ACHARYA NAGARJUNA UNIVERSITY

NAGARJUNA NAGAR – 522 510

ANDHRAPRADESH, INDIA

Course Structure of

ELECTRICAL & ELECTRONICS ENGINEERING

4-Year B. Tech Degree Course

(Semester System)

w.e.f. 2019-2020

Acharya Nagarjuna University
Faculty of Engineering
Academic Regulations 2019 (R19) for B. Tech (Regular)

(Applicable for the students admitted during the
Academic Year 2019-2020 and onwards)

1. Eligibility for Admission:

Admission to the above program shall be made subject to the eligibility, qualification and specialization prescribed by the University for each program from time to time.

i. Admission shall be made either on the basis of merit/rank obtained by the qualifying candidates in EAMCET/ECET or otherwise specified, whichever is relevant.

The duration of B.Tech program is of four academic years divided into eight semesters comprising of two semesters in each academic year. A student is required to choose a branch of study at the time of admission. Students under lateral entry will be admitted straightaway into Third semester of B.Tech course in the respective branch. No change of branch shall be allowed after the admissions are closed.

2. Award of B.Tech. Degree:

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

i. Regular entry students shall pursue a course of study for not less than four academic years and in not more than eight academic years.

ii. Student's who fail to fulfill all the academic requirements for the award of the degree within eight academic years (for Regular Entry) / six academic years (for Lateral Entry) from the year of their admission, shall forfeit their seat in B.Tech course and their admission is cancelled.

Completing the course of study shall mean not only satisfying the attendance requirements but also passing of all the subjects within the respective stipulated period

3. Branches of study:

The following Branches of study are offered at present for B. Tech. degree

S.No.	Branch
1.	Civil Engineering
2.	Electrical and Electronics Engineering.
3.	Mechanical Engineering.
4.	Electronics and Communication Engineering
5.	Computer Science and Engineering.
6.	Chemical Engineering

and any other branch as approved by the authorities of the University from time to time.

Each Branch will have a curriculum with a syllabi that shall consist of the following:

i. General Core Courses 1. Basic Sciences
2. Engineering Sciences
3. Humanities and social sciences

ii. Program core courses in Engineering / Technology

iii. Elective courses of Engineering / Technology / Management Entrepreneurship / Business Communication and allied fields.

iv. Open Electives/CBCS

v. Mandatory learning courses

vi. Project work

4. Credits:

i. *Academic Year:* Two consecutive (one odd + one even) semesters constitute one academic year.

ii. *Choice Based Credit System (CBCS):* The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).

iii. *Credit:* A unit by which the course work is measured.

5. Distribution and Weightage of Marks (Internal & External):

i. The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition internship & project work shall be evaluated for 100 and 200 marks respectively.

ii. For both theory and lab subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the External Evaluation.

iii. There shall be five units in each of the theory subjects.

iv. For theory subjects, there shall be <u>two</u> midterm examinations during the semester. Each midterm examination shall consist of assignment for 15 marks and sessional test for 20 marks with duration of 150 minutes respectively.

First midterm examination shall be conducted for 50% coverage of syllabus and second midterm examination shall be conducted for remaining 50% of syllabus. Both the midterm exams are compulsory. Final midterm examination marks for a total of 35 marks shall be arrived at, by considering the 80% weightage (28 marks) to that midterm examination in which the student scores more marks and the remaining 20% (7 marks) for other midterm exam.

*****Note 1: The assignment test paper shall contain 6 questions of equal weightage and student is asked to answer any 3 questions randomly and shall be condensed for 15 marks, any fraction rounded off to the next higher mark.

*****Note 2: The sessional examination shall contain 3 questions out of which first question is objective(6marks) and compulsory and remaining two questions(7 marks each) having internal choice and shall be considered for 20 marks, any fraction rounded off to the next higher mark.

***Note 3: Remaining** 5 marks allotted for attendance as indicated in CLAUSE(_6)

V. For theory subjects, there will be 5 questions with following pattern in the End-Examination.

a. All Questions have to be answered compulsorily.
b. All five questions, EITHER/OR type shall be followed with 12 marks for each.
c. In each question as mentioned in (c), one, two or more bits can be set.

vii. Further, whenever any theory subject with two parts is offered (combined subject), for ex: Electrical & Mechanical Technology, then there shall be only two parts Part A, Part B in the question paper.
First question objective can be equally divided into two parts.
Part – A: shall contain two questions, EITHER/OR type shall be followed with 12 marks for each.
Part – B: shall also contain two questions, EITHER/OR type shall be followed with 12 marks for each.

viii. Model Question paper for each theory course shall be prepared by the teacher within 15 days from the commencement of the semester and the same shall be forwarded to the Controller of Examinations through the Chairman, BOS concerned.

ix. For practical subjects there shall be a continuous evaluation during the semester for 40 internal marks and 60 end examination marks. Day-to-day work in the laboratory shall be evaluated for 25 marks by the concerned laboratory teacher based on the report of experiments/jobs(10 marks for the record submitted and 15 marks for day to day work). The end examination for 15 marks (10 marks for experiment and 5 marks for viva-voce) shall be conducted by the laboratory teacher and another examiner from the same department.

*Note: Day to day performance shall be recorded in student record(each experiment carries 15 marks, at least ten experiments should be done and average marks must be taken at the end of semester).

x. For the subject having design and / or drawing, such as Engineering Drawing, Machine Drawing and Estimation, the distribution shall be 40 marks for internal evaluation and 60 marks for end examination. The Internal evaluation will be 20 marks for day-to-day work in the class that shall be evaluated by the concerned subject teacher based on the reports/submissions prepared in the class. Further, there shall be two midterm exams in a Semester for a duration of 2 hrs each, evenly distributed over the syllabi for 20 marks and the average marks of both the mid examinations shall be considered as internal test marks. The sum of day to day evaluation and the internal test marks will be the final internal marks for the subject.

xiv. Out of a total of 200 marks for the project work, 80 marks shall be for Internal Evaluation and 120 marks for the End Semester Examination (Viva-voce). The viva-voce shall be conducted by a committee consisting of Head of the Department, Project Supervisor and an External Examiner nominated by the Principal from the panel of 3 members proposed by Head of the Department. The project work shall start in IV year I semester and shall continue in the semester break. The evaluation of project work shall be conducted at the end of the IV year II semester. The Internal Evaluation shall be made on the basis of weekly progress (a minimum of 12 weeks and 3 marks for each week progress) and at least two seminars (one at the beginning of IV B.Tech II semester (20 marks) and the other before submission of project work(24 marks) given by each student on the topic of his project.

xv. The laboratory records and internal test papers shall be preserved for minimum of 2 years in the respective departments and shall be produced to the Committees of the college as and when the same are asked for.

6. Attendance Requirements:

i. A student shall be eligible to appear for end examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.

ii. **Shortage of Attendance below 65% in aggregate shall in <u>NO</u> case be condoned**.

iii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.

v. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that

semester when offered next.

vi. A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

vii. A weightage in sessional marks upto a maximum of 5 marks out of 40 marks in each theory subject shall be given for those students who put in a minimum of 75% attendance in the respective subject in a graded manner as indicated below.

Attendance of 90% and above		5marks
Attendance of 85% and above	and less than 90%	3marks
Attendance of 80% and above	and less than 85%	2marks
Attendance of 75% and above	and less than 80%	1mark

7. Minimum Academic Requirements (For Regular Entry Students):

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.**6**

i. A student who could not secure a minimum of 50% aggregate from midterm examination marks is not eligible to appear for the semester end examination and shall have to repeat that semester.

ii. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, design, drawing subject or project if he secures not less than 40% of marks in the end examination and a minimum of 50% of marks in the sum total of the internal evaluation and end examination taken together. In the internship & project he/she should secure 40%. For practical examination if he secures not less than 50% of marks in the semester end examination.

iii. A student shall be promoted from I to II year only if he/she fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 irrespective of back log subjects in I/IV B.Tech.

iv. A student shall be promoted from II to III year only if he/she fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 and also must secure 70% of the credits of the subjects that have been studied up to I year II semester from

irrespective of whether the candidate takes the end examination or not as per the normal course of study. At the time of commencement of calss work, he must attain the re quired credits

v. A student shall be promoted from third year to fourth year only if he fulfills the academic requirements of of attendance and internal marks as stipulated in clause 6 and 7 and also must secure 70% of the credits of the subjects that have been studied upto II year II semester. At the time of commencement of class work, he must attain the required credits

And in case of getting detained for want of credits by sections ii and iii above, the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of Third or Fourth year I semester respectively.

8. Minimum Academic Requirements (For Lateral Entry Students):

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.**6**

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 40% of marks in the end examination and a minimum of 50% of marks in the sum total of the internal evaluation and end examination taken together. In the Seminar & Comprehensive viva-voce he/she should secure 40%.

ii. A student who could not secure a minimum of 50% aggregate from midterm examination marks is not eligible to appear for the semester end examination and shall have to repeat that semester.

iii. A student shall be promoted from II to III year only if he/she fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 irrespective of back log subjects in II/IV B.Tech

iv. A student shall be promoted from III to IV year only if he/she fulfils the academic requirement of of attendance and internal marks as stipulated in clause 6 and 7 and also must secure **70%** of the subjects that have been studied up to III year I semester from

9. Grading:

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Table – Conversion into Grades and Grade Points assigned

Range in which the marks in the subject fall	Grade	Grade points assigned
≥ 90	O (Outstanding)	10
80-89	A+ (Excellent)	9
70-79	A (Very Good)	8
60-69	B+ (Good)	7
50-59	B (Above Average)	6
45-49	C (Average)	5
40-44	D (Pass)	4
< 40	F (Fail)	0
Absent	Ab (Absent)	0

i. A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered.

ii. For non credit courses 'Satisfactory' or "Unsatisfactory' shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$SGPA = \Sigma (Ci \times Gi) / \Sigma C_i$$

Where, Ci is the number of credits of the i^{th} subject and Gi is the grade point scored by the student in the i^{th} course.

ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$CGPA = \Sigma (Ci \times Si) / \Sigma C_i$$

Where 'Si' is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

iv. While computing the GPA/CGPA the subjects in which the student is awarded Zero grade points will also be included.

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

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

10. Gap - Year:

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. An evaluation committee shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for having the Gap Year.

11. Transitory Regulations:(old regulations changed)

1. Candidates who admitted into the four year B.Tech degree course under R-15 regulations but who got detained in any year for want of attendance/minimum aggregate sessional marks may join the appropriate year /semester in the semester system applicable for that batch and be governed by the regulations of that batch from then onwards unless otherwise specified.
2. A student admitted under credit based regulations(CR) detained due to lack of sessional marks/attendance at the end of the first semester of II/IV B.Tech shall join II/IV first semester fo R-15 batch . Such students will study all the courses prescribed for that R-15 in which the student joins. However the student has to clear all the first year backlog subjects by appearing the supplementary examination. Such candidates will be governed by the regulations applicable to lateral entry candidates of R-15 batch for the award of the degree.
3. A student admitted under CR, detained due to lack of sessional marks/attendance at the end of the second semester of II/IV B.Tech /at the end of subsequent semesters shall follow the credit based regulations only (CR).

12. With–holding of results:

If the candidate has any dues not paid to the college or if any case of indiscipline or malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

13. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	CGPA Secured
First Class with Distinction	≥ 8.0
First Class	$\geq 6.5 < 8.0$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 4.0 < 5.5$

14. Minimum Instruction Days:

The minimum instruction period for a semester is 16 weeks. The minimum instruction days including exams for each semester shall be for 90 days.

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

16. General:

i. The academic regulations should be read as a whole for purpose of any interpretation.
ii. Malpractice rules - nature and punishments is appended
iii. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the BOS is final.
v. The University may from time to time, revise, amend or change the Regulations, Schemes of Examinations, and/or Syllabi.

17. Conduct and discipline

Students shall conduct themselves within and outside the premises of the institute in a manner befitting the students of our institution.
(b) As per the order of Honourable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.
(c) The following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.
(i) Lack of courtesy and decorum, indecent behavior anywhere within or outside the campus.
(ii) Willful damage of college / individual property
(iii) Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.
(iv) Mutilation or unauthorized possession of library books.
(v) Noisy and unseemly behavior, disturbing studies of fellow students.
(vi) Hacking of computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber-crime etc.)
(vii) Usage of camera / cell phone in the campus (viii) Plagiarism of any nature
(ix) Any other acts of gross indiscipline as decided by the academic council from time to time.
(d) Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute / hostel, debar from examination, disallowing the use of certain facilities of the institute, rustication for a specified period or even outright

expulsion from the institute or even handing over the case to appropriate law enforcement or the judiciary, as required by the circumstances.

