnetic Induction due to current carrying circular loop-Faraday's law - Maxwell's equations (Integral and differential forms).

SUPERCONDUCTIVITY: General and Thermal properties –Meissner effect – Type-I and Type-II superconductors – Flux quantization –BCS Theory of Superconductivity - Josephson effects – Applications of Superconductors.

Learning Outcomes: At the end of this unit, the students will be able to

- **Illustrate** the concept of electro magnetism based on fundamental laws of electro magnetism
- **Explicate** Maxwell's equations
- **Summarize** various properties and applications of superconductors

UNIT-IV:PHYSICS OF SEMICONDUCTORS:

Classification of solids based on band theory - Intrinsic semiconductors- density of charge carriers-Equation for conductivity – Extrinsic semiconductors- P-type and N-type- density of charge carriers-Drift and diffusion – Einstein's equation – Hall Effect- Hall coefficient – Applications of Hall effect–direct & indirect band gap semiconductors.

Learning Outcomes: At the end of this unit, the students will be able to

- **Summarize** various types of solids based on band theory.
- **Outline** the properties of n-type and p-type semiconductors.
- **Identify** the type of semiconductor using Hall effect

UNIT-V: LASERS AND OPTICAL FIBERS

LASERS: Introduction– Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion - Three level and four level laser pumping schemes - Ruby laser – Helium-Neon laser- Applications of Laser.

FIBER OPTICS: Introduction to Optical fibers- Critical angle of propagation- Total internal reflection-Acceptance angle and acceptance cone- Numerical aperture- Classification of optical fibers based on refractive index profile-Classification of optical fibers based on modes- Attenuation in optical fibers - Applications of optical fibers.

Learning Outcomes: At the end of this unit, the students will be able to

- **Design** various types of lasers
- **Explicate** the principle and propagation of light through Optical fibers
- **Discuss** the application of lasers and Optical fibers

TEXT BOOK:

1. A text book of "Engineering Physics" by M. N.Avadhanulu, P.G. Kshirasagar& TVS Arun Murthy, SChand publications, 11th Addition 2019.

REFERENCE BOOKS:

1. Introduction to solid state physics 8th edition by Charles Kittel
2. Solid state Physics by S.O. Pillai
3. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Education, 2018.
4. Engineering Physics by Palanisamy(Scitech Publishers)
5. Engineering Physics by D. Thirupathi Naidu and M. Veeranjaneyulu

I SEMESTER	L	T	P	C
	3	-	-	3
20CS1T01: PROBLEM SOLVING USING C PROGRAMMING				

COURSE OUTCOMES

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

CO1: Analyse a computational problem and develop an algorithm/flowchart to find its solution **(K2)**

CO2: Develop C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or bitwise operators **(K3)**

CO3: Divide a given computational problem into a number of modules and develop C program with arrays(K3)

CO4: Write C programs which use pointers for array processing and parameter passing **(K3)**

CO5: Develop C programs with structure or union and files for storing the data to be processed. **(K3)**

UNIT-I **Contact Hours: 10**

INTRODUCTION TO PROGRAMMING: What is computer, Block diagram of Computer, Development of Computer languages, Translators, Computer Codes, Computer Arithmetic, Programming Techniques, Algorithm, Flowchart

BASICS OF C : History of C, Character Set, Identifiers, Keywords, Tokens, Variables, constants, operators, Data types, expressions, expression evaluation, operator precedence and associativity, typecasting C program structure.

UNIT-II

CONSOLE I/O OPERATIONS : Formatted I/O - printf&scanf, Unformatted I/O functions. **CONTROL FLOW STATEMENTS: Branching Statements -** if, if – else, switch. **Looping statements**- while, do – while, for, nested for. **Unconditional Statements -** break, continue, goto, exit.

UNIT-III

ARRAYS : Array declaration , initialization and Accessing, Types of Arrays : 1-D and 2-D Arrays, Arrays as Function Arguments

FUNCTIONS: Introduction to Functions, Types of Function, Function prototypes, parameter passing techniques, Scope of variables, Storage classes, Recursion

UNIT-IV

STRINGS: Reading String from terminal, Writing string to Screen, String Handling Functions.

POINTERS: Pointer Declaration, Initialization and Accessing , Types of Pointers, Pointer Arithmetic, Dynamic memoryallocation

UNIT-V

STRUCTURE: Introduction to structures, Definition of structure , declaration of structure variable, accessing of structure members, array of structures, **Union, enum, bit fileds, typedef**

FILES: Introduction to Files, Types of File, File Modes, Writing and Reading Files,File management I/O functions

Text books

- Programming in ANSI C by E. Balguruswamy, Tata Mc-Graw Hill
- Programming With C, Schaum Series

Reference Books

- The 'C' programming language by Kernighan and Ritchie, Prentice Hall
- Computer Programming in 'C' by V. Rajaraman , Prentice Hall
- Programming and Problem Solving by M. Sprankle, Pearson Education
- How to solve it by Computer by R.G. Dromey, Pearson Education

Online Practice and Reference Material

http://www2.its.strath.ac.uk/courses/c/
http://www.princeton.edu/~achaney/tmve/wiki100k/docs/C_%28programming_language%29.htl
http://www.stat.cmu.edu/~hseltman/Computer.html
http://projecteuler.net/

I SEMESTER	L	T	P	C
	2	-	2	3
20ME1T02: ENGINEERING DRAWING				

COURSE OBJECTIVE

Engineering drawing is the principle method of communication for engineers -the objective is to introduce the students, the techniques of constructing the various types of polygons, curves. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

COURSE OUTCOMES: Students are able to

CO1:Construct polygons, conics, cycloids, involutes. (K2)
CO2:Draw the orthographic projections of points, lines in different positions. (K2)
CO3: Draw the orthographic projections of plane surfaces in different positions. (K2)
CO4: Draw the orthographic projections of solids like prisms, cylinder, pyramids and cone. (K2)
CO5: Convert Isometric views to orthographic views and vice-versa and also visualize 2D & 3D objects using Auto CAD. (K2)

UNIT I

Polygons: Constructing regular polygons by General method.
Curves: Construction of Parabola, Ellipse and Hyperbola by Eccentricity method, Construction of Cycloid, Epi-cycloid and Hypo-cycloid and Involutes of square, Triangle, Pentagon and Hexagon.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines (First angle projection only), line parallel to both the planes, line parallel to one plane and inclined to other plane. Projections of straight lines inclined to both the planes.

UNIT III

Projections of Planes: Regular planes perpendicular and parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes (HP & VP).

UNIT IV

Projections of Solids: Prisms, Pyramids, Cone and Cylinder, Simple positions of solids and axis of the solid parallel to one plane and inclined to other plane.

UNIT V

Isometric Views: Conversion of Isometric views to Orthographic views; Conversion of Orthographic views to Isometric views.
CAD: Fundamentals of AutoCAD - For Polygons, Creating 2D And 3D Drawings.
Using Auto CAD: Computer Aided Design, Drawing practice using Auto CAD simple figures like polygons, creating 2D&3D drawings of objects using Auto CAD.
Note: In the End Examination there will be no question from CAD.

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications 2016
2. Engineering Drawing + AutoCAD by K. Venugopal, V. Prabhu Raja, New Age 2010

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers 2016
2. Engineering Graphics for Degree by K.C. John, PHI Publishers 2009
3. Engineering Graphics by PI Varghese, McGrawHill Publishers 2013

ISEMESTER	L	T	P	C
	-	-	3	1.5
20BS1L01: ENGINEERING PHYSICS LAB				

COURSE OUTCOMES

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

CO1: Demonstrate the basic knowledge to know the frequency of a vibrator, hall coefficient, (K3)

CO2: Attain knowledge to verify some of the properties of physical optics. (K4)

CO3: Develop skills to plot various characteristic curves and to calculate the physical properties of given materials. (K4)

CO4: Calculate some the properties of semiconducting materials. (K2)

STUDENT HAS TO DO ANY TEN OF THE FOLLOWING

1. Determination of wavelength of Laser using diffraction grating.
2. Determination of Numerical Aperture and Acceptance angle of an Optical Fiber.
3. Determination of the charge carrier density by using Hall Effect.
4. Determination of the Band Gap of a Semiconductor using a p-n junction diode.
5. Study of Characteristic curves (l/V) of a Zenerdiodeto determine its Breakdown voltage.
6. Determination of Temperature coefficient of resistance of a Thermistor by using its Characteristic curve.
7. Study the variation of intensity of magnetic field along the axis of a circular current carrying coil by using Stewart and Gee'sexperiment.
8. Study of Characteristic curves (l/V) of a P-Ndiode.
9. Determine Frequency of given electrically driven tuning fork in Transverse and Longitudinal modes by using Melde's apparatus
10. Determine frequency of A.C. supply by using Sonometer.
11. Determination of the Time Constant for a C-R Circuit
12. Determination of the Planck's constant by using Photo-Cell
13. Determination of dielectric constant of a given material

I SEMESTER	L	T	P	C
	-	-	3	1.5
20CS1L01: C PROGRAMMING LAB				

Course Objectives:

- To impart knowledge on various Editors, Raptor.
- To make the students understand the concepts of C programming.
- To nurture the students on Control Structures and develop different operations on arrays
- To make use of String fundamentals and modular programming constructs.
- To implement programs using dynamic memory allocation.
- To Explicate the concepts of Structure, Unions and files for solving various problems

List of Experiments:

1. Introduction to Algorithms and Flowcharts

1.1) Implement Algorithm Development for Exchange the values of Two numbers.

1.2) Given a set of n student's examination marks (in the range 0-100) make a count of the number of students that passed the examination. A Pass is awarded for all of 50 and above.

1.3) Given a set of n numbers design an algorithm that adds these numbers and returns the resultantsum. Assume N is greater than or equal to zero.

2. Introduction to C Programming

2.1) Exposure to Turbo C, Code Blocks IDE, Dev C++, Falcon C++.

2.2) Writing simple programs using printf(), scanf() .

3. Raptor

3.1) Introduction to Raptor.

3.2) Draw a flow chart to find the Sum of 2 numbers.

3.3) Draw a flow chart to find Simple interest.

4. Basic Math

4.1)Write a C Program to convert Celsius to Fahrenheit and vice versa.

4.2) Write a C Program to find largest of three numbers using ternary operator.

4.3) Write a C Program to Calculate area of a Triangle using Heron's formula.

5. Control Flow- I

5.1) Write a C Program to Find Whether the Given Year is a Leap Year or not.

5.2)Write a C program to find the roots of a Quadratic Equation.

5.3) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide UsingSwitch…case.

6. Control Flow- II

6.1) Write a C Program to Find Whether the Given Number is Prime number or not.

6.2) Write a C Program to Find Whether the Given Number is Armstrong Number or not.

6.3) Write a C program to print Floyd Triangle.

7. Control Flow- III

7.1)Write a C program to find the sum of individual digits of a positive integer.

7.2) Write a C program to check whether given number is palindrome or not.

7.3) Write a C program to read two numbers, x and n, and then compute the sum of the geometricprogression $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$.

Practice Programs:

Write a C program to print all natural numbers from 1 to n. - using while loop
Write a C program to print all natural numbers in reverse (from n to 1). - using while loop
Write a C program to print all alphabets from a to z. - using while loop
Write a C program to print all even numbers between 1to100.-using while loop
Write a C program to print sum of all even numbers between 1 to n.
Write a C program to print sum of all odd numbers between 1 to n.
Write a C program to print table of any number.
Write a C program to find first and last digit of any number.
Write a C program to count number of digits in any number.
Write a C program to calculate sum of digits of any number.
Write a C program to calculate product of digits of any number.
Write a C program to swap first and last digits of any number.
Write a C program to enter any number and print its reverse.
Write a C program to enter any number and check whether the number is palindrome or not.
Write a C program to find frequency of each digit in a given integer.
Write a C program to enter any number and print it in words.
Write a C program to print all ASCII character with their values.
Write a C program to enter any number and print all factors of the number.
Write a C program to enter any number and calculate its factorial.
Write a C program to find HCF (GCD) of two numbers.
Write a C program to find LCM of two numbers.
Write a C program to check whether a number is Prime number or not.
Write a C program to check whether a number is Armstrong number or not.
Write a C program to check whether a number is Perfect number or not.
Write a C program to check whether a number is Strong number or not.
Write a C program to print Fibonacci series up to n terms.

8. Arrays

8.1) Write a C program to search an element in the given array (Linear Search).
8.2) Write a C program to perform matrix addition.
8.3) Write a C program to perform matrix multiplication

Practice Programs:

Write a C program to read and print elements of array.
Write a C program to find sum of all array elements. - using recursion.
Write a C program to find maximum and minimum element in an array. - using recursion.
Write a C program to find second largest element in an array.
Write a C program to copy all elements from an array to another array.
Write a C program to insert an element in an array
Write a C program to delete an element from an array at specified position.
Write a C program to print all unique elements in the array.
Write a C program to print all negative elements in an array.
Write a C program to count total number of even and odd elements in an array.
Write a C program to count total number of negative elements in an array.
Write a C program to count total number of duplicate elements in an array
Write a C program to delete all duplicate elements from an array.
Write a C program to count frequency of each element in an array.
Write a C program to merge two array to third array.
Write a C program to find reverse of an array.
Write a C program to convert lowercase string to uppercase
Write a C program to convert uppercase string to lowercase

Write a C program to toggle case of each character of a string.
Write a C program to find total number of alphabets, digits or special character in a string.

9. Pointers

9.1) Write a C Program to Perform Addition, Subtraction, Multiplication and Division of two numbers using Command line arguments.
9.2)Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
9.3) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

10. Functions, Array & Pointers

10.1) Write a C Program to demonstrate parameter passing in Functions.
10.2) Write a C Program to find Fibonacci, Factorial of a number with Recursion and without recursion.
10.3) Write a C Program to find the sum of given numbers with arrays and pointers.

Practice Programs:

Program to change the value of constant integer using pointers.
Program to print a string using pointer
Program to count vowels and consonants in a string using pointer.
Program to read array elements and print with addresses.

11. Strings

11.1) Implementation of string manipulation operations with library function:

a) copy
b) concatenate
c) length
d) compare

11.2) Implementation of string manipulation operations without library function:

a) copy
b) concatenate
c) length
d) compare

11.3) Verify whether the given string is a palindrome or not.

12. Structures

12.1) Write a C Program to Store Information of a book Using Structure.
12.2) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function.

13. Files

13.1) Write a C program to open a file and to print the contents of the file on screen.
13.2) Write a C program to copy content of one file to another file.
13.3) Write a C program to merge two files and store content in another file.

14. Application

Creating structures to capture the student's details save them in file in proper record format, search and prints the student details requested by the user.

Note:Draw the flowcharts using Raptor from Experiment 3 to Experiment 6.

Course Outcomes:

- Implement basic programs in C and design flowcharts in Raptor.
- Use Conditional and Iterative statements to solve real time scenarios in C.
- Implement the concept of Arrays and Modularity and Strings.
- Apply the Dynamic Memory Allocation functions using pointers.
- Develop programs using structures, and Files.

Reference Books:

1. Let Us C YashwanthKanetkar, 16th edition, BPB Publications.
2. Programming in C A-Practial Approach Ajay Mittal. Pearson Education.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.
4. Problem solving using C , K Venugopal,3rdEdition,TMG Publication.

Web Links:

1. https://www.hackerrank.com/
2. https://www.codechef.com/
3. https://www.topcoder.com/
4. https://code-cracker.github.io/
5.https://raptor.martincarlisle.com/
6. https://nptel.ac.in/courses/106105085/2

I SEMESTER	L	T	P	C
	-	-	3	1.5
20ME1L01- ENGINEERING WORKSHOP				

COURSE OBJECTIVE: To impart hands–on practice on basic Engineering trades and skills.

COURSE OUTCOMES: Students will be able to

CO1: Model and Develop various basic prototypes in Carpentry trade [K3]

CO2: Model and Develop various basic prototypes in Fitting trade [K3]

CO3: Perform Various Forging Operations [K3]

CO4: Perform various House Wiring Techniques. [K3]

CO5: Develop various basic prototypes in the trade of Sheet metal. [K3]

NOTE: At least **Two** Exercises to be done from each trade.

TRADE:

I. CARPENTRY:

1. CROSS LAP JOINT 2. DOVETAIL JOINT 3. MORTISE and TENNON JOINT

II. FITTING:

1. SQUARE FIT 2. V-FIT 3. HALF ROUND FIT

- **FORGING:**

1. ROUND ROD TO SQUARE
2. S-HOOK
3. ROUND ROD TO SQUARE HEADED BOLT

IV. HOUSE WIRING:

1. PARALLEL/SERIES CONNECTION OF THREE BULBS
2. STAIRCASE WIRING
3. FLOURESCENT LAMP FITTING

V. SHEET METAL:

1. SQUARE TRAY 2. HOLLOW CYLINDER 3. OPEN SCOOP

MANUAL:

1. Engineering Workshop Practice Lab Manual Prepared by Mechanical Faculty.

I SEMESTER	L	T	P	C
	-	-	3	1.5
20HS1L01: ENGLISH PROFICIENCY LAB				

COURSE OBJECTIVES

- To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
- To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
- To assist students to carry on the tasks and activities through guided instructions and materials.
- To effectively integrate English language learning with employability skills and training.
- To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

COURSE OUTCOMES

a) **Reading Skills.**
   - Addressing explicit and implicit meaning of a text.
   - Understanding the context.
   - Learning new words and phrases.
   - Using words and phrases in different contexts.

b) **Writing Skills:**
   - Using the basic structure of a sentence.
   - Applying relevant writing formats to create paragraphs, essays, letters, E-Mails, reports and presentations.
   - Retaining a logical flow while writing.
   - Planning and executing an assignment creatively.

c) **Interactive skills:**
   - Analyzing a topic of discussion and relating to it.
   - Participating in discussions and influencing them.
   - Communicating ideas effectively.
   - Presenting ideas coherently within a stipulated time.

d) **Life Skills and Core Skills:**
   - Examining self-attributes and identifying areas that require improvement self-diagnosis, self-motivation.
   - Adopting to a given situation and developing a functional approach to find solutions-adaptability, problem-solving.
   - Understanding the importance of helping others-community service, enthusiasm.

RELATIONSHIP OF COURSE TO PROGRAMME OUTCOMES

A	Ability to apply knowledge of mathematics, science, and engineering.	
B	Ability to design and conduct experiments, as well as to analyze and interpret data.	
C	Ability to design anEngineering system, component, or process.	
D	Ability to function on multi-disciplinary teams	
E	Ability to identify, formulate and solve engineering problems.	
F	Understanding of professional and ethical responsibility.	
G	Ability to communicate effectively	√
H	Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.	√
I	Recognition of the need for and an ability to engage in life-long learning.	
J	Knowledge of contemporary issues.	
K	Ability to use the techniques, skills, and modern engineering tools necessary for engineering practices.	
L	Ability to find location of substations and benefits derived through their optimal location.	

COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice English language in order to acquire proficiency in English. 'Enrich your interactive Skills: Part - A' is designed to provide opportunities for engineering students to revise and consolidate the basic skills in listening, speaking, reading and writing in addition to giving ample practice in various communicative functions and Life skills.

PREREQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

Syllabus

Unit	TOPIC
1	Vowels, Consonants, Pronunciation, Phonetic transcripts
2	Word stress and syllables
3	Rhythm and Intonation
4	Contrastive Stress –Homographs
5	Word Stress : Weak and Strong forms , Stress in compound words

Text Book:

"InfoTech English" by Maruthi Publications

Reference Books:

1. Better English Pronunciation by O' Connor
2. Phonetics and Phonology – Peter Roach
3. A Grammar of Spoken English – Harold Palmer
4. English Phonetics – Bansal and Harrison

Testing Pattern:

A) Internal lab Exam: 30 Marks

Regular performance in the language /communication /lab completion in the lab manual15M

Written test 15M

B) External lab Exam Pattern: 70 Marks

Written test 30M

Oral test 30M

Viva(during exam marks will be awarded by external examiner) 10M

II SEMESTER	L	T	P	C
	3	-	-	3
20MA2T02: DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS				

Course Objectives:

- To enlighten the learners in the concept of differential equations.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

UNIT- I: Linear differential equations of higher order:

Solutions of Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous terms of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters.

Learning Outcomes:

At the end of this unit, the student will be able to

- identify the essential characteristics of linear differential equations with constant coefficients (K3)
- solve the linear differential equations with constant coefficients by appropriate method (K3)

UNIT –II: Partial Differential Equations of First Order:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equations and nonlinear (standard types) equations.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply a range of techniques to find solutions of standard PDEs (K3)
- outline the basic properties of standard PDEs (K2)

UNIT III: Interpolation

Finite differences, Differences of a polynomial, relation between operators, to find one or more missing terms, Newton's interpolation formulae, and interpolation with unequal intervals- Lagrange's formula.

Learning Outcomes:

After the completion of this unit student will be able to

- Explicate various discrete operators and find the relation among operators (K2)
- apply Newton's forward and backward formulas for equal and unequal intervals (K3)

UNIT IV: Numerical Solution of Equations and Numerical integration

Numerical Solution of Equations: Solution of algebraic and transcendental equations - Bisection Method, Method of False Position, Newton- Raphson Method, useful deduction from Newton-Raphson Method.

Numerical Integration – Trapezoidal rule, Simpson's $\frac{1}{3}$ rule and Simpson's $\frac{3}{8}$ rule.

Learning Outcomes:

After the completion of this unit student will be able to

- find approximate roots of an equation by using different numerical methods (K3)
- find integral of a function by using different numerical methods (K3)

UNIT V: Numerical Methods to Solve Ordinary Differential Equations

Numerical Methods to Solve Ordinary Differential Equations -Taylor's series, Euler's and modified Euler's methods, Runge-kutta method of fourth order for solving first order equations.

Learning Outcomes:
After the completion of this unit student will be able to

- solve ordinary differential equations by using different numerical schemes (K3)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 43/e, Khanna publishers,2015.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2013.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Course Outcomes:

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

1. solve the differential equations related to various engineering fields (K3)
2. identify solution methods of partial differential equations that model physical processes (K3)
3. evaluate the approximate roots of polynomial and transcendental equations by different algorithms(K3)
4. solve integrate and ordinary differential equations by various numerical techniques.(K3)

II SEMESTER	L	T	P	C
	3	-	-	3
20BS2T02: ENGINEERING CHEMISTRY				

COURSE OUTCOMES

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

CO1: Explicate the impurities present in raw water, problems associated and how to avoid them

CO2: Explicate the advantages of Polymers in daily life

CO3: Explicate the theory of construction of battery and fuel cells and theories of corrosion and prevention methods.

CO4: Differentiate conventional and non-conventional energy sources and their advantages and disadvantages.

CO5: Identify the usage of advanced materials in day to day life

UNIT I: WATER TECHNOLOGY

Part-A

Hard water-Types of hardness-Units of Hard Water-Disadvantages of hard water-Determination of hardness by EDTA complexometric method.

Portable water- its specifications-steps involved in purification of water (Sedimentation, Filtration, Disinfection)-chlorination, break point of chlorination.

Boiler Feed Water-Boiler troubles: Scale and sludge-priming and foaming-boiler corrosion-caustic embrittlement.

Part-B

Industrial Water Treatment: Softening methods: zeolite process-ion exchange process.

Brackish water treatment (desalination methods): Reverse osmosis - electro dialysis.

Learning Outcomes: At the end of this unit, the students will be able to Explicate

The impurities present in raw water, problems associated with them and how to avoidthem

UNIT-II: POLYMERS AND COMPOSITE MATERIALS

Part-A

Polymers-degree of polymerization-functionality-preparation, properties and applications of individual polymers-Bakelite-PVC-Poly styrene.

Plastics: Types (thermosetting and thermoplastic)-compounding of plastics-moulding Process. (Injection moulding, Compression moulding, Extrusion moulding, Transfer moulding)

Part-B

Rubbers and elastomers: Introduction-natural rubber-vulcanization of rubber-synthetic rubbers-Buna-N, Buna-S.

Composite materials: Fiber reinforced plastics-biodegradable polymers-biomedical polymers, Recycling of e-waste.

Learning Outcomes: At the end of this unit, the students will be able to

- **Outline** the properties of polymers and various additives added and different methods of forming plastic materials.
- **Explicate** the preparation, properties and applications of some plastic materials.
- **Discuss** natural and synthetic rubbers and their applications.

UNIT III: ELECTRO CHEMICAL CELLS AND CORROSION

Electrochemical Cells: Introduction–single electrode potential - electrochemical cell-electrochemical series and applications. Reference electrodes-standard hydrogen electrode and calomel electrode-construction of glass electrode. Batteries: Construction, working and cell reaction of primary (dry cell) and Secondary (Pb acid and Li-ion) battery. Fuel cells (H_2-O_2, Methanol-Air cells).

Corrosion: Cause and consequences of corrosion-theories of corrosion (Chemical and Electrochemical corrosion)-types of corrosion (Galvanic, Differential aeration (waterline and pitting corrosion), stress Corrosion). Factors influencing rate of corrosion-nature of metal-nature of corrosive atmosphere. Corrosion Prevention methods: Cathodic protection-Sacrificial anodic method-Impressed voltage method. Metallic coatings: Galvanization-Tinning-Electro plating-Electro less plating.

Learning Outcomes: At the end of this unit, the students will be able to

- **Explicate** the theory of construction of battery and fuel cells.
- **Categorize** the reasons for corrosion and study some methods of corrosion control.

UNIT IV: CONVENTIONAL AND NONCONVENTIONAL ENERGY RESOURCES

Conventional energy sources: Classification and characteristics of fuels-solid, Liquid and gaseous fuels-advantages and disadvantages-calorific value-higher and lower calorific values-construction and working of bomb calorimeter-analysis of coal-proximate and ultimate analysis-numerical problems related to bomb calorimeter, Dulong's formula and coal analysis-petroleum refining-cracking – petrol and diesel knocking – octane number and cetane number – gaseous fuels – Natural gas – CNG - LPG

Non-conventional energy sources: Solar energy: Advantages-disadvantages of solar cells-construction and working of photo voltaic cell -Introduction to hydro power-geo thermal power-tidal and wave power.

Learning Outcomes: At the end of this unit, the students will be able to

- **Differentiate** conventional and non-conventional energy sources and their advantages and disadvantages.
- **design** sources of energy by different natural sources

UNIT V: CHEMISTRY OF MATERIALS

Part-A

Nano materials: Introduction-sol-gel method-characterization by SEM and TEM methods- carbon nanotubes and fullerenes: Types, preparation and applications

Semiconductors: Preparation (Distillation, Zone refining)

Part-B

Cement: Constituents of cement -Setting and Hardening of cement - Decay of Cement.

Refractories: Definition of refractory-classification and properties of refractoriness-applications of refractories.

Learning Outcomes: At the end of this unit, the students will be able to

- **Outline** the awareness of materials like nanomaterials and fullerenes and their uses.
- **Explicate** the techniques that detect and measure the surface properties of materials.
- **Illustrate** the commonly used industrial materials.

Text Books:

T1. A Text Book of Engineering Chemistry -N. Y. S. Murthy, V. Anuradha& K. Ramana Rao, Maruthi Publications. (2018)

T2. A Text Book of Engineering Chemistry - K. SeshaMaheswaramma, MridulaChugh,Pearson Publications (2018).

Reference Books:

R1. Engineering Chemistry – Jain & Jain, Dhanpat Rai Publishing Company (Latest Edition)

R2. Text Book of Engineering Chemistry - Shashi Chawla, Dhanpat Rai & Co. (P) Limited ((Latest Edition))

R3. Chemistry–PrasantaRath, SubhenduChakroborthy, Cengage publications (2018)

II SEMESTER	L	T	P	C
	3	-	-	3
20HS2T01: ENGLISH				

A. PROGRAMMECONTENT

1 Intensive and extensive reading
2 Writtencommunication
3 Listening and oral communication
4 Vocabularyconsolidationandexpansion
5 Practicing grammar

B. ELABORATIONOF THEPROGRAMMECONTENT

1. **Intensive and Extensive Reading**
   a. Identifyingthemaintheme/thecentralideaofapassage
   b. Understandingthemeaningofwords, phrases andsentencesincontext
   c. Understandingthelogicalrelationshipbetweensentences(throughrecognitionof grammatical structures suchaslinkers andconnectors)
   d. Distinguishing statementsof fact from beliefs, opinions, hypotheses, and expressions of probabilityandcertainty
   e. Inferringfacts,opinions,instances,reasons,causes,results,requests,conclusions, andgeneral statements
   f. Skimmingpassages toidentifygeneralideasandinformation
   g. Scanningpassagestolocatespecificdetail
   h. Theuseofone'sknowledge,opinions,andimaginationtoprovideinformation/ situations relatedtothatgiveninthetext;andcomparisonandcontrast.
2. **WrittenCommunication**
   a. Writing outlines and summaries
   b. Writing paragraphs with attention to topic sentences and supporting sentences
   c. Writing paragraphs with attention to coherence and cohesion
   d. Practicingclutter-freewriting

3.**ListeningandOralCommunication**

a. Effectivelisteninginvolving
   - Identificationofkeywordsandphrasesandspecificinformation, applicationofone'spreviousknowledgeoftounderstandtheideasdealtwith inthetextbeinglistenedto.
   - Attentiontocommunicationstrategiessuchasapproachinganotherpersonand openingaconversationwithhim/hermakingfriendswithastranger,thanking,
   - Apologizing,payingacompliment,seekingclarification,makingenquiries,andcreatinganappropriatecontextforaformaldiscussion.

b. Takingpartinspeakingactivitiesforinteractionalpurposessuchas,
   - Introducingoneselftoothers,introducingothers,makingenquiries,seekinginformation
   - Respondingtoenquiries,supplyinginformation
   - Expressingagreement/disagreementininformation situations

c. Takingpartinspeakingactivitiesfortransactionalpurposeswithattentiontothe communicationstrategieslistedin1(a)above.

4. Vocabularyconsolidationandexpansion

a. Inferring word meaning from available clues
b. Distinguishing words with similar meanings

c. Using connecting words
d. Learning one-wordsubstitutes

Developingaverbalrepertoirewiththefollowingdimensions:

- Contexts of use
- Collocations
- Differences in speaking and writing
- Strategic use

e. Using strategicvocabulary to organize and manage both oral and written communicationsuccessfullyinacademic,professional,andsocialcontexts
f. Raising one's knowledgeofredundancy, circumlocution, and imprecise and confusingexpressionsinordertoavoidtheminone'sownspeechandwriting.

5. Practicinggrammar

a. Consolidation as wellasremediationinthefollowingareas:
Parts of speech, Tenses and usage of grammar in context
b. LearningtoavoidsomeofthecommonpitfallsintheareaofgrammarinIndianusageof English(e.g.usingthepresentcontinuoustensetodescribeactionswhichhappen regularly;usingstateverbsinthecontinuousform;tensemixing)

C.TEXT BOOK: Building Effective Communication Skills

By Maruthi Publications (2019)

Syllabus:

S No	Content
UNIT –I	**Vocabulary Building** **1.1** Video Lesson 1.2.1 Word formation 1.2.2. Root words 1.2.3. Prefixes and Suffixes 1.2.4. Synonyms and Antonyms **1.3 Parts of Speech** **1.4 Note- making, Note-taking**
UNIT -II	**Basic Writing Skills** **2.1** Video Lesson 2.2.1 Basic sentence structure 2.2.2. Clauses and Phrases 2.2.3 Punctuations 2.2.4 Creating coherence 2.2.5 Organizing principles of paragraph documents 2.2.6 Techniques for writing precisely **2.3 Tenses** **2.4 Letter Writing**
UNIT-III	**Identifying Common Errors in Writing** **3.1** Video Lesson 3.2.1 Sub +verb agreement 3.2.2 Noun pronoun agreement 3.2.3 Articles 3.2.4 Preposition

	3.2.5 Redundancies 3.2.6 Clichés **3.3.1 Active - Passive Voice** **3.3.2 Reported Speech** **3.4 Resume Writing**
UNIT-IV	**Nature and Style of sensible Writing** **4.1** Video Lesson 4.2.1 Describing 4.2.2 Classifying 4.2.3 Writing Introduction and conclusion **4.3.1Conditional Sentences** **4.3.2Degrees of Comparison** **4.4 Email writing**
UNIT-V	**Writing Practice** **5.1** Video Lesson 5.2.1 Comprehension 5.2.2 Precise writing 5.2.3 Essay Writing **5.3Simple Compound and Complex Sentences** **5.4 Report Writing**

IISEMESTER	L	T	P	C
	3	-	-	3
20ME2T02: BASICS OF CIVIL AND MECHANICAL ENGINEERING				

OBJECTIVES

1. This course provides students with fundamental knowledge about civil and mechanical engineering and to learn about infrastructural development.
2. To impart the knowledge about the basicconcepts of fluid properties, types of fluid flow and flow measuring instruments.
3. To introduce the hydraulic machines to the students and its working principle.

OUTCOMES: At the end of this course students can be able to

CO1: Explicate the importance of civil engineering in the infrastructural development of the country.
CO2: Understand different types of construction materials & Masonry.
CO3: Explicate about the properties of fluids, pressure measuring instruments and different types of fluid flow.
CO4: Describe the working of fluid flow measuring instruments and understand the energy losses in the closed conduit flow.
CO5: Explicate about the construction and working principles of pumps and turbines.

CIVIL ENGINEERING

UNIT – I

General Introduction to civil engineering- various disciplines of civil engineering, relevance of civil engineering in the overall infrastructural development of the country- ancient monuments & Modern marvels- Introduction to types of buildings as per NBC.

UNIT – II

Construction Materials: Cement, Aggregates, Mortar, Concrete, Steel, bricks, stones, timber, bitumen.

Masonry- Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry, Cavity and partition walls.

MECHANICAL ENGINEERING

UNIT III

FLUID STATICS: Dimensions and units- physical properties of fluids: Density, specific weight, specific volume, specific gravity, viscosity, surface tension, capillarity- vapour pressure – atmospheric, gauge and vacuum pressure –measurement of pressure: U Tube and Differential manometers.

FLUID KINEMATICS: Types of fluid flow: Steady and unsteady flow, Uniform and non-uniform flows, Laminar and Turbulent flows, Compressible and incompressible flows, Rotational and irrotational flows- discharge-continuity equation for one dimensional flow, simple problems.

UNIT IV

MEASUREMENT OF FLOW: Different types of head in liquid motion, Bernoulli's equation, Pitot tube, venturi meter, orifice meter, simple problems.