(e) For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief warden, the head of the department and the principal respectively, shall have the authority to reprimand or impose fine.

(f) Cases of adoption of unfair means and / or any malpractice in an examination shall be reported to the principal for taking appropriate action.

(g) All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the academic council.

(h) The institute level standing disciplinary action committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.

(i) The principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the programmes committee in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved by the appropriate authority, shall be reported to the academic council for ratification.

(j) "Grievance and Redressal Committee" (General) constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters

18. Punishments for Malpractice Cases - Guidelines

The examinations committee may take the following guidelines into consideration while dealing with the suspected cases of malpractice reported by the invigilators/squad members etc; during end examinations. The punishment may be more severe or less severe depending on the merits of the individual cases.

S. No	Nature of Malpractices/Improper conduct	Punishment
1.	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
2.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
3.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.

4.	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any other student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
5.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year.
6.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year.
7.	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

9.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
10.	Posseses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year. The student is also debarred and forfeits the seat.
11.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 7 to 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
12.	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college fur one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed over to the police and a case is registered against him. The performance of the original student who has been impersonated, shall be cancelled in all the subjects of the examination including practicals and project work of that semsester/year. The student is rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat

13.	If any malpractice is detected which is not covered in the above clauses 1 to 12 it shall be reported to the college academic council for further action to award suitable punishment.
14.	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable punishment.

ACHARYANAGARJUNA UNIVERSITY
Faculty of Engineering

B.TECH COURSE STRUCTURE

For Circuit Branches: EEE (2019-20)

I/IV B.Tech EE-Semester – 1(Theory - 5, Lab-4)

S.No	Course No	Course Name	Category	L-T-P-C
1	EEE 111	Mathematics- I (Calculus & Linear Algebra)	BS	3-0-0-3
2	EEE 112	Engineering Chemistry	BS	3-0-0-3
3	EEE 113	Problem Solving & Programming(using C)	ES	3-1-0-4
4	EEE 114	Communicative English I	HS	2-0-0-2
5	EEE 115	Constitution of India	MC	3-0-0-0
6	EEE 151	Chemistry lab	BS	0-0-3-1.5
7	EEE 152	Problem solving & Programming using C	ES	0-0-3-1.5
8	EEE153	English lab	HS	0-0-3-1.5
9	EEE 154	Workshop I (Basic Engineering Workshop)	LC	0-0-3-1.5
			Total ==>	**18**

I/IV B.Tech CE-Semester - 2 (Theory - 6, Lab - 5)

S.No	Course No	Course Name	Category	L-T-P-C
1	EEE 121	Mathematics- II (ODE and Multivariable Calculus)	BS	3-0-0-3
2	EEE 122	Engineering Physics	BS	3-0-0-3
3	EEE 123	Engineering Graphics & Design	ES	1-0-3-2.5
4	EEE 124	Essential Electrical & Electronic Engineering	ES	3-1-0-4
5	EEE 125	Python Programming	ES	2-1-0-3
6	EEE 126	Environmental Science	MC	3-0-0-0
7	EEE 161	Physics Lab	BS	0-0-3-1.5
8	EEE 162	Electrical & Electronics Lab	ES	0-0-3-1.5

9	EEE 163	Python Lab	ES	0-0-3-1.5
10	EEE 164	Workshop (Electrical & Electronics Engineering)	LC	0-0-3-1.5
			Total ==>	**21.5**

MATHEMATICS-I

(Calculus & Algebra)
(Common to all branches of Engineering)

L	T	P	C
3	0	0	3

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students 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 10 hrs

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

Learning Outcomes:

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

- solving systems of linear equations, using technology to facilitate row reduction determine the rank, eigenvalues and eigenvectors, diagonal form and different factorizations of a matrix; (L3)
- identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics; (L3)

Unit II: Mean Value Theorems 6 hrs

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);

Learning Outcomes:

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

- Translate the given function as series of Taylor's and Maclaurin's with remainders (L3)
- analyze the behaviour of functions by using mean value theorems (L3)

Unit III: Multivariable calculus 8 hrs

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

- Find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies. (L3)
- Acquire the Knowledge maxima and minima of functions of several variable (L1)
- Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (L3)

Unit IV: Double Integrals 8hrs

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

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 (L5)
- Apply double integration techniques in evaluating areas bounded by region (L4)

Unit V: Multiple Integrals and Special Functions **8 hrs**

Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates, Beta and Gamma functions and their properties, relation between beta and gamma functions.

Learning Outcomes:

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

- Conclude the use of special function in multiple integrals (L4)
- evaluate multiple integrals in Cartesian, cylindrical and spherical geometries (L5)

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

References:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.

Course Outcomes:

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

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- Utilize mean value theorems to real life problems (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems (L5)
- Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

ENGINEERING CHEMISTRY

Common to all branches **L T P C**

3 0 3 4.5

Course Objectives:

- To familiarize engineering chemistry and its applications
- To impart the concept of soft and hard waters, softening methods of hard water
- To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement.
- **compare** the materials of construction for battery and electrochemical sensors (L2)
- **explain** the preparation, properties, and applications of thermoplastics & thermosettings, elastomers & conducting polymers. (L2)
- **explain** the principles of spectrometry, GC and HPLC in separation of gaseous and liquid mixtures (L2)

UNIT-I: WATER TECHNOLOGY

Various impurities of Water, WHO guidelines, Hardness unit sand determination by EDTA method, water treatmentfor drinking purpose-sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

Water treatment for industrial purpose: Boiler troubles, scales, sludges, caustic embrittlement, boiler Corrosion, priming and foaming- causes and prevention, Internal conditioning -Phosphate, Calgon andCarbonate treatment, External conditioning-Lime Soda process (simple problems), softening by ion- Exchange process, Desalination of Brackish water by Electro dialysis and Reverse osmosis.

Learning outcomes:

The student will be able to

- **list** the differences between temporary and permanent hardness of water (L1)
- **explain** the principles of reverse osmosis and electrodialysis. (L2)
- **compare** quality of drinking water with BIS and WHO standards. (L2)
- **illustrate** problems associated with hard water - scale and sludge**.** (L2)
- **explain** the working principles of different Industrial water treatment processes (L2)

UNIT-II: POLYMER CHEMISTRY

Introduction to polymers, Functionality of monomers, chain growth and step growth polymerization, Co- polymerization (Stereo specific polymerization) with specific examples and mechanisms of polymer formation.

PLASTICS: Thermoplastics and Thermosetting, preparation, properties and applications of Bakelite, Elastomers, Preparation, properties and applications of BUNA-S and BUNA-N Rubbers.

Conducting Polymers- Introduction, examples, general applications and mechanism of Conduction on Polyacetylene.**Chemistry of Nano materials:** Introduction to nano chemistry, preparation of nano materials - carbon nanotubes and fullerenes and their engineering applications.

Learning Outcomes:

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

- **explain** different types of polymers and their applications (L2)
- **demonstrate** the mechanism of conduction in conducting polymers (L2)
- **explain** the preparation, properties and applications of Bakelite, Nylon-66, and carbon fibres (L2)
- **describe** the mechanism of conduction in conducting polymers (L2)
- **discuss** Buna-S and Buna-N elastomers and their applications (L2)
- **discuss** types and preparation of Nano materials and Fullerenes(L3)

UNIT-III: ELECTRO CHEMISTRY AND APPLICATIONS

Electrodes-concepts, types of cells, electro chemical series, Nernst equation.

BATTERIES: Primary cell (Dry cell), Secondary cell (Lead-acid), Lithium batteries and their advantages, Fuel cell (H_2-O_2 cell).

Corrosion:

Types of corrosions- chemical corrosion, dry corrosion, electro chemical corrosion and wet corrosion, galvanic series, pitting and differential aeration of corrosion, factors affecting corrosion.

Corrosion control: Cathodic protection, Corrosion Inhibitors, Electro plating (Au) & (Ni).

Learning Outcomes:

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

- **apply** Nernst equation for calculating electrode and cell potentials (L3)
- **differentiate** between pH metry, potentiometric and conductometric titrations (L2)
- **explain** the theory of construction of battery and fuel cells (L2)
- **explain** the types of corrosion, factors affecting corrosion(L2)

- **explain** protection methods of corrosion and corrosion inhibitors(L2)

UNIT-IV: INSTRUMENTAL METHODS

Electromagnetic spectrum-Absorption of Radiation: Beer-Lambert's law-Principle and applications of Ultra-Violet, Infra-Red and Nuclear Magnetic Resonance Spectroscopy. Principle and applications of Gas Chromatography and HPLC Techniques.

Learning outcomes:

After completion of Module IV, students will be able to

- **explain** the different types of spectral series in electromagnetic spectrum (L2)
- **understand** the principles of different analytical instruments (L2)
- **explain** the different applications of analytical instruments (L2)
- **explain** the principles of spectrometry, GC and HPLC in separation of gaseous and liquid mixtures (L2)

UNIT-V: (i) Cement and Concrete Chemistry

Introduction to Building Materials, Portland Cement, Constituents, Manufacturing Process, Setting and Hardening Cement.

(ii) Organic reactions and synthesis of a drug molecule:

Introduction to reactions involving substitution (SN_1 and SN_2), elimination reactions (E_1 and E_2), Synthesis ofcommonly used drug molecule – Aspirin and Paracetmol.

Learning Outcomes:

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

- **explain** the manufacturing of portland cement (L2)
- **demonstrate** the scheme of concrete formation (L2)
- **identify** the constituents of portland cement (L2)
- **enumerate** the reactions at different temperatures in the manufacture of cement (L2)
- **explain** substitution and elimination reactions(L2)
- **explain** the synthesis of aspirin and paracetmol drug molecules(L2)

Prescribed Text Books

1. Engineering Chemistry, P.C. Jain and M. Jain - Dhanapathi Rai & Sons, Delhi
2. A text book of Engineering Chemistry, S.S. Dara - S. Chand & Co. New Delhi
3. Engineering Chemistry, B.K. Sharma - Krishna Prakashan, Meerut
4. Shashi chawla,A text book of engineering chemistry,3rd Edition,Dhanpat rai & co new delhi,2007.
5. Gurudeep raj & chatwal anand , "Instrumental methods of analysis ", 7th edition,CBS publications,1986.
6. Quantitative analysis by day&underwood.
7. A Text book of Instrumental methods by Skoog and West.
8. H.W. Wilard and demerit, "Instrumental methods of analysis ", 7th edition,CBS publications,1986.
9. Text book of Nano Science and Nano technology, B.S. Murthy and P. Shankar, University press.

Course Outcomes:

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

- **demonstrate** the corrosion prevention methods and factors affecting corrosion (L2)
- **explain** the preparation, properties, and applications of thermoplastics & thermosettings, elastomers & conducting polymers. (L2)
- **explain** calorific values, octane number, refining of petroleum and cracking of oils (L2)
- **explain** the manufacturing of portland cement **and** concrete formation (L2)
- **explain** the principles of spectrometry, GC and HPLC in separation of gaseous and liquid mixtures (L2)

CS 113 Problem Solving and Programming(Using C)

L-T-P-C : 3-1-3-5.5

Course Objectives:

1. To teach problem solving through Flow charting tool – Raptor
2. To solve numerical problems using Raptor
3. To analyze problems by modular approach using Raptor
4. To understand the basic concepts and tokens of C
5. To learn the concepts of control structures, functions, arrays and pointers of C
6. To understand the concepts of structures , unions and files in C

Unit – 1: Flowchart design through Raptor

Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems(section 1) – Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers

Example problems(section 2) - Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, Linear search, Binary Search.

Learning Outcomes: Student should be able to

1. Select flowchart symbols for solving problems.
2. Develop basic flowcharts for performing Input, Output and Computations
3. Solve numerical problems using Raptor
4. Analyse problems by modular approach using Raptor

Unit 2: C Basics

C-Basics: C-character set, Data types, Constants, Expressions, Structure of C program, Operators and their precedence & associatively, Simple programs in C using all the operators, Type casting ,type coercion.

Learning outcomes: Student should be able to

1. Exercise concepts of control structures in C
2. Develope user defined and predefined functions in C

Unit 3: Control Structures and Functions

Control Structures, Basic input and output statements, Preprocessor directives.

Functions: Concept of a function, passing the parameters, automatic variables, scope and extent of variables, storage classes, recursion, iteration vs recursion, types of recursion, Simple recursive and non recursive programs, Towers of Hanoi problem.

Learning Outcomes: Student should be able to

1. Illustrate the flowchart and design an algorithm for a given problem and to develop IC programs using operators
2. Develop conditional and iterative statements to write C programs
3. Exercise user defined functions to solve real time problems

Unit 4: Arrays and Pointers

Arrays: Single and multidimensional Arrays, Character array as a string, string functions, Programs using arrays and string manipulation.