CLOSED CONDUIT FLOW: Reynold's experiment, Loss of energy in pipes, major energy losses,Darcyweisbach equation, Minor losses in pipes, pipes in series and pipes in parallel, Total energy line-hydraulic gradient line, simple problems in flow through pipes.

UNIT V

PUMPS: classification of pumps, centrifugal pump, multi stage centrifugal pump, pumps in parallel,cavitations, priming, working of a single acting and double acting reciprocating pump, air vessel, comparison of reciprocating pump with centrifugal pump

HYDRAULIC TURBINE: Classification of Hydraulic Turbines, , construction and working of Pelton wheel, Francis and Kaplan turbines,Difference between Impulse and Reaction Turbine.

TEXT BOOKS:

1. Palanichamy. M.S., "Basic Civil Engineering", Tata McGraw-Hill Publishing company limited, New Delhi, 2002.
2. P.K.Nag, KartikeyaTripathi, C.B.Pawar, "Basic Mechanical Engineering",McGraw-Hill Education (India) Pvt Limited, 2009.
3. Rajput.R. K., "A Textbook of Fluid Mechanics and Hydraulic Machines", India: S CHAND & Company Limited, 2015.
4. Seth, S. M.., Modi, P. N., "Hydraulics And Fluid Mechanics Including Hydraulics Machines", India: Standard Book House, 2002.

REFERENCE BOOKS:

1. National Building Code, BIS, (2017)
2. R.K. Rajput, "Fundamentals of Mechanical Engineering", Laxmi Publications Pvt Ltd, 2017.
3. Agrawal C. M. Agrawal Basant, "Basics of Mechanical Engineering", Wiley India Pvt. Ltd,2011.

II SEMESTER	L	T	P	C
	3	-	-	3
20EE2T02: ELECTRICAL NETWORKS				

Course Outcomes: ***After successful completion of this course, students should be able to:***

CO1: Define the basic concepts of Electrical circuits

CO2: Demonstrate the Single Phase AC circuits.

CO3: Interpret the behavior of the circuit at series & parallel resonance circuits

CO4: Explicate the properties of electromagnetic circuit and their application.

CO5: Illustrate the Network Theorems(DC & AC Excitation)

SYLLABUS

UNIT-I : FUNDAMENTALS OF ELECTRICAL CIRCUITS

Basic Concepts of Active and Passive Components and their V-I Relations - Ohm's and Kirchhoff's laws ,Dependent and Independent Sources- Source Transformation Technique - Network Reduction Techniques(series, parallel, series - parallel, star-to-delta and delta-to-star transformation), Nodal Analysis and Mesh Analysis

UNIT-II : SINGLE PHASE A.C CIRCUITS

Periodic waveforms (determination of rms, average value and form factor), concept of phasor, phase angle and phase difference, complex and polar forms of representations-Concept of Reactance, Impedance, Susceptance and Admittance. Steady state analysis of R, L and C circuits (Series & Parallel Circuits), power factor and its significance.

UNIT-III : RESONANCE - LOCUS DIAGRAMS

Resonance: Series and parallel resonance, Concept of Band Width and Quality Factor ,Problems
Locus diagram for various combinations of Series RL, RC, RLC Circuits & Parallel Circuits

UNIT-IV : MAGNETIC CIRCUITS

Basic Definition of MMF, Flux and Reluctance, Analogy Between Electrical and Magnetic Circuits, Faraday's Laws of Electromagnetic Induction ,Concept of Self and Mutual Inductance, Dot Convention, Coefficient of Coupling and Composite Magnetic Circuit, Analysis of Series and Parallel Magnetic Circuits.

UNIT-V : NETWORK THEOREMS (DC & AC EXCITATION)

Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem, Millman's Theorem and Compensation Theorem.

TEXT BOOKS:

1. Fundamentals of Electric Circuits "Charles K.Alexander, Mathew N.O.Sadiku, TataMcGraw-Hill sixth edition-2019.
2. Circuits & Networks Analysis & Synthesis by A. Sudhakar and Shyammohan S Palli,TataMcGraw- Hill Fifth edition-2017.

3. Circuit Theory by A.ChakrabartiDanapat Rai & Co publisher.Seventh - Revised edition(2018).

REFERENCE BOOKS:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw HillCompany,6th edition Eighth edition (4 August 2013)
2. Network Analysis by N.C.Jagan, C.Lakshmi Narayana BS publications 2nd edition -2017
3. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.Third edition, 2019.

II SEMESTER	L	T	P	C
	-	-	3	1.5
20BS2L02: ENGINEERING CHEMISTRY LAB				

Course Outcomes: ***After successful completion of this course, students should be able to:***

1. Identify the concentration of given solution by different methods of chemical analysis
2. Analyze the water purity by checking hardness, DO and Acidity.
3. Estimate the Cu+2, Fe+3, Ca+2, Mg+2 ions and Ascorbic acid present in given solution.
4. Identify the pour and cloud point of lubricants.
5. Understand the principles of conductometric and potentiometric titrations.

Thus at the end of the lab course, the student is exposed and able to

1. Identify the concentration of given solution by different methods of chemical analysis (**K3**)
2. Analyze the water purity by checking hardness, DO and Acidity. (**K4**)
3. Estimate the Cu^{+2}, Fe^{+3}, Ca^{+2}, Mg^{+2} ions and Ascorbic acid present in given solution. (**K4**)
4. Identify the pour and cloud point of lubricants. **(K3)**
5. Understand the principles of conductometric and potentiometric titrations. (**K2**)

Syllabus:

1. Estimation of HCl using standard Na_2CO_3 through acid-base titration.
2. Estimate the total hardness of water using standardized EDTA solution through complexometrictitration.
3. Estimation of $KMnO_4$ using standard $H_2C_2O_4$ through redox titration method.
4. Estimation of Dissolved Oxygen in given water sample by Wrinkler's Method
5. Determination of Ferric (Fe^{+3}) ions using standard $K_2Cr_2O_7$ solution
6. Determination of Copper (II) using standard hypo solution.
7. Estimation of strong acid by using strong base through conductometric titration method.
8. Estimation of strong acid by using strong base through potentiometric titration method.
9. Preparation of polymer (Demo).
10. Determination of Vitamin 'C'.
11. Determination of Pour and Cloud Point of lubricating oils

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

II SEMESTER	L	T	P	C
	-	-	3	1.5
20IT2L01-IT WORKSHOP				

Course Objectives:

- The course focuses on enhancing student knowledge in computer peripherals and assembling.
- To install operating system on computers and create new email account.
- To understand basic software like WinRAR, WinZip, PDF readers and web browser.
- To provide technical training to the students on Google tools like forms, calendar, drive, and classroom.

Course Outcomes:

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

B Attain complete knowledge of a computer hardware
C Able to install basic computer engineering software.
D Able to do document task through MS office.
E Attain technically strong usage of Google Tools and Email handling.
F Able to understand network troubleshooting.

LIST OF EXPERIMENTS

1. Components of Computer & Assembling a Computer:

Learning about the different parts of the computer and its advancement

- Processor
- Memory – Types
- Motherboard
- Peripheral interfaces – I/O devices

2. Components of Computer & Assembling a Computer:

- Learn about the proper connectivity among the devices inside the PC
- Assembling the different parts of the computer inside the cabinet

3. Productivity Tools - Learning Basic Software:

- Installation of Productivity tools like WinRAR, WinZip, and PDF Reader.
- Installation of Application programs like Microsoft Office, Image Editor and Web browsers.
- Connect the Printer and Scanner Devices perform printing and scanning operation.

4. Productivity Tools:

Microsoft-Word orientation –To create project certificate, Formatting Fonts, Drop Cap,Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option.

5. Productivity Tools:

Microsoft-Word orientation- Mail Merge, Macros, References.

6. Productivity Tools:

Microsoft-PowerPoint utilities - PPT Orientation, Slide Layouts, Inserting Text, Word Art,Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks, Inserting Images, Clip Art, Audio, Video, Objects, Tables and Charts.

7. Productivity Tools:

Microsoft-Excel orientation - Gridlines, Format Cells, Summation, auto fill, Formatting Text,Cell Referencing, Formulae in excel – average, std.deviation etc., Macros.

8. Productivity Tools:

Microsoft-Excel orientation- Charts, Hyper linking, Split cells, freeze panes, group and outline, Conditional formatting, Sort and Filter, .csv file.

9. **Introduction to Google Tools:**

- Design a Google form and collect a response data among students using Google Form.
- Schedule one day of your activities using Google Calendar.
- Store and retrieve data from cloud storage using Google Drive.
- Orientation towards Google Classroom.

10. **Network basics:**

Introduction, Types of networks, IP addressing, LAN, Network troubleshooting.

II SEMESTER	L	T	P	C
	-	-	3	1.5
20ME2L02: BASICS OF CIVIL AND MECHANICAL ENGINEERING LAB				

Course Outcomes: ***After successful completion of this course, students should be able to:***

1. The Student can able to, determine the friction factor of pipe line.
2. The student can able to calibrate venturi meter
3. Able to conduct performance test on single stage centrifugal pump
4. Able to determine finesse modules of cement
5. Able to determine particle size distribution of fine aggerates by sieve analysis

Able to determine particle size distribution of course aggerates

LIST OF EXPERIMENTS

1. Determination of friction factor for a given pipeline.
2. Calibration of Venturimeter.
3. Performance Test on Single Stage Centrifugal Pump.
4. Determination of the fineness of cement by sieving.
5. Determination of particle size distribution of fine aggregate and fineness modulus by sieve analysis.
6. Determination of particle size distribution of coarse aggregate and fineness modulus by sieve analysis

II SEMESTER	L	T	P	C
	-	-	3	1.5
20HS2L02: ENGLISH COMMUNICATIONS LAB				

COURSE OBJECTIVES

- To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
- To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
- To assist students to carry on the tasks and activities through guided instructions and materials.
- To effectively integrate English language learning with employability skills and training.
- To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

COURSE OUTCOMES

a) Reading Skills.

- Addressing explicit and implicit meaning of a text.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

b) Writing Skills:

- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, E-Mails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.

c) Interactive skills:

- Analyzing a topic of discussion and relating to it.
- Participating in discussions and influencing them.
- Communicating ideas effectively.
- Presenting ideas coherently within a stipulated time.

d) Life Skills and Core Skills:

- Examining self-attributes and identifying areas that require improvement self-diagnosis, self-motivation.
- Adopting to a given situation and developing a functional approach to find solutions-adaptability, problem-solving.
- Understanding the importance of helping others-community service, enthusiasm.

RELATIONSHIP OF COURSE TO PROGRAMME OUTCOMES

A	Ability to apply knowledge of mathematics, science, and engineering.	
B	Ability to design and conduct experiments, as well as to analyze and interpret data.	
C	Ability to design anEngineering system, component, or process.	
D	Ability to function on multi-disciplinary teams	
E	Ability to identify, formulate and solve engineering problems.	
F	Understanding of professional and ethical responsibility.	
G	Ability to communicate effectively	√
H	Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.	√
I	Recognition of the need for and an ability to engage in life-long learning.	
J	Knowledge of contemporary issues.	
K	Ability to use the techniques, skills, and modern engineering tools necessary for engineering practices.	
L	Ability to find location of substations and benefits derived through their optimal location.	

COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice English language in order to acquire proficiency in English. 'Enrich your interactive Skills: Part - A' is designed to provide opportunities for engineering students to revise and consolidate the basic skills in listening, speaking, reading and writing in addition to giving ample practice in various communicative functions and Life skills.

PREREQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

Syllabus

UNIT	TOPIC
1	Vowels, Consonants, Pronunciation, Phonetic transcripts
2	Word stress and syllables
3	Rhythm and Intonation
4	Contrastive Stress –Homographs
5	Word Stress : Weak and Strong forms , Stress in compound words

Text Book:

"InfoTech English" by Maruthi Publications

Reference Books:

1. Better English Pronunciation by O' Connor
2. Phonetics and Phonology – Peter Roach
3. A Grammar of Spoken English – Harold Palmer
4. English Phonetics – Bansal and Harrison

Testing Pattern:

A) Internal lab Exam: **30 Marks**

Regular performance in the language /communication /lab completion in the lab manual 15M

Written test 15M

B) External lab Exam Pattern: **70 Marks**

Written test 30M

Oral test 30M

Viva(during exam marks will be awarded by external examiner) 10M

III SEMESTER	L	T	P	C
	3	-	-	3
20MA3T04: TRANSFORMS TECHNIQUES				

Course Objectives:

The objective of this course is to enlighten the learners in the concept of differential equations, differentiation, integration and ordinary differential equations.

Unit I: Laplace Transforms

Introduction – definition – conditions for the existence, Laplace transforms of elementary functions, properties of Laplace transforms, Laplace Transforms of derivatives and integrals, multiplication by t^n , division by t, evaluation of integrals by Laplace transforms.

Learning Outcomes:

After the completion of this unit student will be able to

- examine the properties of Laplace transforms (K3)
- Apply the Laplace transforms for different types of functions(K3)

Unit II: Inverse Laplace Transforms

Introduction – definition, method of partial fractions, other methods of finding inverse transforms, Convolution theorem, Application to differential equations.

Learning Outcomes:

After the completion of this unit student will be able to

- Apply the Inverse Laplace transforms for different types of functions(K3)

Unit III: Fourier Series

Definition, Euler's formulae, Conditions for Fourier expansion, functions having points of discontinuity, change of interval, Odd and Even functions-expansions of odd and even periodic functions, Half- range series.

Learning Outcomes:

After the completion of this unit student will be able to

- evaluate the Fourier series expansions for different periodic functions (K3)

Unit IV: Fourier Transforms

Introduction, Definition, Fourier integrals- Fourier Sine and cosine integrals, Fourier Transforms, Fourier Sine and cosine Transforms, properties of Fourier Transforms, convolution theorem for Fourier Transforms (without proof).

Learning Outcomes:

After the completion of this unit student will be able to

- Understand the nature of the Fourier series that represents even and odd functions and how the derivation of a Fourier series can be simplified in this way (K3)

Unit V: **Z- transforms**

Introduction – definition, some standard Z-transforms, Properties – Linearity, damping rule, shifting rules, multiplication by n, Initial and final value theorems, Inverse Z- transforms, Convolution theorem, Evaluation of inverse Z –transforms -Partial fraction method, Application to difference equations.

Learning Outcomes:

After the completion of this unit student will be able to

- examine the properties of Z-transforms (K3)

- evaluate the difference equations by using Z-transforms technique (K3)

Course Outcomes:

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

1. solve many problems in engineering with the knowledge of Laplace transforms (K3)
2. apply the Inverse Laplace transforms for different types of functions(K3)
3. express a function as a Fourier series (K3)
4. state how the Fourier Transforms of a function depends on whether that function is even or odd or neither.(K3)
5. solve the problems on Z-transforms and Fourier transforms (K1,K3)

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, 43/e Khanna Publishers 2015

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2013
2. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill, 2007.

III SEMESTER	L	T	P	C
	3	-	-	3
20EE3T01: ELECTRICAL CIRCUITS & SYNTHESIS				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1 : Solve three phase circuits under balanced & unbalanced condition [K3]

CO2 : Illustrate transient response of electrical circuits for DC excitations [K2]

CO3 : Illustrate transient response of electrical circuits for AC excitations [K2]

CO4 : Design different kinds of two port networks filter circuits. [K6]

CO5 : Define network functions and Synthesize networks using Foster and Cauer Forms [K1]

SYLLABUS

UNIT-I : THREE PHASE CIRCUITS

Balanced Three Phase Circuits: Phase Sequence –Relation Between Line and Phase Voltages, and Currents in Star and Delta Connected System-Analysis of Balanced Three Phase System- Measurement of Active and Reactive Power in Three Phase Systems.

Unbalanced Three Phase Circuits: Analysis of Three Phase Unbalanced System-Loop Method – Star –Delta Transformation Technique-Two Wattmeter Method for Measurement of Three Phase Power

UNIT-II : D.C TRANSIENT ANALYSIS

Transient response of R-L, R-C, R-L-C series circuits for D.C excitation-Initial conditions-solution method using differential equation and laplace transforms

UNIT-III : A.C TRANSIENT ANALYSIS

Transient response of R-L, R-C, R-L-C series circuits for sinusoidal excitations-Initial conditions-Solution method using differential equations and laplace transforms

UNIT-IV : TWO PORT NETWORKS

Two Port Network Parameters –Z, Y, ABCD and Hybrid Parameters and their Relations, Cascaded Networks-Pole and Zeros of Network Functions

UNIT-V : NETWORK SYNTHESIS

Positive Real Function - Basic Synthesis Procedure - LC Immittance Functions- RC Impedance Functions and RL Admittance Function - RL Impedance Function and RC Admittance Function - Foster and CauerMethods.

TEXT BOOKS:

1. Engineering circuit analysis by William Hayt and Jack E.Kemmerley, Mc Graw Hill Company, 6th edition.

2. Network synthesis: Van Valkenburg; Prentice-Hall of India Private Ltd.

3. Circuit Theory (Analysis and Synthesis) by A.chakrabarthi, Dhanpat Rai& co.

REFERENCE BOOKS:

1. Networks Analysis by A. Sudhakar, ShyammohanS.Pillai, The McGraw-Hill Companies.
2. Introduction to circuit analysis and design by Tildon Glisson, Jr, Springer Publications.
3. Circuits by A.Bruce Carlson , Cengage Learning Publications.
4. Network Theory Analysis and Synthesis by Smarajit Ghosh, PHI publications.
5. Networks and Systems by D. Roy Choudhury, New Age International publishers.
6. Electric Circuits by David A. Bell, Oxford publications.

III SEMESTER	L	T	P	C
	3	-	-	3
20EE3T02: ELECTROMAGNETIC FIELD				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1 : Evaluate electric fields & potentials using Gauss law or solve Laplace's or Poisson's equations

CO2 : Apply the concepts of conductors, dielectrics and capacitance in electrostatic fields

CO3 : Explicate the application of Ampere's law, Maxwell's second and third law

CO4 : Evaluate self &mutual inductances and the energy stored in the magnetic field.

CO5 : Develop knowledge on time varying fields.

SYLLABUS

UNIT-I : ELECTROSTATIC FIELDS

Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge, Electric flux density, Guass's law – Maxwell's first law (div(D)=ρv) , work done in moving a point charge in an electrostatic field, electric potential – potential gradient, Laplace's and Poison's equations.

UNIT-II : CONDUCTORS, DIELECTRICS &CAPACITANCE

Electric dipole – dipole moment – potential and EFI due to an electric dipole, Torque on an Electric dipole in an electric field, conductors and Insulators – their behavior in electric field.

Polarization, boundary conditions. Capacitance of parallel plates, energy stored and energy density in a static electric field, current density, conduction and convection current densities, Ohm's law in point form – equation of continuity.

UNIT-III : MAGNETOSTATIC FIELDS

Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Maxwell's second Equation (div(B)=0).

Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law,Maxwell's third equation (Curl (H)=J).

Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic torque , Magnetic moment and Magnetic dipole

UNIT-IV : SELF AND MUTUAL INDUCTANCE

Determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field.

UNIT-V : TIME VARYING FIELDS

Faraday's laws of electromagnetic induction – integral and point forms, Maxwell's fourth equation (Curl(E)=-∂B/∂t), statically and dynamically induced EMF –Maxwell's equations for time varying fields, displacement current, Poynting

theorem and Poynting vector.

TEXT BOOKS:

1. "EngineeringElectromagnetics" by William H. Hayt& John. A. Buck Mc. Graw-Hill Companies,7th Editon.2006.

2. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd edition.

3. " Principles of Electro Magnetics" by Sadiku, Oxford Publications,4th edition.

REFERENCE BOOKS:

1. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt.Ltd,2nd edition.

2. "Electromagnetic Field Theory" by YaduvirSingh,Pearson.

3. Fundamentals of Engineering Electromagnetics by Sunil Bhooshan,Oxford higher Education.

III SEMESTER	L	T	P	C
	3	-	-	3
20EE3T03: ELECTRICAL MACHINES-I				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Explicate the concepts of D.C Machines& and its applications

CO2: Explicate Various losses taking place in D.C. Machines

CO3: Demonstrate the different testing methods Dc Machines

CO4: Explicate the operation& Performance of transformer

CO5: Explicate About performance of Three face Transformer

SYLLABUS

UNIT-I: INTRODUCTION TO DC MACHINES

Construction and principle of operation of DC machine – Emf equation for generator – classification of DC machines - Types and applications of DC Generators.

D.C Motors – Principle of operation – Back E.M.F. - Torque equation, Types of DC motors – Applications of DC motor

UNIT-II: PERFORMANCE OF D.C. MACHINES

Armature reaction and commutation – characteristics of separately-excited, shunt, series and compound motors – losses and efficiency

Necessity of a starter – starting by 3 point and 4-point starters

UNIT-III: TESTING OF D.C. MACHINES &SINGLE-PHASE TRANSFORMERS

TESTING OF D. C. MACHINES "Speed control by armature voltage and field control – testing of DC machines – brake test, Swinburne's method– separation of losses.

SINGLE-PHASE TRANSFORMERS "Types and constructional details – principle of operation –emf equation – operation on no load and on load – lagging, leading and unity power factors loads –phasor diagrams of transformers – equivalent circuit

UNIT-IV: PERFORMANCE AND TESTING OF TRANSFORMERS

Regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency.

Tests on single phase transformers – open circuit and short circuit tests – Sumpner's test – separation of losses – parallel operation with equal voltage ratios – auto transformer – equivalent circuit – comparison with two winding transformers.

UNIT-V: 3-PHASE TRANSFORMER

Polyphase connections- Y/Y, Y/ Δ, Δ/Y, Δ/ Δ and open Δ- third harmonics in phase voltages – three winding transformers- transients in switching –off load and on load tap changers- Scott connection.

TEXT BOOKS:

1. Electrical Machines by P.S. Bhimbra, Khanna Publishers
2. Electric Machinery by A.E.Fitzgerald,Charleskingsley,StephenD.Umans, TMH

3. Electrical Machines by D. P.Kothari, I .J .Nagarth,McGraw Hill Publications, 4th Edition.
4. Theory & Performance of Electrical Machines by J.B.Guptha. S.K.Kataria& Sons

REFERENCE BOOKS:

1. Electrical Machines by R.K.Rajput, Lakshmi publications, 5th edition.
2. Electrical Machinery by AbijithChakrabarthi and SudhiptaDebnath, Mc Graw Hill education 2015
3. Electrical Machinery Fundamentals by Stephen J Chapman Mc Graw Hill education2010
4. Electric Machines by MulukutlaS.Sarma&Mukeshk.Pathak, CENGAGE Learning.

III SEMESTER	L	T	P	C
	3	-	-	3
20EC3T05: ANALOGELECTRONICS				

COURSEOUTCOMES

After completion of the course students are able to

CO1: Explicate the characteristics of different semiconductor diodes and its applications

CO2: Describe the characteristics of Transistors, FET and biasing.

CO3: Construct the wave shaping circuits of non-sinusoidal signals.

CO4: Analyze and design the Multi vibrators using BJT

UNIT-I

SEMICONDUCTORDIODES AND IT'sAPPLICATIONS

Band structure of PN junction, Diode currentcomponents, Volt-amperecharacteristics, Transitionanddiffusion capacitance of p-n junction diode, Breakdown of junctions, Zener and Avalanchebreakdowns,TunnelDiodeConstruction,operationandcharacteristics.DiodeasaSwitch.Rectifiers:Halfwave,fullwave:center tap and bridge type, analysis for different parameters: PIV, TUF, efficiency, ripple factor, regulation,etc.CapacitiveFilteranalysis forripple factor.

UNIT-II

JUNCTIONTRANSISTORCHARACTERISTICS ANDBIASING

PNP and NPN junction transistors, Characteristics of the current flow across the base regions, Transistor as adevice in CB, CE and CC configurations and their characteristics. The operating Point, DC & AC load lines,Fixed Bias and problems, Collector FeedbackBias, Emitter Feed Back Bias, Self Biasandproblems,Stabilization,variousstabilizationcircuits,Transistor as aSwitch.

UNIT–III

FETS&UJT CHARACTERISTICS

FET types, construction, operation, characteristics, parameters, MOSFET-construction, characteristics andcomparative study of Enhancement and Depletion MOSFET (P-channel& N-channel).Comparison betweenJFET and MOSFET.FET & Constructionand working of Uni- Junction Transistor and its characteristics,UJTas relaxation oscillator

UNIT-IV

WAVESHAPINGCIRCUITS

Low pass & high pass RC circuits (step response & square), High pass RC circuit asDifferentiator,Lowpasses RC circuit as integrator.

Clippingcircuits:Classification,diodeclippers,ZenerdiodeclippersTransfercharacteristics,Clampingcircuits:Classification,clampingoperations, Clamping circuit theorem, practicalclampingcircuits.

UNIT-V

OSCILLATORS

Oscillator principle, types of oscillators, RC-phase shift and Wein-bridge oscillator, Generalized analysis ofLCOscillators, Hartley and Colpitt's oscillatorsandCrystal oscillator.

TEXTBOOKS:

1. SanjeevGupta–'Electronicdevices&circuits'-DhanpatRaiPublicationsIVEdition.,2012.
2. A.AnandKumar-Pulse and Digital Circuits,PHI.-IVEdition,2005.
3. S. Salivahanan, N. Suresh Kumar and A. Vallava Raj, "Electronic Devices and circuits", TMH, 2ndEdition 2008.

e-RESOURCES:

https://www.electronicsforu.com/resources/electronic-devices-and-circuit-theory

https://www.elprocus.com/types-of-clipper-and-clamper-circuits-and-applications

SEMESTER III	L	T	P	C
	-	-	3	1.5
20EC3L04: ANALOG ELECTRONICS LAB				

COURSE OUTCOMES:

After completion of the course students are able to

CO1: Describe the diode, FET and transistor characteristics

CO2: Explicate the rectifier circuits using diodes and implement them using hardware.

CO3: Construct various Linear and Non-Linear wave shaping circuits and implement them using hardware, also observe their responses for different input signals

C04: Analyze the switching characteristics and generate non-sinusoidal waveforms using Transistor circuits.

PART A: (Only for viva voce Examination)

ELECTRONIC WORKSHOP PRACTICE (in 2 lab sessions):

1. Study of basic electronic components-active/passive, meters, DC & AC sources, Switches, Breadboard,etc.
2. Study and operation of a) Multimeters (Analog and Digital) b) Function Generator c) Regulated Power Supplies d) Study and Operation of CRO.

PART B: (Any ten experiments)

1. PN Junction diode characteristics a) Forward bias b) Reverse bias (cut-in voltage &Resistance calculations).
2. Zener Diode regulation characteristics.
3. Transistor CB characteristics (Input and Output)
4. Transistor CE characteristics (Input and Output).
5. Half wave Rectifier without and with filter.
6. Full wave Rectifier without and with filter.
7. FET characteristics (Drain and Transfer)
8. Wave Shaping Circuits: RC Low Pass & High Pass Circuits.
9. Clippers using Diodes
10. Clampers.
11. Transistor acts as a Switch.
12. RC phase shift oscillator
13. Collpits oscillator
14. Hartely oscillator

List of Experiments: (Content Beyond the syllabus)

1. LED Characteristics
2. Characteristics of SCR
3. UJT Characteristics

Equipment Required for Laboratory:

1. Regulated Power supplies (RPS) - 0-30v
2. CROs - 0-20 MHz

3. Function Generators - 0-1 M Hz
4. Multimeters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes.
7. Micro Ammeters (Analog or Digital) - 0-20μA, 0-50μA, 0-100μA, 0-200μA
8. Voltmeters (Analog or Digital) - 0-50V, 0-100V, 0-250V
9. Electronic Components - Resistors, Capacitors, BJTs, PN diode, Zener diode, Photo diode, FETs, diodes (Ge & Si Type), transistors (NPN & PNP)

III SEMESTER	L	T	P	C
	-	-	3	1.5
20EE3L01: ELECTRICAL CIRCUITS LAB				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Explicate about basics electrical circuits with nodal and mesh analysis.

CO2: Determine the resonant Frequency, quality factor & bandwidth of the RLC circuits

CO3: Solve and verify electrical network theorems

C04: Determine Self and Mutual Inductance

CO5: Determine the Impedance, Admittance, Transmission and hybrid parameters for a two-port network

LIST OF EXPERIMENTS

(Any 10 of the following experiments has to be conducted)

1. Verification of KCL & KVL.
2. Mesh Analysis & Nodal Analysis
3. Series and Parallel Resonance
4. Determination of time constants of R-L, R-C networks using CRO.
5. Locus Diagrams of R-L(L Variable) and R-C (C Variable) series circuits
6. Determination of Self, Mutual Inductances and coefficient of coupling.
7. Verification of Superposition theorem
8. Verification of Maximum power transfer theorem
9. Verification of Thevenin's and Norton's Theorems
10. Verification of compensation Theorem
11. Verification of Reciprocity andMillimann's Theorems.
12. Determination of Impedance (Z)& Admittance (Y) Parameters for a two port network
13. Determination of Transmission and hybrid parameters for a two port network

REFERENCE BOOKS:

1. Department lab manual.

III SEMESTER	L	T	P	C
	-	-	3	1.5
20EE3L02: ELECTRICAL MACHINES-I LAB				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Explicate and analyze DC Machine [K2]
CO2: Analyze and understand the operation and characteristics of DC Motor [K4]
CO3: Demonstrate No-load/magnetization characteristics of DC Generators [K2]
CO4: Demonstrate the OC & SC Test on 1-Ph transformer [K2]
CO5: Determine the efficiency and Regulation of Transformer by various tests [K5]

LIST OF EXPERIMENTS

PART-A

(Do Any 5 Experiments from Part-A)

1. Open Circuit Characteristics of DC Shunt Generator
2. Load Test on DC Shunt Generators.
3. Swinburne's test
4. Brake Test on D.C. Shunt Motor
5. Brake Test on D.C. Series Motor
6. Load Test on DC Series Generators
7. Speed control of D.C. motors using armature control and field control methods

PART-B

(Do Any 5 Experiments from Part-B)

1. Open circuit & Short circuit test on single phase transformer
2. Sumpner's test on two single phase transformers
3. Parallel operation of Single Phase Transformers
4. Separation of core losses of a single phase transformer
5. Scott connection of single phase transformers
6. Load test on single phase transformer
7. To Find The Polarity And Turns Ratio Of A Single Phase Transformer

REFERENCE BOOKS:

1. Department lab manual.

III SEMESTER	L	T	P	C
	-	-	4	2
20EE3S01:DESIGN OF ELECTRICAL CIRCUITS – MATLAB/SIMULINK				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Explicate different types of signals using MATLAB. [K2]

CO2: Determine the responses of R-L, R-C, R-L-C Networks using MATLAB[K5].

CO3: Determine the Impedance (Z) and Admittance (Y) parameters using MATLAB[K5]

CO4: Determine the self and mutual inductances using MATLAB[K5]

CO5: Solve the Network theorems using MATLAB .[K3]

LIST OF EXPERIMENTS

1. Generation of various signals and sequences
2. Verification of Kirchhoff's current law and voltage law using simulation tools.
3. Verification of mesh analysis using simulation tools.
4. Verification of nodal analysis using simulation tools.
5. Determination of average value, rms value, form factor, peak factor of sinusoidal Wave, square wave using simulation tools.
6. Verification of series resonance using simulation tools.
7. Verification of parallel resonance using simulation tools.
8. Verification of self inductance and mutual inductance by using simulation tools.
9. Verification of super position theorem using simulation tools.
10. Verification of reciprocity theorem using simulation tools.
11. Verification of maximum power transfer theorem using simulation tools.
12. Verification of Thevenin's theorem using simulation tools.
13. Verification of Norton's theorem using simulation tools.
14. Verification of compensation theorem using simulation tools.
15. Verification of Milliman's theorem using simulation tools.

Any 10 Experiments has to be conducted

REFERENCE BOOKS:

1. Department lab manual.

III SEMESTER	L	T	P	C
	2	-	-	-
20CE3M01: ENVIRONMENTAL SCIENCE				

UNIT-I: Multidisciplinary nature of Environmental Studies:
Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects;.Role of information technology in environment and human health.
Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-II: Natural Resources:
Natural resources and associated problems. Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT-III: Biodiversity and its conservation:
Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV Environmental Pollution:
Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his wellbeing.
Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V Social Issues and the Environment:
Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.
Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.
The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. K. V. S. G. MuraliKrishna , Environmental Studies,VGS Publishers, Vijayawada, 2010
2. R. Rajagopalan, Environmental Studies, 2nd Edition, Oxford University Press, 2011
3. P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani, Environmental Studies, 2nd Edition , Pearson Education, Chennai,2015

Reference:

1. Deeshita Dave & P. UdayaBhaskar Text Book of Environmental Studies, Cengage Learning, 2011
2. Shaashi Chawla, A Textbook of Environmental Studies, TMH, New Delhi,2017
3. Benny Joseph, Environmental Studies, Tata McGraw Hill Co, New Delhi, 2006
4. Anubha Kaushik, C P Kaushik , Perspectives in Environment Studies, New Age International Publishers, 2014

IV SEMESTER	L	T	P	C
	3	-	-	3
20EC4T`04: DIGITAL ELECTRONICS				

COURSE OUTCOMES:

After completion of the course students are able to

CO1: Describe the different types of number systems and Boolean algebra.(K1)

CO2: Explicate the minimization techniques and universal gates.(K2)

CO3: Construct the logic circuits of various combinational circuits.(K3)

CO4: Explicate the behavior of various sequential circuits.(K2,K4)

UNIT-I

BASICS OF DIGITAL SYSTEMS:

Introduction to Number Systems: Number base conversions, Binary to Octal, Octal to Binary, Binary to Hexadecimal, Hexadecimal to Binary, Unsigned and Signed Binary numbers.1's and 2's complement of binary numbers, Binary codes, Special codes like Gray codes, Excess-3 codes, Binary to Gray code and Gray code to Binary code conversion. Logic gates.

UNIT-II

SIMPLIFICATION OF BOOLEAN FUNCTIONS:

Minimization Techniques: Boolean postulates and laws, De-Morgan's theorems, Principle of Duality, Boolean laws, Canonical and Standard forms.Min-terms, Max terms, Sum of Products (SOP) and Product of Sums (POS), Minimization of Booleanexpressions by using Boolean laws and theorems. Karnaugh map minimization: 3 and 4 variables. Design of all logic gates by using Universal gates

UNIT-III

ARITHMATIC LOGIC CIRCUITS:

Half adder, Half Subtractor, Full adder, Full Subtractor,4-bit Parallel adder, 4-bit Adder/Subtractor, Carry look ahead adder, BCD adder, Excess-3 adder, Magnitude Comparators, Code converters.