Pointers: Pointers declarations, Pointer expressions, Pointer parameters to functions. Pointers, Pointers and array, Pointer arithmetic.

Learning Outcomes: Student should be able to

1. Inscribe C programs that use the concepts of structures , unions in C
2. Develop programs on files and command line arguments in C
3. Inscribe C programs that use Pointers to access arrays, strings and functions.
4. Inscribe C programs using pointers and to allocate memory using dynamic memory management functions.

Unit 5: Structures and Files

Structures: Declaring and using structures, operations on structures, structures and arrays, user defined data types, pointers to structures.Command line arguments.

Files: Introduction, file structure, file handling functions, file types, file error handling, Programs using file functions.

Learning Outcomes: Student should be able to

4. Exercise user defined data types including structures and unions to solve problems
5. Exercise files concept to show input and output of files in C

Text Books:

1. https://raptor.martincarlisle.com/
2. Programming with C-Gottfried-Schaums Outline Series-TMH
3. C Programming – AnithaGoel/Ajay Mittal/E.Sreenivasa Reddy-Pearson India

Referrences:

1. Problem Solving with C- Somasekharan-PHI.
2. C Programming- Behrouz A forouzan – CENGAGE Learning
3. Test your c skills-Yaswanthkanithker
4. Let us C- Yaswanthkanithker

Communicative English-I

B.T./CE/Ch.E./CSE/ECE/EEE/EI/IT/ME

L-T-P-C

2-1-3-3.5

Course Objectives:

The course aims to inculcate a sense of professionalism among the students while emphasizing on the basic aspects of the language learning such as grammar and vocabulary building. It also aspires to train the students to meet the global challenges.

- Adopt activity based teaching-learning methods to ensure that learners would be engaged in use of language in the classroom sessions.
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Syllabus:

UNIT-1: 6 Hrs.

1. Reading: Reading Comprehension (Skimming, Scanning & Inference)
2. Writing: Paragraph Writing
3. Grammar: Common Errors in Nouns- Pronoun Agreement
4. Vocabulary Building: Content and Functional word list -100

Learning Outcomes:

At the end of the module, the learners will be able to

- identify the context, topic, and pieces of specific information (L3)
- ask & answer general questions on familiar topics (L2)
- employ suitable strategies for skimming & scanning to get the general idea of a text and specific information (L3)
- recognize paragraph structure with beginnings/endings (L3)
- form sentences using proper grammatical structures and correct word forms (L3)

UNIT- II: 6 Hrs.

1. Reading: Jumbled Sentences
2. Writing: Proposal Writing
3. Grammar: Correction of Errors in Subject- Verb Agreement
4. Vocabulary Building: Sign Post, Transition signals

Learning Outcomes:

At the end of the module, the learners will be able to

- comprehend short paragraphs on general topics (L2)
- understand the use of cohesive devices for better reading comprehension (L2)
- write well-structured paragraphs on specific topics (L3)
- make necessary grammatical corrections in short texts (L3)

UNIT - III: 6 Hrs.

1. Reading: Article Review

2. Writing: Note Making, Note Taking
3. Grammar: Correction of errors in Tense Usage
4. Vocabulary Building: Synonyms and Antonyms

Learning Outcomes:

At the end of the module, the learners will be able to

- Review the content with clarity & precision from an article (L3)
- infer meanings of unfamiliar words using contextual clues (L3)
- write summaries based on global comprehension of reading texts (L3)
- produce a well-organized essay with adequate details (L3)
- use correct tense forms, appropriate structures in speaking and writing (L3)

UNIT - IV: 6 Hrs.

1. Reading: Story Reflection
2. Writing: Pictorial Description
3. Grammar: Correction of Errors in Adjectives, Articles, Prepositions
4. Vocabulary Building: Root Words (200)

Learning Outcomes:

At the end of the module, the learners will be able to

- Reflect the content of the story with clarity & creatively (L3)
- infer meanings of unfamiliar words using contextual clues in the story (L3)
- infer & predict about content of a discourse (L4)
- interpret graphic elements used in academic texts (L2)
- make formal written communication using effective strategies (L3)

UNIT - V: 6 Hrs.

1. Reading: Mind Mapping
2. Writing: Information Transfer
3. Grammar: Correction of Errors in Wh- questions, Question Tags
4. Vocabulary Building: One Word Substitutes

Learning Outcomes:

At the end of the module, the learners will be able to

- take notes in mind while reading a text to answer questions (L3)
- edit short texts by correcting common errors (L4)
- produce a coherent paragraph interpreting a figure/graph/chart/table (L4)
- use language appropriate for description and interpretation of graphical elements (L4)

Course Outcomes:

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

- identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English (L3)
- formulate sentences using proper grammatical structures and correct word forms (L3)
- speak clearly on a specific topic using suitable discourse markers in informal discussions (L3)
- write summaries based on global comprehension of reading texts (L3)
- produce a coherent paragraph interpreting a figure/graph/chart/table (L4)
- take notes while listening to a talk/lecture to answer questions (L3)

REFERENCE BOOKS:

1. Bailey, Stephen. *Academic writing: A handbook for International Students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2nd Edition, 2018.
3. *Skillful Level 2 Reading & Writing Student's Book Pack (B10)*, Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
5. Michael Swan. *Practical English Usage*, OUP. 1995.
6. F.T. Wood. *Remedial English Grammar*, Macmillan.2007

7. William Zinsser. *On Writing Well.* Harper Resource Book. 2001
8. Liz Hamp-Lyons and Ben Heasly. *Study Writing*, Cambridge University Press. 2006.
9. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad.
10. Sharon J.Gerson, Steven M.Gerson, *Technical Writing*, New Delhi: Pearson education, 2007.
11. Sanjay Kumar and Pushp Lata, *Communication Skills*, Noida: Oxford University Press, 2012.
12. Dr. Shalini Verma, *Word Power Made Handy*, S.Chand & Co Ltd., 2009.

Constitution of India

L-T-P-C
3-0-0-0

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of india and election commission of india.
- To understand the central and state relation financial and administrative.

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.

LEARNING OUTCOMES:

After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT-II

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

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT-III

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

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secrateriate

UNIT-IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: 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

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zilla panchayat block level organisation

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

LEARNING OUTCOMES:- After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

REFERENCES:

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

E-RESOURCES:

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

Course Outcomes: At the end of the semester/course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.

- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission

ENGINEERING CHEMISTRY LABORATORY

Course Objectives:

- Verify the fundamental concepts with experiments

LIST OF EXPERIMENTS:

1. **Determination of hardness of water by EDTA method**
2. **Estimation of Mohr's salt by Permanganometry**
3. **Estimation of Mohr's salt by Dicrometry**
4. **Determination of alkalinity of water**
5. **Percentage of purity of washing soda**
6. **Determination of available chlorine in bleaching powder**
7. **Preparation of Urea-formaldehyde resin**
8. **Determination on strength of NaoH using HCl conductometrically**
9. **Acid-Base titration by P^H meter**
10. **Acid-Base titration by Potentiometer**
11. **Determination of viscosity of lubricating oil**
12. **Determination of Surface tension**

Course Outcomes:

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

- **measure** the strength of an acid present in secondary batteries (L3)
- **determine** the cell constant and conductance of solutions (L3)
- **prepare** advanced polymer materials (L2)
- **determine** the physical properties like surface tension, adsorption and viscosity (L3)
- **estimate** the Iron and Calcium in cement (L3)
- **calculate** the hardness of water (L4)

Problem Solving & Programming Using C Lab (CSE152)

Cycle 1:

1. Construct flowcharts to
a. calculate the maximum, minimum and average of N numbers
b. develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
2. Construct flowcharts with separate procedures to
a. calculate simple and compound interest for various parameters specified by the user
b. calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user
3. Construct flowcharts with procedures to
a. generate first N numbers in the Fibonacci series
b. generate N Prime numbers
4. Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)
5. Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)
6. Design a flowchart to determine the number of characters and lines in a text file specified by the user

Cycle 2:

1. Exercises on data types and operators?

a) Practice exercises 3.1 to 3.16 and 4.1 to 4.17 and 14.1 to 14.20 Test your C Skills – yaswanth kanitkar text book.

b) Write a program which determines the largest and the smallest number that can be stored in different data types of like short, int., long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?

c) Write a program to find greatest of three numbers using conditional operator?

d) Write a program to swap two numbers with and without temp variable?

e) Practice a program using multiple unary increment and decrement operators in arithmetic expressions?

2. Exercises on control structures?

a) Practice exercise 2.1 to 2.15 Test your C Skills - yaswanthkanitkar text book.

b)Write a program to find greatest of three numbers? Use nested if, if else if and switch statements?

c) Write a program to read marks of a student and print the sum and average?

d) Display the grade based on the sum of marks?

e) write a program to count the digits of a number? Use for loop

f) Write a program to check whether a number is perfect or not? Use do-while

g) Write a program to check whether a number is strong or not? Use while

h) Write a program to check whether a number is amstrong or not? Use for

i) Write a program to check whether a number is palindrome or not? Use for

j) Write a program to find the Fibonacci series upto the given number? Use while

k) Write a program to print the pascals triangle? Used do-while

l) Write a program to print the result of the series 1+x^2/2+x^3/3+….+x^n/n

3. Exercises on functions?

a) Practice exercise 5.1 to 5.14 Test your C skills -yaswanthkanitkar text book.

b) Write program to swap two variables using functions? Write a program to perform menu driven arithmetic operations using functions?

c) Write a program to find the factorial of a number using recursive and non- recursive functions?

d) Write a program to find the Fibonacci series using recursive functions?

e) Write a program to find the solution for towers of Hanoi using recursive function?

f) Write a program to pass parameters to a functions using call by value and call by reference?

4. Exercises on Arrays?

a) Practice exercise 9.1 to 9.17 Test your C skills - yaswanthkanitkar text book.

b) Write a program to read n numbers and sort them?

c) Write a program to find the minimum and maximum numbers of the array?

d) Write a program to read two matrices and find their sum, difference and product of them?

e)Find the transpose of a matrix?

f) Write a program to print upper and lower triangle of a given matrix?

5. Exercises on strings?

a) Practice exercise 10.1 to 10.15 yaswanthkanitkar text book.

b) Write a program to demonstrate the use of string manipulation functions?

c) Write a program to compare two strings?

d) Write a program to sort the names in Alphabetical order?

6. Exercises on pointers?

a) Practice exercise 7.1 to 8.26 yaswanthkanitkar text book.

b) Write a program to read dynamic array and sort the elements?

c) Write a program to read dynamic array and find the minimum and maximum of the elements?

d) Write a program to perform pointer arithmetic?

e) Write a program on pointers for strings?

f) Write a program to use array of pointers?

7. Exercises on structures?

a) Practice exercise 11.1 to 11.30 yaswanthkanitkar text book.

b) Write a program to create student structure and read marks of three subjects and find the sum and total of the student?

c) Write a program on arrays of structures for 60 students record using the above student structure?

d) Write a program for complex structure? Perform addition, subtraction and multiplication of two complex numbers?

e) Write a program for addition and multiplication of two polinomials?

8. Write a program on Files?

a) Practice exercise 12.1 to 12.20 yaswanthkanitkar text book.

b)write a program to append content of a file?

c)Write a program to display the content of a file?

d)Write a program to copy content of one file to other file?

e)Write a program to count the no of characters in a file?

f)Write a program to compare the contents of two files?

References:

1. Test your C Skills by – YaswanthKanithkar-BPB Publishers

2. C programming; Test your skills-A.N.Kamthane-Pearson India

Communicative English Lab -I

(*Common to all branches)*

Lectures: 3 Periods Sessional Marks: 40

University Exam: 3 hours University Examination Marks: 60

Learning Objectives

The C***ommunicative English Lab*** mainly focuses on to improve the Linguistic Listening, Communicative Competence and Presentation Skills of the learners. Activities in the English Communication Skills Lab will simulate actual discourses that students will engage in their interaction with their peers, teachers or strangers in their day-to-day situations.

Learning Outcomes

The students will be able to

- Identify the sounds of English and able to check the correct pronunciation of the words
- Able to listen carefully to communicate effectively in cross- cultural contexts
- Capable to make the students communicate in Daily life situations
- Capable to read for content/ main idea
- Able to communicate confidently in oral presentations
- Enhance vocabulary

List of Activities

1. Identifying phonic sounds, listening to the sounds, practice and record the sounds from the English learning software
2. Common mispronounced words
3. Listening to the short audios and complete the tasks based on the audios
4. Listening to motivational speeches and answering the questions
5. Comprehending Spoken material in British English & American English
6. Situational Dialogues
7. Role plays
8. Reading comprehension exercises for GRE, TOEFL, GATE etc
9. Reading articles from newspaper
10. Specific reading for enhancing vocabulary
11. Vocabulary building exercises
12. Extempore
13. JAM sessions
14. Small talks
15. Oral presentations

Basic Engineering Workshop (Common to all branches)

L	T	P	C
0	0	3	1.5

Course Objective:
To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Wood Working:
Familiarity with different types of woods and tools used in wood working and make following joints

a. Half – Lap joint
b. Mortise and Tenon joint
c. Corner Dovetail joint or Bridle joint

Sheet Metal Working:
Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets

a. Tapered tray b) Conical funnel c) Elbow pipe d) Brazing

Fitting:
Familiarity with different types of tools used in fitting and do the following fitting exercises

a. V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two wheeler tyre

Electrical Wiring:
Familiarities with different types of basic electrical circuits and make the following connections

a. Parallel and series b) Two way switch c) Godown lighting d) Tube light e) Three phase motor f) Soldering of wires

Course Outcomes:
After completion of this lab the student will be able to

1. apply wood working skills in real world applications. (L3)
2. build different parts with metal sheets in real world applications. (L3)
3. apply fitting operations in various applications. (L3)
4. apply different types of basic electric circuit connections. (L3)
5. demonstrate soldering and brazing. (L2)

Mathematics-II

(ODE, PDE and Multivariable Calculus)

(Common to all branches of Engineering except CSE)

L	T	P	C
3	0	0	3

Course Objectives:

1) To enlighten the learners in the concept of differential equations and multivariable calculus.
2) 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

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, 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 (L3)
- solve the linear differential equations with constant coefficients by appropriate method (L3)

UNIT II: Equations Reducible to Linear Differential Equations and Applications

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, Applications: Mass spring system and L-C-R Circuit problems.

Learning Outcomes:

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

- classify and interpret the solutions of linear differential equations (L3)
- formulate and solve the higher order differential equation by analyzing physical situations (L3)

UNIT III: Partial Differential Equations – First order 8 hrs

First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential 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 (L3)
- outline the basic properties of standard PDEs (L2)

UNIT IV: Multivariable Calculus (Vector differentiation)

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

Learning Outcomes:

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

- apply del to Scalar and vector point functions (L3)
- illustrate the physical interpretation of Gradient, Divergence and Curl (L3)

UNIT V: Multivariable Calculus (Vector integration)

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

Learning Outcomes:

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

- find the work done in moving a particle along the path over a force field (L4)
- evaluate the rates of fluid flow along and across curves (L4)
- apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals (L3)

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

References:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

Course Outcomes:

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

- solve the differential equations related to various engineering fields (L6)

- Identify solution methods for partial differential equations that model physical processes (L3)
- interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- estimate the work done against a field, circulation and flux using vector calculus (L6)

Engineering Physics
(ECE, CSE, EEE)

L T P C
3 0 3 4.5

Course Objectives:

- To impart knowledge in basic concepts of wave optics, properties of dielectric and magnetic materials, electromagnetic theory, fiber optics, semiconductors, superconductivity
- To familiarize the applications of nanomaterials relevant to engineering branches

Course Outcomes:

The students will be able to

- **interpret** the interaction of energy with the matter (L2)
- **explain** the principles of physics in materials science, nanoscience, medical physics and communication industry (L2)
- **apply** electromagnetic wave propagation in different guided media (L3)
- **calculate** conductivity of semiconductors (L3)
- **interpret** the difference between normal conductor and super conductor (L2)
- **demonstrate** the application of nanomaterials (L2)

Unit-I : Wave Optics (8hrs)

Principle of Superposition-Interference of light-Theory of Interference fringes-Conditions for sustained Interference - Interference in thin films (reflected light)-Newton's Rings-Determination of Wavelength.

Diffraction-Fraunhofer Diffraction-Single slit Diffraction -Diffraction Grating – Grating Spectrum - Determination of Wavelength.

Polarization-Polarization by reflection, refraction and double refraction-Nicol's Prism--Half wave and Quarter wave plate- Engineering applications of Interference, Diffraction and Polarization.

Learning Outcomes:

The students will be able to

- **explain** various types of coherent sources (L2)
- **outline** the conditions for sustained interference (L2)
- **identify** applications of interference including homodyne and heterodyne detection (L3)
- **analyze** the differences between interference and diffraction (L4)
- **illustrate** the concept of polarization of light and its applications (L2)
- **classify** the production and detection of different polarized light (L4)
-

Unit-II: Dielectrics and Magnetics (10hrs)

Introduction to Dielectrics--Electric polarization-Dielectric polarizability, Susceptability and Dielectric constant- Typesof polarizations Lorentz(internal) field-Claussius -Mosotti equation-Applications of Dielectrics .

Introduction to Magnetics-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials - Hysteresis-soft and hard magnetic materials- Ferrites and applications.

Learning Outcomes:

The students will be able to

- **explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **summarize** Gauss's law in the presence of dielectrics (L2)
- **interpret** dielectric loss, Lorentz field and Claussius- Mosotti relation (L2)
- **classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **explain** the applications of dielectric and magnetic materials (L2)

Unit – III: Electromagnetic Waves and Fiber Optics (10hrs)

Divergence and Curl of Electric and Magnetic Fields-Maxwell's Equations- Electromagnetic wave Equation and velocity.

Introduction to Optical Fibers-Total Internal Reflection-Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile, modes - Propagation of electromagnetic wave through optical fiber - -Block Diagram of Fiber optic Communication.

Learning Outcomes:

The students will be able to

- **apply** the Gauss' Theorem for divergence and Stokes' Theorem for curl (L3)
- **evaluate** Maxwell's displacement current and correction in Ampere's law (L3)
- **assess** the electromagnetic wave propagation in different media and its power (L3)
- **explain** the working principle of optical fibers and its classification based on refractive index profile and mode of propagation (L2)
- **identify** the applications of optical fibers in medical , communication and other fields (L2)

Unit – IV: Semiconductors (8 hrs)

Origin of energy bands - Classification of solids based on energy bands – Intrinsic semi conductors - Fermi energy – Electrical conductivity - extrinsic semiconductors - P-type & N-type Dependence of Fermi energy on carrier concentration and temperature (Qualitative)- Direct and Indirect band gap semiconductors-Hall effect- Hall coefficient

- Applications of Hall effect - Applications of Semiconductors.

Learning Outcomes:

The students will be able to

- **classify** the energy bands of semiconductors (L2)
- **outline** the properties of n-type and p-type semiconductors (L2)
- **interpret** the direct and indirect band gap in semiconductors (L2)
- **identify** the type of semiconductor using Hall effect (L2)
- **list** the applications of semiconductors in electronic manufacturing (L2)
-

Unit – V: Superconductors and Nano materials (8 hrs)

Superconductors-Properties-Critical parameters of Superconductors- Meissner effect-BCS Theory-Josephsoneffect(AC & DC)-Types of Superconductors-High T_C Superconductors- Applications.

Basics of Nano materials - Preparation and characterization – CNTs - Applications of Nano materials.

Learning Outcomes:

The students will be able to

- **explain** electrical resistivity of solids with temperature (L2)
- **classify** superconductors based on Meissner effect (L2)
- **explain** BCS theory , Josephson effect and high T_c materials (L2)
- **analyze** the size dependent properties of nanomaterials (L4)
- **choose** the methods for the preparation and characterization of CNTs (L3)

Text books:

1. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics"-S.Chand Publications,2017
2. H.K.Malik & A.K.Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018

Reference Books:

1. David J.Griffiths, "Introduction to Electrodynamics"- 4/e, Pearson Education,2014
2. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata Mc GrawHill ,2008
3. Charles Kittel "Introduction to Solid State Physics",Wiley Publications,2011
4. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008
5. T Pradeep "A Text book of Nano Science and Nano Technology"- Tata Mc GrawHill 2013

Engineering Graphics and Design

L T P C

1 0 3 2.5

Course Objectives:

- Bring awareness that Engineering Drawing is the Language of Engineers.
- Familiarize how industry communicates technical information.
- Teach the practices for accuracy and clarity in presenting the technical information.
- Develop the engineering imagination essential for successful design.
- Instruct the utility of drafting & modeling packages in orthographic and isometric drawings.
- Train the usage of 2D and 3D modeling.
- Instruct graphical representation of machine components.

Manual Drawing: (7 Classes)

Introduction to Engineering graphics: Principles of Engineering Graphics and their significance- Conventions in drawing-lettering - BIS conventions. Dimensioning principles and conventional representations
a) Conic sections including the rectangular hyperbola- general method only, b) Cycloid, epicycloids and hypocycloid
c) Involutes **(2L + 6P hrs)**

Projection of points, lines and planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces. **(2L + 6P hrs)**

Projections of solids: Projections of regular solids inclined to one or both planes by rotational. **(1L + 3P hrs)**
Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections. **(1L + 3P hrs)**

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts. **(1L + 6P hrs)**

Orthographic Projections: Systems of projections, orthographic projections (Simple Figures). **(3L +9P hrs)**

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids. **(2L + 6P hrs)**

Text
Books:

1. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers,

2016. Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Course Outcomes:

After completing the course, the student will be
àble to

- draw various curves applied in engineering. (L2)
- show projections of solids and sections graphically. (L2)
- draw the development of surfaces of solids. (L3)
- use computers as a drafting tool. (L2)
- draw isometric and orthographic drawings using CAD

packages. (L3) Note:

1. Manual and Computer Aided Drafting classes can be held in alternative weeks for optimal utilization of computer facilities.
2. External examinations to be conducted both manual and computer mode with equal

weightage of marks. Additional Sources

1. Youtube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

Essential Electrical & Electronic Engineering

Common to all branches **L-T-P-C**
3-1-3-5.5

Course Objectives:
1. To introduce basics of electric circuits.
2. To teach DC and AC electrical circuit analysis.
3. To explain working principles of transformers and electrical machines.
4. To impart knowledge on Basic Electronic Components.

UNIT – I: DC & AC Circuits
Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Nodal and loop analysis. Thevenin's and Superposition Theorems

Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits. Series Resonance and band width.

Learning Outcomes:
The students will be able to

- **explain** properties and behaviour of Electric circuit elements (R, L and C) in DC and AC circuits.
- **analyze** various circuits using Kirchhoff laws, Nodal and loop analysis & Theorems.
- Make use of basic principles involved in electrical engineering concepts.
- Analysis of single phase ac circuits.

.**UNIT-II: Poly phase & Magnetic circuits**
Generation of 3-phase voltages - phase sequence - star & delta connections - voltage, current & power in star & delta connected systems - analysis of 3-phase balanced circuits - measurement of 3-phase power by 2 wattmeter method.
Faraday's Laws of Electromagnetic Induction .Dynamically induced EMF –Statically induced EMF – Self Inductance – Mutual Inductance - Coefficient of coupling –Inductances in Series – Inductances in parallel – Dot convention.

Learning Outcomes:
The students will be able to

- Analysis of Poly Phase AC Circuits, the representation of alternating quantities and determining the power in these circuits.
- Faraday's laws.

UNIT-III: DC Machines
Principle and operation of DC Generator - EMF equation - OCC characteristics of DC generator – Principle and operation of DC Motor – Performance Characteristics of DC Motors - Speed control of DC Motors.

Learning Outcomes:
The students will be able to

- Know the principles and basics of DC machines used in industries.
- Analyze the performance of DC Machines.
- Summarize the different applications of commonly used electric machinery.

UNIT-IV: AC Machines:

Principle and operation of Single Phase Transformer - EMF equations-losses in transformers, regulation and efficiency. OC and SC test on transformer – auto transformer.
Principle, operation and construction of Three phase Induction Motor –torque equation and torque slip characteristics-power losses and efficiency.

Learning Outcomes:
The students will be able to

- Know the principles and basics of AC machines used in industries.
- Analyze the performance of AC Machines.
- Summarize the different applications of commonly used electric machinery.

UNIT-V: Semiconductor Devices:
Characteristics of Semiconductor junction Diode, Zener diode, transistor, JFET, UJT, SCR and their applications. Half-wave, Full-wave rectifiers and Bridge rectifier, with (L and LC) and without filters.
Bipolar Junction Transistor: Transistor operation, Common base configuration, Common emitterconfiguration, Transistor amplifying action, Common collector configuration, Operating point

Learning Outcomes:
The students will be able to

- . To acquire the knowledge about the characteristics and working principles of semiconductor diodes, Bipolar Junction Transistor.
- To study the Characteristics of basic electronic devices like P-N junction diode, zener diode & transistor in various configurations.