UNIT-IV

COMBINATIONAL LOGIC CIRCUITS:

Encoders, Decoders, Priority encoder, Multiplexer, De-multiplexers, Realization of Boolean functions using decoders and multiplexers.Memory devices: Random Access Memory, Read only Memory, Programmable Read only Memory, Programmable Logic Devices: Programmable Logic Array, Programmable Array Logic.

UNIT-V

SEQUENTIAL LOGIC CIRCUITS:

Latches, Flip-Flops: RS, D, JK, T and Master-Slave JK, Truth tables and Excitation tables. Flip-Flop conversions, Synchronous and Asynchronous counters, Up-Down counter, Ring counter and Johnson counter. Shift Registers: SISO, SIPO, PISO, PIPO.

TEXTBOOKS:

1. M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.

REFERENCES:

1. John F.Wakerly, “Digital Design”, Fourth Edition, Pearson/PHI, 2008
2. John.M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2006.
3. Donald P.Leach and Albert Paul Malvino, “Digital Principles and Applications”, 6th Edition, TMH, 2006.

e-RESOURCES:

1. www.pdfdrive.com
2. www.booksboon.com
3. www.manybooks.com

IV SEMESTER	L	T	P	C
	3	-	-	3
20EE4T01: ELECTRCIAL MEASUREMENTS				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Explicate the different electrical instrument used for electrical measurement. [K2]
CO2: Measure the resistances, inductance and capacitance using different bridges [K5]
CO3: Measure various electrical measuring instruments for calculating power [K5]
CO4: Explicate the concept of measuring Energy[K2]
CO5: Classify different Digital meters and Explicate the principles of each device[K5]

SYLLABUS

UNIT-I

MEASURING INSTRUMENTS: Classification – Deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type, dynamometer and electrostatic instruments – Expression for the Deflecting torque and control torque – Errors, compensation, Extension range of instruments – Principles of CT and PT and errors.

UNIT-II

DC AND AC BRIDGES Method of measuring low, medium and high resistance, Wheatstone bridge, Kelvin‘s double bridge, Loss of charge method for measurement of high resistance – Measurement of earth resistance – Measurement of inductance – Maxwell‘s bridge–Hay‘sbridge– Anderson‘sbridge–Measurementofcapacitanceandlossangle– Desauty bridge – ScheringBridge.

UNIT-III

MEASUREMENT OF POWER Measurement of power: Operation and analysis of single phase and three phase dynamometer wattmeter, LPF wattmeter and UPF wattmeter – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems – Type of P.F Meters.

UNIT-IV

MEASUREMENT OF ENERGY Single phase and three phase dynamometer and moving iron type 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– Electrical resonance type frequency meter and Weston type synchroscope

UNIT-V

POTENTIOMETERS& DIGITAL METERS

POTENTIOMETERS: Principle and operation of D.C Crompton’s potentiometer – standardization – Measurement of unknown resistance – current – Voltage. A.C Potentiometers: Polar and coordinate types – Standardization – Applications

DIGITAL METERS: Digital voltmeter – Successive approximation – Measurement of phase difference – frequency – Hysteresis loop using lissajious patterns in CRO – Ramp and integrating type – Digital Frequency meter – Digital multimeter – Digital Tachometer

TEXT BOOKS:

1. Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis,fifth Edition, Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCE BOOKS:

1. Electrical & Electronic Measurement & Instruments by A.K.SawhneyDhanpat Rai & Co.Publications.
2. Electrical and Electronic Measurements and instrumentation by R.K.Rajput, S.Chand.
3. Electrical Measurements by Buckingham and Price, Prentice – Hall
4. Electrical Measurements by Forest K. Harris. John Wiley and Sons
5. Electrical Measurements: Fundamentals, Concepts, Applications by Reissland, M.U, New Age International (P) Limited, Publishers.
6. Electrical and Electronic Measurements by G.K.Banerjee, PHI Learning Private Ltd, New Delhi– 2012.

IV SEMESTER	L	T	P	C
	3	-	-	3
20EE4T02: ELECTRICAL MACHINES-II				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Explicate the Construction and working of 3-ph Induction Motor [K2]

CO2: Determine the Starting, Breaking and speed control of 3- ph induction motor[K5]

CO3: Explicate the Principle, construction, operation of synchronous machine. [K2]

CO4: Examine the Synchronous machine on infinite bus, synchronous motor operation with variable excitation &load[K4]

CO5: Explicate the construction, operation and characteristics of commonly used special purpose machines. [K2]

SYLLABUS

UNIT-I

THREE PHASE INDUCTION MOTORS Introduction-Construction Details of Cage and Wound Rotor Machines - Production of Rotating Magnetic Field -Principle of Operation - Rotor EMF and Rotor Frequency - Rotor Current and Power Factor at Standstill and During Running Conditions - Rotor Power Input, Rotor Copper Loss and Mechanical Power Developed and their Interrelationship – Equivalent Circuit – Phasor Diagram.

UNIT-II

CHARACTERISTICS, STARTING & TESTING METHODS OF INDUCTION MOTORS Torque Equation - Expressions for Maximum Torque and Starting Torque - Torque Slip Characteristic - Double Cage and Deep Bar Rotors - Crawling and Cogging – Speed Control of Induction Motor With *V/f* Method – No Load and Blocked Rotor Tests - Circle Diagram for Predetermination of Performance– Methods of Starting – Starting Current and Torque Calculations – Induction Generator Operation (Qualitative Treatment Only).

UNIT-III

SYNCHRONOUS GENERATORS Introduction-Constructional Features of Alternators –Principle of Operation –Winding Factors-EMF Equation- Synchronous Reactance-Armature Reaction— Predetermination of Voltage Regulation Using E.M.F, M.M.F, Potier Triangle–Parallel Operation– Synchronizing Power-Active and Reactive Power Sharing-Alternator on Infinite Bus Bars-Salient Pole Synchronous Machine –Two Reaction Theory–Operating Characteristics-Capability Curves.

UNIT-IV

SYNCHRONOUS MOTOR Introduction-Constructional Features of synchronous Motor – Principle of Operation- Methods of Starting–Torque and Power Developed Equations–Effect of Change in Excitation and Load on Synchronous Motor-V Curves and Inverted V Curves–Hunting and Suppression Methods-Synchronous Condenser.

UNIT-V

SINGLE PHASE INDUCTION MOTOR Introduction – Constructional Features and Theory of Operation – Equivalent Circuit-Performance Characteristics- Starting Methods, Shaded Pole Motor-Reluctance Motor - Hysteresis Motors-Stepper Motor-AC Series Motor.

TEXT BOOKS:

1. Electric Machines, Nagrath.I.J. andKothari.D.P.,McGraw Hill Education; 4-Edition, 2010.
2. Electric Machinery and Transformers, B. S. Guru and H. R. Hiziroglu, Oxford University Press; Third edition, 2012.

REFERENCE BOOKS:

1. Principle of Electrical Machines, by V.K Mehta (Author), Rohit Mehta (Author), S Chand; Reprint Edn. 2006 edition (1 December 2014)
2. Electric Machinery and Transformers, I. L. Kosow, Prentice Hall of India, New Delhi, Prentice Hall India (2008)
3. Electric Machines, P. S. Bimbhra (Author), Khanna Publishing; Second edition (2017)
4. A Course in “Electrical Machine Design” A.K.Sawhney , Dhanpat Rai & Co. (P) Limited (2016)

IV SEMESTER IV	L	T	P	C
	3	-	-	3
20EE4T03: CONTROL SYSTEMS				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Understand linear systems, deduce mathematical model, obtain block diagrams/signal flow graphs and to obtain Transfer function[K2]

CO2: Analyze the time response and time response specifications with steady state error for various types of input.[K4]

CO3: Understand the Frequency response analysis using Bode plot, Polar Plot and Nyquist plot Method [K2]

CO4:Evaluate Preliminary ideas of compensation[K5]

CO5: Explicate concept of state variable, state space, nonlinear system, nonlinear characteristics. [K2]

SYLLABUS

UNIT-I

MATHEMATICAL MODELING OF CONTROL SYSTEMS Introduction, Open Loop and Closed Loop control systems and their differences, Classification of control systems, Feedback characteristics, and Transfer function of linear systems. Differential equations of electrical networks, Translational and Rotational mechanical systems. Transfer function of DC Servo motor, Transfer function of AC Servo motor, Synchro transmitter and Receiver, Block diagram algebra and Problems, Signal flow graph – Reduction using Mason's gain formula.

UNIT-II

TIME RESPONSE ANALYSIS Introduction-Standard Test Signals-Time Response of First Order Systems-Time Response of Second Order Systems-Time Domain Specifications, Steady State Errors and Error Constants, Effects of PI, PD and PID Controllers.

Stability and Root Locus Technique

The concept of stability – Routh's stability criterion –limitations of Routh's stability, Root locus concept – construction of root loci (simple problems).Effect of addition of poles and zeros root locus

UNIT-III

FREQUENCY RESPONSE ANALYSIS Introduction to frequency domain specifications – Bode diagrams – transfer function from the Bode diagram – phase margin and gain margin – stability analysis from Bode plots. Polar plots, Nyquist stability criterion.

UNIT-IV

CONTROL DESIGN TECHNIQUES Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers.

UNIT-V

STATE SPACE ANALYSIS Concepts of state, state variables and state model, state space representation of transfer function, diagonalization, solving the time invariant state equations, State Transition Matrix and it's Properties, concepts of controllability and observability.

Text Books:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India.
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India,2nd Edition.

Reference Books:

1.Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition.
2.Control Systems by Manik Dhanesh N, Cengage publications.
3.Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
4.Control Systems Engineering by S.Palani,Tata Mc Graw Hill Publications.
5.Control Systems by A. NagoorKani, RBA Publications.

IV SEMESTER	L	T	P	C
	3	-	-	3
20BM4T02: PRINCIPLESOFECONOMICSANDMANAGEMENT				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Evaluate different market structures and discriminate various pricing methods.

CO2: Recognize the role of HR management for effective functioning of the organization.

CO3: Illustrate the contemporary concepts of marketing and types of production management.

CO4: Enumerate the role of financial management in day-to-day business activities and examine the ability and read readiness to develop, organize and run a business enterprise.

UNITI:

IntroductiontoEconomics: Concept,Nature&Scope-MacroandMicroEconomics-Demand Analysis:Demand Determinants- Law of Demand & its exceptions- Elasticity ofDemand-Types-DemandForecasting-Methods.

UNITII:

CostAnalysis: Cost Concepts-Break– EvenAnalysis (simpleproblems).

MarketStructures: TypesofMarkets-Features,PriceoutputdeterminationinPerfectCompetition, Monopoly,Monopolistic Competition,Oligopoly-Pricingmethods.

UNITIII:

IntroductiontoManagement:Concept-FunctionsofManagement-Scientific**Management**-Principles of Management-FunctionalareasofManagement-LeadershipStyles.

Human Resource Management: Concept, Significance and Functions - PM Vs HRM – Recruitment, Selection, Training and Development -Job Analysis - Role and position of HRdepartment– Performance Appraisal.

UNITIV:

MarketingManagement: Definition-Concepts-MarketingMix-RecentTrends-DigitalMarketing-GreenMarketing-Rural Marketing.

ProductionManagement:Concept-TypesofProductionprocesses-PlantLocation&Layout-Statistical Quality Control-Quality Circles-TQM.

UNITV:

FinancialManagement: Concept-ObjectivesofFinance – WealthMaximizationVs.ProfitMaximization-FunctionsofFinance-Roleoffinancialmanager-FinancialStatements–Contents of Trading Account, Profit and Loss Account – Balance Sheet (Theory only)

Entrepreneurship- Concept– Qualities of a good entrepreneur-trepreneurialDevelopment-Project Appraisal-Organizational assistancetoentrepreneurs.

TEXTBOOKS:

1. P.G.Ramanujam,B.V.R.Naidu&PVRSastry,**ManagementScience**,HimalayaPublishingHouse,Mumbai.

2. A.R.Aryasri,**ManagerialEconomicsandFinancialAnalysis**,TataMcGraw-Hill,NewDelhi.
3.

REFERENCEBOOKS:

1. M.Y.Khan&P.K.Jain, **FinancialManagement**,TATAMcGraw-Hill,NewDelhi.
2. KoontzODonnel,**Management**, TATAMcGraw-Hill, NewDelhi.
3. K.Aswathappa,**Production Mangement**,HimalayaPublishingHouse,Mumbai.
4. P.SubbaRao,**HumanResourceManagement**,HimalayaPublishingHouse,Mumbai.
5. PhilipKotler,**MarketingManagement**,Pearson PrenticeHall,NewDelhi.
6. VasantDesai,**Entreprenuership**,HimalayaPublishingHouse,Mumbai.
7. Varshini&Maheswari,**ManagerialEconomics**,SChand&Co,NewDelhi.

IV SEMESTER	L	T	P	C
	-	-	3	1.5
20EC4L03: DIGITAL ELECTRONICS LAB				

COURSE OUT COMES

After completion of the course students are able to

CO1: Describe and implementation of code conversion(K1)

CO2: Explicate simple Boolean expressions using the theorems and to minimize the combinational functions.(K2,K3)

CO3: Analyze combinational circuits like Adders, Subtractors, Encoders, Decoders etc. (K4)

CO4: Construct various types of sequential circuits like Flipflops, counters and Registers (K3)

LIST OF EXPERIMENTS:

Minimum of TEN Experiments has to be performed

1. Implementing of logic gates with Universal Gates.
2. Design a logic diagram for the given SOP or POS form and verify the De-Morgan laws.
3. Construct and verify the truth tables of Half Adder, Full Adder using two Half Adders & one OR gate.
4. Design a Combinational Logic circuit for
   a. 4x1 MUX and verify the truth table.
   b. 2 - variable function using 4x1 MUX and verify the truth table.
5. Design a Combinational Logic circuit for 1x4 De- MUX and verify the truth table.
6. Design 4-bit Comparator using IC 7485 and verify the Truth Table.
7. Design 3 to 8 Decoder using IC 74138 and verify the Truth Table.
8. Design and implementation of code conversion from binary -to-gray.
9. Design Universal Shift Register using IC 74194 and verify the Truth Table.
10. Verify the truth tables of all Flip- Flops.
11. Implementation of Master Slave Flip-Flop with J-K Flip- Flop and verify the truth table.
12. Design a Decade Counter using IC 7490 and verify the truth table.
13. Design the Mod 5 counter using any Flip -Flop.
14. Construct 4-bit ring counter using any Flip –Flop and verify the truth table.
15. Design a 8 – bit Shift right Register using D-Flip -Flop and verify the truth table.

Equipment Required For Laboratory:

1. RPS – 0-30 v
2. IC‘s- 7400, 7402, 7485, 74194, 74138, 7408, 7404, 7432, 7468, 74151, 74153, 7490.
3. Digital logic trainers & bread boards.

IV SEMESTER	L	T	P	C
	-	-	3	1.5
20EE4L01: ELECTRICAL MEASUREMENTS LAB				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Measure resistance, inductance and capacitance using bridges[K5]

CO2: Examine and conduct experiments, as well as to analyze and interpret data of power andenergy.[K4]

CO3: Analyze based on comparing true and actual value of potentiometer & Power factor meter.[K4]

CO4: Measure three phase power and energy[K5]

CO5: Measure the electrical power and energy and use of CT[K5]

LIST OF EXPERIMENTS

(Any 10 Experiments has to be conducted)

1. Measurement of low resistance using Kelvin's double Bridge.
2. Measurement of Capacitance using Schering Bridge.
3. Crompton D.C. Potentiometer - Calibration of PMMC ammeter and PMMC voltmeter
4. Calibration of LPF wattmeter – by direct loading
5. Calibration of single-phase energy meter.
6. Calibration of dynamometer power factor meter.
7. Measurement of power and power factor using two wattmeter method.
8. Measurement of 3 phases reactive power with single wattmeter.
9. Measurement of 3 phase power with single watt meter and 2 No's of C.T.
10. Testing of C.T. using mutual inductor – Measurement of % ratio error and phase angle of given C.T. by Null method.
11. Measurement of earth resistance.
12. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.
13. Measurement of % ratio error and phase angle of given C.T. by comparison
14. Measurement of phase difference, frequency using Lissajous patterns in CRO

REFERENCE BOOKS:

1. Department lab manual.

IV SEMESTER	L	T	P	C
	-	-	3	1.5
20EE4L02: ELECTRICAL MACHINES-II LAB				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Determine equivalent circuit parameters of 3ph Induction motor[K5]

CO2: Demonstrate the basic operation of synchronous machines. [K2]

CO3: Determine the different parameters of a 3-phase alternator & its regulation [K5]

CO4: Determine the different parameters of a three-phase synchronous motor as well as its 'V' and 'inverted V' curves [K5]

CO5: Determine the parameters of equivalent circuit of single-phase motor [K5]

LIST OF EXPERIMENTS

PART-A

(Do Any 5 Experiments from Part-A)

1. Brake test on three phase squirrel cage induction Motor
2. Circle Diagram of three phase squirrel cage induction Motor
3. Brake test on 3-phase slip ring induction motor
4. Determination of equivalent circuit parameters, efficiency and regulation of a three phase Induction motor
5. Speed control of induction motor by V/f method.
6. Determination of equivalent circuit parameters of single-phase induction motor
7. Determination of efficiency of a single-phase Induction Motor by conducting Brake test.

PART-B

(Do Any 5 Experiments from Part-B)

1. Regulation of a three –phase alternator by EMF &MMFMethods
2. Regulation of three–phase alternator by Potier triangle method
3. Determination of Xd and Xq of a salient pole synchronous machine
4. Parallel operation of three-phase alternator under no-load and load conditions
5. Efficiency of a three-phase alternator
6. Determination of V and Inverted V curves of a three-phase synchronous motor.
7. Determination of efficiency of three-phase alternator by loading with three phase induction motor

REFERENCE BOOKS:

Department lab manual.

SEMESTER IV(SKILLED COURSE)	L	T	P	C
	-	-	4	2
20EE4S01: INDUSTRIAL AUTOMATION –PLC				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1 : Demonstrate basic functions of Siemens PLC's [K2]
CO2 : Construct various ladder logic programs.[K3]
CO3 : Solve plc practical problems.[K3]
CO4 : Design various relay logic circuits to operate the motors.[K6]
CO5 : Develop and rectify errors in order to control the motors[K6]

LIST OF EXPERIMENTS

1. To study Ladder logic programming of a industrial PLC like SEIMENS / FATEK / MICROLOGIX
2. Verify the logic gates using PLC
3. Verify the latching and blinking concepts in ladder logic diagram with suitable examples
4. Verify the timer counter concepts
5. Using PLC with suitable examples
6. Write a ladder logic program for filling beverage in a bottle using PLC
7. Write a ladder logic program to maintain the water level with valve control using PLC
8. Write a ladder logic program for 4-way traffic signals controller in PLC environment
9. Write a program for filling three different water tanks using PLC
10. Write a ladder logic circuit for star delta starter control using PLC
11. Write a ladder logic program for six lamp sequence operation using PLC
12. Write a ladder logic program for a 3 stage air condition system in function hall using PLC
13. Write a ladder logic program for operating conveyor belt using PLC
14. Write a ladder logic program to generate pulse for controlling dc motor speed using PLC

Any 10 Experiments has to be conducted

REFERENCE BOOKS:

1 Department lab manual.

IV SEMESTER	L	T	P	C
	2	-	-	-
20BM4M01 :INDIACONSTITUTION				

UNIT I: Introduction to Indian Constitution-Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II: Union Government and Administration Structure of the Indian Union: Federalism, Centre State relationship, President: Role, powers and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions

UNIT III: State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT IV:.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions of Pachayat Raj Institution: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT V:Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate -State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women.

TEXTBOOKS:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics

REFERENCE BOOKS:

1. D.C. Gupta, Indian Government and Politics
2. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
3. J.C. Johari, Indian Government andPolitics Hans
4. J. Raj IndianGovernment and Politics
5. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
6. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012.

e-Resources:

1) nptel.ac.in/courses/109104074/8
2) nptel.ac.in/courses/109104045/
3) nptel.ac.in/courses/101104065/
4) www.hss.iitb.ac.in/en/lecture-details
5) www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

V SEMESTER	L	T	P	C
	3	0	0	3
20EE5T01 :: POWER GENERATION & TRANSMISSION SYSTEM				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1 : Explicate the basics of electrical power generation from conventional Energy Sources [K2]
CO2 : Analyze the economic aspects of power generation and different tariff methods [K4]
CO3 : Simplify the expressions for transmission line parameters(R,L,C) [K4]
CO4 : Compare various types of transmission line (Short, medium, long) and its performance [K2]
CO5 : Analyze the performance of overhead transmission line [K4]

SYLLABUS

UNIT-I : CONVENTIONAL ENERGY SOURCES

Thermal power stations: Selection of site, general layout of a thermal power plant, Types of boilers, economizers, super heaters, condensers and turbines, merits and demerits- ESPs

Hydro electric plants: Selection of site, layout of Hydro stations- types of hydro stations, Merits & Demerits

Gas Power Plants: Introduction -Simple layout, combined cycle, Merits and Demerits.

Nuclear Power Plants: Introduction- layout – Merits & Demerits

UNIT-II : ECONOMIC ASPECTS OF POWER GENERATION & TARIFF

Economic Aspects –load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor and plant use factor, base and peak load plants.

Tariff Methods– costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods.

UNIT-III : TRANSMISSION LINE PARAMETERS

Types of conductors – Calculation of resistance for solid conductors, skin effect, Proximity effect and Ferranti effect – Calculation of inductance for single phase and three phase– Single and double circuit lines– Concept of GMR and GMD–Symmetrical and asymmetrical conductor configuration with and without transposition–Bundled conductors – Calculation of capacitance for 2 wire and 3 wire systems – Effect of ground on capacitance – Capacitance calculations for symmetrical and asymmetrical single and three phase–Single and double circuit lines with Bundled conductors

UNIT-IV : PERFORMANCE ANALYSIS OF TRANSMISSION LINES

Classification of Transmission Lines – Short, medium, long line and their model representations –Nominal-T–Nominal-Pie and A, B, C, D Constants , Rigorous Solution for long line equations – Surge Impedance and SIL of Long Lines – Representation of Long lines – Equivalent T and Equivalent Pie network models - Mathematical Solutions to estimate regulation and efficiency of all types of lines.

UNIT-V : MECHANICAL DESIGN OF TRANSMISSION LINES

Corona – Description of the phenomenon–Factors affecting corona–Critical voltages and power loss. Sag and Tension calculations with equal and unequal heights of towers–Effect of Wind and Ice on weight of Conductor – Stringing chart .Types of Insulators – String efficiency and Methods for improvement - Voltage distribution–Calculation of string efficiency – Capacitance grading and Static Shielding.

Text Books:

1. A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar , "A Text book of Power System Engineering" , DhanpatRai Publication
2. V. K. Mehta, Rohit Mehta, "Principles of Power Systems", S. Chand Publication.
3. S. N. Singh, "Electric Power Generation, Transmission and Distribution", PHI Learning, New Delhi

Reference Books:

1. Elements of power system analysis, C.L Wadwa, New age international
2. Electrical Power System, AshfaqHussain, CBS Publishers & Distributors
3. Power SystemEngineering ,IJNagrath& D.P Kothari ,TMH 3rd Edition

V SEMESTER	L	T	P	C
	3	0	0	3
20EE5T02 :: POWER ELECTRONICS				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1 : Illustrate the characteristics of SCR, Power-MOSFET and Power-IGBT

CO2 : Understand the operation of Single phase Converters

CO3 : Analyze the operation of three-phase converters and AC-AC Converters.

CO4 : Learn the basic concepts of operation of dc-dc converters in steady state in continuous and discontinuous mode

CO5 : Analyze the operation of Single and three Phase inverter

SYLLABUS

UNIT-I : POWER SEMI-CONDUCTOR DEVICES

Basic Theory of Operation - Static Characteristics-Two Transistors analogy -Turn on and Turn off Methods - Methods of SCR Triggering - Dynamic & Gate Characteristics of SCR - Series and Parallel Operation - Snubber circuit - Characteristics of Power MOSFET and IGBT.

UNIT-II : SINGLE PHASE AC-DC CONVERTERS

Single Phase half wave controlled rectifiers - R and RL load with and without free wheelingdiode - Single Phase fully controlled bridge converter with R and RL load -Continuous and Discontinuous conduction - Effect of source inductance in 1-phase fully controlled bridge rectifier with continuous conduction – Expression for output voltages – Single Phase semi Converter with R and RL load– Continuous and Discontinuous conduction - Harmonic Analysis - Single Phase Dual Converters

UNIT-III : THREE PHASE AC-DC CONVERTERS &AC – AC CONVERTERS

Three Phase half wave Rectifier with R and RL load -Three Phase fully controlled rectifier withR and RL load - Three Phase semi converter with R and RL load - Expression for OutputVoltage - Harmonic Analysis - Three Phase Dual Converters

AC voltage controller: Principle of phase control- integral cycle control-Single phase AC voltage controller with R and RL load

Cycloconverter: Principle of cyclo converter-Single phase Step-up &Step-down cyclo converter,

UNIT-IV : DC–DC CONVERTERS

Operation of Basic Chopper - Classification - Control Techniques - Analysis of Buck, Boost and Buck-Boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) - Output voltage equations using volt-sec balance in CCM & DCM – Expressions for output voltage ripple and inductor current ripple.

UNIT-V : DC–AC CONVERTERS

Introduction - Classification - Single Phase half bridge and full bridge inverters with R and RL loads – PhaseDisplacement Control – PWM with bipolar voltage switching, PWM with unipolar voltage switching- Three Phase square wave inverters – 120^0 conduction and 180^0 conduction modes of operation - PWM inverters - Sinusoidal

Pulse Width Modulation - Current Source Inverter (CSI)

TEXT BOOKS:

1 Power Electronics Devices, Circuits and Applications by Muhammad H.Rashid,Fourth Edition Pearson, 2017

2 Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited,India, 2009

REFERENCE BOOKS:

1 Power Electronics– by Mandal, McGraw Hill Education (1 July 2017).

2 Power Electronics – by P.S.Bhimbra, Khanna Publishers, 2018

3 Power Electronics handbook by Muhammad H.Rashid, Elsevier

4 Power Electronics: converters, applications & design -by Nedmohan, Tore M.Undeland, Robbins by Wiley India Pvt. Ltd.

5 Power Converter Circuits -by William Shepherd, Li zhang, CRC Taylor & Francis

V SEMESTER	L	T	P	C
	3	0	0	3
20CS5T04 :: PYTHON PROGRAMMING				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Recognize core programming basics and program design with functions using Pythonprogramming language.
CO2	:	Interpret the high-performance programs designed to strengthen the practical expertise
CO3	:	Develop applications for real time problems by applying python data structure concepts.
CO4	:	Understand and apply the concepts of packages, handling, multithreading and socketprogramming.
CO5	:	Analyze the importance of object-oriented programming over structured programming.

SYLLABUS

UNIT-I	:	INTRODUCTION TO PYTHON:
Features of Python, History of Python, Need of Python Programming,Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts,Variables, Assignment, Keywords, Input-Output, Indentation.Data types: Integers, Strings, Booleans.		
UNIT-II	**:**	**OPERATORS AND EXPRESSIONS:**
Types - Operators- Arithmetic Operators, Comparison (Relational)Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators,Identity Operators, Expressions and order of evaluationsControl Flow: if, if-elif-else, for, while, break, continue, pass		
UNIT-III	**:**	**DATA STRUCTURES:**
Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences.Comprehensions. Functions: Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.		
UNIT-IV	**:**	**OBJECT ORIENTED PROGRAMMING IN PYTHON:**
Classes, Data hiding, 'self-variable'Methods,Constructor, methods, and inheritance: Various Types of Inheritance and Function Overloading,Overriding Methods.		
UNIT-V	**:**	**ERROR AND EXCEPTIONS:**
Difference between an error and Exception, Handling Exception, tryexcept block, Raising Exceptions, User Defined ExceptionsBrief Tour of the Standard Library: Operating System Interface - String Pattern Matching,Mathematics, Internet Access, Dates and Times		

TEXT BOOKS:

1 Learning Python, Mark Lutz, Orielly

2 Python Programming: A Modern Approach, VamsiKurama, Pearson

3 R NageswaraRao, “Core Python Programming”, Dream tech press, 2017 Edition

4 Dusty Philips, “Python 3 Object Oriented Programming”, PACKT Publishing, 2 nd Edition, 2015

REFERENCE BOOKS:

1 Think Python, Allen Downey, Green Tea Press

2 Core Python Programming, W.Chun, Pearson.

3 Introduction to Python, Kenneth A. Lambert, Cengage

4 Michael H.Goldwasser, David Letscher, “Object Oriented Programming in Python”, Prentice Hall, 1 st Edition, 2007.

WEB REFERENCES:

1. https://realpython.com/python3-object-oriented-programming/

2. https://python.swaroopch.com/oop.html

3. https://python- textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html

4. https://www.programiz.com/python-programming

V SEMESTER(ELECTIVE –I)	L	T	P	C
	3	0	0	3
20EE5E01 :: UTILIZATION OF ELECTRICAL ENERGY				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Understanding of selection of drives for industrial application
CO2	:	Distinguish between various types of heating methods and Welding methods
CO3	:	Design Illumination systems for various applications.
CO4	:	To understand the basic principle of electric traction including speed– time curves
CO5	:	To understand the method of calculation of various traction system for braking, acceleration and other related parameters

SYLLABUS

UNIT-I : SELECTION OF DRIVES:

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

UNIT-II : ELECTRIC HEATING & ELECTRIC WELDING:

Advantages and methods of electric heating, resistance heating induction heating and dielectric heating. - Electric welding: Resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT-III : ILLUMINATION FUNDAMENTALS & VARIOUS METHODS:

Introduction, terms used in illumination, laws of illumination, polar curves, integrating sphere, lux meter, sources of light.- Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting, LED lighting.

UNIT-IV : ELECTRIC TRACTION – I:

System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement–Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves.

UNIT-V : ELECTRIC TRACTION – II:

Calculations of tractive effort– power –Specific energy consumption for given run–Effect of varying acceleration and braking retardation–Adhesive weight and braking retardation adhesive weight and coefficient of adhesion– Principles of energy efficient motors.

TEXT BOOKS:

1 Utilization of Electric Energy – by E. Openshaw Taylor

2 Art & Science of Utilization of electrical Energy – by Partab

3 Generation

REFERENCE BOOKS:

1 Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana - New Age International (P) Limited - Publishers - 1996.

2 "Thermal energy storage systems and applications"-by Ibrahim Dincer and Mark A.Rosen. John Wiley and Sons 2002

V SEMESTER(ELECTIVE –I)	L	T	P	C
	3	0	0	3
20EE5E02 :: SPECIAL ELECTRICAL MACHINES				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Demonstrate the Construction, principle of operation and control of stepping motors (K2)
CO2	:	Explicate the performance of switched reluctance motor. (K2)
CO3	:	Compare the between brush less dc motor and Permanent magnet Dc Motor(K2)
CO4	:	Explicate the performance of **Permanent Magnet Synchronous Motor**. (K2)
CO5	:	Explicate the applications of Linear Electrical Machines (K2).

SYLLABUS

UNIT-I	**:**	**STEPPER MOTOR**
Variable Reluctance Stepper Motor, Permanent Magnet Stepper Motor, Hybrid Stepper Motor, Torque Equation, Characteristics of Stepper Motor, Open – loop and Closed – loop Control of Stepper Motor, Microprocessor – Based Control of Stepper Motor, Applications of Stepper Motor.		
UNIT-II	**:**	**SWITCHED RELUCTANCE MOTOR (SRM)**
Construction, Principle of Working, Basics of SRM Analysis, Constraints on Pole Arc and Tooth Arc, Torque Equation and Characteristics, Power Converter Circuits, Control of SRM, Rotor Position Sensors, Current Regulators, Microprocessor – Based Control of SRM, Sensor less Control of SRM.		
UNIT-III	**:**	**PERMANENT MAGNET DC MOTOR & BRUSHLESS DC MOTOR**
Permanent Magnet DC (PMDC) Motor: Construction, Principle of Working, torque Equation, Equivalent Circuit, Performance Characteristics. **Brushless Permanent Magnet DC (BLDC) Motors**: Classification of BLDC, Construction, Principle of Operation, Types of BLDC Motor and its applications.		
UNIT-IV	**:**	**PERMANENT MAGNET SYNCHRONOUS MOTOR (PMSM):**
Construction , Principle of operation, EMF Equation, Torque equation, Phasor Diagram, Circle Diagram of PMSM, Comparison of conventional and PMSM, Control of PMSM, Applications.		
UNIT-V	**:**	**LINEAR ELECTRIC MACHINES**
Linear Induction motor: Construction-Thrust Equation-Equivalent Circuit-Characteristics, Linear synchronous motor: Types & Construction- Thrust Equation-Application of LSM. Linear Reluctance motor –Construction –Working and features of LRM		

TEXT BOOKS:

1 E.G. Janardanan, " Special Electrical Machines" PHI 1st Edition 2014.

2 K Venkata Ratham, "Special Electrical Machines" University Press 2009

3 R.Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.

REFERENCE BOOKS:

1 B.R Gupta," Fundamentals of Electric Machines ". New Age International (P) Limited 3rd Edition 2005

2 A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.

3 Kenjo T and Nagamori S Clerendon, "Permanent Magnet and Brushless DC Motors", Press Oxford 2019

4 J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons,2002.

V SEMESTER(ELECTIVE –I)	L	T	P	C
	3	0	0	3
20EC5E05 :: LINEAR IC APPLICATIONS				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Describe fundamental of IC Fabrication process.
CO2	:	Explicate different applications based on operational amplifier.
CO3	:	Designtheapplicationsofwaveformgeneratorsbasedonoperationalamplifierand IC555timers
CO4	:	Construct D to A & A to D converters.

SYLLABUS

UNIT-I : INTEGRATEDCIRCUITFABRICATION:

IC classification, IC chip size and circuit complexity, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. IC Package Types and temperature ranges. Fabrication of diodes, resistance and capacitance.

UNIT-II : OPERATIONALAMPLIFIER:

Differential Amplifier- Differential Amplifier Configurations and Properties. Characteristics of OP-Amps, Op-amp Block Diagram, Level translator, ideal and practical Op-amp specifications, Op-Amp parameters, AC and DC characteristics of 741 op-amp & its features. Input & Output offset currents and voltages, slew rate, CMRR, PSRR.