Text Books:

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.

References:

1. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.

Python programming

L	T	P	C
2	1	3	4.5

Course Objectives:

- To understand software development life cycle
- To learn the basics of Python Programming
- Apply a solution clearly and accurately in a program using Python.
- Apply the best features of mathematics, engineering and natural sciences to program real life problems.

Unit 1:

Context of software development: Software, Development tools, Learning programming with Python, Writing a python program.

Values and Variables: Variables and assignments, identifier, Control codes within Strings, User Input, The eval function, the print function.

Expressions and Arithmetic: Expressions, Operator precedence and Associativity, Comments, Errors, More arithmetic operators.

Learning Outcomes: The students will be able to

- Learn how to design and program Python applications.
- Learn how to write loops and decision statements in Python.
- Acquire programming skills in core Python.

Unit 2:

Conditional Execution: Boolean Expressions, Simple if and if else,nested conditionals, multiway decision statements, conditional expressions, errors in conditional statements.

Iteration: While statements, for statement, definite loops and indefinite loops, nested loops, abnormal loop termination, infinite loops, iteration examples: computing square root, drawing a tree, printing prime numbers.

Learning Outcomes: The students will be able to

- Develop write functions and pass arguments in Python.
- Exercise custom and standard functions of Python programming

Unit 3:

Functions: Introduction, standard mathematical functions, time functions, Random numbers, main function, parameter passing, Function examples: Better organized prime number, Command Interpreter, Restricted Input, Better Die rolling simulator, Tree-Drawing Function, Floating –Point equality, Custom functions Vs Standard functions.

More on Functions: Global variables, Default Parameters, recursion, Making functions reusable, documenting functions and modules, functions as data.

Learning Outcomes: The students will be able to

- Exercise usage of Lists in Python programming
- To learn processing of Lists in Python programming

Unit 4:

Lists: Using Lists, List assignment and equivalence, list bounds, Slicing, Lists and functions, Prime generation with a list

Lists processing: Sorting, flexible sorting, search, list permutations, randomly permuting a list, reversing a list.

Learning Outcomes: The students will be able to

- Develop programs on Lists in Python programming
- Develop programs on processing Lists using Python

Unit 5:

Objects: Using Objects, String Objects, List Objects.

Custom types: geometric points, Methods, Custom type examples, Class inheritance.

Handling Exceptions: Motivation, Exception examples, Using Exceptions, Custom Exceptions.

Learning Outcomes: The students will be able to

- Understand String and List Objects
- Exercise on exception handling in Python applications

Text books:

1. LEARNING TO PROGRAM WITH PYTHON Richard L. Halterman
2. Core Python Programming by Dr. R.Nageswara Rao, dreamtech, second edition

Environmental Science

Common to all branches
L-T-P-C

3-0-0-0

OBJECTIVE:
To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

UNIT – I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES
Definition, Scope and Importance – Need for Public Awareness.
NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems
– Forest resources – Use and over – exploitation, deforestation, case studies – 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, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

LEARNING OUTCOMES
Students will be able to
1. articulate the basic structure, functions, and processes of key social systems affecting the environment.
2. explain how water resources should be used.
3. articulate basic understanding of effects of modern agriculture on environment.
4. explain how various paradigms or world views and their implicit and explicit assumptions and values shape the viewer's perception of environmental problems and solutions.

UNIT – II: Ecosystems, Biodiversity, and its Conservation
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 the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION : Definition: genetic, species and ecosystem diversity – Bio- geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

LEARNING OUTCOMES
Students will be able to
1. get a clear picture of structure and functions of ecosystems.
2. explain why renewable and non-renewable energy resources are important.
3. get awareness about land degradation, soil erosion & desertification.
4. gain a rigorous foundation in various scientific disciplines as they apply to environmental science, such as ecology, evolutionary biology, hydrology, and human behavior.

UNIT – III: Environmental Pollution and Solid Waste Management

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution

f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cycloneand landslides.

LEARNING OUTCOMES UNIT-3

Students will be able to

1. demonstrate knowledge and understanding of theories in the field of Biodiversity and Systematics in the broad sense.
2. conduct basic conservation biology research.
3. explain endangered and endemic species of India.
4. identify the threats to biodiversity.

UNIT – IV: Social Issues and the Environment

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment 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.

LEARNING OUTCOMES:

Students will be able to

1. understand Cause, effects and control measures of air pollution.
2. understand soil, noise & water pollution.
3. explain the enforcement of Environmental legislation
4. understand solid waste management.

UNIT – V: Human Population and the Environment

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK : Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

LEARNING OUTCOMES

Students will have

1. knowledge about watershed management and environmental ethics.
2. explain the reasons for global warming
3. explain principles and impact of disasters on environment.
4. explain disaster management cycle in India.

TEXT BOOKS :

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company

REFERENCES :

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of

India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

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

CO1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO4	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO5	Influence their society in proper utilization of goods and services.
CO6	Learn the management of environmental hazards and to mitigate disasters and have a clear understanding of environmental concerns and follow sustainable development practices.

ENGINEERING PHYSICS LABORATORY SYLLABUS

Learning Outcomes:

The students will be able to

- **handle** optical instruments like microscope and spectrometer
- **determine** thickness of a hair/paper with the concept of interference
- **estimate** the wavelength and resolving power of different colors using diffraction grating
- **demonstrate** the importance of dielectric material in storage of electric field energy in the capacitors
- **plot** the intensity of the magnetic field of circular coil carrying current with varying distance
- **evaluate** the acceptance angle of an optical fiber and numerical aperture
- **determine** magnetic susceptibility of the material and its losses by B-H curve
- **determine** the fill-factor of the given semiconductor using solar cell
- **identify** the type of semiconductor i.e., n-type or p-type using Hall effect
- **determine** the band gap of a given semiconductor

List of Physics Experiments

1. Determine the thickness of the fiber using wedge shape method
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Dispersive power of a Prisam
5. Resolving power of a grating
6. Photo cell – I-V Characteristic curves and determination of stopping potential
7. Magnetic field along the axis of a circular coil carrying current.
8. To determine the self inductance of the coil (L) using Maxwells-wines bridge.
9. B-H Curve
10. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
11. Hall effect
12. Photo voltaic cell - Determination of fill-factor
13. To determine the energy gap of a semiconductor
14. Measurement of resistance with varying temperature
15. Determination of Acceleration due to gravity by using compound Pendulum

16. References:

1. S. Balasubramanian , M.N. Srinivasan " A Text book of Practical Physics"- S Chand Publishers, 2017

2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

ELECTRICAL & ELECTRONICS LABORATORY SYLLABUS

Learning Outcomes:

The students will be able to

1. Verify Kirchoff's Laws, Superposition theorem & Thevenin's Theorem for dc excitation
2. Analyze the performance of AC and DC Machines by testing.
3. Study Characteristics of P-N junction and Zener diode, transistor
4. Perform speed control of dc shunt motor

List of experiments: -

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of Kirchhoff laws.
3. Verification of Superposition Theorem.
4. Verification of Thevenin's Theorems
5. Open circuit characteristics of a DC Shunt Generator.
6. Speed control of DC Shunt Motor.
7. Brake test on DC Shunt Motor.
8. OC & SC test of 1 – Phase Transformer.
9. Brake test on 3 - Phase Induction Motor.
10. Characteristics of PN junction and zener diode
11. Characteristics of transistor in common emitter configuration
12. Verification of transistor self bias circuit

Python Programming Lab

1. Design a Python script to convert a Binary number to Decimal number and verify if it is a Perfect number.
2. Design a Python script to determine if a given string is a Palindrome using recursion
3. Design a Python script to sort numbers specified in a text file using lists.
4. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.
5. Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.
6. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)
7. Design a Python Script to find the value of (Sine, Cosine, Log, PI, *e*) of a given number using infinite series of the function.
8. Design a Python Script to convert a given number to words
9. Design a Python Script to convert a given number to roman number.
10. Design a Python Script to generate the frequency count of words in a text file.
11. Design a Python Script to print a spiral pattern for a 2 dimensional matrix.
12. Design a Python Script to implement Gaussian Elimination method.
13. Design a Python script to generate statistical reports(Minimum, Maximum, Count, Average, Sum etc) on public datasets.
14. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorising them into distinction, first class, second class, third class and failed.
15. Design a Python script to search an element in the given list.
16. Design a Python script on *str* methods and *list* methods.

Electrical & Electronics Engineering Workshop

I B. Tech – II Semester
WORKSHOP-II

L	T	P	C
0	0	3	1.5

Course Objectives for Workshop:

1. To know about different tools, abbreviations and symbols in Electrical Engineering
2. To learn about types of measuring instruments to measure electrical quantities
3. To gain knowledge on different types of earthing and earth resistance
4. To study different types of wiring

Syllabus:

1. Study on Introduction to Electrical tools, symbols and abbreviations
2. Study of types of sizes of wires and making "T" joint and straight joint for wires
3. Measurements of Electrical quantities (like Voltage, Current, Power, Power factor in RLC circuits)
4. Study of measurements of Energy (using Single phase and Three phase Energy meter) by connecting different loads
5. Study of earthing and measurement of earth resistance
6. Study and performance of residential wiring (using Energy meter, Fuses, Switches, Indicator, Lamps, etc.)
7. Study of Fluorescent lamp wiring
8. Study of various electrical gadgets (CFL and LED)
9. Study of PV Cell
10. Study of Induction motor and Transformer
11. Assembly of choke or small transformer
12. Study of trouble shooting of electrical equipments (fan, iron box, mixer-grinder, etc.)
13. Introduction to basics of Electronic components: Solder practice, Multi meter, Power supply
14. Measurement of wire gauges using gauge meter
15. Identification of color code, resistors, ICs, Transistors, capacitors, diodes, SCRs, IGBTs etc.

References:

1. Lab manual of Electrical Engineering by TTTI, Chennai.

Course Outcomes for Workshop:

1. Able to demonstrate knowledge on different tools, abbreviations and symbols used in Electrical Engineering (L2)
2. Able to measure different electrical quantities using measuring instruments (L3)
3. Able to demonstrate how to trouble shoot the electrical equipments (like fan, grinder, motor, etc.) (L4)
4. Able to perform wiring and earthing for residential houses (L5)

ACHARYA NAGARJUNA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2019-2022
ELECTRICAL & ELECTRONICS ENGINEERING
II/IV B.TECH -SEMESTER I

II/IV B.TECH -SEMESTER I

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	EE 211	Mathematics-III (Probability & Statistics)	BS	3	0	0	40	60	3
2	EE 212	Digital Logic Design	PC	3	0	0	40	60	3
3	EE 213	Electrical Circuit Analysis	PC	3	0	0	40	60	3
4	EE 214	Electrical Machines-I	PC	3	0	0	40	60	3
5	EE 215	Analog Electronic Circuits	PC	3	0	0	40	60	3
6	EE 216	Essence of Indian Traditional Knowledge	MC	2	0	0	100	0	0
7	EE 251	Electrical Circuit Analysis lab	PC	0	0	3	40	60	1.5
8	EE 252	Electrical Machines-I lab	PC	0	0	3	40	60	1.5
9	EE 253	Electronics Lab	PC	0	0	3	40	60	1.5
10	EE 254	MATLAB	Skill	0	0	3	40	60	2
Total Credits									21.5

ELECTRICAL AND ELECTRONICS ENGINEERING

EE 211 Mathematics-III
(Probability and Statistics) 3L: 1T:0P 4 credits

UNIT - I

Basic Probability: Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

UNIT - II

Continuous and Bivariate Probability Distributions: Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

UNIT - III

Basic Statistics: Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

UNIT - IV

Applied Statistics: Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

UNIT- V

Small samples: Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Text / References:

1. E. Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, “Introduction to Probability Theory”, Universal Book Stall, 2003.
3. S. Ross, “A First Course in Probability”, Pearson Education India, 2002.
4. W. Feller, “An Introduction to Probability Theory and its Applications”, Vol. 1, Wiley, 1968.
5. N.P. Bali and M. Goyal, “A text book of Engineering Mathematics”, Laxmi Publications, 2010.
6. B.S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 2000.
7. T. Veerarajan, “Engineering Mathematics”, Tata McGraw-Hill, New Delhi, 2010.

EE212 DIGITAL LOGIC DESIGN 3L:0T:0P 3 credits

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Understand working of logic families and logic gates.
- Design and implement Combinational and Sequential logiccircuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.