UNIT-III : LINEARANDNON-LINEARAPPLICATIONSOFOP-AMPS:

Linear applications of op-amps: Inverting and Non- inverting amplifier, Integrator and differentiator, Difference amplifier, AC amplifier, V to I, I to V converters. Non-linear applications of op-amps: Comparators, Triangular and Square wave generators.

UNIT-IV : TIMERS&PHASELOCKEDLOOPS:

Introduction to 555 timer, functional diagram, Mono stable and Astable operations and applications, Schmitt Trigger. Introduction to Phase Locked Loop(PLL565),Voltage Controlled Oscillator(IC566)

UNIT-V : D to A & A to D CONVERTERS:

Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, Inverted R-2RDAC,Different types of ADCs , parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. Specifications of DAC and ADC.

TEXT BOOKS:

1 D. Roy Chowdary, "Linear Integrated Circuits", 2nd Edition, New Age International (p)Ltd,2003.**Unit-I,II, III,IV&V**

2 RamakanthA.Gayakwad,"Op-Amps&LinearICs"-,4th EditionPHI,2010.**Unit-II,III&IV**

REFERENCE BOOKS:

1 Sergio Franco, "Design with Operational Amplifiers & Analog Integrated Circuits", McGraw Hill,1988.

2 S.Salivahana,VSKBhaskaran,"Linearintegratedcircuits"1stEditionTMH,2008.

3 DavidABell"OperationalAmplifiers&LinearICs",2ndEdition,OxfordUni.Press,1997.

E-RESOURCES:

1. https://lecturenotes.in/s/899-linear-integrated-circuits-and-applications
2. https://nptel.ac.in/courses/108/108/108108111/

V SEMESTER (ELECTIVE –I)	L	T	P	C
	3	0	0	3
20CS5E05 :: DATA STRUCTURES				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Design applications using stacks and implement various types of queues.
CO2	:	Analyze and implement operations on linked lists and demonstrate their applications.
CO3	:	Demonstrate operations on trees.
CO4	:	Demonstrate implementation of various types of Graphs and Graph Traversals.
CO5	:	Implement various searching and sorting techniques.

SYLLABUS

UNIT-I	:	

Introduction: Definition of data structure, types and overview of data structures.

Algorithm: Preliminaries of algorithm, Algorithm analysis and complexity

Stacks and Queues: Stack Representation using Arrays, operations on stack, Applications ofstacks - Factorial Calculation, Infix to postfix Transformation, Evaluating ArithmeticExpressions. Queue Representation using Arrays, operations on queues, Applications of queues,Circular queues, Priority queues, Implementation of queue using stack

UNIT-II	:	

Linked Lists: Introduction, Single linked list, representation of a linked list in memory,Operations on a single linked list. Double linked list, Operations on a double linked list. Circularlinked list, Operations on a circular linked list. Applications of single linked list

UNIT-III	:	

Trees: Basic tree concepts. Binary Trees: Properties, Representation of Binary Trees usingArrays and Linked List, Binary Tree Traversals, Creation of binary tree from pre-order, in-orderand post order traversals, threaded binary tree. Binary search trees: Basic concepts, BSToperations: Search, insertion, deletion and traversals, Creation of binary search tree from in-orderand pre (post)order traversals.

AVL Trees: Self Balanced Trees, Height of an AVL Trees and AVL Tree Rotations

UNIT-IV	:	

Graphs: Basic concepts, Representations of Graphs: using Linked list and adjacency matrix,

Graph Traversals - BFS & DFS, Applications: Dijkstra’s shortest path algorithm, MinimumSpanning Tree using Prim’s algorithm and Kruskal’s algorithm, Transitive closure, Warshall’salgorithm.

UNIT-V	:	

Searching: Linear Search, Binary Search and Fibonacci search.

Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort and Radix sort.

Hashing: Introduction, Hash Function, Collision Resolution Techniques: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Separate Chaining, Extendible Hashing

TEXT BOOKS:

1 Richard F. Gilberg and Behrouz.A. Forouzan, “Data Structures: A Pseudo code approachwith C”, 2 nd edition, Cengage, 2012.

2 ReemaThareja, “Data Structures using C”, 2 nd Edition, Oxford, 2015.

3 YashavantKanetker, “Data Structures through C”, 2 nd edition BPB publications, 2017.

4 Alfred V Aho, John E Hopcraft, Jeffery D Ullman, “Data Structures & Algorithms”, SecondEdition, Pearson Education. Ltd., 2016.

REFERENCE BOOKS:

1 Seymour Lipschutz, “Data Structure with C”, TMH, 2017

2 G. A. V. Pai, “Data Structures and Algorithms”, TMH, 2017.

3 Horowitz, Sahani, Anderson Freed, “Fundamentals of Data Structure in C”, 2 ndEdition,University Press, 2018.

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20EE5O01 - NON-CONVENTIONAL ENERGY SOURCES				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	**:**	Analyze solar radiation data and solar thermal systems (k4)
CO2	:	Identify the methods and analysis of wind energy generation systems (k3)
CO3	:	Explicate the biomass and geothermal energy, its mechanism of production and its applications (k2)
CO4	:	Explicate basic principle and working of hydro, tidal energy systems. (k2)
CO5	:	Explicate basics of Chemical Energy Sources(k2)

SYLLABUS

UNIT-I	**:**	**Solar Energy:**
Introduction - Renewable Sources - prospects, Solar radiation at the Earth Surface - Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics - Solar Energy Collectors: Flat plate Collectors, concentrating collectors - Solar Energy storage systems and Applications: Solar Pond - Solar water heating - Solar Green house.		
UNIT-II	**:**	**Wind Energy**:
Introduction - basic Principles of Wind Energy Conversion, the nature of Wind - the power in the wind - Wind Energy Conversion - Site selection considerations - basic components of Wind Energy Conversion Systems (WECS) - Classification - Applications.		
UNIT-III	**:**	**Biomass and Geothermal Energy:**
Introduction - Biomass conversion technologies - Photosynthesis, factors affecting Bio digestion - classification of biogas plants - Types of biogas plants - selection of site for a biogas plant **Geothermal Energy**: Introduction, Geothermal Sources – Applications - operational and Environmental problems		
UNIT-IV	**:**	**Energy From hydro, oceans, Waves & Tides:**
Hydro: Basic working principle – classification of hydro – types of turbines **Oceans:** Introduction - Ocean Thermal Electric Conversion (OTEC) – methods - prospects of OTEC in India. **Waves:** Introduction - Energy and Power from the waves - Wave Energy conversion devices. **Tides:** Basic principle of Tide Energy -Components of Tidal Energy.		
UNIT-V	**:**	**Chemical Energy Sources:**
Fuel Cells: Introduction - Fuel Cell Equivalent Circuit - operation of Fuel cell - types of Fuel Cells - Applications. **Hydrogen Energy:** Introduction - Methods of Hydrogen production - Storage and Applications		

Magneto Hydro Dynamic (MHD) Power generation: Principle of Operation - Types.

TEXT BOOKS:

1. G.D.Rai, Non-Conventional Energy Sources, Khanna Publications, 2011.
2. John Twidell& Tony Weir, Renewable Energy Sources, Taylor & Francis, 2013.

REFERENCE BOOKS:

1. S.P.Sukhatme&J.K.Nayak, Solar Energy-Principles of Thermal Collection and Storage, TMH, 2011.
2. John Andrews & Nick Jelly, Energy Science- principles, Technologies and Impacts, Oxford, 2nd edition, 2013.
3. Shoba Nath Singh, Non- Conventional Energy Resources, Pearson Publications, 2015.

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20ME5O01 - WASTE TO ENERGY CONVERSION				

COURSE OBJECTIVES

- To enable students to understand of the concept of waste to energy.
- To link technical and management principles for production of energy from waste.
- To learn about the best available technologies for waste to energy.
- To facilitate the students in developing skills in the decision making process.

COURSE OUTCOMES: Students are able to

CO1. Describe of the concept of waste to energy, classifications and principles. [K2]
CO2. Explicate management principles for production of energy from waste. [K2]
CO3. Explicate the best available technologies for waste to energy. [K2]
CO4. Describe the waste to energy options landfill gas, and energy from plastics.[K2]
CO5. Apply the knowledge in planning and operations of waste to energy plants [K3]

UNIT-IINTRODUCTION

Waste - types of waste, Principles of waste management, Waste utilization, Waste management hierarchy, 3R Principle of Reduce, Reuse and Recycle, Waste as a resource, alternate energy source.

UNIT-II WASTE SOURCES & CHARACTERIZATION

Source of waste, Waste production in different sectors such as domestic, industrial, agriculture, postconsumer waste etc, Waste management tools and techniques for reducing waste segregation and scientific disposal, Characterization of waste for energy utilization, Waste selection criteria.

UNIT-III TECHNOLOGIES FOR WASTE TO ENERGY

Energy biochemical conversion – energy production from organic waste through anaerobic digestion, fermentation, Thermo-chemical conversion – combustion, incineration, heat recovery, pyrolysis, gasification, plasma arc technology, other newer technologies, Case studies.

UNIT-IV WASTE TO ENERGY OPTIONS

Waste to energy options - landfill gas, methane emission, collection and recovery, Refuse Derived Fuel (RDF), Fluff, Briquettes, Pellets, Alternate Fuel Resource (AFR) – production and use in cement plants, Energy from plastic wastes, Non-recyclable plastic wastes for energy recovery, Energy recovery from wastes and optimization of its use, Energy analysis.

UNIT-V WASTE TO ENERGY PLANTS & ENVIRONMENTAL IMPLICATIONS

Wasteto Energy Plants: Waste management activities – collection, segregation, transportation and storage requirements, Location and Site of waste to energy plants.
EnvironmentalImplications: Environmental impact of waste to energy, Safety and environmental standards, Savings on non-renewable fuel resources, Carbon credits and its types.

TEXT BOOKS:

1. Marc Rogoff Francois Screve, Waste-to-Energy, 3rd Edition, William Andrew, 2019.
2. B.T. Nijaguna, Biogas Technology, 1st Edition, New Age International Pvt. Ltd, 2002.

REFERENCE BOOKS:

1. Vishal Prasad, BarkhaVaish, Advances in Waste-to-Energy Technologies, 1st Edition, CRC Press, 2019.
2. Dev Vrat Kamboj, Manoj Kumar Solanki, Waste to Energy: Prospects and Applications, 1st Edition, Springer, 2021.
3. P. Jayarama Reddy, Energy Recovery from Municipal Solid Waste by Thermal Conversion Technologies, 1st Edition, CRC Press/ Balkema, 2016.

WEB REFERENCE:

1. https://archive.nptel.ac.in/courses/103/107/103107125/

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20CS5O01 - INTERNET OF THINGS AND APPLICATIONS				

Course Outcome:

At the end of the course students are able to

1. Explicate Arduino IDE tool and Arduino Programming concept.
2. Illustrate concept hardware configuration with Firmata protocols.
3. Explicate the knowledge Arduino pin configuration.
4. Differentiate various sensors configuration and workflows.
5. Define architecture of IoT.

UNIT-I (Introduction to Arduino)

Introduction to Arduino, history of Arduino, variants, Uno board block diagram, installation of Arduino, Arduino IDE, Arduino programming, functions and statements.

UNIT-II (Configuration)

Connecting Arduino borad, introducing the Firmata Protocol, uploading a Firmata sketch to the Arduino board, testing the Firmata protocol.

UNIT-III (Components)

List of components, software flow design, hardware flow design, hardware prototyping software, designing the hardware prototype, Arduino sketch default functions and custom function, setting Arduino board, pin configuration, working with pins.

UNIT-IV (Prototype)

Potentiometer-continuous observation from an analog input connection, Buzzer-generating sound alarm pattern, DC motor-controlling motor speed using PWM, LED- controlling LED brightness using PWM, Servomotor- moving the motor to a certain angle.

UNIT-V (Networking and cloud)

Arduino and computer networking, networking fundamentals, Obtaining the IP address, Networking extensions for Arduino with libraries and class, architecture of IoT web applications, IoT cloud platforms, develop cloud-based IoT applications.

Textbooks:

1. Python programming for Arduino by Pratik desai, Packt Publishing.
2. Internet of Things with Arduino Cookbook by Marco Schwartz.
3. Introduction to Arduino by Alan G. Smith.

References

1. Beginning Arduino by Michael McRoberts, 2e.
2. Getting Started with Arduino Massimo Banzi Second Edition.

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20CS5O02 - DATA ENGINEERING				

Course Outcomes:

Student able to state and analyze:

1. Preprocessing techniques for various datasets,
2. Standard database systems concepts like tables, relations, query,NoSQL
3. Information retrieval techniques such as **Relevance Ranking,Indexingetc**
4. Data processing algorithms and data structures
5. Visualization techniques like Table, graph, histogram, pie-chart

UNIT- I:

Data Engineering: introduction, importance of data engineering, Data engineering vs data science
Data Collection: Various sources of data, types of data: text, video, audio, biology etc.
Data Preprocessing: data Cleaning: missing values, noise elimination, data integration, data transformation: Normalization, Data Reduction: data cube aggregation, dimensionality reduction.

UNIT-II

Data bases: Database Schema, ER diagram, introduction to SQL, functions and stored procedures, indexing: B+tree index files, data base system architecture: Client-Server Architecture, introduction to MongoDB,
NoSQL: The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL

UNIT-III

Information Retrieval:Relevance Ranking Using Terms,Relevance Using Hyperlinks,Synonyms, Homonyms, and Ontologies,Indexing of Documents,Measuring Retrieval Effectiveness,Crawling and Indexing the Web,Information Retrieval: Beyond Ranking of Pages, Directories and Categories

UNIT-IV

Data Analysis: correlation analysis: bivariate correlation, partial correlation, correlation coefficients. Regression: simple linear regression, multiple linear regression, principal component analysis, analysis of variance

UNIT- V

Data Visualization: Table, graph, histogram, pie-chart, area-plot, box-plot, scatter-plot, bubble-plot, waffle charts, word clouds.

Text Books:

1. Data mining concepts and techniques Jiawei Han and Micheline Kamber (UNIT-I)
2. Silberschatz, Korth, Sudarshan, "Database System Concepts" McGraw Hill Education, Sixth edition, 2010, ISBN-13: 978-9332901384 (UNIT-II, UNIT-III)
3. "NoSQL distilled" A Brief Guide to the Emerging World of Polyglot PersistencePramod J. Sadalage Martin Fowler, Addison Wesley (UNIT-II)
4. correlation and regression analysis by Dr. Mohamed Ahmed Zaid (UNIT-IV)

Reference Books:

1. Brian Shive, "Data Engineering: A Novel Approach to Data Design", Technics Publications, 2013. ISBN-13: 978-1935504603.
2. Joel Grus, "Python Data Science Handbook: Essential Tools for Working with Data", 1st Edition, O'Reilly, 2016. ISBN-13: 978-9352134915.

Web links:

https://chartio.com/learn/charts/essential-chart-types

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20BM5O01 - INNOVATIONS AND ENTREPRENEURSHIP				

UNIT-I INNOVATION MANAGEMENT: Concept–Objectives-types of Innovation process of Innovation- sources of Innovation-Levels of Innovation -barriers of Innovation-– Open and Closed Innovation-challenges faced while managing innovation.

UNIT-IICREATIVE INTELLIGENCE: Concept of Creativity-Importance Characteristics-Types of Creativity-Traits Congenial to Creativity-Triarchic theory of Intelligence – Creative thinking –Types-process of creative thinking-Sources and techniques for generating ideas.

UNIT-III ENTREPRENEURSHIP: Concept- characteristics-Importance classification-Theories of Entrepreneurship-entrepreneurship development-entrepreneurial process- challenges-Women Entrepreneurs.

UNIT-IVPROJECT FORMULATION AND APPRAISAL: Concept -Need Significance-steps - Economic Analysis; Financial analysis; Market analysis; Technical feasibility-project Appraisal-techniques of project appraisal.

UNIT-V INSTITUTIONS PROMOTING SMALL BUSINESS ENTERPRISES: Central level Institutions; SIDBI, NSIC, KVIC,SSIDC - State level Institutions- DICs – SFC SSIDC- other financial assistance, Government policy and taxation benefits- government policy for SSIs

TEXT BOOKS:

1. Vasanth Desai, ―Entrepreneurship, Himalaya Publishing House, New Delhi, 2012 2. Arya Kumar: ―Entrepreneurship, Pearson, Publishing House, New Delhi, 2012. 3. Keith Goffin and Rick Mitchell-Innovation Management,Springer,2016

REFERENCES BOOKS:

1. Pradip N Khandwalla, Lifelong Creativity, An Unending Quest, Tata McGraw Hill, 2004.
2. Vinnie Jauhari, SudanshuBhushan, Innovation Management, Oxford Higher Education, 2014

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20BM5O03 - DIGITAL MARKETING				

UNIT I- Introduction to Digital Marketing: Concept – scope- importance of digital marketing - Traditional marketing versus digital marketing – Types of digital marketing marketing mix and its implications for digital marketing--Challenges and opportunities for digital marketing

UNIT II- Content Marketing: Understanding Content Marketing, Content Creation Framework, Content marketing strategy and planning- Types of content marketing - Measuring and Analysing Your Content-Viral Marketing-Blog Marketing.

Unit III- Search Engine Optimization (SEO): What is SEO? SEO Importance and Its Growth in recent years, Ecosystem of a search Engine , kinds of traffic, Keyword Research & Analysis (Free and Paid tool & Extension), Recent Google Updates

UNIT IV-Email and Mobile Marketing: Introduction, process, design, content,email marketing metrics. Mobile Marketing: Concept, Process-tools-opportunities and challenges.

UNIT V-Social Media Marketing: Concepts- Process - Tools- Google and the Search Engine, Facebook, Twitter, YouTube and LinkedIn- Issues: Credibility, Fake News, Paid Influencers; social media and Hate/ Phobic campaigns.

TEXT BOOKS:

1.Puneet Singh Bhatia, “Fundamentals of Digital Marketing”, Pearson Education Publications, 2nd edition 2019

2. Seema Gupta, “Digital Marketing”, McGraw Hill Publications”, 2nd edition 20203.RyanDeiss, Russ Henneberry, “Digital Marketing For Dummies”, Wiley Publications, 2020

REFERENCES BOOKS:

1. Joe Pulizzi, “Epic Content Marketing”, McGraw Hill Education, 2019 2. Puneet Singh Bhatia , “Social Media & Mobile Marketing”, Wiley Publications, 2019

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20BM5O04 - BUSINESS ENVIRONMENT				

Unit-I Business Environment: Components and Significance – Economic Scope – Factors Influencing Business Environment – Dimensions of International Business Environment – Challenges.

Unit-II: Structure of Indian Economy: Economic systems- Economic planning with special reference to last three plans, public, private joint and cooperative sectors - Industrial Policy - Policy Resolutions of 1991- Economic Reforms-PPP

Unit-III Indian Business Environment: Competitiveness, Changes and Challenges, Sustainable Development, Social Responsibilities, Ethics in Business- Competition Act 2002 - Emerging Trend in Indian Business Environment

Unit-IV: International Trade: Balance of Payments – Concepts, Disequilibrium in BOP: Methods of Correction - Trade Barriers and Trade Strategy - Free Trade vs. Protection - World Financial Environment: Foreign Exchange Market Mechanism, Exchange Rate Determination, and Euro Currency.

Unit-V: Globalisation: International Economic Integration, Country Evaluation and Selection, Foreign Market Entry Methods, International Trading Blocks – WTO Origin, Objectives, Organisation, Structure and Functioning – WTO and India.

TEXT BOOKS:

1. Chidambaram, Indian Business Environment, Vikas, New Delhi
2. Suresh Bedi: Business Environment, Excel, New Delhi.
3. K.V.Sivayya and VBM Das: Indian Industrial Economy, Sultan Chand Publishers, Delhi.

REFERENCES BOOKS:

1. Pandey G.N., Environmental Management, Vikas Publishing House.
2. Sundaram& Black, International Business Environment – The Text and Cases, Prentice Hall of India.
3. Ghosh PK., Business Environment,Sultan Chand & Sons, New Delhi
4. Daniel John D and Redebough, Lee. H., International Business, AddisionWesley India
5. Saleem, Business Environment, Pearson, New Delhi.
6. Bhalla, V.K., & S. Sivaramu, International Business Environment and Business, Annual Publications

V SEMESTER (JOB ORIENTED ELECTIVE-I)	L	T	P	C
	3	-	-	3
20IT5J01 - LINUX ADMINISTRATION				

Course Outcomes:

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

1. Use various Linux commands that are used to manipulate system operations at admin level.

2. Write Shell Programming using Linux commands.

3. Design and write application to manipulate internal kernel level Linux File System.

4. Explicate the user, group and storage management.

5. Configure SSH client and server.

UNIT – I

Introduction To Linux And Linux Utilities: A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor. Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, unlink, du, find, unmask, ulimit, ps, finger, tail, head, sort, nl, uniq, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio, apt.

UNIT – II

Introduction to Shells: Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization.

Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

UNIT - III

Grep: Operation, grep Family(grep, egrep, fgrep), Searching for File Content.

Sed: Scripts, Operation, Addresses, commands, Applications, grep and sed.

Unix File Structure: Introduction to UNIX file system, inode (Index Node), file descriptors, system calls and device drivers.

UNIT – IV

User and Group Management: User accounts, local groups and group memberships, Configure networking and hostname resolution statically or dynamically, start, stop, and check the status of network services and network related commands.

Storage Management: List, create, delete, and modify physical storage partitions and tools

UNIT – V

Configuring SSH: Enabling the SSH Server, Using the SSH Client, Configuring Key- Based SSH Authentication, Using Graphical Applications with SSH.

Practical Learning: Installation of Any open source Linux Distribution, AWS Instance Creation and Learn How to Access through SSH.

TEXT BOOKS:

1. W. Richard. Stevens, Advanced Programming in the UNIX Environment, 3rd edition,

Pearson Education, New Delhi, India.

2. Behrouz A. *Forouzan, Richard F. Gilberg*, Unix and shell Programming Thomson

REFERENCES:

1. *Robert Love, O'Reilly*, Linux System Programming, SPD.

2. *W.R.Stevens*, Advanced Programming in the UNIX environment, 2nd Edition, PearsonEducation.

3. *W.R. Stevens*, UNIX Network Programming, PHI.

4. *Graham Glass, King Ables*, UNIX for Programmers and Users, 3rd Edition, Pearson Education.

V SEMESTER (JOB ORIENTED ELECTIVE-I)	L	T	P	C
	3	-	-	3
20CS5J01 - FULL STACK WITH JAVA				

COURSE OUTCOMES:

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

Design simple web pages using markup languages like HTML and CSS.

Create dynamic web pages using DHTML and java script that is easy to navigate and use.

Create web pages using AngularJS.

Build web applications using Servlet and JSP.

Understand various operations on Mongo Database.

UNIT-I:

HTML: An Introduction to HTML, Basic XHTML Syntax and Semantics, Basic HTML Elements: Images, Links, Lists, Tables, Forms, Frames, Division and Spanning, HTML 5.0.

CSS: Levels of Style sheets, Style specification formats, Selector forms, CSS Colors and Backgrounds,CSS Text and Font Properties, The Box Model, CSS Margins, Padding, and Borders Conflict Resolution.

UNIT-II:

Client-Side Scripting using Java Script and DOM

Java Script: The Basics of Java Script, Objects, Primitive operations and Expressions, Screen output and Keyboard input, Control statements, Object Creation and modification, Arrays, functions, Constructors, Pattern matching using Regular Expressions, DHTML: Positioning moving and Changing Elements.

DOM: Introduction to the Document Object Model DOM, HTML DOM Event Handling, Modifying Element Style, Document Tree, DOM Event Handling

UNIT-III:

Angular JS

Introduction to AngularJS: Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, HTTP, Tables, Select, Fetching Data from MySQL.

UNIT-IV:

Servlet and JSP

Servlet: Servlet Basics, Need of Server Side Programming,Servlet Life Cycle, Servlet Hello World Application, Web.xml Structure, Servlet Directives-include (), forward(), sendRedirect(), HttpServletRequest and HttpServlet Response in Servlet, Servlet and JDBC Integration.

JSP: JSP Basics, JSP Scripting Elements (Declaration, Expression, Scriptlet), Directive Elements (page,include,taglib) , Action Elements (jsp:forward, jsp: include,jsp:useBean), JSP Implicit Objects.

UNIT-V

Mongo DB: Introduction to Mongo DB, Mongo DB Environment, Create Database, Drop Database, Create Collection, Drop Collection, Read Operations, Write Operations.

TEXT BOOKS:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. Head First Servlet and JSP
4. Node.js, MongoDB, and AngularJS Web Development by Brad Dayley

REFERENCE BOOKS:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage
3. Pro Angular JS by Adam Freeman
4. MEAN Web Development by Amos Q. Haviv

V SEMESTER	L	T	P	C
	0	-	3	1.5
20EE5L01 - CONTROL SYSTEMS & SIMULATION LAB				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Demonstrate the response of second order systems
CO2	:	Estimate the error obtained in control system with the effect of P, PI, PID controllers.
CO3	:	Design of lead, lag, lag-lead compensator to improve characteristics of control system.
CO4	:	Analyze the stability of time invariant control system using root locus, bode plot, nyquist criterions
CO5	:	Able to Design controllers, compensators using MATLAB software

LIST OF EXPERIMENTS

PART-A

(Do Any 7 Experiments from Part-A)

1. Time response of Second order system
2. Characteristics of Synchros
3. Effect of P, PD, PI, PID Controller on a second order systems
4. Design of Lag and lead compensation – Magnitude and phase plot
5. DC position control system
6. Characteristics of magnetic amplifiers
7. Temperature controller using PID
8. Characteristics of AC servo motor
9. Characteristics of DC servo motor

PART-B

(Do Any 3 Experiments from Part-B)

1. Stability analysis (Bode Plot) of Linear Time Invariant system using Matlab.
2. Stability analysis (Root Locus) of Linear Time Invariant systemUsing Matlab.
3. Stability analysis (Nyquist) of Linear Time Invariant system using Matlab.
4. Simulation of P, PI, PD, PID controllers Using Matlab.
5. State Space model for classical transfer function using Matlab.
6. Controllability and Observability Test Using Matlab.

REFERENCE BOOKS:

1. Department lab manual.

V SEMESTER	L	T	P	C
	0	-	3	1.5
20CS5L03 - PYTHON PROGRAMMING LAB				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Apply core programming basics and program design with functions using Pythonprogramming language. K4
CO2	:	Interpret the high-performance programs designed to strengthen the practical expertise. K3
CO3	:	Develop applications for real time problems by applying python data structure concepts K3
CO4	:	Test and apply the concepts of packages, handling, multithreading and socket programming. K4
CO5	:	Divide the importance of object oriented programming over structuredprogramming .K4
CO6	:	Apply the data from existing packages in various application development.K3

PROGRAMS LIST

1. Write a program to find the given number is positive or negative.
2. Write a program to find the maximum of given three numbers.
3. Write a program to find the given year is leap year or not
4. Write a program for sum of N numbers
5. Using functions:To convert Decimal to Binary, Decimal to Octal and Decimal to Hexa Number system.
6. Write a program to find the ASCII value of a given character
7. Write a program to make a simple calculator
8. Write a program to display calendar
9. Write a program to create a List collection using methods (Square Brackets andConstructor) and also perform the following operations on Lists

A) Append() B) Copy() C) Count()D) Extend() E) Insert() F) Pop()G) Remove() H) Reverse() I) Sort()

10.Write a program to create a Tuple collection using parenthesis and tuple constructor and perform the following operations

A) count B) Index

11)Write a program to create a Set collection using curly braces and set constructor andperform the following operations

A) AddB) Copy C) DifferenceD) Insertion E)IssubsetF)Union G) Update H) Issuperset

12)Write a program to create a Dictionary and perform the following operations

A) Copy B) Get C) Items D) KeysE) Popitem F)Values G) Update

13)Data analysis or manipulation using the following packages

A) Pandas B)NumpyC) ScipyD) Matplotlib

V SEMESTER	L	T	P	C
	0	-	4	2
20EE5S01 - IOT APPLICATIONS IN ELECTRICAL ENGINEERING				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Understand the basic concept of Internet of Things
CO2	:	Develop web services to access/control IoT devices.
CO3	:	Deploy an IoT application and connect to the cloud.
CO4	:	Analyze applications of IoT in real time scenario.
CO5	:	Implement IoT to study Smart Home, Smart city, etc

LIST OF EXPERIMENTS

Any TEN of the following Experiments are to be conducted

1. Familiarization with Arduino and perform software installation.
2. To interface LED/Buzzer with Arduino and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface temperature sensor with Arduino and write a program to print temperature and humidity readings.
5. To interface Organic Light Emitting Diode (OLED) with Arduino
6. To interface Bluetooth with Arduino and write a program to send sensor data to smart phone using Bluetooth.
7. To interface Bluetooth with Arduino and write a program to turn LED ON/OFF when '1'/'0' is received from smart phone using Bluetooth.
8. Write a program on Arduino to upload and retrieve temperature and humidity data to thing speak cloud.
9. 7 Segment Display
10. Analog Input & Digital Output
11. Night Light Controlled & Monitoring System
12. Fire Alarm Using Arduino
13. IR Remote Control for Home Appliances
14. A Heart Rate Monitoring System
15. Alexa based Home Automation System.

V SEMESTER	L	T	P	C
	0	-	4	2
20BM5M01 - ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE				

UNIT-I:

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge

UNIT-2:

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-3:

Legal framework and TK: 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); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

UNIT-4:

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge

UNIT-5:

Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, 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

Text books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.

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.

Web Links:

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

V SEMESTER	L	T	P	C
	-	-	-	1.5
20EE5I01 - INTERNSHIP-I				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	To learn the application of knowledge in real world problems. [k1]
CO2	:	To get exposure to team-work and leadership quality. [k4]
CO3	:	To deal with industry-professionals and ethical issues in the work environment. [k2, k3]

VI SEMESTER	L	T	P	C
	3	0	0	3
20EC6T01 :: MICROPROCESSORS AND MICROCONTROLLERS				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Summarize architecture, instructions and addressing modes of 8086 Microprocessor (K2)
CO2	:	Explicate 8086 interfacing with different peripherals and implement programs (K2)
CO3	:	Examine 8051 Microcontroller interfacing and implement programs (K1)
CO4	:	Understand the architecture and applications of advanced processors (K2)

SYLLABUS

UNIT-I	:	

UNIT-I: INTRODUCTION TO PROCESSORS

Introduction: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, CISC and RISC architectures.

8086 : Main features, pin diagram/description, 8086 microprocessor family, Architecture of 8086 , Register Organization, Memory Segmentation, Memory addresses, Physical Memory Organization , interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT-II	:	8086 PROGRAMMING

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-III	:	8086 INTERFACING

8086 Interfacing: Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters

UNIT-IV	:	8051 MICROCONTROLLER

8051 microcontroller: Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts. Assembly language programming: Instructions, addressing modes, simple programs. Interfacing to 8051: A/D and D/A Convertors, LCD Interfacing

UNIT-V	:	ADVANCED PROCESSORS

ARM processor Architecture: ARM Processor fundamentals, ARM Architecture – Register, 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.

Intel Processors: Recent INTEL processors-Pentium processors, i3, i5 and i7 processors.

Text Books:

1. Douglas V Hall, SSSP Rao, Microprocessors and Interfacing – Programming and Hardware, 3rd Edition, Tata McGraw Hill Education Private Limited,2017.
2. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D.McKinlay, The 8051 Microcontrollers and Embedded systems Using Assembly and C, 2-Edition, Pearson, 2011.
3. Joseph Yiu's ,The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors , Third Edition, Elsevier, 2014

Reference Books:

1. 1.A.K.Ray,K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition, Tata McGrawHill, 2017.
2. Dr. Alexander G. Dean ,Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach, Published by Arm Education, Media,2017.

E-REFERENCES:

1. Microprocessors and Microcontrollerswww.tutorialspoint.com/microprocessor/index.htm
2. Microprocessors and Microcontrollers, NPTELhttps://nptel.ac.in/courses/108/105/108105102/

VI SEMESTER	L	T	P	C
	3	0	0	3
20EE6T01 :: POWER SYSTEM ANALYSIS				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Determine Per unit quantities and to form aYbusandZbusfor a power system networks. (K5)
CO2	:	Illustrate the load flow solution of a power system using different methods (K2)
CO3	:	Develop the concepts of Z-bus building algorithm (K3)
CO4	:	Categorize the fault currents and sequence components of currents for both balanced and unbalanced power system network (K4)
CO5	:	Analyze the steady state, transient and dynamic stability concepts of a power system (K4)

SYLLABUS

UNIT-I	:	**PER-UNIT REPRESENTATION**
Per-Unit Representation: Per Unit Quantities–Single line diagram– Impedance diagram of a power system, Graph theory definition – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y– bus matrix by singular transformation and direct inspection methods.		
UNIT-II	**:**	**POWER FLOW STUDIES**
Necessity of power flow studies – Derivation of static power flow equations – Power flow solution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) –Decoupled and Fast Decoupled methods – Algorithmic approach –Problems on 3bus system only.		
UNIT-III	**:**	**Z-BUS ALGORITHM & SYMMETRICAL FAULT ANALYSIS**
Z-Bus Algorithm: Formation of Zbus**:** Algorithm for the Modification of Zbus Matrix (without mutual impedance). **Symmetrical Fault Analysis:** Reactance of Synchronous Machine – Three Phase Short Circuit Currents - Short circuit MVA calculations for Power Systems.		
UNIT-IV	**:**	**SYMMETRICAL COMPONENTS & FAULT ANALYSIS**
Definition of symmetrical components - symmetrical components of unbalanced three phase systems – Power in symmetrical components – Sequence impedances: Synchronous generator – Transmission line and transformers – Sequence networks –Various types of faults LG– LL– LLG and LLL on unloaded alternator–unsymmetrical faults on power system.		
UNIT-V	**:**	**POWER SYSTEM STABILITY ANALYSIS**
Elementary concepts of Steady state, Dynamic and Transient Stabilities. Description of Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability. Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, methods to improve steady state and transient stability.		