UNIT-I

NUMBER SYSTEMS AND CODES: Decimal, Binary, Hexadecimal Number Systems and their Conversions Arithmetic Additions Subtraction using the method of Complements, Multiplication and Division Codes: BCD, Excess-3, Gray and Alphanumeric Codes

BOOLEAN ALGEBRA: Boolean Expressions and Theorems, Logic Gates, Universal Gates, Canonical and Standard forms, Boolean functions, Simplification of Boolean functions using K maps, Minimal Functions and their properties, Tabulation Method NAND and NOR Implementations Two Level and Multi Level

UNIT-II

COMBINATIONAL LOGIC CIRCUITS: EX-OR EX-NOR Circuits, General procedure **for combinational logic circuits, design and application of binary** Adders and Subtractors, Comparators, Encoders, Decoders Multiplexers and Demultiplexers, Design of BCD to 7 Segment Decoder, Parity Generator and Checker, BCD Adder/Subtractor, Carry Look Ahead Adders

UNIT-III

SEQUENTIAL LOGIC CIRCUITS: Latches, characteristic table, characteristic Equation, Excitation Table, State table and State Diagrams for SR, JK, Master Slave JK, D and T flip-flops, Conversion from one type of Flip-Flop to another, shift registers, Analysis and Synthesis of Sequential Circuits, Sequence Generator, Sequence detector, Parity Generator

COUNTERS USING FLIP-FLOPS: Design of Ripple Counters, **Synchronous** Counter Up/Down Counters using Flip-Flops.

UNIT-IV

SYNCHRONOUS SEQUENTIAL CIRCUITS: Basic Design Steps, Sate Assignment Problem, Mealy State Model, Serial Adder Example, State Minimization, Design of a Counter using the Sequential Circuit Approach, FSM as an Arbiter Circuit, Analysis of Synchronous Sequential Circuits, ASM Charts, Formal Model for Sequential Circuits.

UNIT V

IC LOGIC FAMILIES: RTL, DTL, TTL, ECL and IIL families and their comparison

TEXT BOOKS:

1. M Morris Mano and Micael D. Ciletti, Digital Design, Pearson Education, 2008
2. Digital Principles and Design, Donald D. Givone, TMH, 20Cb

REFERENCE BOOKS

1. Thomas L. Floyd, Digital Fundamentals 7th Edition, Pearson
2. Charles H. Roth jr., Fundamentals of logic Design, Jaico publications, 1992
3. Taub and Schilling, Digital Integrated Electronics.

EE213 ELECTRICAL CIRCUIT ANALYSIS 3L:1T:0P 4 credits

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Apply network theorems for the analysis of electrical circuits.
- Obtain the transient and steady-state response of electrical circuits.
- Analyse circuits in the sinusoidal steady-state (single-phase and three-phase).
- Analyse two port circuit behavior.

UNIT-I: Network Theorems (10 Hours) Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources. Node and Mesh Analysis. Concept of duality and dual networks.

UNIT-II: Solution of First and Second order networks (8 Hours) Solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.

UNIT-III: Sinusoidal steady state analysis (8 Hours) Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.

UNIT-IV: Electrical Circuit Analysis Using Laplace Transforms (8 Hours) Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances

UNIT-V: Two Port Network and Network Functions (6 Hours) Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.

Text / References:

1. M. E. Van Valkenburg, “Network Analysis”, Prentice Hall, 2006.
2. D. Roy Choudhury, “Networks and Systems”, New Age International Publications, 1998.
3. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, McGraw Hill Education, 2013.
4. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education, 2004. 5. K. V. V. Murthy and M. S. Kamath, “Basic Circuit Analysis”, Jaico Publishers, 1999.

EE214 ELECTRICAL MACHINES-I 3L:0T:0P 3 credits

Course Outcomes: At the end of this course, students will demonstrate the ability to

Understand the concepts of magnetic circuits.
Understand the operation of dc machines.
Analyse the differences in operation of different dc machine configurations.
Analyse single phase and three phase transformers circuits.

UNIT-I: Electromagnetic force and torque (9 Hours) B-H curve of magnetic materials; flux-linkage vs current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element. Examples - galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency

UNIT-II:DC machines (8 Hours) Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation - Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.

UNIT-III: DC machine - motoring and generation (7 Hours) Armature circuit equation for motoring and generation, Types of field excitations - separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines

UNIT-IV Transformers (12 Hours) Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses

UNIT-V Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing

Text / References 1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004
.3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
4. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011. 5. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

EE215 ANALOG ELECTRONIC CIRCUITS 3L:0T:0P 3 credits

Course Outcomes: At the end of this course, students will demonstrate the ability to
Understand the characteristics of transistors.
Design and analyse various rectifier and amplifier circuits.
Design sinusoidal and non-sinusoidal oscillators.
Understand the functioning of OP-AMP and design OP-AMP based circuits.

Diode circuits (4 Hours) P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes,.

UNIT-I: BJT circuits (8 Hours) Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common-collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits. Clamping and clipping circuits

UNIT-II: MOSFET circuits (8 Hours) MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit.

UNIT-III: Differential, multi-stage and operational amplifiers (8 Hours) Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

UNIT-IV: Linear applications of op-amp (8 Hours) Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion.

UNIT-V: Nonlinear applications of op-amp (6 Hours) Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector. Monoshot.

Text/References:

1. A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, New York, Oxford University Press, 1998.
2. J. V. Wait, L. P. Huelsman and G. A. Korn, “Introduction to Operational Amplifier theory and applications”, McGraw Hill U. S., 1992.
3. J. Millman and A. Grabel, “Microelectronics”, McGraw Hill Education, 1988.
4. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1989.
5. P.R. Gray, R.G. Meyer and S. Lewis, “Analysis and Design of Analog Integrated Circuits”, John Wiley & Sons, 2001.

EE 216 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE 3L:0T:0P 3 credits

Course Objectives:

The course will introduce the students to:

1. To get a knowledge in Indian Culture
2. To know Indian languages, literature and the fine arts in India.
3. To explore the science and scientists of Medieval and Modern India.

UNIT I:

Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.

UNIT II:

Indian Languages, culture and Literature: The role of Sanskrit, Significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of South India.

UNIT III:

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious reform movements in Modern India(selected movements only).

UNIT IV:

Fine Arts in India: (Arts, Technology & Engineering): Indian painting, Indian handicrafts, music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (Ancient, Medieval and Modern), Science and Technology in India, development of science in ancient, medieval and modern India.

UNIT V:

Education system in India: Education in Ancient, Medieval and Modern India, aims of Education, subjects, languages, science and scientists of Ancient India, Medieval and Modern India.

Reference Books:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005
2. "Science and Samskrit", SamskritaBhartiPublisher, ISBN 13:978-8187276333, 2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN: 81-7450 494- X, 200

Course Outcomes:

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

1. Understand philosophy of Indian culture.
2. Distinguish the Indian languages and literature.
3. Learn the philosophy of ancient, medieval and modern India.
4. Acquire the information about the fine arts in India.
5. Know the contribution of scientists in different eras.

EE 251: ELECTRICAL CIRCUIT ANALYSIS LAB **L T P M C**

LIST OF EXPERIMENTS **0 0 3 100 1.5**

1. Determination of Z, Y Parameters of a Two port network
2. Determination of h, Transmission line Parameters of a Two port network.
3. Verification of Superposition theorem
4. Verification of Thevenin's&Norton's theorem
5. Verification of Reciprocity theorem
6. Verification of Maximum Power Transfer theorem
7. Determine the parameters of Choke coil
8. Measurement of low and medium resistance using volt ampere method
9. Locus diagram of RL series circuit
10. Determination of self, mutual inductance and coefficient of coupling.
11. Steady state analysis of RL, RC and RLC series circuits using software
12. Verification of Superposition theorem using software
13. Verification of Thevenin's and Norton's theorem using software
14. Verification of Maximum Power Transfer theorem DC and AC circuits using software
15. Locus diagram of RL and RC series circuit using software
16. Series and parallel resonance.

Note: Minimum 10 experiments should be carriedout.

EE252: ELECTRICAL MACHINES-I LAB **L T P M C**

LIST OF EXPERIMENTS **0 0 3 100 1.5**

1. Speed control of DC shunt motor.
2. Open circuit characteristics of separately excited / self excited D.C shunt generator.
3. Swinburne's Test on a D.C Shunt Machine.
4. Load test on D.C Shunt Generator.
5. Load test on D.C Compound Generator.
6. Load test on D.C series generator.
7. Brake test on D.C Shunt Motor
8. Hopkinson's test on Two Identical D.C Machines
9. Retardation test on D.C. Machine.
10. Field test on two identical DC series machine.
11. OC & SC tests on single - phase transformer.
12. Load test on single - phase transformer.
13. Scott Connection of Transformers
14. Parallel Operation of Two Single - Phase Transformers.
15. Separation of losses in single – phase transformer

Note: Minimum 10 experiments should be carriedout.

EE253	ELECTRONICS LAB	L	T	P	M	C
		0	0	3	100	1.5

LIST OF EXPERIMENTS:

1. Characteristics of PN Junction and Zener diode
2. Full wave rectifier with and without filter
3. *Non-linear wave shaping – clippers
4. Characteristics of Transistor in Common Emitter configuration
5. Verification of Transistor Self Bias Circuit
6. Characteristics of Junction Field Effect Transistor, MOSFET.
7. Design of voltage shunt feedback amplifier.
8. Design of RC phase shift oscillator.
9. Realization of Gates using Discrete Components & Universal Building Block (NAND only).
10. Design of Combinational Logic Circuits like Half-adder, Full-adder and Full- Subtractor.
11. Design of Code Converters, Multiplexers and Decode r.
12. Verification of Truth-Table of Flip-Flops using Gates &Conversion of flip-flops (JK-T, JK-D).
13. Design of ring& Johnson counters using flip-flops.

Note: Minimum 10 experiments should be carried out.

*Compulsory Experiment

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II/IV B.TECH -SEMESTER II

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	EE 221	Electromagnetic Field Theory	PC	3	0	0	40	60	3
2	EE 222	Power Systems-I	PC	3	0	0	40	60	3
3	EE 223	Electrical Machines-II	PC	3	0	0	40	60	3
4	EE 224	Microprocessor & Microcontrollers	PC	3	0	0	40	60	3
5	EE 225	Oops through Java	ES	3	0	0	40	60	3
6	EE 261	Electrical Machines-II Lab	PC	0	0	3	40	60	1.5
7	EE 262	Microprocessor & Microcontrollers Lab	PC	0	0	3	40	60	1.5
8	EE 263	Communicative English Lab-II	PC	0	0	3	40	60	1.5
9	EE 264	Object Oriented Programming through JAVA lab	SKILL	0	0	3	40	60	2
Total Credits									21.5

EE 221 ELECTROMAGNETIC FIELD THEORY L T P M C
3 0 0 100 3

Course Objectives:

The objectives of this course:

1. To understand the use of electromagnetic fields in the wireless communication.
2. To analyze the characteristics of Maxwell's equation in Electric and Magnetic field.
3. To understand the use of Transmission Lines and their applications.

Course Outcomes:

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

1. Analyse the relation between electric and magnetic fields using vector analysis.
2. Evaluate the Maxwell's Equation in Static Electric and Magnetic Field.
3. Apply Maxwell's equations in Electromagnetic fields.
4. Characterize Maxwell's equation in both static and Time varying fields.
5. Understand the propagation of electromagnetic waves in different media.
6. Understand the concepts of Transmission lines and Their Applications.

UNIT – I

Electrostatics-I: Coulomb's Law and Field Intensity - Electric Fields due to Continuous Charge Distributions – Line Charge, Surface Charge, Volume Charge - Electric Flux Density - Gauss Law – Applications of Gauss Law – Point Charge, Infinite Line Charge, Infinite Sheet Charge, Uniformly Charged Sphere - Electric Potential - Relations Between E and V - Illustrative Problems.

UNIT – II

Electrostatics-II: The nature of dielectric materials, boundary conditions for perfect dielectric materials. Capacitance. Several capacitance examples. Capacitance of a two wire line. Derivations of Poisson's and Laplace's equations, Examples of the solution of Laplace s equation. Current and current density, continuity of current, conductor properties and boundary conditions - Illustrative Problems.

UNIT – III

The Steady Magnetic Field: Biot-Savart's Law, Ampere's Circuital Law Magnetic Flux and Magnetic Flux Density, The scalar and vector magnetic potentials.

Magnetic Forces and Materials: Force on a moving charge, force on a differential current element, force between differential current elements, force and torque on a closed circuit, the nature of magnetic materials, magnetization and permeability, magnetic boundary conditions. Potential energy in magnetic fields. - Illustrative Problems.