TEXT BOOKS:

1 Power System Analysis by John.J Grainger and Stevenson, Tata McGraw Hill – 2017.

2 Modern Power system Analysis – by I.J.Nagrath&D.P.Kothari: Tata Mc Graw–Hill Publishing Company, 4th edition.

3 Electrical power systems by C.L. Wadhwa, New age- International(P) Ltd., - 7th Edition

4 Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J. Overbye –Cengage Learning India Pvt. Ltd.; 6th edition

5 Modern Power System Analysis with MATLAB Applications, R. Jegatheesan K. Vijayakumar, First Editon, By Pearson, 2020.

REFERENCE BOOKS:

1 Power Systems Analysis, 2nd Edition, Arthur R. Bergen, University of Californa, Berkeley, Vijay Vittal, Lowa State University.

2 Power System Analysis by Hadi and Saadat – TMH Edition

3 Power System Analysis by DrB.R.Gupta, SChandPublications,7th edition.

4 Electrical Power Systems by P.S.R.Murthy, B.S.Publications, 3rd edition

5 Electrical Power Systems by Dr S Sivanagaraju, Laxmi publications

VI SEMESTER	L	T	P	C
	3	0	0	3
20EE6T02 :: CONTROL OF ELECTRIC DRIVES				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Explicate the single phase rectifier fed DC drives and its operation (K2)
CO2	:	Illustrate the Speed-Torque characteristics of different motor drives by various power converter topologies(K2)
CO3	:	Classify the different quadrant operations of motors by using choppers (K4)
CO4	:	Explicate control schemes of various drives fed to induction motor(K2)
CO5	:	Explicate speed control mechanism of synchronous motors(K5)

SYLLABUS

UNIT-I	**:**	**FUNDAMENTALS OF ELECTRIC DRIVES**
Electric drive and its components– Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Load equalization– Four quadrant operation of drive (hoist control) – Braking methods**:** Dynamic – Plugging – Regenerative methods		
UNIT-II	**:**	**CONTROLLED CONVERTER FED DC MOTOR DRIVES**
3-phase half and fully-controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics – Dual converter fed DC motor drives -Numerical problems.		
UNIT-III	**:**	**DC–DC CONVERTERS FED DC MOTOR DRIVES**
Single quadrant – Two quadrant and four quadrant DC-DC converter fed separately excited and self-excited DC motors – Continuous current operation -Output voltage and current waveforms – Speed–torque expressions and characteristics – Closed loop operation (qualitative treatment only).		
UNIT-IV	**:**	**STATOR & ROTOR SIDE CONTROL OF 3-PH INDUCTION MOTOR DRIVE**
Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter – Closed loop V/f control of induction motor drives (qualitative treatment only). Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics.		
UNIT-V	**:**	**CONTROL OF SYNCHRONOUS MOTOR DRIVES**
Separate control of synchronous motor – self-control of synchronous motor employing load commutated thyristor inverter - closed loop control of synchronous motor drive (qualitative treatment only)– PMSM (Basic operation only).		

TEXT BOOKS:

1. Fundamentals of Electric Drives – by G K Dubey - Narosa Publications - 2nd edition – 2002.
2. Power Semiconductor Drives - byS.B.Dewan - G.R.Slemon - A.Straughen - Wiley India - 1984.

REFERENCE BOOKS:

1. Electric Motors and Drives Fundamentals - Types and Apllications - by Austin Hughes and Bill Drury - Newnes.4th edition - 2013.
2. Thyristor Control of Electric drives – VedamSubramanyam Tata McGraw Hill Publications - 1987.
3. Power Electronic Circuits - Devices and applications by M.H.Rashid - PHI - 3rd edition - 2009.

VI SEMESTER (ELECTIVE-II)	L	T	P	C
	3	0	0	3
20EE6E01 :: POWER SYSTEM PROTECTION				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Define the principle of operation of circuit breaker with arc phenomena and also different types of circuit breaker (K1)
CO2	:	Identify different types of relays and circuit breakers depends on applications and electrical equipment which has to be protected [K3]
CO3	:	Explicate the protection schemes for different power system components.(K2)
CO4	:	Identify the basic principles of digital protection.(K3)
CO5	:	Explicate about Generation of over voltages in power systems (K2)

SYLLABUS

UNIT-I	**:**	**CIRCUIT BREAKERS**

Introduction, Miniature Circuit Breaker(MCB)– Elementary principles of arc interruption– Restrike and Recovery voltages– Restrike phenomenon– Average and Max. RRRV– Current chopping and Resistance switching– Types of circuit breakers– Oil CB ,Air Blast CB, Vacuum and SF6 circuit breakers– CB and specifications– Testing of CB-Auto reclosing.

UNIT-II	**:**	**PROTECTIVE RELAYS RATINGS**

Principle of operation and construction of attracted armature relay– Balanced beam– Induction disc and induction cup relays– Instantaneous– DMT and IDMT types–Over current relays– Directional relays– Differential relays and percentage differential relays–Distance relays**:** Impedance– Reactance– Mho and offset mho relays– Characteristics of distance relays and comparison.

UNIT-III	**:**	**EQUIPMENT PROTECTION**

Generator Protection: Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth fault and inter turn fault protection.

Transformer Protection: Protection of transformers**:** Percentage differential protection– Design of CT's ratio– Buchholz relay protection,

Feeder and Bus bar Protection: Protection of lines**:** Over current– Carrier current and three zoneDistance relay using impedance relays–Tran slay relay–Protection of bus bars– Differential protection.

UNIT-IV	**:**	**STATIC AND DIGITAL RELAYS**

Static relays**:** Static relay components– Static over current relay– Static distance relay– Micro processor based digital relays: Over current and Impedance relay, Computer aided protection

UNIT-V	**:**	**PROTECTION AGAINST OVER VOLTAGE AND GROUNDING**

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– Grounded and ungrounded neutral systems–Effects of ungrounded neutral on system performance– Methods of neutral grounding**:** Solid–Resistance–Reactance–Arcing grounds and grounding Practices.

TEXT BOOKS:

1 Protection and Switch Gear by BhaveshBhalja, R.P. Maheshwari, Nilesh G. Chothani, Oxford University Press, Second Edition, 2018

2 Switch Gear and Protection, ArunIngole, Pearson Education, 2018

3 Power System Protection and Switchgear by Badari Ram, D.N Viswakarma, New Age International (P) Ltd. Second Edition, 2018.

REFERENCE BOOKS:

1 Power system protection- Static Relays with microprocessor applications. by T.S. Madhava Rao, TMH 3.

2 Fundamentals of Power System Protection by Paithankar and S.R. Bhide, First Edition, PHI, 2003.

VI SEMESTER (ELECTIVE-II)	L	T	P	C
	3	0	0	3
20EE6E02 :: AI APPLICATIONS TO ELECTRICAL ENGINEERING				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Analyse different models of artificial neuron & Use learning methods of ANN.
CO2	:	Evaluate different paradigms of ANN.
CO3	:	Classify between classical and fuzzy sets
CO4	:	Illustrate different modules of Fuzzy logic controller.
CO5	:	Apply Neural Networks and fuzzy logic for real-time applications.

SYLLABUS

UNIT-I	**:**	**INTRODUCTION TO AI TECHNIQUES**

Artificial Neural Networks (ANN) – Humans and computers – Biological neural networks – ANN Terminology – Models of Artificial neuron – activation functions – typical architectures – biases and thresholds – learning strategy (supervised - unsupervised and reinforced) – Neural networks learning rules.

Single layer feed forward neural networks: concept of pattern and its types - perceptron training and classification using Discrete and Continuous perceptron algorithms– linear separability- XOR function.

UNIT-II	**:**	**MULTI-LAYER FEED FORWARD NETWORKS**

Generalized delta rule– Back Propagation algorithm– Radial Basis Function (RBF) network - Kohonen's self-organizing feature maps (KSOFM) - Learning Vector Quantization (LVQ) – Bidirectional Associative Memory (BAM) – Hopfield Neural Network.

UNIT-III	**:**	**CLASSICAL AND FUZZY SETS**

Introduction to classical sets- properties - Operations and relations - Fuzzy sets - Operations - Properties - Fuzzy relations - Cardinalities - Membership functions.

UNIT-IV	**:**	**FUZZY LOGIC SYSTEM COMPONENTS**

Fuzzification - Membership value assignment - development of rule base and decision making system - Defuzzification to crisp sets - Defuzzification methods

UNIT-V	**:**	**APPLICATION OF AI TECHNIQUES**

Load forecasting – Load flow studies – Economic load dispatch – Load frequency control – Reactive power control – Speed control of dc and ac motors.

TEXT BOOKS:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by S.Rajasekaran and G.A. VijayalakshmiPai – PHI Publication.
2. Fuzzy logic with fuzzy applications- by T.J. Ross,TMH.

REFERENCE BOOKS:

1. Introduction to Artificial Neural Systems – Jacek M. Zurada, Jaico Publishing House,1997.
2. Fundamentals of Neural Networks Architectures, Algorithms and Applications - by laureneFausett,Pearson.
3. Neural Networks, Algorithms, Applications and programming Techniques by James A. Freeman, David M.Skapura.
4. Introduction to Neural Networks using MATLAB 6.0 by S N Sivanandam, S Sumathi, S N DeepaTMGH

VI SEMESTER (ELECTIVE-II)	L	T	P	C
	3	0	0	3
20EC6E05 :: SIGNALS AND SYSTEMS				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Describe the signal fundamentals in terms of types and how to represent the various signals. (K1)
CO2	:	Explicate the concept of Fourier series and Fourier transforms to determine the signal and system characteristics. (K2, K4)
CO3	:	Demonstrate the concept of sampling theorem, convolution and correlation and also signal transmission through linear systems. (K3)
CO4	:	Demonstrate the concept of ROC (Region Of Convergence) using Laplace and Z- Transforms to analyze the continuous and discrete time systems. (K3, K4)

SYLLABUS

UNIT-I	**:**	
:INTRODUCTION TO SIGNALS AND SYSTEMS Introduction to Signals: Continuous time signals and Discrete time signals- Periodic and Aperiodic signals- Even and Odd signals- Energy and Power signals- Deterministic and Random signals-Complex Exponential and Sinusoidal signals, Standard Functions - Unit impulse and Unit step &Unit ramp signal. Systems: Continuous time systems and Discrete time systems- Linear and Non-Linear systemsTime Invariant and Time Variant systems- Causal and Non-causal system- BIBO system- Memory and Memoryless systems		
UNIT-II	**:**	UNIT-II: CONVOLUTION AND CORRELATION
Convolution and Correlation: Concept of convolution, Graphical representation of convolution, Properties of Convolution like Cumulative, Associative, Distributive, Shifting, Scaling. Convolution Integral and Convolution Sum. Cross correlation and Auto correlation of functions, properties of correlation function with examples Relation between Auto correlation and energy signal, PSD.		
UNIT-III	**:**	T-III: FOURIER SERIES AND SAMPLING
UNI Concept pf Orthogonal functions with examples. -Fourier Series Representation of ContinuousTime Periodic Signals. Deriving Fourier transform coefficients. Relation between Trigonometric coefficients anf Exponential coefficient, Dirchillet conditions. Sampling Theorem-Time domain and frequency domain statements- Reconstruction of a Signal from its sample- The Effect of under sampling (Aliasing).		
UNIT-IV	**:**	CONTINUOUS-TIME TRANSFORMS:
Unilateral and bi-lateral Fourier Transform- Properties of Fourier transform, The Convolution Property, Parseval's Theorem, The Multiplication Property. Inverse Fourier Transform. Relation between LT and CTFT. Laplace Transform: Unilateral and bi-lateral Laplace Transforms. ROC, Constraints of ROC, Laplace Transform of standard functions, Properties, Inverse Laplace Transform. Initial and Final Value theorems		
UNIT-V	**:**	DISCRETE-TIME TRANSFORMS
Z-transform: Unilateral and bi-lateral z-transform, ROC, Constraints of ROC, Properties of Ztransforms, Convolution Property, Inverse z-Transform(Direct and Indirect methods). Initial and Final Value theorems, Relation between DTFT and Z-Transform		

TEXT BOOKS:

1 B.P. Lathi, “Principles of Linear Systems & Signals”, Oxford Press, Second Edition 2005.
2 A.V.Oppenheim, A.S.Willsky and S.H.Nawab,,Signals and Systems – 4nd Edition, Prentice-Hall India.2009

REFERENCE BOOKS:

1 John G. Proakis and Manolakis, “Digital Signal Processing, Principles, Algorithms and Applications”, PearsonEducation, 3rdedition, 2002
2 Simon Haykin and Barry Van Veen,“Signals and Systems”, John Wiley & Sons In, 2001.

E-CONTENT
1. .https://nptel.ac.in/courses/117/101/117101055/
2.www.pdfdrive.com
3. https://www.tutorialspoint.com/signals_and_systems/signals_and_systems_overview.htm
4. www.booksboon.com 5. www.manybooks.com 6. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011

VI SEMESTER (ELECTIVE-II)	L	T	P	C
	3	0	0	3
20CS6E05 :: OBJECT ORIENTED PROGRAMMING USING JAVA				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Able to solve real world problems using OOP techniques.
CO2	:	2. Able to understand the use of abstract classes.
CO3	:	3. Able to solve problems using java collection framework and I/o classes.
CO4	:	4. Able to focus multithreaded applications with synchronization.
CO5	:	5. Able to apply applets for web applications.

SYLLABUS

UNIT-I	**:**	

Object-oriented thinking- A way of viewing world – Agents and Communities, messages and methods, Responsibilities, Classes and Instances, Class Hierarchies- Inheritance, Method binding, Overriding and Exceptions, Summary of Object-Oriented concepts. Java buzzwords, AnOverview of Java, Data types, Variables and Arrays, operators, expressions, control statements,Introducing classes, Methods and Classes, String handling.

Inheritance– Inheritance concept, Inheritance basics, Member access, Constructors, Creating Multilevel hierarchy, super uses, using final with inheritance, Polymorphism-ad hocpolymorphism, pure polymorphism, method overriding, abstract classes, Object class, forms ofinheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance.

UNIT-II	**:**	

Packages- Defining a Package, CLASSPATH, Access protection, importing packages.

Interfaces- defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces and extending interfaces.

Stream based I/O(java.io) – The Stream Classes-Byte streams and Character streams, readingconsole Input and Writing Console Output, File class, Reading and writing Files, Random accessfile operations, The Console class, Serialization, Enumerations, auto boxing, generics.

UNIT-III	**:**	

UNIT – III:

Exception handling - Fundamentals of exception handling, Exception types, Termination orpresumptive models, Uncaught exceptions, using try and catch, multiple catch clauses, nested trystatements, throw, throws and finally, built-in exceptions, creating own exception sub classes.

Multithreading- Differences between thread-based multitasking and process-basedmultitasking, Java thread model, creating threads, thread priorities, synchronizing threads, interthread communication.

UNIT-IV	**:**	

The Collections Framework (java.util)- Collections overview, Collection Interfaces, TheCollection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque.Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, MapInterfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy

Classes andInterfaces- Dictionary, Hashtable,Properties, Stack, VectorMore Utility classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner
UNIT-V :
GUI Programming with Swing – Introduction, limitations of AWT, MVC architecture,components, containers. Understanding Layout Managers, Flow Layout, Border Layout, GridLayout, Card Layout, Grid Bag Layout.**Event Handling-** The Delegation event model- Events, Event sources, Event Listeners,Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, AnonymousInner classes. A Simple Swing Application,

TEXT BOOKS:

1	Herbert Schildt, "Java The complete reference", 9 th edition, McGraw Hill Education (India) Pvt. Ltd.
2	T. Budd, "Understanding Object-Oriented Programming with Java", updated edition, Pearson Education.
3	James Gosling, David Holmes, "Java Programing", 4 th Edition,.Addision Wesley, 2005

REFERENCE BOOKS:

1	J. Nino and F.A. Hosch, "An Introduction to programming and OO design using Java", JohnWiley& sons.
2	Y. Daniel Liang, "Introduction to Java programming", Pearson Education.
3	P. Radha Krishna, "Object Oriented Programming through Java", Universities Press.
4	S. Malhotra, S. Chudhary, "Programming in Java", 2 ndedition, Oxford Univ. Press.
5	R. A. Johnson, "Java Programming and Object-oriented Application Development", Cengage Learning.

VI SEMESTER :OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20CE6O02 :: DISASTER MANAGEMENT				

Course Outcomes:

Students are able to

1. identify the tools of integrating disaster management principles in disaster mitigation process. (K2)
2. discuss about different approaches needed to manage pre and post- disaster activities**. (K2)**
3. prepare the process of risk management and develop a basic understanding method for the role of public in risk management. (K2)
4. administer the role of technology in Disaster management. (K2)
5. conclude the planning strategies for education and community preparedness programmes. (K2)

SYLLUBUS

UNIT-I : Natural Hazards and Disaster management:

Introduction of DM – Inter disciplinary nature of the subject- Disaster Management cycle- Five priorities for action. Case study methods of the following: floods, draughts -Earthquakes- global warming, cyclones & Tsunamis- Post Tsunami hazards along the Indian coast - landslides.

UNIT-II: **Man Made Disaster and their management along with case study methods of the following**: Fire hazards - transport hazard dynamics -Solid waste management- post disaster – Bio terrotirism -threat in mega cities, rail and air craft's accidents, and Emerging infectious diseases & Aids and their management.

UNIT-III: **Risk and Vulnerability**:

Building codes and land use planning - social vulnerability - environmental vulnerability - Macroeconomic management and sustainable development, climate change risk rendition - financialmanagement of disaster - related losses.

UNIT-IV: **Role of Technology in Disaster managements**:

Disaster management for infra structures, taxonomy of infrastructure - treatment plants and process facilities-electrical substations- roads and bridges- mitigation programme for earth quakes-flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training transformable indigenous knowledge in disaster reduction.

UNIT-V: **Education and Community Preparedness**

Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building community capacity for action.

Text Books

1. JagbirSingh , 'Disaster Management - Future Challenges and Opportunities' , I K International Publishing House Pvt. Ltd-2017
2. Tushar Bhattacharya, 'Disaster Science & Management', Tata McGraw Hill Education Pvt. Ltd., New Delhi.-2012.

References Books

1. Prof. R.B. Singh , "Disaster Management and Mitigation", World Focus 2016.
2. Rajib shah & R. Krishnamurthy, 'Disaster Management - Global Challenges and Local Solutions' Universities press-2009.
3. H K Gupta ,'Disaster Management', Universities press-2003

E-resources

1. https://archive.nptel.ac.in/courses/105/104/105104183/

VI SEMESTER :OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20EE6O01 :: FUNDAMENTALS OF ELECTRIC VEHICLES				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Explicate the basics of electric vehicles fundamentals. (K2)
CO2	:	Discuss different energy storage concepts used for electric vehicles. (K6)
CO3	:	Explicate about fundamental of electrical Machines. (K2)
CO4	:	Analyze various drive trains suitable for electric vehicles. (K4)
CO5	:	Explicate about different types of EV Systems. (K2)

SYLLABUS

UNIT-I	:	INTRODUCTION TO ELECTRIC VEHICLES
Introduction, Components, vehicle mechanics – Roadway fundamentals, vehicle kinetics, Dynamics of vehicle motion - Propulsion System Design.		
UNIT-II	**:**	**BATTERY**
Basics – Types, Parameters – Capacity, Discharge rate, State of charge, state of Discharge, Depth of Discharge, Technical characteristics, Battery pack Design, Properties of Batteries.		
UNIT-III	**:**	**DC & AC ELECTRICAL MACHINES**
Motor and Engine rating, Requirements, Fundamental concepts of DC machines- Three phase A/c machines- Induction machines- permanent magnet machines-switched reluctance machines		
UNIT-IV	**:**	**ELECTRIC VEHICLE DRIVE TRAIN**
EV Transmission configuration, Components – gears, differential, clutch, brakes regenerative braking, motor sizing.		
UNIT-V	**:**	**HYBRID ELECTRIC VEHICLES**
Types – series, parallel and series, parallel configuration – Design – Drive train, sizing of components.		

TEXT BOOKS:

1. Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2021.

2. Denton - Tom. Electric and hybrid vehicles. Routledge - 2020.

REFERENCE BOOKS:

1. Kumar - L. Ashok - and S. Albert Alexander. Power Converters for Electric Vehicles. CRC Press - 2020.

2. Chau - Kwok Tong. Electric vehicle machines and drives: design - analysis and application. John Wiley & Sons - 2015.

3. Berg - Helena. Batteries for electric vehicles: materials and electrochemistry. Cambridge university press - 2015.

VI SEMESTER :OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20EC6O01 ::MOBILE COMMUNICATION AND IT'S APPLICATIONS				

COURSE OUTCOMES:

Students are able to

CO1. Design Hexagonal shaped cells and how these are implemented in real world.

CO2. Explicate different types of antenna systems in mobile communication.

CO3. Analyze Handoffs and different types of handoffs and Dropped call rates and their evaluation.

CO4. Describe the Parameters of Mobile multipath channels, Types of small scale fading.

UNIT-I

INTRODUCTION :

Evolution of Mobile Communications, Mobile Radio Systems around the world, First, Second, Third Generation Wireless Networks, Wireless Local Loop(WLL), Wireless LANs, Bluetooth, Personal Area Networks(PANs), A Simplified Reference Model, Applications.

UNIT-II

ELEMENTS OF MOBILE COMMUNICATIONS:

General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

UNIT-III

THE MOBILE CONCEPT :

Introduction, Frequency reuse, Handoff strategies, Interference and System Capacity: Co- Channel Interference, Channel Planning, Adjacent Channel Interference, Power control for reducing interference, Trunking and Grade of Service, Cell Splitting, Sectoring.

UNIT-IV

MOBILE RADIO PROPAGATION :

Introduction, Free space propagation model, The three basic propagation models-Reflection, Diffraction and Scattering, Two-ray model, Outdoor propagation models, Indoor propagation models, Signal Penetration into building, Small scale multipath Propagation, Parameters of Mobile multipath channels, Types of small scale fading.

UNIT-V

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT:

Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.

TEXTBOOKS:

1. Wireless Communications by Theodore S. Rappaport, principles and practice,2nd Editions. (**Unit-I, III, IV & V)**

2. Mobile Cellular Communication by GottapuSasibhushana Rao, Pearson International, 2012.

(UNIT - I, II, III &IV)

3. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006. **(UNIT - V & VI)**

REFERENCES:

1. Wireless and Mobile Communications-Lee, McGraw Hill, 3rd Edition, 2006.
2. Wireless Communications and Networks-William Stallings, Pearson Education, 2004.

VI SEMESTER : OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20ME6O01 :: BASICS OF 3D PRINTING				

COURSEOBJECTIVES:

- To explore technology used in additive manufacturing.
- ToacquireknowledgeforselectingcorrectCADformatsinmanufacturingprocess.
- To understand the operating principles and limitations of liquid, solid and laser based additive manufacturing system.
- To design the process of additive manufacturing including tools used for design.
- Toacquireknowledgeonimportantprocessparametersforbio-manufacturing

COURSEOUTCOMES: Students are able to

CO1: To impart the fundamentals of Additive Manufacturing Technologies for engineering applications. [K2]

CO2:Selectand use correct CAD for mats in the manufacture of a3D printed part.[K2]

CO3: Explicate the operating principles, capabilities, and limitations of liquid, solid and laser based additive manufacturing system.[K2]

CO4:Enumerate the design process for additive manufacturing including tools used for design and some features required for design. [K2]

CO5: Describe the important process parameters for bio-manufacturing and determine the suitable additive technique for bio-manufacturing, aerospace and manufacturing engineering.[K2]

UNITI

INTRODUCTION

3D printing Overview, History ,Need, Classification ,Additive Manufacturing Technology in product development, Materials for Additive Manufacturing Technology

UNITII

REVERSEENGINEERING

BasicConcept–3DScanningDigitizationtechniques,ModelReconstruction,DataProcessingforAdditive Manufacturing Technology, Part Orientation and support generation, Model Slicing, Tool path Generation.

UNITIII

ADDITIVEMANUFACTURINGSYSTEMS

SOLID& LIQUID BASED- Classification ,Stereo lithography Apparatus (SLA) - Principle, process, advantages, Fused Deposition Modeling –Principle, process, advantages.
LASERBASED-Selective LaserSintering–Principle,Process,advantages,ThreeDimensionalPrinting –Principle, process, advantages – Laser Engineered Net Shaping(LENS)

UNITIV

DESIGNFORAM

Motivation,DesignforManufacturingandAssembly(DFMA)-
conceptsandobjectives,AMuniquecapabilities,Exploring design freedoms, Design tools for AM-Part Orientation, Removal of Supports,

Hollowing out parts, Inclusion of Undercuts, Other Manufacturing Constraining Features, Interlocking Features, Reduction of Part Count in an Assembly, Identification of markings/numbers etc.

UNITV

APPLICATIONSOF3DPRINTING.

Customized implants and prosthesis: Design and development, Bio-Additive Manufacturing- Computer Aided Tissue Engineering (CATE), Applications of 3D Printing in Aerospace, Automotive, Manufacturing and Architectural Engineering.

TEXTBOOKS

1. Patri K. Venuvinod., and Weiy in Ma., Rapid prototyping Laser based and other Technologies, First Edition, Springer Science +Business Media, LLC, 2004.

2. Chua C.K., Leong K.F., and Lim C.S., Rapid prototyping: Principles and applications, Third Edition, World Scientific Publishers, 2016.

3. GebhardtA,Rapidprototyping,HanserGardenerPublications,2017.

4. Chee Kai Chua, Kah Fai Leong, 3D Printing and Additive Manufacturing: Principles and Applications, World Scientific Publishers, Fourth Edition of Rapid Prototyping, 2018.

REFERENCES

1. LiouL.W.andLiouF.W.,RapidPrototypingandEngineeringapplications:Atoolboxforprototypedevelopment,CRC Press, 2017.

2. Kamrani A.K. and Nasr E.A.,Rapid Prototyping: Theoryand practice, Springer, 2016.

3. Hilton P.D. and Jacobs P.F., Rapid Tooling: Technologies and Industrial Applications, CRC press,2015.

VI SEMESTER : OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20ME6O02 :: FARM MACHINERY				

COURSE OBJECTIVES: The objectives of this course are

- To impart the students to understand the fundamentals of machinery in farming.
- To enable the students to acquire knowledge on tillage and equipment used.
- To introduce the students about various types of earth moving equipment.
- To enable the students to acquire knowledge on seeding and spraying equipment.
- To introduce the fundamentals of transplanting machinery and fertilizer equipment.

COURSE OUTCOMES: Students will be able to

CO1. Explicate various types of machinery in farming. [K2]
CO2. Illustrate types of farm operation for craft cultivation with scientific understanding. [K2]
CO3. Explicate various types of earth moving equipment. [K2]
CO4. Summarize various seeding methods and sprayer types. [K2]
CO5. Explicate transplanting methods and fertilizer equipment. [K2]

UNIT I
FARM MECHANIZATION:
Farm mechanization- objectives of farm mechanization, sources of farm power, classification of farm machines. Materials of construction and heat treatment. principles of operation and selection of machines used for production of crops, Field capacities of different implements and their economics, Problems on field capacities and cost of cultivation

UNIT II
TILLAGE EQUIPMENT:
Tillage equipment - classification and types of tillage, Primary tillage implements-mould board plough and its parts, disc plough, and other ploughs, Secondary tillage equipment- disc harrows, Implements-cultivators, intercultural implements. Forces acting on tillage tools, Problems on forces analysis, Draft measurement of tillage equipment, Draft and unit draft related problems.

UNIT III
EARTH MOVING EQUIPMENT
Earth moving equipment - terminology, construction and their working principles, shovels, bulldozers, trenches and elevators.

UNIT IV
SEED DRILLS AND SPRAYER:
Seeding - methods, types of seed metering mechanism, types of furrow openers. Calibration of seed drills, Adjustment of seed drills – objectives, uses of plant protection equipment
Sprayers - types of sprayers and dusters, sprayer calibration and selection, Constructional features of different components of sprayers and dusters

UNIT V
TRANSPLANTING AND FERTILIZER:
Transplanting and fertilizer - transplanting methods, different types of transplanting machinery, working principle, adjustments in transplanting equipment
Fertilizer - application equipment, fertilizer meeting mechanism calibration of fertilizer equipment.

TEXTBOOKS

1. Fakir Chara Das, Kishore Chandra and ShishiraKanth, Farm Machinery and Equipment, 1st Edition, Akinik Publications, 2020
2. Triveni Prasad Singh, Farm Machinery, 1st Edition, Prentice Hall India Pvt, Limited, 2016.

REFERENCES

1. Surendra Singh, Farm Machinery Principal And Applications, 1st Edition, ndian Council of Agricultural Research, 2017

2. Smith H P, Farm Machinery and Equipment, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2007.

VI SEMESTER : OPEN ELECTIVE - II	L	T	P	C
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20EC6O01:: FUNDAMENTALS OF SOFTWAREENGINEERING				

COURSE OUTCOMES:

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

1. Identify, formulate the various software engineering concepts
2. different software development process models.
3. analyze and specify software requirements with various stakeholders of a software development project
4. Apply systematic procedure for software design and deployment.
5. Compare and contrast the various testing methods and art of debugging

UNIT I

SOFTWARE AND SOFTWARE ENGINEERING: The nature of Softwaree: Define software (Software Characteristics), Software Application Domains, **SoftwareEngineering**: Definition, Llayered Technology,**Software Process:** GenericProcess framework activities, Umbrella activities,Software Myths and Reality,GenericProcess model, Capability Maturity Model Integration (CMMI).

UNIT-II

PROCESS MODELS: Process Assessment and improvement.Prescriptive Process models:Waterfall Model, IncrementalProcess Model**,**Evolutionary Process Models: Prototyping, Spiral model, The Unified Process.Personal and Team process models: Personal software process (PSP), Team software process (TSP), Product and Process,

UNIT-III

REQUIREMENTS ANALYSIS AND SPECIFICATION: Functional Requirements, Non- Functional Requirements, Software Requirements Document (Software Requirements Specification SRS),Requirements Specification, Requirements Engineering**,** Eliciting Requirements(elicitation), Developing Use cases, Validating Requirements, Requirements Management: Requirements Planning, Requirements Change management.

UNIT-IV

SOFTWARE DESIGN: Design process**, Design concepts**: Abstraction, Architecture, Patterns, Separation of Concerns, Modularity, Information hiding, Functional independence, Refinement, Aspects, refactoring, Object oriented design concepts, Design classes.

The Design Model: Data Design Elements, Architectural Design elements, Designing Class Based Components: Basic Design Principles, Component-Level Design guidelines, Cohesion and coupling.
User Interface Design: The Golden Rules

UNIT-V

TESTING: The strategies for Conventional Strategies: Unit Testing – Integration Testing. Test Strategies for Object-Oriented Software, Software testing fundamentals, white box testing- Basis path testing: Flow graph Notation, independent Program paths, Deriving test cases, Graph Matrices. control structure testing. black box testing: Graph Based Testing Methods, Equivalence Partitioning, Boundary value Analysis. Validation Testing, System Testing. Art of Debugging: The Debugging process.

TEXTBOOK:

1. Software Engineering, A practitioner's Approach- Roger S. pressman, 8th edition, McGraw-HillinternationalEdition, 2014.
2. SoftwareEngineering,IanSommerville,10thEdition,PearsonEducationAsia,2016.

REFERENCEBOOKS:

1. SoftwareEngineering,PankajJalote,APreciseApproach",WileyIndia,2010.
2. SystemsAnalysisandDesign-ShelyCashmanRosenblatt,9th Edition, Thomsonpublications, 2016.
3. SoftwareProjectManagement,BobHughes,MikeCotterellandRajibMall,FifthEdition,TataMc GrawHill,New Delhi, 2012.
4. https://nptel.ac.in/courses/106101061/

VI SEMESTER : OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20CS6O02 :: FUNDAMENTALS OF COMPUTER NETWORKS				

COURSE OUTCOMES

At the end of the course students are able to

1. Differentiatenetwork reference models such as OSI, TCP/IP
2. Classify variousData Link Layer protocols such as sliding window.
3. Distinguish various MACsublayer protocols such as ALOHA, CSMA, CSMA/CD
4. DifferentiateNetwork layerprotocols IPv4 and IPv6
5. Distinguish various Transport layer protocols and its applications

UNIT 1:

Data communication Components: Representation of data and its flow of networks, Categories of Networks, Various Connection Topologies, Protocols and Standards, OSI network model, TCP/IP Protocol suit, addressing

UNIT 2:

Physical Layer: Transmission Media:Guided Media,Unguided Media

Data Link Layer: Error Detection and Error Correction -Fundamentals, Block coding, Hamming Distance, CRC, Flow Control and Error control protocols: Stop and Wait, Go back – N ARQ, Selective Repeat ARQ

UNIT 3:

Medium Access Sub Layer: Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.Controlled Access protocols: Reservation, Polling, Token passing

UNIT 4:

Network Layer: IPv4 address: Address Space,Notations,Classful Addressing,Classless Addressing,Network Address Translation (NAT)**IPv6 Addresses**: Structure,Address Space

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP)

UNIT 5:

Application layer:

Domain name system (DNS), E-mail, File Transfer Protocol (FTP), www and HTTP

Text Books:

1. Data Communication and Networking, 5th Edition, Behrouz A. Forouzan, McGrawHill, 2017
2. Computer Networks, 6th Edition, Andrew S. Tanenbaum, Pearson New International Edition, 2021.
3. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India, 2007

Reference Books:

1. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
2. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

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20BM6O01 :: STRESS AND WORK LIFE MANAGEMENT				

UNIT-I

Understanding stress**:** Meaning – Symptoms – Works Related Stress – Individual Stress –Reducing Stress – Burnout. Setting to Stress- Stress: Meaning - Approaches to stress, Good Stress Vs Bad Stress, The individual and work.

UNIT-II

Common stress factors time & career plateauing**:** Time Management – Techniques – Importance of planning the day – Time management schedule – Developing concentration – Organizing the Work Area – Prioritizing – Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say 'No

UNIT-III

Introduction to Work-Life Balance - Importance of Work-Life Balance - Benefits of Work-Life Balance to Employees - Benefits of Work-Life Balance for Organization - Effects of Poor Work-Life Balance on Employees - Relation between Work-Life Balance & Stress - Outline for Work-Life Balance Planning- Approaches to Work-Life Balance planning - Process of Work-Life Balance - Steps of Work-Life Balance Planning

UNIT-IV

Work place humour**: Developing** a sense of Humour – Learning to laugh – Role of group cohesion and team spirit – Using humour at work – Reducing conflicts with humour.

UNIT-V

Self-development: Improving Personality – Leading with Integrity – Enhancing Creativity – Effective decision making – Sensible Communication – The Listening Game – Managing Self – Meditation for peace – Yoga for Life. Organization and Stress Management - Recognize the signs, Approaches to the problem, Providers Assistance.

References

1. Cooper, Managing Stress, Sage, 2011
2. Waltschafer, Stress Management, Cengage Learning, 4th Edition 2009.
3. Jeff Davidson, Managing Stress, Prentice Hall of India, New Delhi, 2012.
4. Juan R. Alascal, Brucata, Laurel Brucata, Daisy Chauhan. Stress Mastery. Pearson
5. Argyle. The Psychology of Happiness. Tata McGraw Hill. 2012
6. Bartlet. Stress – Perspectives & Process. Tata McGraw Hill. 2012
7. Handbook on Work –Life Balance-A New Approach, 2017, Dr. C Swarnalatha,Mrs.S.Rajalakshmi,Lulu Press.

VI SEMESTER : OPEN ELECTIVE - II	L	T	P	C
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20BM6O02 :: BANKING AND INSURANCE				

Unit I

Origin of banking: Definition, Types of deposits, Origin, and growth of commercial banks in India. India's Approach to banking Sector Reforms, International security standards in banking, Global Financial Crisis and India's banking Sector.

UnitII

Introduction to E-Banking-Impact of Information Technology on Banking Changing Financial Environment and IT as a strategic response Hardware and Software.

Unit III

Delivery Channels-ATM, EFTPOS, Phone Banking, Internet Banking, SMS Banking, Mobile Banking, Credit/Debit Cards, Smart Cards E-Commerce-Secure Electronic Transfer (SET), Payment Gateways (Credit card/Debit cards), Authentication of payments, etc.

Unit IV

Principles and Practice of Insurance-Introduction to Risk and Insurance, Types of Insurance-General and Life, Basic principles of General and Life Insurance,

Unit V

General insurance products, underwriting concepts, standard conditions and warranties with respect to Fire, Marine, Motor, Engineering and Miscellaneous products.

Reference Books:

1. Agarwal, OP, Banking & Insurance, Himalaya Publishing House, Mumbai
2. George E Rejda, Principles of Risk Management & Insurance, Pearson Education, New Delhi
3. Balachandran S., General Insurance, Insurance Institute of India, Mumbai
4. Arthur C., William Jr., Michael Smith, Peter Young, Risk Management and Insurance, Tata McGraw Hill Publishing Company, New Delhi
5. Tripathy Nalini Prava & Prabir Pal, Insurance Theory & Practice, Prentice Hall of India Pvt. Ltd., New Delhi
6. Balachandran S., Life Insurance, Insurance Institute of India, Mumbai

VI SEMESTER : OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20MA6O01 :: OPERATION RESEARCH				

COURSE OBJECTIVES:

1.Ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, machinesetc) more effectively.

2.Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry

UNIT—I

LINEAR PROGRAMMING:

Introduction-General formulation LPP- Formulation of LP problems - Graphical solution –Slack and Surplus and Artificial variables-simplex method (simple problems) - artificial variable techniques – twophase method, Big-M-method(simple problems) –Concept of Duality-general rules for converting any primal into its dual.

UNIT – II

TRANSPORTATION PROBLEM:

Introduction-mathematical formulation-Feasible, Basic Feasible and Optimum solution -Methods for initial basic feasible solution to transportation problem-optimal Test by u, v method(MODI)-Degeneracy in Transportation problems –.Unbalanced Transportation problems

UNIT – III

SEQUENCING PROBLEM:

Introduction –Johnson's Algorithm for n jobs 2 machines- Optimal Solution for processing n jobs through two machines- processing n jobs through three machines - processing n jobs through m machines - processing two jobsthrough m machines

UNIT – IV

REPLACEMENT PROBLEMS:

Introduction – replacement policy for items whose maintenance cost increases with time, and money value is constant – Money value, present worth Factor and Discount Rate- replacement policy when maintenance cost increases with time and money valuechanges with constant rate – Individual Replacement Policy-group replacement of items that fail completely.

UNIT – V

WAITING LINES:

Introduction- transient and steady states-Probability Distributions in Queening systems-Kendall's notation for Representing Queening models- Single channel-Poisson arrivalsExponential service times-with infinitepopulation model (M/M/1: FIFO/∞/∞)

INVENTORY:

Introduction – types of inventory models – Costs involved in Inventory problems-Variables in inventory problem-Classification of Inventory Models-Concept of EOQ-The EOQ model without shortage – Quantity Discounts-purchase inventory models with one price break - purchase inventory models with two price breaks- purchase inventory models with any number of price breaks-shortages are not allowed

COURSE OUTCOMES: Students can able to

CO1: Formulate the resourcemanagement problem andidentify appropriate methods to solve them. [K3]

CO2:Applytransportationmodel to optimize the industrial resources. [K3]

CO3: Solve sequencing problems using operation research techniques. [K3]
CO4: Apply thereplacementmodel to increase the efficiency of the system. [K3]
CO5: Apply theinventory and queuingmodel to increase the efficiency of the system. [K4]

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TEXT BOOKS:

1. Operations Research / S.D.Sharma, Ramnath co,Meerut
2. Operations Research, P.K.Gupta, D.S.Hira,S.Chand

REFERENCE BOOKS:

1. Operations Research /A.M.Natarajan,P.Balasubramani, A.Tamilarasi/PearsonEducation.
2. Operations Research / R.Pannerselvam,PHIPublications.

VI SEMESTER : OPEN ELECTIVE - II	L	T	P	C
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20IT6O01 :: INTRODUCTION TO CLOUD COMPUTING				

Course Outcomes:

Upon completion of the course, it is expected that student will be able to:

1. Articulate the main concepts, key technologies, strengths and limitations of cloud computing.

2. Learn the key and enabling technologies that help in the development of cloud.

3. Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.

4. Explicate the core issues of cloud computing such as resource management and security.

5. Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

UNIT-I:

Introduction: Introduction to Cloud Computing, Definition of Cloud, Evolution of Cloud Computing, Underlying Principles of Parallel and Distributed Computing, Cloud Characteristics, Elasticity in Cloud – On-Demand Provisioning.

UNIT-II:

Cloud Enabling Technologies: Service Oriented Architecture, REST and Systems of Systems, Web Services, Publish-Subscribe Model, Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtualization Support and Disaster Recovery.

UNIT-III:

Cloud Architecture, Services And Storage: Layered Cloud Architecture Design, NIST Cloud Computing Reference Architecture, Public, Private and Hybrid Clouds, IaaS, PaaS, SaaS, Architectural Design Challenges, Cloud Storage, Storage-as-a-Service, Advantages of Cloud Storage, Cloud Storage Providers, S3.

UNIT-IV:

Resource Management And Security In Cloud: Inter Cloud Resource

Management, Resource Provisioning and Resource Provisioning Methods, Global Exchange of Cloud Resources, Security Overview, Cloud Security Challenges, Software-as-a-Service Security, Security Governance, Virtual Machine Security, IAM, Security Standards.

UNIT-V:

Cloud Technologies And Advancements: Hadoop, MapReduce, Virtual Box, Google App Engine, Programming Environment for Google App Engine, Open Stack, Federation in the Cloud, Four Levels of Federation, Federated Services and Applications, Future of Federation.

Text Books:

1. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Morgan KaufmannPublishers.

2. Cloud Computing: Implementation, Management and Security, Rittinghouse, John W., and James F. Ransome, CRCPress.

References:

1. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Tata McgrawHill.

2. Cloud Computing - A Practical Approach, Toby Velte, Anthony Velte, Robert Elsenpeter, Tata McGrawHill.

3. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), George Reese, O'Reilly.

VI SEMESTER:OPEN ELECTIVE - II	L	T	P	C
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20IT6O02 ::E-COMMERCE				

COURSE OUTCOMES

After the completion of the course the students are able to

1. Define the fundamentals E-commerce framework.
2. Explicate the basics of Consumer Oriented Electronic models.
3. Distinguish different electronic payment systems and their issues.
4. Demonstrate Inter-organizational and intra-organizational electronic commerce.
5. Explicate advertising and marketing on the Internet, consumer search and resource discovery and key multimedia concepts.

UNIT-I

Electronic Commerce-Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

UNIT-II

Consumer Oriented Electronic commerce - Mercantile Process models, Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

UNIT-III

Inter Organizational Commerce - EDI, EDI Implementation, Value added networks. Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT-IV

Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research.

UNIT-V

Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering.

Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing, Desktop video conferencing.

Text Books:

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson.

References Books:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, TharamDillon,Ellizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal – Galgotia.E-Commerce, Efrain Turbon, Jae Lee, David King, H.Michael Chang.
3. Electronic Commerce – Gary P.Schneider – Thomson.
4. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol GuyericoTraver.

VI SEMESTER :OPEN ELECTIVE - II	L	T	P	C
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20CE6O01:: ENVIRONMENTAL POLLUTION AND CONTROL				

Course Outcomes:

Students are able to

1. Identify the air pollutant causes and control devices. (K2)
2. Differentiate the treatment techniques used for sewage and industrial wastewater treatment methods. (K2)
3. Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city. (K2)
4. know the causes for noise pollution and ISO14000 standards. (K2)
5. know Treatment and management of hazardous waste. (K2)

SYLLUBUS

UNIT – I : Air Pollution

Air pollution causes-control methods–particulate control devices – methods of controlling Gaseous Emissions – Air quality standards.

UNIT –II: Industrial wastewater Management

Strategies for pollution control – Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants – Recirculation of industrial wastes – Effluent standards.

UNIT – III : Solid Waste Management

Solid waste characteristics–basics of on-site handling and collection–separation and processing – Incineration- Composting-Solid waste disposal methods – fundamentals of landfilling.

UNIT – IV: Noise Pollution

Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000

UNIT – V: Hazardous Waste

Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods.

Text books

1. K. Sasi Kumar, S.A. Gopi Krishna ,"Solid Waste Management",PHI New Delhi,2014.
2. D. Srinivasan, "Environmental Engineering", PHI Learning Private Limited, New Delhi, 2011.

References books

1. Ruth F. Weiner and Robin Matthews , 'Environmental Engineering', 4th Edition Elesevier, 2003.
2. J.G. Henry and G.W. Heinke,'Environmental Science and Engineering'– Pearson Education,2002
3. Mackenzie L Davis & David A Cornwell, "Environmental Engineering ',McGraw Hill Publishing,2002.
4. Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus,"Environmental Engineering", Mc-Graw-Hill Book Company, New Delhi, 1985.

E-Resources

https://nptel.ac.in/courses/123105001

VISEMESTER:JOB ORIENTED ELECTIVE -II	L	T	P	C
	3	-	-	3
20CS6J01 ::AWS CLOUD PRACTITIONER				

Course outcomes:

After completing this course, students should be able to

1. Define AWS cloud and identify the Global Infrastructure components of AWS.
2. Demonstrate when to use Amazon EC2, AWS Lambda and AWS Elastic Beanstalk.
3. Differentiate Storage Services and demonstrate when to use AWS Database services.
4. Demonstrate Networking and Content Delivery Services.
5. Understand the Cloud economics and security.

UNIT 1:

CLOUD CONCEPTS OVERVIEW – Introduction to cloud computing, Cloud service models, Cloud computing Deployment models , Advantages of the cloud, Introduction to AWS.
AWS GLOBAL INFRASTRUCTURE OVERVIEW: AWS GLOBAL INFRASTRUCTURE, AWS Services and Service categories

UNIT 2:

COMPUTE – Compute services overview, Amazon EC2, Amazon EC2 pricing models, Benefits, use cases, four pillars of cost optimization, Container services, Introduction to AWS Lambda, Benefits of Lambda, Introduction to AWS Elastic Beanstalk, Benefits.

UNIT 3:

STORAGE: Amazon Elastic Block Store (EBS), Amazon Simple Storage Service (Amazon S3), Amazon Elastic File System (Amazon EFS), Amazon Simple Storage Service Glacier (Amazon S3 Glacier).

DATABASES: Amazon Relational Database Service (Amazon RDS), Amazon DynamoDB, Amazon RedShift, Amazon Aurora.

UNIT 4:

Networking and Content Delivery: Networking Basics, Amazon VPC, VPC Networking, VPC SECURITY, Amazon ROUTE-53, Amazon Cloud Front

UNIT 5:
CLOUD ECONOMICS AND BILLING: Fundamentals of pricing, AURI,PURI,NURI ,Total cost of Ownership (TOC).
AWS CLOUD SECURITY: AWS Shared Responsibility Model, AWS IAM (Identity and Access Management),Elastic Load Balancing (ELB), Amazon CloudWatch.

Web references and AWS LMS portal :

https://aws.amazon.com/ec2
https://aws.amazon.com/ecs/
https://aws.amazon.com/about-aws/global-infrastructure/

VISEMESTER:JOB ORIENTED ELECTIVE - II	L	T	P	C
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20CS6J02 ::SOFTWARE TESTING TOOLS				

COURSE OUTCOMES:
At the end of the course students are able to

1. learn Manual testing techniques and software test levels
2. practice Java Programme for Selenium and Test frame works
3. learn Apache JMeter and Building a JMeter Test Plan
4. Running Multiple Scripts with JMeter and Different Types of JMeter Test Plans
5.practicing JIRA and Test Management In JIRA (Using Zephyr Plug-in)

UNIT-I:

Manual Testing : Software Development Life Cycle (Requirements Gathering, Analysis and Planning, Software Design, Coding/Implementation, Testing, and Release and Maintenance Phase)

Software Test Levels (Unit Testing, Integration Testing, System Testing, and Acceptance Testing)
Software Test Types
Software Test Design Techniques
Software Test Life Cycle
Software Documents
Software Testing Standards
Software Testing certification/s

UNIT-II:

'Selenium with Java' : Java Programme for Selenium (Data Types, Variables, Operators, Control Flow, Strings, Arrays, IO, Methods, Exception Handling, and Object-Oriented Programming.)

- Selenium WebDriver (Web/HTML Elements, Inspecting Web Elements, Locating Elements, Selenium WebDriver API commands, Wait statements, and Page Object Model.)
- TestNG Testing Framework (Create Test cases, Prioritise Test cases, Grouping Test Cases, Batch Testing, and Generating Test Results.)
- Automation Framework

UNIT-III:

JMeter:

- Introduction to Apache JMeter
- Elements of JMeter Test Plan
- Building a JMeter Test Plan
- Recording Tests Using JMeter
- Enhancements in Test Scripts

UNIT-IV:

JMeter Result Analysis

- Running Multiple Scripts with JMeter
- Different Types of JMeter Test Plans
- JMeter Distributed (Remote) Testing
- JMeter Functions, Variables and Regular Expressions
- JMeter Best Practices

UNIT-V:

Jira Tool Syllabus:

- Introduction of JIRA
- Getting started with JIRA
- Test Management In JIRA (Using Zephyr Plug-in)
- Defect Management In JIRA
- Advanced Search Using JQL
- Generating Reports In JIRA

Web references:

https://www.lambdatest.com/blog/selenium-with-java/
https://www.gcreddy.com/2021/09/apache-jmeter-syllabus.html
https://www.javatpoint.com/jira-tutorial

VISEMESTER : JOB ORIENTED ELECTIVE - II	L	T	P	C
	3	-	-	3
20IT6J01 ::FULL STACK DEVELOPMENT				

Course Outcomes:

At the end of the course students will be able to

1. Identify the Basics concepts of Web Page and Markup Languages
2. Develop web Applications using Scripting languages and Frameworks
3. Creating and Running Applications using PHP
4. Creating First Controller Working with and Displaying in AngularJS and Nested Forms with ng-form
5. Working with the Files in React JS and Constructing Elements with Data

Unit- 1: HTML

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols- The World Wide Web-HTTP request message-response message-Web clients Web Servers. Markup Languages: XHTML, an introduction to HTML, History, Versions, Basics, XHTML Syntax and semantics some fundamentals of HTML Elements-Relative URLs-Lists-Tables-Frames-Forms-HTML 5.0

Unit- 2: Cascading Style Sheets (CSS)

Style Sheets: CSS-Introduction to Cascading Style Sheets- Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance- Text Properties-Box Model Normal Flow Box Layout beyond the Normal Flow-CSS3.0, Introducing to Java Script, JavaScript basics, JavaScript objects, JSON.

Unit- 3: PHP

Introduction to PHP, Language Basics, Functions, Strings, Arrays. MYSQL Installation, Accessing MySQL Using PHP, Form Handling, Cookies, Sessions, and Authentication, Tables, Inserting Data into Tables, Selecting Data from a Table, Updating Table, Deleting data from Table, Webpage creation.

Unit- 4: Angular JS

Introducing Angular JS, Starting out with Angular JS, Basic AngularJS, Directives and Controllers, AngularJS Modules, Creating First Controller, working with and Displaying, Arrays, more Directives, working with ng-repeat, Unit Testing in AngularJS, Forms, inputs and Services, Working with ng-model, Working with Forms, Leverage Data-Binding and Models, Form Validation and States, Error Handling with Forms, ngModelOptions, Nested Forms with ng-form, Other Form Controls.

Unit- 5: React JS

Introduction to react, Obstacles and Roadblocks, keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, React DOM, Children, Constructing Elements with Data, React Components, DOM Rendering , Factories

Text Books:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007
3. Brad Green, Shyam Seshadri, AngularJS, Up and Running Enhanced Productivity with Structured Web Apps, Publisher O'Reilly Media
4. Alex Banks, Eve Porcello,Learning React, Functional Web Development with React and Redux Publisher O'Reilly Media

Reference Books:

1. Bert Bates, Kathy Sierra,Head First Java, 2nd Edition Publisher O'Reilly Media, Inc

VISEMESTER : JOB ORIENTED ELECTIVE - II	L	T	P	C
	3	-	-	3
20IT6J02 ::BLOCK CHAIN TECHNOLOGY				

Course Outcomes

After the completion of the course the students are able to

CO1 Discover the secure and efficient transactions with crypto-currencies

CO2 Experiment with cryptocurrency trading and crypto exchanges

CO3 Explicate bitcoin usage and applications

CO4 Develop private block chain environment and develop a smart contract on Ethereum

CO5 Build the hyperledger architecture and the consensus mechanism applied in the hyperledger

Unit-I

CRYPTOCURRENCY AND BLOCKCHAIN- INTRODUCTION:

Blockchain- An Introduction, Distinction between databases and blockchain, Distributed ledger. Blockchain ecosystem - Consensus Algorithms & Types, Blockchain structure, Distributed networks- Distributed Applications (DApps) – Web 3.0 - DApps Ecosystems. Working - Permissioned and permission-less Blockchain – Cross Chain Technologies. – IOT & Blockchain - Digital Disruption in Industries – Banking, Insurance, Supply Chain, Governments, IP rights, Creation of trustless Ecosystems – Block chain as a Service – Open Source Block chains

Unit-II

CRYPTO CURRENCIES: Crypto Currencies - Anonymity and Pseudonymity in Cryptocurrencies - Digital Signatures - Cryptocurrency Hash Codes -Need for Crypto Currencies – Crypto Markets – Explore Crypto Currency Ecosystems - ICOs – Crypto Tokens - Atomic Swaps – Crypto Currency Exchanges – Centralised and Decentralized Crypto exchanges – Regulations on Crypto Currencies & exchanges – Downside of non-regulated currencies – crypto Scams – Exchange hacks

Unit-III

BITCOIN: Bitcoin – history- Bitcoin- usage, storage, selling, transactions, working- Invalid Transactions Parameters that invalidate the transactions- Scripting language in Bitcoin- Applications of Bitcoin script- Nodes and network of Bitcoin- Bitcoin ecosystem

Unit-IV

ETHEREUM: The Ethereum ecosystem, DApps and DAOs - Ethereum working- Solidity- Contract classes, functions, and conditionals- Inheritance & abstract contracts- Libraries- Types & optimization of Ether- Global variables- Debugging- Future of Ethereum- Smart Contracts on Ethereum- different

stages of a contract deployment- Viewing Information about blocks in Blockchain- Developing smart contract on private Blockchain- Deploying contract from web and console

Unit-V

HYPERLEDGER: Hyperledger Architecture- Consensus- Consensus & its interaction with architectural layers Application programming interface- Application model -Hyperledger frameworks- Hyperledger Fabric -Various ways to create Hyperledger Fabric Block chain network- Creating and Deploying a business network on Hyperledger Composer Playground- Testing the business network definition- Transferring the commodity between the participants

TEXT BOOKS

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas M Antonopoulos 2018

2. Henning Diedrich, Ethereum: Block chains, Digital Assets, Smart Contracts, Decentralized Autonomous Organizations-2016

ONLINE REFERENCES

1. https://www.coursera.org/learn/ibm-blockchain-essentials-for-developers

2. https://museblockchain.com/

3. https://www.provenance.org/

4. https://www.coursera.org/learn/blockchain-basics

5. https://steemit.com/

6. https://101blockchains.comhttps://followmyvote.com/

VISEMESTER :	L	T	P	C
	0	0	3	1.5
20EC6L01 ::MICROPROCESSORS AND MICROCONTROLLERS LAB				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Write ALP for Arithmetic operations (K3)
CO2	:	Explicate 8086 interfacing with different peripherals and implement programs (K2
CO3	:	Write Programs in 8051(K3).
CO4	:	Write Programs in ARM CORTEX M3 PROCESSOR using KEIL MDK ARM (K3).

LIST OF EXPERIMENTS

(Minimum of TEN Experiments has to be performed):

PART-A (Minimum of FIVE Experiments has to be performed) 8086/8051 Programs

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic operations.
4. Unpacked BCD to ASCII
5. String manipulations, sorting and searching
6. Counters and Time Delay

PART-B (Minimum of THREE Experiments has to be performed)

Peripherals and Interfacing Experiments

1. Traffic light controller
2. Stepper motor control
3. Key board and Display
4. Serial interface and Parallel interface
5. A/D and D/A interface and Waveform Generation

PART-C (Minimum of TWO Experiments has to be performed)

Conduct the following experiments using ARM CORTEX M3 PROCESSOR using KEIL MDK ARM

1. Write an assembly program to multiply of two 4-bit binary numbers.
2. Write an assembly program to find the sum of first 10 integer numbers.
3. Write a program to toggle LED every second using timer interrupt.

Equipment Required:

1. Regulated Power supplies 7. Stepper motor module
2. Analog/Digital Storage Oscilloscopes 8. Keyboard module
3. 8086 Microprocessor kits 9. LED, 7-Segment Units
4. 8051 microcontroller kits 10. Digital Multimeters
5. ADC module 11. Bread Boards
6. DAC module 12. KEIL MDK ARM

ONLINE TOOL:

http://vlabs.iitb.ac.in/vlabs-dev/labs/8051-Microcontroller-Lab/labs/exp1/simulation.php 1.

REFERENCE BOOKS:

1.Department lab manual.

VI SEMESTER	L	T	P	C
	0	0	3	1.5
20EE6L01 :: POWER SYSTEMS AND SIMULATION LAB				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Estimate the sequence impedances of 3-phase Transformer
CO2	:	Estimate the sequence impedances of 3-phase Alternators
CO3	:	Determine the Parameters of Transmission lines(K5)
CO4	:	Analyze and simulate power flow methods in power systems
CO5	:	Analyze faults in power system (K4)

LIST OF EXPERIMENTS

PART-A

(Do Any 4 Experiments from Part-A)

1. Estimation of sequence impedances of 3-phase Transformer
2. Estimation of sequence impedances of 3-phase Alternator by Fault Analysis
3. Estimation of sequence impedances of 3-phase Alternator by Direct method
4. Estimation of ABCD parameters on transmission line model
5. Analyze the Ferranti effect on long transmission line

PART-B

(Do Any 6 Experiments from Part-B)

1. Compute the Parameters of the Transmission Lines
2. Formation of Y_{bus} using Direct Inspection method
3. Formation of Z Bus using Z-Bus Building Algorithm.
4. Load flow solution of a power system network using Gauss-Seidel method
5. Load flow solution of a power system network using Newton Raphson method.
6. Determination of Fault Analyses for different faulty Conditions.
7. Modeling of transformer and simulation of lossy transmission line.
8. Matlab Program To Solve Swing Equation Using Point-By-Point Method

REFERENCE BOOKS:

1. Department lab manual.

VI SEMESTER	L	T	P	C
	0	0	3	1.5
20EE6L02 :: POWER ELECTRONICS & SIMULATION LAB				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Analysethe characteristics of various power electronic devices with firing circuits. (K2).
CO2	:	Analyze the performance of single phase and three phase full wave converters. (K4)
CO3	:	Examine the operation of AC voltage controller and Cyclo converter. (K2)
CO4	:	Analyze the performance of 1-Ph bridge inverter, converter and PWM inverter. (K2)
CO5	:	Explicate the working of Buck, Boost converters (K2)

LIST OF EXPERIMENTS

PART-A

(Do Any 7 Experiments from Part-A)

1. Characteristics of Thyristor, MOSFET & IGBT.
2. R, RC & UJT firing circuits for SCR.
3. Single –Phase Half Controlled Bridge converter with R & RL loads.
4. Single -Phase full converter with R & RL loads.
5. Three- Phase full converter with R &RL loads.
6. Single Phase dual converter with R and RL loads
7. Single -Phase AC Voltage Controller with R and RL Loads
8. Single Phase Cyclo converter with R & RL Loads.
9. Boost converter in Continuous Conduction Mode operation.
10. Buck converter in Continuous Conduction Mode operation
11. Single - Phase PWM inverter.

PART-B

(Do Any 3 Experiments from Part-B)

1. Simulation of 3 Phase AC voltage controller using Matlab / Simulink
2. Simulation of Single phases fully controlled converter using R and RL load using Matlab / Simulink.
3. Simulation of Three phases fully controlled converter using R and RL load using Matlab / Simulink.
4. Simulation of Buck & Boost converters using Matlab / Simulink
5. Single - Phase PWM inverter using Matlab / Simulink.

REFERENCE BOOKS:

1.Department lab manual.

VI SEMESTER	L	T	P	C
	0	0	4	2
20HS6S01 :: ADVANCED COMMUNICATION SKILLS LAB				

At the end of the course students will be able to prepare themselves for their career which may require them to listen and speak in English both for their professional and interpersonal communication in the globalized context.

Course objectives

- Analyzing a topic of discussion and relating to it.
- Planning and executing an assignment creatively.
- Presenting ideas coherently within a stipulated time.
- Communicating ideas effectively in prescribed oral activities.
- Applying relevant writing formats for resume and presentations.
- Facing interviews with confidence.

Course outcomes

At the end of the course students will be able to

- Gather ideas and organize information relevantly and coherently
- Participate in group discussions and face interviews with confidence
- Write Resume with covering letter
- Make oral presentations and public speaking
- Take part in social and professional communication.

SYLLABUS

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

UNIT I

Communication Skills

- Introduce Yourself
- JAM
- J2M
  - Identifying one's career objective, projecting strengths and skills, organization of ideas within given time.

UNIT II

Interaction Skills

- Body Language
- Role- Plays
  - Students start a conversation - Respond appropriately and relevantly in different situations with right body language.

UNIT III

Oral Skills

- Presentations
- Public Speaking
  - Planning preparation and presentation - organization of ideas with clarity , coherence and style.

UNIT IV

Writing Skills

• Covering Letter

• Resume Writing

- To communicate the ideas relevantly and coherently in writing.

UNIT V

Team Work Skills

• Group Discussion

- Dynamics of Group Discussion - Modulation of voice, Body language , relevance , fluency and coherence.

UNIT VI

Interview Skills

- Pre-interview planning, opening strategies, answering strategies, interview through tele and video conference.

Reference Books:

1. Ashraf Rizvi- Effective Technical Communication - McGraw Hill Education- 2017.
2. Madhavi Apte - A Course in English Communication – Prentice - Hall of India- 2007.
3. Dr. Shalini Verma - Body Language – Your Success Mantra- S. Chand- 2006.
4. Sunita Mishra &C.Murali Krishna- Communication Skills for Engineers - Pearson Education - 2007.

SUBJECT CODE	NAME OF THE SUBJECT	L	T	P	C
20EE6C01	**Community Service Project**	**0**	**0**	**0**	**4**
Subject Category	-				
Semester	VIII\\				

After successful completion of this course, students should be able to:

CO1	:	To make students aware of their inner strength and help them to find new/out of box solutions to the social problems []k4]
CO2	:	To make students socially responsible. [k3]
CO3	:	To develop holistic life among the students by making study culture, habits, lifestyle and wastage management. [k5]

VI SEMESTER	L	T	P	C
	2	0	0	0
20BM6M01 :: PROFESSIONAL ETHICS AND INTELLECTUAL PROPERTY RIGHTS				

COURSE OUTCOMES:Students are able to

CO1. Identify the professional roles played by an engineer and illustrate the process of Social experimentation

CO2. Determine Engineer's responsibilities and rights towards the society

CO3. Analyze various aspects of Intellectual Property Rights and recognize the process of protecting the copyrights

CO4. Describe the registration process of Patents and trademarks and also demonstrate the concept of trade secrets and cybercrimes

UNIT-I
ENGINEERING ETHICS:
Importance of Engineering Ethics-–Professional and Professionalism –Professional Roles to be played by an Engineer –Professional Ethics.

UNIT-II
ENGINEERING AS SOCIAL EXPERIMENTATION :
Role of engineering in knowledge society- Knowledge acquired – Conscientiousness – Relevant Information Engineers as Managers, Consultants, and Leaders.
ENGINEERS' RESPONSIBILITY FOR SAFETY AND RISK: Role and importance of Safety and riskTypes of Risks –Threshold Levels for Risk– RiskBenefit Analysis.

UNIT-III
ENGINEERS' RESPONSIBILITIES AND RIGHTS:
Collegiality-Conflict of Interest-solving conflict problems – Ethical egoism-Collective bargaining - Confidentiality-Acceptance of Bribes/Gifts--Occupational Crimes-industrial espionage-Whistle Blowingtypes of whistle blowing.

UNIT IV
INTELLECTUAL PROPERTY AND COPY RIGHTS:
Introduction to Intellectual Property Law - Types ofIntellectual Property – Infringement,Copyrights:Introduction to Copyrights – Principles of Copyright – Rights Afforded by Copyright Law –Copyright Formalities and Registration.
UNIT-V

PATENTS AND TRADEMARKS:
Introduction to Patent Law –Rights under Patent Law – Patent Requirements – Patent Application Process and Granting of Patent – Double Patenting – Patent Cooperation Treaty. Trademarks:Introduction to Trade Mark – Trade Mark Registration Process – Trade Markmaintenance – Likelihood of confusion

TEXT BOOKS:

1. M.Govindarajan, S.Natarajan and V.S.SenthilKumar- "Engineering Ethics and Human Values" by PHI Learning Pvt. Ltd-2009.
2. Deborah E.Bouchoux, "Intellectual Property". Cengagelearning ,NewDelhi, BS Publications (Press)
3. PrabhuddhaGanguli,' Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi

VII SEMESTER(PROFESSIONAL ELECTIVE-III)	L	T	P	C
	3	0	0	3
20EE7E01 :: POWER SYSTEMS OPERATION AND CONTROL				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Explicate the Economic Operation of power system(K2)
CO2	:	Explicate the hydrothermal Scheduling and Unit commitment Problems(K2)
CO3	:	Analyze the power system and to control the power and frequency in power system(K4)
CO4	:	Interpret impact of load frequency control and Plan for optimum load dispatch.(K2)
CO5	:	Analyze different compensation technique for power system stability(K4)

SYLLABUS

UNIT-I	**:**	**ECONOMIC OPERATION OF POWER SYSTEMS**
Optimal Operation Of Generators In Thermal Power Stations, – Heat Rate Curve – Cost Curve – Incremental Fuel And Production Costs – Input–Output Characteristics – Optimum Generation Allocation With Line Losses Neglected – Optimum Generation Allocation Including The Effect Of Transmission Line Losses – Loss Coefficients – General Transmission Line Loss Formula.		
UNIT-II	**:**	**HYDROTHERMAL SCHEDULING & UNIT COMMITMENT**
Optimal scheduling of Hydrothermal System**:** Mathematical Formulation of short Term Hydro-Thermal Scheduling Problem – Solution Technique. Unit Commitment Problem : Need for unit commitment – Constraints in unit commitment – Unit Commitment Solution methods – Priority List Methods – Dynamic programming		
UNIT-III	**:**	**LOAD FREQUENCY CONTROL-I**
Modeling of steam turbine – Generator Load Model – Mathematical modeling of speed governing system –Transfer function – Necessity of keeping frequency constant – Definitions of Control area – Single area control system – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response for Uncontrolled case, Proportional plus Integral control of single area and its block diagram representation – Steady state response		
UNIT-IV	**:**	**LOAD FREQUENCY CONTROL-II**
Block diagram development of Load Frequency Control of two area system uncontrolled case and controlled case – Tie-line bias control – Load Frequency Control and Economic dispatch control		
UNIT-V	**:**	**COMPENSATION IN POWER SYSTEMS**
Overview of Reactive Power control – Reactive Power compensation in transmission systems – Advantages and disadvantages of different types of compensating equipment for transmission systems –Load compensation – Specifications of load compensator – compensated transmission lines.		

TEXT BOOKS:

1 S. Sivanagaraju , "Power System Operation And Control", Dorling Kindersley ,2015

2 C. L. Wadhwa, " Electrical Power Systems" ,New Age International (P) Limited, 2009

3 Abhijit Chakrabarti, Sunita Halder , "Power System Analysis: Operation And Control 3Rd Ed", PHI Learning, 30 January 2010.

4 Allen J Wood - Bruce F WollenBerg, "Power Generation - Operation and Control" 3rd Edition -Wiley Publication 2014.

REFERENCE BOOKS:

1 Kothari &Nagrath, , " Power System Engineering" , Mc Graw Hill,2008

2 Granger and Stevension, "Power System Analysis" , Mc Graw Hill,2017 ,

3 Wood and Woolenberg, "Electric Power Genration operation and control", Willey. 3rd Edition,2013

4 O.I.Elgerd, " Electric Energy systems Theory" , Tata McGraw–hill Publishing Company Ltd. - Second edition

VII SEMESTER (PROFESSIONAL ELECTIVE-III)	L	T	P	C
	3	0	0	3

20EE7E02 :: HIGH VOLTAGE ENGINEERING

After successful completion of this course, students should be able to:

CO1 : Demonstrate the performance of high voltages with regard to different configurations of electrode systems.(K2)

CO2 : Explicate the theory of breakdown phenomena of all types of dielectric materials.(K2)

CO3 : Explicate the techniques of generation of AC, DC and Impulse voltages.(K2)

CO4 : Explicate the testing of Various Non–destructive materials and electrical apparatus (K2)

CO5 : Distinguish the techniques of testing various Equipment's used in HV Engineering. (K4)

SYLLABUS

UNIT-I : INTRODUCTION TO HIGH VOLTAGE TECHNOLOGY

Electric Field Stresses, Gas/Vacuum Insulator, liquid Dielectrics, Solids and Composites, Estimation and control of electric Stress-Electric Field- Uniform and non–uniform field configuration of electrodes, Numerical methods for electric field computation, Surge Voltages, Distribution & control.