UNIT – IV

Time Varying Fields and Maxwell's Equations: Faraday's Law - Transformer and Motional EMFs – Stationary Loop in Time Varying B Field, Moving Loop in Static B Field, Moving Loop in Time Varying Field - Displacement Current – Maxwell's Equations in Different Final Forms - Illustrative Problems.

UNIT – V

The Uniform Plane Wave: Waves in General – Wave Propagation in Lossy Dielectrics – Plane Waves in Lossless Dielectrics – Plane Wave in Free Space – Plane Waves in Good Conductors - Power and the Poynting Vector - Reflection of a Plane wave at Normal Incidence - Reflection of a Plane wave at Oblique – Parallel Polarization, Perpendicular Polarization - Illustrative Problems.

TEXTBOOKS:

1. Matthew N.O. Sadiku, Elements of Electromagnetics, Oxford University Press, 3rd edition, 2008.
2. William H. Hayt Jr. and John A. Buck, Engineering Electromagnetics, Tata McGraw-Hill publications, 7th edition, 2006.
3. G S N Raju, Electromagnetic Field Theory and transmission lines, 1st Edition, Pearson Education India,2005.

REFERENCES:

1. E.C. Jordan and K.G. Balmain, Electromagnetic Waves and Radiating Systems, PHI, 2nd Edition, 2000
2. John D. Krauss, Electromagnetics, Tata McGraw-Hill publications, 4th edition, 1991.
3. Schaum's out line series, Electromagnetics, 2nd edition, Tata McGraw-Hill publications, 2006.

EE 222 **POWER SYSTEMS-I** **L T P M C**
3 0 0 100 3

Course Objectives:

The objectives of this course:

1. To understand the economic aspects of power generation.
2. To understand the significance of conventional energy resources and their operation
3. To calculate transmission line parameters.
4. To discuss the theory of transmission lines and introduce various types of insulators and cables.

Course Outcomes:

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

1. Explain the economic aspects of power stations
2. Analyze the significance of conventional energy resources and their operation.
3. Analyze the performance of short, medium and long transmission lines and identify the transmission system which requires minimum volume of conductor materials.
4. Classify the types of insulators and cables.

UNIT – I

Thermal power stations: Selection of site for thermal station – layout and salient features - boilers – economizers – condensers – coal handling – feed water treatment - steam turbines – turbo generators.

Hydroelectric Stations: Hydrology – hydrographs – mass curves – classification of hydroelectric plants - general arrangement and operation of hydroelectric plants and its function.

Nuclear Power Stations: Principles of nuclear power station – basic factors in designing of reactors – pressurized water reactor – boiling water reactor – CANDU reactor – liquid metal cooled reactor – shielding and safety precautions.

UNIT – II

Economic Aspects: Economics of generation - factors affecting cost of generation - Definitions: load factor – diversity factor – plant use factor – Load curve - load duration curve – problems. Reduction of cost by inter connected stations.

Transmission line parameters: Resistance-Skin effect-Expressions for inductance and capacitance of single phase and 3-phase lines of symmetrical and transposed configurations - concept of self GMD (GMR) and mutual GMD - double circuit lines and bundled conductors - effect of ground on capacitance.

UNIT – III

Transmission line theory: Short, medium and long lines - regulation and efficiency - Pie, T and rigorous methods of solution - ABCD constants - sending and receiving end power angle equations and power circle diagrams. Surge impedance loading - Ferranti effect.

UNIT – IV

Insulators: Types of insulators - voltage distribution in a string of suspension insulators.

Travelling wave Phenomenon: Travelling waves on transmission lines, attenuation of travelling waves

Corona: Factors effecting corona, critical voltages and power loss, Radio Interference. **–** Methods of reducing corona,

UNIT – V

Underground Cables: Types of cables - laying of cables - insulation resistance - electric stress and capacitance of single core cable - use of inter sheath - capacitance grading - capacitance of three core belted type cable - stress in a three core cable - sheath effects - currents in bonded sheaths - electrical equivalent of sheath circuit - thermal characteristics of cables.

Text Books:

1. Generation of Electric Power by B.R. Gupta S. Chand & Company Ltd
2. Generation distribution and utilization of electrical energy by C.L.Wadhwa, New Age Internations (P) Limited, 2005 Reference
3. Electrical power systems by C.L. Wadhwa, New age International (P) Limited 3rd edition
4. Modern power system analysis by D.P. Kothari & I.J. Nagrath McGraw Hill 3rdedition,2003
5. Electric power transmission and distribution by Sivanagaraju and Satyanarayana, Pearson Education

Reference Books:

1. Electrical power systems theory and practice by M. N. Bandyopadhyay – PHI
2. Transmission and Distribution by H. Cotton B. I. Publishers, New Delhi, 1998
3. Electric Power Generation, Transmission & Distribution by S.N. Singh, PHI, 2003

EE 223 **ELECTRICAL MACHINES –II** **L T P M C**
3 0 0 100 3

Course Outcomes: At the end of this course, students will demonstrate the ability to
Understand the concepts of rotating magnetic fields.
Understand the operation of ac machines.
Analyse performance characteristics of ac machines.

UNIT I: Pulsating and revolving magnetic fields (4 Hours) Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternating current Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field.

UNIT II: Induction Machines (12 Hours) Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors. Generator operation. Self-excitation. Doubly-Fed Induction Machines.

UNIT III: Single-phase induction motors (6 Hours) Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and applications

UNIT IV: Synchronous machines (10 Hours) Constructional features, cylindrical rotor synchronous machine –armature windings, pitch factor, distribution factor- generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation- two reaction theory, analysis of phasor diagram, power angle characteristics.

UNIT V: Parallel operation of alternators - synchronization and load division. Principle of operation of synchronous motors-starting methods- Operating characteristics of synchronous machines V & inverted V curves-Hunting-Torque equation-Synchronous condensers.

Text/References:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.

2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.

4. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

5. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.

6. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

EE 224 **MICROPROCESSOR & MICROCONTROLLERS** **L T P M C**
3 0 0 100 3

Course Objectives:
1. To understand the architecture of 8085 microprocessor.
2. To learn 8086 architecture Instruction set
3. To learn and understand 8051 Architecture assembly Language programming

Course Outcomes:
After completion of this subject the students will be able to:
1. Do programming with 8086 microprocessors Understand concepts of Intel x86 series of advanced processors
2. Able to understand the basic concepts of 8051 architecture Design and implement some specific real time applications Using 8051 Microcontroller

UNIT – I
Microprocessors: Introduction to microcomputers and microprocessors, introduction and architecture of 8086 family, addressing modes, instruction description and assembler directives of 8086 microprocessors.

UNIT - II
8086 Programming and System Connections: Program development steps, writing programs for use with an assembler, assembly language program development tools, writing and using procedures and assembler macros. 8086 interrupts and interrupt responses.

UNIT - III
Digital Interfacing: Programmable parallel ports, handshake IO, interface Microprocessor to keyboards.
Analog interfacing: DAC principle of operation, specifications and different types of DAC's and interfacing.
Programmable devices: Introduction to Programmable peripheral devices 8255, 8254, 8259, 8251, DMA data transfer, RS232 communication standard.

UNIT - IV
Micro controllers: Introduction to Micro controllers, comparing microprocessors and microcontrollers Architecture of 8051, Registers, Pin configuration of 8051, I/O Ports, Memory Organization, Addressing Modes.

UNIT - V
Programming & Interfacing 8051- Instruction set, Assembly language Programming, Counters & Timers, Serial data Communication – Interrupts,
Interfacing of 8051 – keyboard, Displays, ADC converters.

TEXT BOOKS:

1. Microprocessor architecture programming & applications with the 8085,S.Ramesh Gaonkar, PRI Publishers. 6th Edition
2. Advanced Microprocessors & Peripheral interfacing, Ray Bhurchandi, 3rd edition, MC graw hill Publications
3. The INTEL Microprocessors, Brey, 6th edition, PHI Publishers 4. The 8051 Microcontroller and architecture, Kenneth J. Ayala, PRI Publishers 2nd edition

REFERENCES:

1. Microprocessor and Microcontrollers, N. Senthil Kumar, M.Saravanan, S.Jeevanathan, Oxford Publishers. 1st Edition, 2010
2. The X86 Microprocessors , Architecture, Programming and Inerfacing, Lyla B. Das, Pearson Publications, 2010

ECE/EEE 225

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

OBJECTIVES:

The course should enable the students to:

- Understand the basic object-oriented programming concepts and apply them in problem solving.
- Illustrate inheritance concepts for reusing the program.
- Demonstrate on the multi-tasking by using multiple threads

COURSE OUTCOMES:

- Use object-oriented programming concepts to solve real world problems.
- Explain the concept of class and objects with access control to represent real world entities.
- Demonstrate the behaviour of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Use overloading methodology on methods and constructors to develop application programs.
- Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords.
- Describe the concept of interface and abstract classes to define generic classes.
- Use dynamic and static polymorphism to process objects depending on their class.
- Illustrate different techniques on creating and accessing packages (fully qualified name and import statements).
- Understand the impact of exception handling to avoid abnormal termination of program using checked and unchecked exceptions.
- Demonstrate the user defined exceptions by exception handling keywords (try, catch, throw, throws and finally).
- Use multithreading concepts to develop inter process communication.

UNIT – I: - OOPS CONCEPTS AND JAVA PROGRAMMING

OOP concepts: procedural and object oriented programming paradigm, Class and object, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism.

Java programming: History of java, comments, data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow statements, jump statements, simple java programs, arrays, console input and output, formatting output, constructors ,methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, exploring string class.

UNIT – II INHERITANCE

Inheritance: Inheritance hierarchies, super and subclasses, member access rules, super keyword, preventing inheritance: final classes and methods, the object class and its methods;

Polymorphism: dynamic binding, method overriding, abstract classes and methods.

UNIT-III INTERFACES AND PACKAGES

Interface: Interfaces VS Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface.

Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages

UNIT-IV EXCEPTION HANDLING AND MULTITHREADING

Exception Handling: Benefits of exception handling, the classification of exceptions, exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes.

Multithreading: Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication.

UNIT-V FILES

IO Programming: Introduction to Streams, Byte Streams, Character stream, Readers and Writers, File Class, File InputStream, File Output Stream, InputStreamReader, OutputStreamWriter, FileReader, FileWriter, Buffered Reader, random access file operations.

Text Books:

1. Herbert Schildt and Dale Skrien, "Java Fundamentals –A comprehensive Introduction", McGraw Hill, 1stEdition, 2013.
2. Herbert Schildt, "Java the complete reference", McGraw Hill, Osborne, 11thEdition, 2018.
3. T.Budd, "Understanding Object-Oriented Programming with Java", Pearson Education, Updated Edition (New Java 2 Coverage), 1999

Reference Books:

1. P.J.Dietel and H.M.Dietel , "Java How toprogram", Prentice Hall, 6thEdition, 2005.
2. P.Radha Krishna ,"Object Oriented programming through Java",CRC Press,1stEdition, 2007.
3. S.Malhotra and S. Choudhary, "Programmingin Java", Oxford University Press, 2ndEdition, 2014

Web References:

1. http://java.sun.com
2. http://www.oracle.com/technetwork/java/index.html)
3. http://java.sun.com/javase

E-Text Books:

1. http://docs.oracle.com/javase/tutorial/
2. iiti.ac.in/people/~tanimad/JavaTheCompleteReference.pdf
3. https://www.codejava.net/books/4-best-free-java-e-books-for-beginners

EE 261 **ELECTRICAL MACHINES – II LAB** **L T P M C**
0 0 3 100 1.5

Course Objective: To make the students

- To develop experimental setups for studying the performance and operation of squirrel cage and slip ring induction motors.
- To perform Direct and Indirect tests of various induction motors.
- Acquire hands on experience of conducting various tests on alternators and obtaining
- their performance indices using standard analytical as well as graphical methods.
- To develop experimental setups for studying the performance and operation of synchronous Motors.

Course Outcomes: After completion of this lab course, the student is able to

- Analyze the performance characteristics of Induction motors.
- Asses the performance of the given Induction motors.
- Know the performance of synchronous generators.
- Know the performance of synchronous motors.

List of Experiments:

1. Load test on Squirrel-Cage Induction motor.
2. Load test on Slip-Ring Induction motor.
3. No-load and Blocked rotor test on 3-phase induction motor.
4. Separation of losses of 3-phase Induction motor.
5. Brake test on single - phase induction motor.
6. Determination of Equivalent circuit of single - phase induction motor.
7. Real Power flow Control of 3-Phase Induction Generator.
8. Regulation of alternator by EMF &MMF method.
9. Regulation of alternator by ZPF method.
10. Synchronization of alternator with infinite bus with P & Q control.
11. Load test on Alternator.
12. Measurement of Xd and Xq of a three phase alternator.
13. V and inverted V curves of synchronous motor.
14. Synchronous Motor performance with constant excitation.
15. Load test on Universal Motor.
16. Load test on AC Series Motor.