UNIT-II : CONDUCTION & BREAKDOWN IN GASEOUS,LIQUID& SOLID DELECTRICS

Gases as insulating media – Collision process – Ionization process – Townsend's criteria of breakdown in gases – Paschen's law – Liquid as Insulator – Pure and commercial liquids – Breakdown in pure and commercial liquid – Intrinsic breakdown – Electromechanical breakdown – Thermal breakdown Breakdown of solid dielectrics, composite dielectrics used in practice.

UNIT-III : GENERATION AND MEASUREMENTS OF HIGH VOLTAGES &CURRENTS

Generation of high DC voltages – Generation of high alternating voltages – Generation of impulse voltages and currents – Tripping and control of impulse generators.

Measurement of high DC Voltages, high AC and Impulse voltages, Measurement of high Currents-Direct, Alternating and Impulse and Cathode ray oscillographs for Impulse voltage and current measurement.

UNIT-IV : NON–DESTRUCTIVE TESTING OF MATERIAL

Measurement of DC resistivity – Measurement of dielectric constant and loss factor – Partial discharge measurements.

UNIT-V : HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS

Testing of insulators and bushings – Testing of isolators and circuit breakers – Testing of cables – Testing of transformers – Testing of surge arresters – Radio interference measurements.

TEXT BOOKS:

1 High Voltage Engineering,Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition, 2000.

2 High Voltage Engineering and Technology by Ryan H U, IET Publishers, 2012.

REFERENCE BOOKS:

1 High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 6th Edition, 2020.

2 Fundamentals of High voltage engineering by Ravindra Arora and Bharat Singh Rajpurohit, Wiley India Pvt.Ltd, 2019.

VII SEMESTER (PROFESSIONAL ELECTIVE-III)	L	T	P	C
	3	0	0	3
20EC7E13 :: DIGITAL SIGNAL PROCESSING				

COURSE OUTCOMES:

After completion of the course students are able to,

CO1: Illustrate digital signals, systems and their significance. (K1)

CO2: Develop the digital signals using various digital transforms DFT, FFT etc. (K3)

CO3: Understand the FIR and IIR structures from the designed digital filter. (K2)

CO4: Use the Multirate Processing concepts in various applications. (K3)

UNIT-I: INTRODUCTION: Discrete time signals & sequences, Classification of Discrete timesystems, stability of LTI systems, Response of LTI systems to arbitrary inputs. Solution ofLinear constant coefficient difference equations. Frequency domain representation of discretetime signals and systems. Review of Z-transforms, solution of difference equations using Ztransforms,System function.

UNIT-II: DISCRETE FOURIER SERIES & FOURIER TRANSFORMS: Properties ofdiscrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms:Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) -Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT-III: DESIGN OF IIR DIGITAL FILTERS& REALIZATIONS: Analog filterapproximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters,Design Examples, Analog and Digital frequency transformations. Basic structures of IIRsystems, Transposed forms.

UNIT- IV: DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS: Characteristics ofFIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniquesand Frequency Sampling technique, Comparison of IIR & FIR filters. Basic structures of FIRsystems, Lattice structures, Lattice-ladder structures.

UNIT-V: MULTIRATE DIGITAL SIGNAL PROCESSING: Introduction, Decimation,Interpolation Sampling rate conversion , Implementation of sampling rate converters,Applications – Sub-band Coding of Speech Signals, Implementation of Digital Filter Banks,Trans-multiplexers.

TEXT BOOKS:

1. John G. Proakis, Dimitris G.Manolakis, “Digital Signal Processing, Principles, Algorithms,and Applications”, Pearson Education / PHI, 2017. (Unit I-V)

2. MH Hayes, Digital Signal Processing – Schaum’s Outlines, TATA McGraw Hill, 2016 (I-V)

REFERENCES

1. A.V.Oppenheim and R.W. Schaffer , “Discrete Time Signal Processing”,1st edition, PHI,2015.

2. B.Venkataramani, M.Bhaskar, “Digital Signal Processors – Architecture, Programming andApplications” ,TATA McGraw Hill, 2015.

E-REFERENCES:

1. https://nptel.ac.in/courses/117102060

2. www.ocw.mit.edu

VII SEMESTER (PROFESSIONAL ELECTIVE-III)	L	T	P	C
	3	0	0	3
20CS7E10 :: SOFTWAREENGINEERING				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Identify, formulate the various software engineering concepts
CO2	:	different software development process models.
CO3	:	analyze and specify software requirements with various stakeholders of a softwaredevelopmentproject
CO4	:	Apply systematic procedure for software design and deployment.
CO5	:	Compare and contrast the various testing methods and art of debugging

UNIT I

SOFTWARE AND SOFTWARE ENGINEERING: The nature of Softwaree: Define software (Software Characteristics), Software Application Domains, Legacy software,**SoftwareEngineering**: Definition, Llayered Technology,**Software Process:** GenericProcess framework activities, Umbrella activities,software engineering Practice: the essence of Practice, general principles, Software Myths and Reality,GenericProcess model, Capability Maturity Model Integration (CMMI).

UNIT-II

PROCESS MODELS: Process Assessment and improvement.Prescriptive Process models:Waterfall Model, IncrementalProcess Model**,**Evolutionary Process Models: Prototyping, Spiral model, The Unified Process.Personal and Team process models: Personal software process (PSP), Team software process (TSP), Product and Process,

Agile Process: Agility and the cost of change, Agility Principles, the politics of agile development, Human Factors.

UNIT-III

REQUIREMENTS ANALYSIS AND SPECIFICATION: Functional Requirements, Non- Functional Requirements, Software Requirements Document (Software Requirements Specification SRS),Requirements Specification, Requirements Engineering**,** Establishing the Ground work, Eliciting Requirements(elicitation), Developing Use cases, Validating Requirements, Requirements Management: Requirements Planning, Requirements Change management.

UNIT-IV

SOFTWARE DESIGN: Design process**, Design concepts**: Abstraction, Architecture, Patterns, Separation of Concerns, Modularity, Information hiding, Functional independence, Refinement, Aspects, refactoring, Object oriented design concepts, Design classes.

The Design Model: Data Design Elements, Architectural Design elements, Interface Design Elements, Component-Level Design Elements, Deployment-Level Design Elements. Designing Class Based Components: Basic Design Principles, Component-Level Design guidelines, Cohesion and coupling.
User Interface Design: The Golden Rules

UNIT-V

TESTING: Elements of software quality assurance, SQA Tasks and Goals. The strategies for Conventional Strategies: Unit Testing – Integration Testing. Test Strategies for Object-Oriented Software, Software testing fundamentals, white box testing- Basis path testing: Flow graph Notation, independent Program paths, Deriving test cases, Graph Matrices. control structure testing. black box testing: Graph Based Testing Methods, Equivalence Partitioning, Boundary value Analysis. Validation Testing, System Testing. Art of Debugging: The Debugging process, Psychological Considerations, Debugging Strategies, Correcting the error.

TEXTBOOK:

1. Software Engineering, A practitioner's Approach- Roger S. pressman, 8th edition,McGraw-HillinternationalEdition, 2014.
2. SoftwareEngineering,IanSommerville,10thEdition,PearsonEducationAsia,2016.

REFERENCEBOOKS:

1. SoftwareEngineering,PankajJalote,APreciseApproach",WileyIndia,2010.
2. SystemsAnalysisandDesign-ShelyCashmanRosenblatt,9th Edition, Thomsonpublications, 2016.
3. SoftwareProjectManagement,BobHughes,MikeCotterellandRajibMall,FifthEdition,TataMcGrawHill,New Delhi, 2012.
4. https://nptel.ac.in/courses/106101061/

VII SEMESTER (PROFESSIONAL ELECTIVE-IV)	L	T	P	C
	3	0	0	3
20EE7E03 :: **FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS**				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Know the concepts of facts controller and power flow control in transmission line.
CO2	:	Demonstrate operation and control of voltage source converter and know the concepts current source converter
CO3	:	Analyze compensation by using different compensators to improve stability and reduce power oscillations in the transmission lines.
CO4	:	Know the concepts methods of compensations using series compensators.
CO5	:	Analyze operation of Unified Power Flow Controller and Interline power flow controller.

SYLLABUS

UNIT-I	**:**	**Introduction to FACTS**
Power flow in an AC System – Loading capability limits – Dynamic stability considerations – Importance of controllable parameters – Basic types of FACTS controllers – Benefits from FACTS controllers – Requirements and characteristics of high power devices.		
UNIT-II	**:**	**Voltage source and Current source converters**
Voltage source converter (VSC) – Single phase full-wave bridge converter – Square wave voltage harmonics for a single–phase bridge converter – Three–phase full-wave bridge converter - Transformer connections for 12 pulse operation. Current Source Converter (CSC)-Three–phase current source converter – Comparison of current source converter with voltage source converter.		
UNIT-III	**:**	**Shunt Compensators And Variable Impedance Type VAR Generator**
Shunt Compensators Objectives – Mid–point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping. **Variable Impedance Type VAR Generator**: Thyristor Switched/Controlled Reactor (TSR/TCR) – Thyristor Switched Capacitor (TSC) – Fixed Capacitor–Thyristor Controlled Reactor (FC-TCR) - Thyristor Switched Capacitor and Thyristor Controlled Reactor (TSC–TCR) - Switching Converter type VAR generator,Principle of operation and comparison of SVC and STATCOM.		
UNIT-IV	**:**	**Series Compensators**
Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. Variable Impedance type series compensators – GTO Thyristor controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC) - Switching Converter type Series Compensation – Static Synchronous Series Compensator.		
UNIT-V	**:**	**Combined Compensators**
Schematic and basic operating principles of unified power flow controller (UPFC) and Interline power flow controller (IPFC) – Controller applications of transmission lines.		

TEXT BOOKS:.

1. N.G.Hingorani and L.Guygi, "Understanding FACTS" IEEE Press.Indian Edition Standard Publications, 2001.
2. Sang.Y.H and John.A.T, "Flexible AC Transmission systems" IEEE Press 2006.
3. Vijay K.Sood , "HVDC & FACTS Controllers: applications of static converters in power systems" Springer publishers

REFERENCE BOOKS:

1. "Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
2. . Mohan Mathur and Rajiv K.Varma, "Thyristor-based FACTS Controllers for Electrical Transmission Systems" by RWiley.

VII SEMESTER (PROFESSIONAL ELECTIVE-IV)	L	T	P	C
	3	0	0	3
20EE7E07::ELECTRICAL POWER QUALITY				

SYLLABUS

UNIT-I	:	INTRODUCTION

Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems – Transients – Long– duration voltage variations – Short–duration voltage variations – Voltage unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations.

UNIT-II	:	VOLTAGE IMPERFECTIONS IN POWER SYSTEMS

Power quality terms – Voltage sags – Voltage swells and interruptions – Sources of voltage sag, swell and interruptions – Nonlinear loads – IEEE and IEC standards. Source of transient over voltages – Principles of over voltage protection – Devices for over voltage protection – Utility capacitor switching transients.

UNIT-III	:	VOLTAGE REGULATION AND POWER FACTOR IMPROVEMENT

Principles of regulating the voltage – Device for voltage regulation – Utility voltage regulator application – Capacitor for voltage regulation – End–user capacitor application – Regulating utility voltage with distributed resources – Flicker – Power factor penalty – Static VAR compensations for power factor improvement.

UNIT-IV	:	HARMONIC DISTORTION AND SOLUTIONS

Voltage distortion vs. Current distortion – Harmonics vs. Transients – Harmonic indices – Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers, motors and meters – Point of common coupling – Passive and active filtering – Numerical problems.

UNIT-V	:	DISTRIBUTED GENERATION &MONITORING

DG technologies – Interface to the utility system – Power quality issues and operating conflicts

Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data

TEXTBOOKS:

1. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw–Hill, 2012, 3rd edition.
2. Electric power quality problems –M.H.J. Bollen IEEE series-Wiley india publications, 2011.
3. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.

REFERENCE BOOKS:

1. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
2. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
3. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostradeinhold, New York.
4. Power Quality c.shankaran, CRC Press, 2001
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis).
6. Power Quality in Power systems and Electrical Machines–EwaldF. fuchs, Mohammad A.S. Masoum–Elsevier.

VII SEMESTER (PROFESSIONAL ELECTIVE-IV)	L	T	P	C
	3	0	0	3
20EC7E14::VLSI DESIGN				

After successful completion of this course, students should be able to:

CO1	:	Develop the VHDL program for digital circuits using different styles (K3)
CO2	:	Explicate the fabrication process and Electrical properties of MOS Circuits (K2)
CO3	:	Describe the CMOS circuit design processes, scaling and testing of MOS circuits (K1)
CO4	:	Summarize the use of different semiconductor ICs (K2)

UNIT-I: DIGITAL SYSTEM DESIGN USING HDL:

Introduction to HDL and History of VHDL, VHDL requirements, VLSI Design flow and Circuit design process, Hardware simulation and Synthesis, Levels of abstraction. Various design styles of VHDL-data flow modeling, Behavioral modeling, structural modeling. VHDL Programs to design the circuits using all the three modeling –Half adder, Full adder , Mux, Demux, Decoder, Encoder Universal shift register, and counter.

UNIT-II: FABRICATION AND BASIC ELECTRICAL PROPERTIES OF MOSFET:

Introduction to IC Technology – MOS, NMOS, PMOS, CMOS &BiCMOS. Introduction to GaAs, FinFET, ULSI Technology and its applications.

BASIC ELECTRICAL PROPERTIES : Basic Electrical Properties of MOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of merit ; Pass transistor, Transmission Gates, NMOS Inverter, CMOS Inverter analysis and design, Bi-CMOS Inverter.

UNIT-III: **MOS CIRCUIT DESIGN PROCESS AND SCALING:** VLSI Design Flow, MOS Layers, CMOS circuit diagram, Stick Diagram, Design Rules-Lambda Based, micron based and Layout diagram, 2 micrometer CMOS Design rules for wires, Contacts and Transistors, Layout Diagrams of CMOS Inverters and Gates.

SCALING: Scaling of MOS circuits, Limitations of Scaling.

UNIT-IV: BASIC CIRCUIT CONCEPTS AND CMOS TESTING:

Sheet Resistance, and its concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, and some examples with calculations. The Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation delays, Wiring capacitances and Choice of layers.

CMOS TESTING : CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

UNIT-V: SEMICONDUCTOR IC DESIGN:

Introduction to Programmable Logic Devices (PLDs)- Programmable Logic Array (PLA), Programmable Array Logic (PAL)-implementation of logic functions using PLA/PAL. Implementation approaches in ASIC Design- Full custom design, semicustom design, gate arrays, standard cells, Complex Programmable Logic Devices (CPLDs), Field programmable gate arrays (FPGAs)-architectures and applications.

Introduction to System-on-Chip (SoC) and Network-on-Chip (NoC)-2D NoC, 3D NoC, Wireless NoC.

TEXTBOOKS:

1. Kamran Eshraghian, EshraghianDougles and A. Pucknell, and SholehEshraghian, "Essentials of VLSI Circuits and Systems", PHI, 2015 Edition. .**(UNIT-II,III,IV,V)**

2. J.Bhaskar , "VHDL Primer",Prentice Hall Of India Publications,2018 edition. **(UNIT-I)**

REFERENCES:

1. K.Lal Kishore and V.S.V.Prabhakar, "VLSI Designing", 2nd Edition, I.K.International Publishing House Private Limited, 2018.

2. A.Albert Raj &T.Latha, "VLSI Design", PHI Learing Private Limited, 2019.

E-REFERENCES:

1. https://nptel.ac.in/courses/117101058

2. https://www.tutorialspoint.com/vlsi_design/vlsi_design_digital_system.html.

VII SEMESTER (PROFESSIONAL ELECTIVE-IV)	L	T	P	C
	3	0	0	3
20CS7E11::DATABASE MANAGEMENT SYSTEMS				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Explicate the basic concepts of database management system and design an Entity Relationship (E-R) model and convert E-R model to relational model.
CO2	:	Construct database using Relational algebra and SQL.
CO3	:	Apply Normalization techniques to normalize the database.
CO4	:	Discuss transaction management using different concurrency control protocols and recovery algorithms
CO5	:	Illustrate different file organization and indexing methods.

UNIT-1

Introduction-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages, Database Architecture, Database Users and Administrators.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations.
Enforcing Integrity constraints, querying relational data, Logical data base Design, Views.

UNIT-II

Relational Algebra: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division.

SQL: Form of Basic SQL Query - Examples of Basic SQL Queries, UNION, INTERSECT, and EXCEPT, Introduction to Nested Queries, Correlated Nested Queries, Set Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Outer Joins, Disallowing NULL values, Triggers.

UNIT-III

SCHEMA REFINEMENT AND NORMAL FORMS: Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form.

UNIT-IV

Transaction Management - The ACID Properties - Transactions and Schedules- Concurrent Execution of Transactions- Lock-Based Concurrency Control- 2PL, Serializability, and Recoverability- Dealing With Deadlocks - Concurrency Control without Locking.

CRASH RECOVERY: Introduction to ARIES- The Log - The Write-Ahead Log Protocol – Checkpoints - Recovering from a System Crash(ARIES) - Media Recovery.

UNIT-V

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing-Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke, "Data base Management Systems", 3rd Edition, McGrawHill Education, 2014.
2. A.Silberschatz, H.F. Korth, S.Sudarshan, "Data base System Concepts", 6th edition, McGraw Hill, 2016.
3. BrahmankarPankajb, Sadaf Lqbal Shaikh, Raut Bhakti, "Database Management System", 1st Edition, tech-neo, 2019.

REFERENCE BOOKS:

1. RamezElmasri, Shamkant B Navathe "Fundamentals of Database Systems", 7th Edition, 2016.
2. C.J. Date, "Introduction to Database Systems", 8/e, Pearson, 2012.
3. Rob, Coronel, "Database System Design, Implementation and Management", 5/e, Thomson, 2012.

VII SEMESTER (PROFESSIONAL ELECTIVE-V)	L	T	P	C
	3	0	0	3
20EE7E05**::HYBRID ELECTRIC VEHICLES**				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Illustrate different types of electric vehicles (K2)
CO2	:	Select suitable power converters for EV applications (K3)
CO3	:	Design HEV configuration for a specific application (K4)
CO4	:	Choose an effective method for EV and HEV applications (K4)
CO5	:	Analyze a battery management system for EV and HEV (K4)

SYLLABUS

UNIT-I	**:**	**INTRODUCTION**
Fundamentals of vehicles - Components of conventional vehicles - drawbacks of conventional vehicles – Need for electric vehicles - History of Electric Vehicles – Types of Electric Vehicles – Advantages and applications of Electric Vehicles		
UNIT-II	**:**	**COMPONENTS OF ELECTRIC VEHICLES**
Main components of Electric Vehicles – Power Converters - Controller and Electric Traction Motor – Rectifiers used inEVs – Bidirectional DC–DC Converters – Voltage Source Inverters – PWM inverters used in EVs.		
UNIT-III	**:**	**HYBRID ELECTRIC VEHICLES**
Evolution of Hybrid Electric Vehicles – Advantages and Applications of Hybrid Electric Vehicles – Architecture ofHEVs - Series and Parallel HEVs – Complex HEVs – Range extended HEVs – Examples - Merits and Demerits.		
UNIT-IV	**:**	**MOTORS FOR ELECTRIC VEHICLES**
Characteristics of traction drive - requirements of electric machines for EVs – Different motors suitable for Electric and Hybrid Vehicles – Induction Motors – Synchronous Motors – Permanent Magnetic Synchronous Motors – Brushless DC Motors – Switched Reluctance Motors (Construction details and working only)		
UNIT-V	**:**	**ENERGY SOURCES FOR ELECTRIC VEHICLES**
Batteries - Types of Batteries – Lithium-ion - Nickel-metal hydride - Lead-acid – Comparison of Batteries – BatteryManagement System – Ultra capacitors – Flywheels – Fuel Cell – it‟s working.		

TEXT BOOKS:

1. Iqbal Hussein .“ Electric and Hybrid Vehicles: Design Fundamentals”, CRC Press - 2021.
2. Denton ,Tom, “ Electric and hybrid vehicles”, Routledge,2020.

REFERENCE BOOKS:

1. Kumar L. Ashok and S. Albert Alexander, “ Power Converters for Electric Vehicles”, CRC Press -2020
2. Chau Kwok Tong, “ Electric vehicle machines and drives: design - analysis and application”, JohnWiley & Sons, 2015.
3. Berg,Helena, “Batteries for electric vehicles: materials and electrochemistry”, Cambridge universitypress - 2015.

VII SEMESTER (PROFESSIONAL ELECTIVE-V)	L	T	P	C
	3	0	0	3
20EE7E06::ELECTRICAL DISTRIBUTED SYSTEM				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Relate the various concepts of distribution system.(K1)
CO2	:	Explicate the design of substations and feeders. (K2)
CO3	:	Determine the voltage drop and power loss in distribution systems. (K5)
CO4	:	Explicate the protection and its coordination in distribution system. (K2)
CO5	:	Explicate the effect of compensation on power factor improvement & voltage control in distribution systems. (K2)

SYLLABUS

UNIT-I	**:**	**DISTRIBUTION SYSTEMS**
Classification of Distribution systems, design features of distribution systems, radial distribution, ring main distribution , voltage drop calculations for various cases : radial DC distributor fed at one end and at both ends (equal and unequal voltages), ring main distributor, stepped distributor and AC Distribution , Comparison of AC and DC Distribution systems.		
UNIT-II	**:**	**SUBSTATIONS & DISTRIBUTION FEEDERS**
Location of substations: Rating of distribution substation – Service area with"n" primary feeders – Benefits derived through optimal location of substations. Design Considerations of distribution feeders: Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.		
UNIT-III	**:**	**SYSTEM ANALYSIS**
Voltage drop and power–loss calculations: Derivation for voltage drop and power loss in non-three phase primary lines – **Manual methods of solution for radial networks** – Three phase balanced primary lines		
UNIT-IV	**:**	**PROTECTION AND COORDINATION**
Objectives of distribution system protection – Types of common faults and procedure for fault calculations – Protective devices: Principle of operation of fuses – Circuit reclosures – Line sectionalizes and circuit breakers. Coordination of protective devices: General coordination procedure – **Residual current circuitbreaker RCCB.**		
UNIT-V	**:**	**POWER FACTOR IMPROVEMENT AND VOLTAGE CONTROL**
Capacitive compensation for power–factor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor correction – Capacitor allocation – Economic justification – Procedure to determine the best capacitor		

location.

Equipment for voltage control – Effect of series capacitors – **Effect of AVB/AVR** –Line drop compensation.

TEXT BOOKS:

1 Electric Power Distribution system, Engineering" – by TuranGonen, CRC Press, 4th edition, 2018.
2 Electric Power Distribution system by A.S Pabla, 7th Edition, Tata Mc Graw-Hill Publishing company, 2019.
3 Electrical Power Distribution Systems by V.Kamaraju , Tata Mc Graw- Hill Publishing company, 2017.

REFERENCE BOOKS:

1 Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press, 2nd edition, Published by River Publishers 2021.
2 Electrical Distribution Systems by D.Gireesh Kumar & Dr S Saravanan, Notion press, 1st edition, 2020.
3 Smart power distribution systems by Qiang Yang, Ting Yang, Wie Li,1stedition , Imprint academic press, 2018.

VII SEMESTER (PROFESSIONAL ELECTIVE-V)	L	T	P	C
	3	0	0	3
20EC7E06:: EMBEDDED SYSTEMS				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Understand the basic knowledge about fundamentals of Embedded Systems (K2)
CO2	:	Describe about various components used in Embedded systems (K1)
CO3	:	Understand about the PIC, AVR controllers and Processors (K2)
CO4	:	Use the design case study of Embedded Systems(K3)

UNIT-I: Introduction to Embedded Systems Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT-II: Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT-III: Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT-IV: Overview of PIC, AVR controllers and ARM processors: Introduction to PIC family of Microcontroller. Introduction to AVR family of Microcontroller. Introduction to ARM family Processors

UNIT-V: Design Case studies: Digital clock, Battery operated smartcard reader, Automated meter reading system, Digital camera.

TEXT BOOKS:

1. Shibu K.V, "Introduction to Embedded Systems", McGraw Hill, 2017 **(Unit I-V)**

2. David E Simon, "An Embedded Software Primer", Pearson Education, 2015.

REFERENCE BOOKS:

1. Raj Kamal, "Embedded Systems", 3rd edition,TMH.2017.

E-REFERENCES:

1. Embedded Systems

https://archive.org/details/K.ShibuIntroductionToEmbeddedSystemsTmh2009/page/n5/mode/2up?view=theater

2. https://nptel.ac.in/courses/108102045

VII SEMESTER (PROFESSIONAL ELECTIVE-V)	L	T	P	C
	3	0	0	3
20CS7E12:: CLOUD COMPUTING				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
CO2	:	Learn the key and enabling technologies that help in the development of cloud.
CO3	:	Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
CO4	:	Explicate the core issues of cloud computing such as resource management and security.
CO5	:	Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

UNIT-I:

Introduction: Introduction to Cloud Computing, Definition of Cloud, Evolution of Cloud Computing, Underlying Principles of Parallel and Distributed Computing, Cloud Characteristics, Elasticity in Cloud – On-Demand Provisioning.

UNIT-II:

Cloud Enabling Technologies: Service Oriented Architecture, REST and Systems of Systems, Web Services, Publish-Subscribe Model, Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtualization Support and Disaster Recovery.

UNIT-III:

Cloud Architecture, Services And Storage: Layered Cloud Architecture Design, NIST Cloud Computing Reference Architecture, Public, Private and Hybrid Clouds, IaaS, PaaS, SaaS, Architectural Design Challenges, Cloud Storage, Storage-as-a-Service, Advantages of Cloud Storage, Cloud Storage Providers, S3.

UNIT-IV:

Resource Management And Security In Cloud: Inter Cloud Resource Management, Resource Provisioning and Resource Provisioning Methods, Global Exchange of Cloud Resources, Security Overview, Cloud Security Challenges, Software-as-a-Service Security, Security Governance, Virtual Machine Security, IAM, Security Standards.

UNIT-V:

Cloud Technologies And Advancements: Hadoop, MapReduce, Virtual Box, Google App Engine, Programming Environment for Google App Engine, Open Stack, Federation in the Cloud, Four Levels of Federation, Federated Services and Applications, Future of Federation.

Text Books:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Morgan KaufmannPublishers.

2. Rittinghouse, John W. and James F. Ransome, Cloud Computing: Implementation, Management and Security, CRCPress.

References:

1.Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing, Tata McgrawHill.

2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing - A Practical Approach, Tata McGrawHill.

3. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly.

VII SEMESTER : OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20CE7O02:: BUILDING PLANNING AND DRAWING				

COURSE OUTCOMES

Students are able to

1. Understand the building bye-laws, plan various buildings as per the building by-laws.
2. Plan the individual rooms with reference to functional and furniture requirements.
3. prepare different sign conventions and bonds
4. Learn the skills of drawing building elements like doors and windows.
5. Develop the skills of Drawing Plans, Sections and Elevations of different buildings.

SYLLABUS:

UNIT-I

BUILDING BYELAWS AND REGULATIONS: Introduction - terminology - objectives of building Bye laws - floor area ratio - floor space index - principles under laying building bye laws - classification of buildings - open space requirements - built up area limitations- height of buildings- wall thickness - lightening and ventilation requirements.

UNIT -IIRESIDENTIAL AND PUBLIC BUILDINGS

Residential buildings: Minimum standards for various parts of buildings -requirements of different rooms and their grouping- characteristics of various types residential buildings.

Public buildings: Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels & motels, buildings for recreation.

UNIT-III

SIGN CONVENTIONS AND BONDS : Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles. English bond and Flemish bond- odd and even courses for one, one-half, two and two & half brick walls in thickness at the junction of a corner.

UNIT- IV

DOORS, WINDOWS, VENTILATORS AND ROOFS: Panelled door, panelled and glassed door, glassed windows, paneled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs. King Post truss, Queen Post truss Sloped and flat roof buildings: drawing plans, Elevations and Cross Sections of given sloped roof buildings.

UNIT-V

PLANNING AND DESIGNING OF BUILDINGS: Draw the Plan, Elevation and sections of a Residential & Public buildings from the given line diagram.

TEXT /REFERENCE BOOKS:

1. Y.S. Sane., Planning and Design of buildings, 2010.
2. Gurucharan Singh and Jagadish Singh , Planning, designing and scheduling, 2015.
3. M. Chakravarthi., Building planning and drawing, 2015.
4. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur.
5. Shah and Kale , Building drawing, 2013.

VII SEMESTER : OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20EE7O01::ENERGY AUDITING, CONSERVATION AND MANAGEMENT				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Understand the principles of energy audit
CO2	:	Explicate the role of Energy Manager and Energy Management program.
CO3	:	Design a energy efficient motors and good lighting system
CO4	:	Evaluate the methods to improve the power factor
CO5	:	Estimate the computational techniques with regard to economic aspects.

SYLLABUS

UNIT-I	**:**	**PRINCIPLES OF ENERGY AUDIT**
Energy audit- definitions - concept - types of audit - energy index - cost index - pie charts - Sankey diagrams and load profiles - Energy conservation schemes and energy saving potential - Energy audit of industries- energy saving potential - energy audit of process industry - thermal power station - building energy audit– Numerical problems.		
UNIT-II	**:**	**ENERGY MANAGEMENT**
Principles of energy management - organizing energy management program - initiating - planning - controlling - promoting - monitoring - reporting. Energy manager - qualities and functions - language - Questionnaire – check list for top management.		
UNIT-III	**:**	**Energy Efficient Motors and Lighting**
Energy Efficient Motors: Energy efficient motors - factors affecting efficiency - loss distribution - constructional details - characteristics – variable speed - RMS - voltage variation-voltage unbalance-over motoring-motor energy audit. **Lighting** : lighting system design and practice - lighting control - lighting energy audit.		
UNIT-IV	**:**	**POWER FACTOR IMPROVEMENT AND ENERGY INSTRUMENTS**
Power factor – methods of improvement - location of capacitors - Power factor with non-linear loads - effect of harmonics on p.f - p.f motor controllers – Energy Instruments- watt meter - data loggers - thermocouples - pyrometers - lux meters - tongue testers.		
UNIT-V	**:**	**ECONOMIC ASPECTS AND COMPUTATION**
ECONOMIC ASPECTS : Economics Analysis depreciation Methods - time value of money - rate of return - present worth method - replacement analysis - lifecycle costing analysis. **COMPUTATION ASPECTS:** Calculation of simple payback method - net present value method- Power factor correction - lighting – Applications of life cycle costing analysis - return on investment.		

TEXT BOOKS:

1. Energy management by W.R.Murphy&G.Mckay Butter worth - Heinemann publications - 1982.
2. Energy management hand book by W.CTurner - John wiley and sons - 1982.

REFERENCE BOOKS:

1. Energy efficient electric motors by John.C.Andreas - Marcel Dekker Inc Ltd-2nd edition – 1995.
2. Energy management by Paul o' Callaghan - Mc-graw Hill Book company-1st edition – 1998.
3. Energy management and good lighting practice : fuel efficiency- booklet12-EEO

VII SEMESTER : OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20EC7O01 :: INTRODUCTION TO GLOBAL POSITIONING SYSTEMS				

COURSE OUTCOMES:
After completion of this course, the students are able to,

CO1: Describe global navigation satellite systems (K1)

CO2: Understand GNSS Satellite signal characteristics (K2)

CO3: Develop GNSS Receiver (K3)

CO4: Analyze the impact of various error sources on the precision of positioning. (K4)

UNIT I :FUNDAMENTALS OF SATELLITE NAVIGATION:
Concept of Ranging using Time of arrival Measurements: Two-Dimensional Position Determination, Principle of Position Determination via Satellite-Generated Ranging signals, Fundamentals of satellite orbits: Orbital Mechanics, Constellation Design, Positioning determination using Ranging codes: Determining Satellite-to-User Range,Indian Developed GNSS- Indian Regional Navigation Satellite System (IRNSS) : NavIC and its applications, GPS-Aided Geo-Augmented Navigation (GAGAN)

UNIT II :GLOBAL POSITIONING SYSTEM SEGMENTS:
Space Segment Description: GPS Satellite Constellation Description, Constellation Design Guidelines, Space Segment Phased Development, Control Segment: Current Configuration, CS Planned Upgrades , User Segment: GPS Set Characteristics, GPS Receiver Selection

UNIT-III : GPS SATELLITE SIGNAL CHARACTERISTICS:
Modulations for Satellite Navigation: Modulation Types, Multiplexing Techniques, Signal Models and Characteristics, Legacy GPS Signals: Frequencies and Modulation Format, Power Levels, Autocorrelation Functions and Power Spectral Densities, Cross-Correlation Functions and CDMA Performance, Navigation Message Format.

UNIT-IV :GNSS RECEIVER:
Acquisition: Single Trial Detector, Tong Search Detector, M of N Search Detector, Combined Tong and M of N Search Detectors, FFT-Based Techniques, Direct Acquisition of GPS Military Signals, Vernier Doppler and Peak Code Search, carrier tracking, code tracking: Carrier Loop Discriminator, sequence of initial receiver operation.

UNIT-V: GNSS ERRORS: Introduction, Measurement errors: satellite clock error, ephemeris error, relative effects, atmospheric effects, receiver noise and resolution, multipath and shadowing effects, hardware bias errors, Pseudo range error budgets.

TEXTBOOKS:
1. Elliott D. Kaplan, Christopher J. Hegarty, Understanding **GPS/GNSS** principles and applications, third edition, artech house publishers, Boston, 2017
2. G S Rao, Global Navigational satellite system, Tata McGraw-Hill education private Ltd, New Delhi, 2015.

REFERENCES:

1. ISRO-IRNSS-ICD-SPS-1.1, Bangalore, 2017
2. Bhatta, B. ". Global Navigation Satellite Systems: Insights Into GPS, Glonass, Galileo, Compass, and Others", BS Publications, New Delhi, 2015.

E-REFERENCES:

1. https://archive.nptel.ac.in/courses/105/107/105107194/
2. https://d1.amobbs.com/bbs_upload782111/files_33/ourdev_584835O21W59.pdf

VII SEMESTER : OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20BM7O01 :: INDUSTRIAL SOCIOLOGY AND PSYCHOLOGY				

UNIT I: Industrial Sociology: Nature and Scope of Industrial Sociology-Development of Industrial Sociology, Factors of social change – the technological factors, the cultural factors, effects of technology on major social institutions, social relations in industry.

UNIT II: Group Dynamics: Concept- factors influencing individual behaviour- Work Teams & Groups, Group Behavior, Group formation & development, Decision Making by Individuals, Groups Decision making process-techniques.

UNIT III: Industrial Psychology: Nature and Meaning of Industrial Psychology, Role of Industrial Psychology, Organizational Attitude, Motivation at work-Theories of Motivation (Theory X and Y, McClelland's Theory, Maslow's Need Theory, Herzberg's Two Factor Theory), Cultural Differences in Motivation.

UNIT IV: Organizational Design and Leadership: Organizational Design & Structure- organizational design- process, Structural differentiations, factors influencing design of organizations, Leadership-concept, types, Leadership vs. Management, Leadership Theories, Emerging issues in Leadership.

UNIT V: Organizational Conflicts and Change management: - Causes and Consequences of Conflict-Conflict handling techniques, Managing Change, Forces for change in Organization, Resistance to change.

TEXT BOOKS:

1. Nelson, Quick and Khandelwal, ORGB : An innovative approach to learning and teaching Organizational Behaviour. A South Asian Perspective, Cengage Learning, 2012
2. Luthans, Fred, Organizational Behavior, McGraw Hill, 2008.
3. Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.

REFERENCES BOOKS:

1. Schneider Engno V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi,2011.
2. Ivancevich, Konopaske &Maheson, OrganisationalBehaviour& Management, 7th edition, Tata McGraw Hill, 2008.
3. L.M.Prasad.,OrganisationalBehaviour, 5th Edition, Sulthan Chand & Sons.,2014

VII SEMESTER : OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20ME7O01 :: BIO-MECHANICAL ENGINEERING				

COURSE OBJECTIVES: The main objectives of this course are

- To make the student familiar with fundamentals of bio mechanics.
- To gain knowledge about musculoskeletal system.
- To impart knowledge about linear kinetics and angular kinetics
- Make the student to illustrate the mathematical models used in the analysis of biomechanical systems

COURSE OUTCOMES: Students are able to

CO1: Explicate about fundamentals of Bio mechanics. [K2]
CO2: Describe the mechanics of musculoskeletal system. [K2]
CO3: Relate the concept of kinetics with human motion. [K3]
CO4: Explicate mechanical analysis of human motion. [K3]
CO5: Analyze human movements. [K4]

UNIT-I
INTRODUCTION TO BIO MECHANICS

Principles of mechanics in human movement, Qualitative and quantitative Analysis, Key mechanical concepts of mechanics and basic units, Nine fundamentals of biomechanics, Nine principles for application of Biomechanics.

UNIT-II
MECHANICS OF MUSCULOSKELETAL SYSTEM

Principles of joint motions, Muscle structures, Mechanical method of muscle action analysis, Tissue loads and forces, Biomechanics of bones and ligaments, Three mechanical characters of muscle, stretch-shortening cycle (SSC).

UNIT-III
LINEAR KINETICS AND ANGULAR KINETICS

Vector analysis of angle of pull and muscle angle pull, Contact forces, Impulse-Momentum Relationship, Force-Time Principle, Work-Energy relationship, Segmental interaction principle, Torque, Equilibrium, Center of gravity and Principle of balance.

UNIT-IV
MECHANICAL ANALYSIS OF HUMAN MOTION

Linear kinematics - linear kinematic analysis, position and displacement, velocity and speed, acceleration, differentiation and integration, kinematics of running, kinematics of projectiles, equations of constant acceleration, Angular kinematics - angular motion, measurements of angles, types of angles, representation of angular motion vectors, lower extremity joint angles, relationship between angular and linear motion, angular kinematics of running.

UNIT-V

APPLICATIONS OF MEDICAL REHABITATION

Qualitative analysis of kicking technique, batting, catching, throwing techniques, injury risk assessment, equipment design for strength training, Injury mechanics, injury prevention.

TEXT BOOKS:

1. Ronald L. Huston, Principles of Biomechanics,1st edition CRC Press, 2019
2. Joseph E. Muscolino, " Kinesology", 3rd edition, Mosby, 2016.
3. Subrata Pal, "Textbook of Biomechanics", 1st edition, Springer US, 2016.

REFERENCE BOOKS:

1. Duane Knudson, "Fundamentals of Biomechanics", 2nd edition, Springer, 2013.
2. Ajay Bahl, "Basics of Biomechanics", 1st edition, Jaypee Brothers Medical Publishers, 2010.
3. Robert frost, "Applied Kinesiology", 1st edition, North Atlantic Books, 2013
4. David A. Winter, "Biomechanics and Motor Control of Human Movement", John Wiley & sons, 2009.

WEB REFERENCE:

1. https://archive.nptel.ac.in/courses/112/105/112105305/
2. https://archive.nptel.ac.in/courses/112/106/112106248/

VII SEMESTER : OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20CS7O01 :: FULL-STACK DEVELOPMENT				

COURSE OUTCOMES:

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

1. Design simple web pages using markup languages like HTML and CSS.
2. Create dynamic web pages using DHTML and java script that is easy to navigate and use.
3. Create web pages using AngularJS.
4. Build web applications using Servlet and JSP.
5. Understand various operations on Mongo Database.

UNIT-I: HTML and CSS

HTML: An Introduction to HTML, Basic XHTML Syntax and Semantics, Basic HTML Elements: Images, Links, Lists, Tables, Forms, Frames, Division and Spanning, HTML 5.0.

CSS: Levels of Style sheets, Style specification formats, Selector forms, CSS Colors and Backgrounds, CSS Text and Font Properties, The Box Model, CSS Margins, Padding, and Borders Conflict Resolution.

UNIT-II: Client-Side Scripting using Java Script and DOM

Java Script: The Basics of Java Script, Objects, Primitive operations and Expressions, Screen output and Keyboard input, Control statements, Object Creation and modification, Arrays, functions, Constructors, Pattern matching using Regular Expressions, DHTML: Positioning moving and Changing Elements.

DOM: Introduction to the Document Object Model DOM, HTML DOM Event Handling, Modifying Element Style, Document Tree, DOM Event Handling

UNIT-III: Angular JS

Introduction to AngularJS: Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, HTTP, Tables, Select, Fetching Data from MySQL.

UNIT-IV: Servlet and JSP

Servlet: Servlet Basics, Need of Server Side Programming, Servlet Life Cycle, Servlet Hello World Application, Web.xml Structure, Servlet Directives- include(), forward(), sendRedirect(), HttpServletRequest and HttpServletResponse in Servlet, Servlet and JDBC Integration.

JSP: JSP Basics, JSP Scripting Elements(Declaration, Expression, Scriptlet), Directive Elements(page, include, taglib), Action Elements(jsp:forward,jsp:include,jsp:useBean), JSP Implicit Objects.

UNIT-V Mongo DB

Introduction to Mongo DB: Mongo DB Environment, Create Database, Drop Database, Create Collection, Drop Collection, Read Operations, Write Operations.

Text Books:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. Head First Servlet and JSP
4. Node.js, MongoDB, and AngularJS Web Development by Brad Dayley

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage
3. Pro Angular JS by Adam Freeman
4. MEAN Web Development by Amos Q. Haviv

VII SEMESTER : OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20CE7O03 :: INTRODUCTION TO WATERSHED MANAGEMENT				

Course Outcomes:

Students are able to

1. Analyze watershed characteristics to take appropriate management action.
2. Quantify soil erosion and design control measures.
3. Apply land grading techniques for proper land management.
4. Suggest suitable harvesting techniques for better watershed management.
5. Apply appropriate models for watershed management.

SYLLUBUS:

UNIT-I: Introduction:

Concept of watershed development, objectives of watershed development, need for watershed development, Characteristics of Watersheds: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics.

UNIT-II: Principles of Erosion:

Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, check dams, rock-fill dams, brushwood dam, Gabion.

UNIT-III: Water Harvesting:

Techniques of rain water harvesting- rain water harvesting from roof top, surface flow harvesting, farm ponds and dugout ponds, percolation tanks.

UNIT-IV: Land Management:

Land use and Land capability classification, management of forest, agricultural, grassland and wild land, Reclamation of saline and alkaline soils.

UNIT-V: Watershed Modeling:

Data of watershed for modeling, model calibration and validation, advances of watershed models. Integrated and multidisciplinary approach for watershed management.

Text/ References books:

1. Abrar Yousuf and Manmohanjit Singh, 'Watershed Hydrology, Management and Modeling', Taylor & Francis Ltd; 1st edition, 2021.
2. Das MM and M.D Saikia , 'Watershed Management', PHI Learning Pvt. Ltd, 2013.
3. Murthy VVN , 'Land and Water Management', Kalyani Publications, 2007.
4. Murthy J V S, 'Watershed Management', New Age International Publishers, 2006.
5. Wurbs R A and James R A 'Water Resource Engineering', Prentice Hall Publishers, 2002.

VII SEMESTER : OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20EE7O02 :: INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLLER				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Illustrate I/O modules of PLC systems and ladder diagrams
CO2	:	Demonstrate various types registers and programming instructions.
CO3	:	Examine various types of PLC functions and its applications
CO4	:	Assess different data handling functions and its applications.
CO5	:	Describe the analog operations and PID modules

SYLLABUS

UNIT-I	**:**	**INTRODUCTION TO PLC SYSTEMS**
I/O modules and interfacing - CPU processor - programming Equipment - programming formats - construction of PLC ladder diagrams - Devices connected to I/O Modules. Digital logic gates - programming in the Boolean algebra system - conversion examples Ladder Diagrams for process control: Ladder diagrams & sequence listings - ladder diagram construction and flowchart for spray process system		
UNIT-II	**:**	**PLC PROGRAMMING & REGISTERS**
PLC Programming: Input instructions - outputs - operational procedures - programming examples using contacts and coils. Drill press operation. **PLC Registers:** Characteristics of Registers - module addressing - holding registers - Input Registers - Output Registers.		
UNIT-III	**:**	**PLC FUNCTIONS**
Timer functions & Industrial applications - counters - counter function industrial applications - Arithmetic functions - Number comparison functions - number conversion functions		
UNIT-IV	**:**	**DATA HANDLING FUNCTIONS**
SKIP - Master control Relay - Jump - Move - FIFO - FAL - ONS – CLR & Sweep functions and their applications. Bit Pattern and changing a bit shift register – sequence functions and applications - controlling of two-axis & three axis Robots with PLC - Matrix functions		
UNIT-V	**:**	**ANALOG PLC OPERATION**
Analog modules & systems - Analog signal processing - Multi bit Data Processing - Analog output Application Examples - PID principles - position indicator with PID control - PID Modules - PID tuning - PID functions.		

TEXT BOOKS:

1. Programmable Logic Controllers- Principles and Applications by John W. Webb & Ronald A. Reiss - Fifth Edition – PHI.
2. Programmable Logic Controllers- Programming Method and Applications – JR.Hackworth&nF.D Hackworth Jr. –Pearson - 2004

REFERENCE BOOKS:

1. Introduction to Programmable Logic Controllers- Gary A. Dunning - 3rd edition – Cengage Learning - 2005.
2. Programmable Logic Controllers –W.Bolton - 5th Edition - Elsevier publisher - 2009.

VII SEMESTER : OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20BM7O02 :: BUSINESS SKILL DEVELOPMENT				

UNIT- I

Communication in Business Objectives of communication - The Process of Human Communication – Types of Communication-Written, Oral, Visual, Audio Visual - Developing Listening Skills – Types, essentials of good listening and tips.

UNIT -II

Managing Organizational Communication– Formal and Informal Communication – Intra- personal– Inter-Personal Communication-Communication Models - Johari Window, Transactional Analysis, and Social Exchange theory. Role of emotion, barriers to interpersonal communication- Gateways to effective interpersonal communication.

UNIT -III

Nonverbal communication and Body language: Kinesics, Proxemics, Paralanguage, Haptics, handshakes, Appropriate body language and Mannerisms for interviews: business etiquettes- cultural effects of communication. Communication styles.

UNIT- IV

Business Correspondence- Essentials of Effective Business Correspondence, Norms for business letters- Letter for different kinds of situations- Business Letter and Forms, Resume writing, Meeting, Telephonic Communication – Use of Technology in Business Communication.

UNIT -V

Report Writing and Presentation skills – Formal and Informal Reports-Reports and Proposals Prerequisites for effective presentation -Types and Stages of presentation – Communication skills for group discussion and interviews-interview techniques.

Text / Reference Books

1. K Bhardwaj, Professional Communication, IK Int Pub House, New Delhi
2. Rayudu, CS: “Communication”, Himalaya Publishing House, Mumbai.
3. Krizan: “Essentials of Business Communication”, Cengage Learning, New Delhi.
4. UrmilaRai& S.M. Rai, Business Communication, Himalya Publishers,
5. Dalmar Fisher: “Communication in Organizations”, JAICO Publishing House, New Delhi, 2007.
6. Paul Turner: “Organisational Communication”, JAICO Publishing House, New Delhi.
7. Meenakshi Rama: “Business Communication”, Oxford University Press, New Delhi.

VII SEMESTER : OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20EC7O02 :: REMOTE SENSING				

COURSE OUTCOMES:

After Completion of this course, students are able to

CO1: Understand the subject of satellite communication and remote sensing with the core knowledge of space and satellite, communication and the international space laws.

CO2: Comprehend different remote sensing signaling techniques, capable of interpreting signature of satellite communication from bodies like soil, vegetation and ocean.

CO3: Analyze various components used in satellite communication and remote sensing applications.

CO4: Acquire and keep abreast of designing satellite remote sensing system and also analyze the sensor data for drawing inference and conclusions.

UNIT I

Introduction: Historical background, International space laws, Advantages of space based observations, Global coverage, Multi scale observation, repeat observation immediate transmission and digital format, Source of information on remote sensing region.

UNIT II

Principles of remote sensing: Fundamentals of remote sensing signals, The electromagnetic spectrum, Terms and units of measurements, EM radiation laws, Spectral signature in the solar spectrum, vegetation reflectance, soil reflectance, water in the solar spectrum, The thermal infrared domain, characteristics of EM radiation in thermal infrared, Thermal properties of vegetation, Soils thermal domain, thermal signature of water and snow, The microwave region, Atmospheric interaction.

UNIT III

Sensors and remote sensing satellite: Type of sensors, Resolution of sensor systems, spatial, spectral, radiometric, temporal, angular - resolution, passive sensors, photographic cameras, cross and along track - scanners, active sensors, Radar and Lidar, satellite remote missions, Satellite orbits, Landsat programs, SPOT satellites, IRS program, High resolution commercial satellites, Polar orbiting meteorological satellites, Terra Aqua, Geostationary meteorological satellites.

UNIT IV

Basis for interpretations of remote sensing images: Constraints in using remote sensing data, types of interpretation, Costs of data acquisitions, end-user requirements, Thematic classification, Generation of biophysical variables, Change detection, spatial patterns, organization of remote sensing project, interpretation phase, presentation of study cases.

UNIT V

Characteristic of photographic images, Feature identification, criteria for visua interpretation, Brightness, color, texture, spatial contexts, shadows, spatial patterns, shap and size, stereoscopic view, period of acquisition, elements of visual analysis, Geometric characteristics of satellite image, Color composites, Multitemporal approaches.

TEXTBOOKS:

1. Emilio Chuvieco, “Fundamentals of Satellite Remote Sensing”, CRC press, Edition,2009.

REFERENCES:

1.C. H. Chen, “Signal Processing for Remote Sensing‖, CRC press, Edition-2007.

2. R. N Mutagi, “Satellite Communication Principles and Applications”, Oxford University press, 2016.

3. Enrico Del Re, and Marina Ruggieri, “Satellite communications and navigation systems”, Springer.

VII SEMESTER : OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20ME7O02 :: GREEN ENGINEERING SYSTEM				

COURSE OBJECTIVES

- To understand the basic concept of solar energy.
- To gain knowledge about renewable energy.
- To learn about the best energy efficient systems.
- To impart knowledge about energy efficient processes

COURSE OUTCOMES: Students are able to

CO1: Recognize the energy scenario and Explicate solar radiation conversion and collection phenomena. [K3]
CO2: Illustrate solar energy storage methods and applications and also Explicate the principles of wind energy, classification, conversion and applications [K4]
CO3: Explicate the principle, classification, conversion and applications of Bio mass, geothermal energy and ocean energy. [K3]
CO4: Describe the importance of energy efficient systems and interpret working of a few mechanical and electrical efficient systems. [K2]
CO5: Identify the need of energy efficient processes and analyze their significance in view of their importance in the current scenario and their potential future applications. [K4]

UNIT – I

INTRODUCTION: Energy chain and common forms of usable energy – Present energy scenario – World energy status – Energy scenario in India, Traditional energy systems, Renewable energy – sources and features.

SOLAR RADIATION:

Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells, I-V characteristics.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT – II

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, solar cookers, central power tower concept and solar chimney

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

UNIT – III

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT – IV

ENERGY EFFICIENT SYSTEMS:

ELECTRICAL SYSTEMS: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variaXble voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

MECHANICAL SYSTEMS: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, environmental friendly and energy efficient compressors and pumps

GREEN BUILDINGS: Definition features and benefits.

UNIT – V

ENERGY EFFICIENT PROCESSES: Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems - vegetable based cutting fluids, zero waste manufacturing.

TEXT BOOKS:

1. Sukhatme S.P. and J. K. Nayak, Solar Energy – Principles of Thermal Collection and Storage, Tata McGraw Hill, 2018.
2. Khan B.H., Non-Conventional Energy Resources, Tata McGraw Hill, New Delhi, 2015.
3. Green Manufacturing Processes and Systems, Edited by J. Paulo Davim, Springer 2016.

REFERENCES:

1. Alternative Building Materials and Technologies, K. S. Jagadeesh, B.V. Venkata Rama Reddy and K. S. Nanjunda Rao, New Age International (P) Ltd.
2. Principles of Solar Engineering, Yogi Goswami, Frank Krieth and John F Kreider, Taylor and Francis
3. Non-Conventional Energy , Ashok V Desai, Wiley Eastern
4. Renewable Energy Technologies, Ramesh & Kumar, Narosa
5. Non-Conventional Energy Sources, G. D. Rai, Kanna Publishers, New Delhi, 2018.

WEB REFERENCE:

1. https://archive.nptel.ac.in/courses/112/104/112104225/
2. https://archive.nptel.ac.in/courses/105/102/105102195/

VII SEMESTER : OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20CS7O02 :: SOFTWARE TESTING TECHNIQUES				

COURSE OUTCOMES:

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

1. Design simple web pages using markup languages like HTML and CSS.
2. Create dynamic web pages using DHTML and java script that is easy to navigate and use.
3. Create web pages using AngularJS.
4. Build web applications using Servlet and JSP.
5. Understand various operations on Mongo Database.

UNIT-I: HTML and CSS

HTML: An Introduction to HTML, Basic XHTML Syntax and Semantics, Basic HTML Elements: Images, Links, Lists, Tables, Forms, Frames, Division and Spanning, HTML 5.0.

CSS: Levels of Style sheets, Style specification formats, Selector forms, CSS Colors and Backgrounds, CSS Text and Font Properties, The Box Model, CSS Margins, Padding, and Borders Conflict Resolution.

UNIT-II: Client-Side Scripting using Java Script and DOM

Java Script: The Basics of Java Script, Objects, Primitive operations and Expressions, Screen output and Keyboard input, Control statements, Object Creation and modification, Arrays, functions, Constructors, Pattern matching using Regular Expressions, DHTML: Positioning moving and Changing Elements.

DOM: Introduction to the Document Object Model DOM, HTML DOM Event Handling, Modifying Element Style, Document Tree, DOM Event Handling

UNIT-III:Angular JS

Introduction to AngularJS: Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, HTTP, Tables, Select, Fetching Data from MySQL.

UNIT-IV:Servlet and JSP

Servlet: Servlet Basics, Need of Server Side Programming, Servlet Life Cycle, Servlet Hello World Application, Web.xml Structure, Servlet Directives- include(), forward(), sendRedirect(), HttpServletRequest and HttpServletResponse in Servlet, Servlet and JDBC Integration.

JSP: JSP Basics, JSP Scripting Elements(Declaration, Expression, Scriptlet), Directive Elements(page, include, taglib), Action Elements(jsp:forward,jsp:include,jsp:useBean), JSP Implicit Objects.

UNIT-V Mongo DB

Introduction to Mongo DB: Mongo DB Environment, Create Database, Drop Database, Create Collection, Drop Collection, Read Operations, Write Operations.

Text Books:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. Head First Servlet and JSP
4. Node.js, MongoDB, and AngularJS Web Development by Brad Dayley

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage
3. Pro Angular JS by Adam Freeman
4. MEAN Web Development by Amos Q. Haviv

VII SEMESTER: OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20IT7O01 :: INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT				

Course Outcomes:

Upon the completion of the course students will be able to:-

1. Apply the process to be followed in the software development life-cycle models.
2. Apply the concepts of project management & planning.
3. Implement the project plans through managing people, communications and change
4. Conduct activities necessary to successfully complete and close the Software projects
5. Implement communication, modeling, and construction & deployment practices in software development.

UNIT – I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT – II:

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT – III:

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT – IV:

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT – V:

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

Text Books:

1. Software Project Management, Walker Royce, Pearson Education, 2005.
2. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

Reference Books:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3. Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

VII SEMESTER B. TECH VII SEM (Humanities and Social Science Elective)	L	T	P	C
	3	-	-	3
20HS7T01 :: UNIVERSAL HUMAN VALUES : UNDERSTANDING HARMONY				

COURSE OUTCOMES:

Students are able to

CO1: Understand the need, basic guidelines, content and process of value education; explore the meaning of happiness and prosperity.

CO2: DistinguishbetweentheSelfandtheBody,understandthemeaningofHarmonyin the SelftheCo-existenceof SelfandBody.

CO3: Analyze the value of harmonious relationship based on trust and respect in life and profession

CO4: Examine the role of a human being in ensuring harmony in society and nature.

CO5: Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.

Syllabus

Unit 1: Introduction-Basic Human Aspiration

Understanding the need, basic guidelines, content and process for Value Education-Self-Exploration, its content and process - 'Natural Acceptance' and 'Experiential Validation' as the mechanism for self exploration-Continuous Happiness and Prosperity the basic requirements for fulfillment of aspirations of every human being with their correct priority- Understanding Happiness and Prosperity correctly-Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit 2: Harmony in the Human Being

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'-Understanding the characteristics and activities of 'I' and harmony in 'I'.

Unit 3: Human-Human relationships

Understanding values in human-human relationship-Meaning of justice-Nine universal values in relationship-Meaning of trust and respect-Difference between respect and differentiation-Harmony in society-undivided society-from family to world family.

Unit 4: Nature and existence

Self exploration – self awareness and self evaluation- Self realization-Understanding and contemplation in the Self - Realization of Co-existence- Understanding of harmony in Nature and contemplation of participation of Human in development of harmony.

Unit 5: Implications of Harmony on professional ethics

Basis for Humanistic Education-Humanistic Constitution and Humanistic Universal Order- Case studies of typical holistic technologies-management models-Production systems-Strategy for transition from the present state to universal human order.

TEXT BOOKS:

1. R R Gaur, R Sangal, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", Excel Books, 2010.

REFERENCES

1. A.N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004.
2. Mahadev Desai, Shriman Narayan, “The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi”, NavajivanMudranalaya, Ahemadabad, India.1925
3. A Nagaraj, Jeevan Vidya: EkParichaya, Jeevan Vidya Prakashan, Amarkantak, 1999.
4. P. L. Dhar& R. R. Gaur, “Science & Humanism – towards a unified worldview”, Commonwealth Publishers, New Delhi-1990.
5. J. C. Kumarappa, “Economy of Permanence – (a quest for social order based on non-violence)”, Sarva-Seva-Sangh-Prakashan, Varansi, India-2010.

VII SEMESTER	L	T	P	C
	0	0	4	2
20EE7S01::**RENEWABLE ENERGY SYSTEMS**				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Ability to understand and analyze Renewable energy sources available at present
CO2	:	Ability to understand the solar energy operation and its characteristics.
CO3	:	Ability to simulate the various Renewable energy sources.
CO4	:	Ability to recognize current and possible future role of Renewable energy sources.
CO5		CO3: To educate the wind energy operation and its types.

LIST OF EXPERIMENTS

1. Simulation of solar photo voltaic system in MATLAB.
2. Effect of Temperature Variation & irradiation on a photovoltaic array in MATLAB.
3. Experiment on VI-Characteristics and Efficiency of solar photo voltaic system.
4. Simulation on Shadowing effect & diode-based solution of PV System in MATLAB.
5. Simulation on Performance assessment of Grid connected and Standalone of Solar Power System.
6. Integration of photovoltaic system and dc-dc converter with MPPT algorithm using MATLAB.
7. Simulation study on wind turbine using MATLAB.
8. Simulation of PMSG based stand-alone wind power system using MATLAB.
9. Active and reactive power measurement of phasor type wind turbine induction generator using MATLAB.
10. Simulation study on hybrid (solar-wind) power system in MATLAB.
11. Simulation study on HYDEL power in MATLAB
12. Simulation on fuel cell stack model with dc-dc boost converter in MATLAB

REFERENCE BOOKS:

Department lab manual.

VII SEMESTER	L	T	P	C
	0	0	0	3
20EE7I01 :: INDUSTRIAL/RESEARCH INTERNSHIP				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	To learn the application of knowledge in real world problems. [k1]
CO2	:	To get exposure to team-work and leadership quality. [k3]
CO3	:	To deal with industry-professionals and ethical issues in the work environment. [k2]

VII SEMESTER	L	T	P	C
	0	0	0	8
20EE8P01 :: PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Undertake problem identification, formulation and solution.
CO2	:	Demonstrate a sound technical knowledge of their selected project topic.
CO3	:	Analyze and assemble the basic information to find solution of a complex engineering problem by using suitable methodology/procedure.
CO4	:	Demonstrate the knowledge, skills and attitudes of a professional engineer.
CO5	:	Document and report the project work carried out in an appropriate format.

MINOR DEGREE
IN

EEE DEPARTMENT

SYLLABUS

SUBJECT CODE	NAME OF THE SUBJECT	L	T	P	C
	FUNDAMENTALS OF ELECTRICAL CIRCUITS	**4**	**0**	**0**	**4**
Subject Category	MINOR				
Semester	IV				

SYLLABUS

UNIT-I	**:**	**INTRODUCTION TO ELECTRICAL CIRCUITS**

Basic Conceptsof passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources.

UNIT-II	**:**	**SINGLE PHASE A.C SYSTEMS**

Periodic waveforms (determination of rms, average value and form factor), concept of phasor, phase angle and phase difference – waveforms and phasor diagrams for lagging, leading networks, complex and polar forms of representations-node and mesh analysis.

Steady state analysis of R, L and C circuits, power factor and its significance, real, reactive and apparent power, waveform of instantaneous power and complex power.

UNIT-III	**:**	**NETWORK THEOREMS (DC & AC EXCITATIONS)**

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

UNIT-IV	**:**	**BALANCED AND UNBALANCED THREE PHASE CIRCUITS-I**

Phase sequence, star and delta connection of sources and loads, relation between line and phase voltages and currents, analysis of balanced three-phase circuits, measurement of active and reactive power.

UNIT-V	**:**	**BALANCED AND UNBALANCED THREE PHASE CIRCUITS-II**

Loop method, Star-Delta transformation technique, two wattmeter method for measurement of three phase power.

TEXT BOOKS:

1. Fundamentals of Electric Circuits "Charles K.Alexander, Mathew N.O.Sadiku, TataMcGraw-Hill sixth edition-2019.
2. Circuits & Networks Analysis & Synthesis by A. Sudhakar and Shyammohan S Palli,TataMcGraw-Hill Fifth edition-2017.
3. Circuit Theory by A.ChakrabartiDanapat Rai & Co publisher.Seventh - Revised edition(2018).

REFERENCE BOOKS:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw HillCompany,6th edition Eighth edition (4 August 2013)
2. Network Analysis by N.C.Jagan, C.Lakshmi Narayana BS publications 2nd edition -2017
3. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.Third edition, 2019.

SUBJECT CODE	NAME OF THE SUBJECT	L	T	P	C
	CONCEPTS OF ELECTRICAL MEASUREMENTS	**4**	**0**	**0**	**4**
Pre-requisite	Engineering Physics				
Subject Category	MINOR				
Semester	V				

SYLLABUS

UNIT-I ANALOG AMMETER AND VOLTMETERS

Classification – deflecting - control and damping torques – Construction of PMMC - Moving Iron and Electrodynamo instruments - Torque equation - Errors and Compensation – Numerical Problems.

UNIT-II : ANALOG WATTMETERS AND ENERGY METERS

Electrodynamometer type wattmeter (LPF and UPF) - Induction Type Energy meters-Construction and working - Errors and Compensation– Numerical Problems.

UNIT-III MEASUREMENTS OF ELECTRICAL PARAMETERS

DC Bridges: Measurement of Resistance – Kelvin's double bridge - Wheatstone bridge – Numerical Problems.

AC Bridges: Measurement of inductance and quality factor - Maxwell's bridge - measurement of capacitance - Schering Bridge– Numerical Problems.

UNIT-IV TRANSDUCERS

Classification - Resistive (Strain Gauge) - Inductive (LVDT) and Capacitive (Piezo electric) Transducer – Numerical Problems.

UNIT-V DIGITAL METERS

Successive approximation Digital Voltmeter — Digital frequency meter - Digital multimeter - Digital Energy Meter.

TEXT BOOKS:

1. Electrical & Electronic Measurement & Instruments by A.K.SawhneyDhanpat Rai &Co.Publications.
2. Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis,fifth Edition, Wheeler Publishing.
3. Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCE BOOKS:

1. Electrical and Electronic Measurements and instrumentation by R.K.Rajput, S.Chand.
2. Electrical Measurements by Buckingham and Price, Prentice – Hall
3. Electrical Measurements by Forest K. Harris. John Wiley and Sons

4. Electrical Measurements: Fundamentals, Concepts, Applications by Reissland, M.U, New Age International (P) Limited, Publishers.
5. Electrical and Electronic Measurements by G.K.Banerjee, PHI Learning Private Ltd, New Delhi– 2012.

SUBJECT CODE	NAME OF THE SUBJECT	L	T	P	C
	FUNDAMENTALS OF UTILIZATION OF ELECTRICAL ENERGY	4	0	0	4
Pre-requisite	Engineering Physics				
Subject Category	Minor				
Semester	VI				

SYLLABUS

UNIT-I	:	Illumination fundamentals

Introduction - terms used in illumination–Laws of illumination–Lux meter–Sources of light.

Various Illumination Methods

Tungsten filament lamps and fluorescent lamps - Comparison –Basic principles of light control– Types and design of lighting and flood lighting–LED lighting - Energy conservation.

UNIT-II	:	ELECTRIC HEATING

Advantages and methods of electric heating–Resistance heating induction heating and dielectric heating.

UNIT-III	:	ELECTRIC WELDING

Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding

UNIT-IV	:	ELECTRIC TRACTION

System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement–Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves. Calculations of tractive effort– power – Specific energy consumption for given run–Effect of varying acceleration and braking retardation– Adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

UNIT-V	:	INTRODUCTION TO ENERGY STORAGE SYSTEMS

Need for energy storage - Types of energy storage-Thermal - electrical - magnetic and chemical storage systems - Comparison of energy storage technologies-Applications.

TEXT BOOKS:

1. Electrical Power Systems(Generation, Transmission, Distribution, Protecection and Utilization of Electrical Energy) – Dr. S.L.Uppal and Prof. Sunil S.Rao – Khanna Publisher, 15th edition, 1987.
2. Electric Power Distribution – A S Pabla – McGrawHill.

REFERENCE BOOKS:

1. Generation Distribution and Utilization of Electrical Energy – C.L.Wadhwa- New Age International Publishers- revised third edition.

SUBJECT CODE	NAME OF THE SUBJECT	L	T	P	C
	BASICS OF POWER SYSTEM ENGINEERING	3	0	0	3
Subject Category	MINOR				
Semester	VII				

SYLLABUS

UNIT-I : POWER GENERATION

Generation and sources of Energy – working principle and Schematic diagram approach of ThermalPower Plant – Hydro Power Plant - Nuclear Power Plant – Comparison betweenPower Plants

UNIT-II : ECONOMIC ASPECTS

Definitions of Load - Load & Load Duration Curves - Load Factor - Demand Factor – Utilization Factor – Types of Tariff - Cost of Electrical Energy – Expression for Cost of Electrical Energy – Numerical Problems

UNIT-III : TRANSMISSION CONCEPTS

Types of Conductors Materials – Constants of Transmission Line – Classification of OverheadTransmission Lines – Performance of Short Transmission Lines – Simple Problems.

UNIT-IV : DISTRIBUTION CONCEPTS

Basic concept of Sub Station – Distribution Systems – Connection Schemes of Distribution Systems – Differences between Overhead & Underground systems

UNIT-V : PROTECTION AND GROUNDING

List of Faults – Basic concepts of fuse – Concept of Circuit Breakers –Concept of Relays.– Grounding and its advantages - Methods of NeutralGrounding: Resistance and Reactance Grounding – Numerical Problems.

TEXT BOOKS:

1. A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar , “A Text book of Power System Engineering” , Dhanpat Rai Publication
2. V. K. Mehta, Rohit Mehta, “Principles of Power Systems”, S. Chand Publication.
3. S. N. Singh, “Electric Power Generation, Transmission and Distribution”, PHI Learning, New Delhi
4. A. J. Wood and B. F. Wallenberg, “Power generation, operation and control”, WileyInterscience, 2nd Edition.

REFERENCE BOOKS:

1. Elements of power system analysis, C.L Wadwa, New age international
2. Electrical Power System, Ashfaq Hussain, CBS Publishers & Distributors
3. Power System Engineering ,I J Nagrath& D.P Kothari ,TMH 3rd Edition