Note: Minimum 10 experiments should be conducted.

EE 262 MICROPROCESSOR & MICROCONTROLLERS LAB L T P M C
0 0 3 100 1.5

Course Objectives:
The course should enable the students to:
1: Introduce the programming and interfacing techniques of 8086 microprocessor.
2: Analyze the basic concepts and programming of 8051 microcontroller

Course Outcomes:
Students will be able to
1: Develop 8086 programming skills in assembly language.
2: Understand the instruction set of 8051 microcontroller, and have the ability to program 8051 using proper simulation tools.

List of Experiments:
Experiments Based on ALP (8086)
1. Programs on Data Transfer Instructions.
2. Programs on Arithmetic and Logical Instructions.
3. Programs on Branch Instructions.
4. Programs on Subroutines.
5. Sorting of an Array.
6. Programs on Interrupts (Software and Hardware).
7. 8086 Programs using DOS and BIOS Interrupts.

Experiments Based on Interfacing & Microcontroller (8051)
8. DAC Interface-Waveform generations.
9. Stepper Motor Control.
10. Keyboard Interface / LCD Interface.
11. Data Transfer between two PCs using RS.232 C Serial Port
12. Programs on Data Transfer Instructions using 8051 Microcontroller.
13. Programs on Arithmetic and Logical Instructions using 8051 Microcontroller.
14. Applications with Microcontroller 8051.

EE 263 **COMMUNICATIVE ENGLISH LAB II** **L T P M C**
0 0 3 100 1.5

Course Objectives:

The main course objective of ***Advanced English Communication Skills Lab*** is to develop the student's Non-Verbal Communication, Cognitive and Poignant Skills, Interview Skills, Employability and Interpersonal skills, which relate to situations in the work place. The skills imparted to the learners are body language, leadership, time management, team management, assertive skills, group discussions, interview techniques and positive work ethics ...etc.

The methodology includes Interactive sessions, Role Play, Team Work/Group Work/Pair Work and Peer Evaluation. The emphasis is on learning by doing to improve the learners' life skills.

Course Outcomes:

CO1	To realize the importance of communication skills in job arena To enhance the students ability to communicate
CO2	Able to learn vocabulary for GRE, TOEFL, IELTS,IES etc
CO3	Capable to participate in all recruitment procedures
CO4	Able to communicate effectively over a phone and proficient to demonstrate telephoning skills
CO5	Able to describe procedures and improves analytical thinking
CO6	Able to know the importance of personality development

Syllabus:

Module-l Communication Skills:

I. Verbal

a) Types of Communication
b) Barriers to Communication
c) Strategies for effective communication

II. Nonverbal Skills -

a) Body Language – Voluntary and Involuntary
b) Kinesics
c) Facial Expressions
d) Proxemics
e) Oculesics
f) Haptics and Chronemics

Module-2: Advanced Vocabulary:

a) Word list (GRE & TOEFL related)
b) One Word Substitutes
c) Idioms

Module-3: Employability Skills (Ref: 6):

a) Interview Skills
b) Group Discussion
c) Resume Writing

Module-4: Telephonic Skills:

a) Formal &Informal interaction
b) Receiving Messages & Complaints
c) Tone modulation

Module-5: Descriptions:

a) Process Description
b) Pictures
c) Narration

Module-6: Behavioural Skills:

a) Emotional Intelligence
b) Positive Attitude
c) Team Work
d) Organization Skills

	L	T	P	M	C
EE 264	**0**	**0**	**3**	**100**	**2**

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

WEEK-1 BASIC PROGRAMS

1. Write java programs to find the following
   a) largest of given three numbers
   b) reverses the digits of a number
   c) given number is prime or not
   d) GCD of given two integers
2. Try debug step by step with small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
3. Write a java program that prints all real solutions to the quadratic equation ax2+bx+c=0. Read in a, b, c and use the quadratic formula.
4. The Fibonacci sequence is defined by the following rule. The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a java program that uses both recursive and non recursive functions.

WEEK-2 MATRICES, OVERLOADING, OVERRIDING

1. Write a java program to multiply two given matrices.
2. Write a java program to implement method overloading and constructors overloading.
3. Write a java program to implement method overriding.

WEEK-3 PALINDROME, ABSTRACT CLASS

1. Write a java program to check whether a given string is palindrome.
2. Write a java program for sorting a given list of names in ascending order.
3. Write a java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape

WEEK-4 INTERFACE

1. Write a program that creates a user interface to perform integer division. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

WEEK-5 MULTITHREADING

1. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
2. Write a java program that correct implements of producer consumer program
3. Write a program that creates three threads. First thread displays “Good Morning” every one second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.

WEEK-6 FILES

1. Write a java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
2. Write a java program that displays the number of characters, lines and words in a text file.
3. Write a java program that reads a file and displays the file on the screen with line number before each line.

Reference Books:

1. P. J. Deitel, H. M. Deitel, "Java for Programmers", Pearson Education, PHI, 4thEdition, 2007.
2. P. Radha Krishna, "Object Oriented Programming through Java", Universities Press, 2ndEdition, 2007
3. Bruce Eckel, "Thinking in Java", Pearson Education, 4thEdition, 2006.
4. Sachin Malhotra, Saurabh Chaudhary, "Programming in Java", Oxford University Press, 5thEdition, 2010

ACHARYA NAGARJUNA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2019
ELECTRICAL & ELECTRONICS ENGINEERING
III/IV B.TECH -SEMESTER I

III/IV B.TECH -SEMESTER I

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	EE/EC311	Linear Control Systems	PC	3	0	0	40	60	3
2	EE 312	Linear IC Applications & Pulse circuits	PC	3	0	0	40	60	3
3	EE 313	Power Electronics	PC	3	0	0	40	60	3
4	EE 314	Professional Elective Course I	PEC	3	0	0	40	60	3
5	EE 315	Job oriented courseI	JOC	3	0	0	40	60	3
6	EE351	Linear IC's &Pulse Circuits Lab	PC	0	0	3	40	60	1.5
7	EE352	Power Electronics Lab	PC	0	0	3	40	60	1.5
8	EE353	Control Systems Lab	PC	0	0	3	40	60	1.5
9	EE354	Systems Engineering Workshop	SKILL	0	0	3	40	60	2
Total Credits									**21.5**

Professional Elective Course I

EE314/1 Digital Signal ProcessingEE314/2 Electrical machine Design
EE314/3 Electrical Energy Conservation andAuditing

Job oriented Course I

EE315/1: Wind and Solar Energy Systems
EE315/2: Demand Side Energy ManagementEE315/3: Electrical Materials
EE315/4: Utilization of Electrical Energy

	L	T	P	M	C
EE 311 LINEAR CONTROL SYSTEMS (COMMON FOR ECE AND EEE)	**3**	**1**	**0**	**100**	**3**

UNIT – I

Introduction: Basic concept of simple control system – open loop – closed loopcontrol systems. Effect of feedback on overall gain – stability sensitivity and external noise. Types of feedback control systems – Liner time invariant, time variant systems and nonlinear control systems.

Mathematical models and Transfer functions of Physical systems

Differentialequations – impulse response and transfer functions – translational and rotational mechanical systems. Transfer functions and open loop and closed loop systems. Block diagram representation of control systems – block diagram algebra – signal flow graph – Mason's gain formula.

Components of control systems: DC servo motor – AC servo motor – synchrotransmitter & receiver.

UNIT – II

Time domain analysis: Standard test signals – step, ramp, parabolic and impulseresponse function – characteristic polynomial and characteristic equations of feed back systems – transient response of first order and second order systems to standard test signals. Time domain specifications - steady state response – steady state error and error constants.Effect of adding poles and zeros on over shoot, rise time, band width – dominant poles of transfer functions.

Stability analysis in the complex plane: Absolute, relative, conditional, boundedinput –bounded output, zero input stability, conditions for stability, Routh –Hurwitz criterion.

UNIT - III

Frequency domain analysis: Introduction – correlation between time and frequencyresponses – polar plots – Bode plots – Nyquist stability criterion – Nyquist plots. Assessment of relative stabilityusing Nyquist criterion – closed loop frequency response.

UNIT – IV

Root locus Technique: Introduction – construction of root loci Introduction to CompensationTechniques- Lag Compensation, Lead Compensation, Lag Lead Compensation.

UNIT-V

State space analysis: Concepts of state, state variables and state models –diagonalization – solution of state equations – state models for LTI systems. Concepts of controllability and Observability.

TEXT BOOKS:

1. B.C. Kuo, Automatic control systems, 7th edition, PHI.
2. I.J.Nagrath& M Gopal, Control Systems Engineering, 3rd edition, New Age International.
3. K. Ogata, Modern Control Engineering, 3rd edition, PHI.

REFERENCE BOOKS:

1. Schaum Series, Feedback and Control Systems, TMH
2. M.Gopal, Control Systems Principles and Design, TMH
3. John Van de Vegta, Feedback Control Systems, 3rd edition, Prentice Hall,1993.

	L	T	P	M	C
EE312 LINEAR IC APPLICATIONS & PULSE CIRCUITS	**3**	**0**	**0**	**100**	**3**

UNIT-I

OPERATIONAL AMPLIFIERS:

Operational amplifier and block diagram representation, op-amp with negative feedback. Block diagram representation of feedback configurations, voltage series feedback amplifier, voltage shunt feedback amplifier, differential amplifier with one op-amp, input offset voltage, input bias current, input offset current,total output offset voltage, frequency response of op-amp, stability, slew rate.

ACTIVE FILTERS:

Active LP and HP filters, Band pass filters: Wideband, Narrow Band pass filters, Band stop filters, State variable filters, All pass filters

UNIT – II

OSCILLATORS:

Oscillator principles, Oscillator types, Frequency stability, Phase shift oscillator, Wein bridge oscillator,

Quadrature oscillator, Saw tooth wave generator, and Voltage controlled oscillator.

APPLICATIONS OF SPECIAL ICS:

The 555 timer, 555 as Monstable and AstableMultivibrator and applications. Phase Locked Loops, Operating principles, Monolithic PLLs, 565 PLL applications, A 723 Voltage Regulator and its design.

UNIT – III

LINEAR AND NON-LINEAR WAVE SHAPING:

Responses of RC-high pass circuit and low pass circuits to sinusoidal, step, pulse, square, ramp and exponential inputs, Criteria for good differentiation and integration, Uncompensated and compensated attenuators, Ringing circuit.

Clipping circuits with diodes, Multi-diode circuits, Transient and steady state response of a diode clampingcircuit, Clamping circuit theorem, Practical clamping circuits.

UNIT – IV

MULTIVIBRATORS (using BJTs):

BistableMultivibrator: Fixed bias and self-bias transistor binary, Commutating capacitors, Non-saturated binary, Direct coupled binary, Unsymmetrical and Symmetrical triggering of binary, Schmitt Trigger circuit,Collector Coupled Monostable and AstableMultivibrators operation & design

UNIT – V

SWEEP CIRCUITS:

Voltage sweep circuits, Deviation from linearity expressed as errors, Exponential and Constant current charging voltage sweep circuits, Principles of Miller and Bootstrap Sweep circuits, Simple current sweep circuit, Need for a trapezoidal waveform for linearity correction, its generation and application.

TEXT BOOKS:

1. A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, New York, Oxford University Press, 1998.
2. J. V. Wait, L. P. Huelsman and G. A. Korn, “Introduction to Operational Amplifier theory and applications”, McGraw Hill U. S., 1992.
3. J. Millman and A. Grabel, “Microelectronics”, McGraw Hill Education, 1988.
4. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1989.

5. P.R. Gray, R.G. Meyer and S. Lewis, “Analysis and Design of Analog Integrated Circuits”, John Wiley & Sons, 2001.
6. J Millman and H Taub, Pulse, Digital and Switching Circuits, TMH, 2003
7. David A Bell, Solid State Pulse Circuits, 4th Edition, PHI, 2003

8. Mothiki S. Prakash Rao, Pulse Digital & Switching Waveforms, 2nd Edition,TMH.

		L	T	P	M	C
EE 313	**POWER ELECTRONICS**	**3**	**0**	**0**	**100**	**3**

UNIT-I

Power devices: SCR - Theory of operation of SCR - Two transistor model of SCR - Characteristics and ratings - SCR turn on and turn off methods - Protection of SCR - Series and parallel operation of SCRs - P-N-P-N devices - SCS, LASER, DIAC, TRIAC, IGBT, MOSFET andtheir characteristics – ratings - TRIAC triggering and turn off methods.

UNIT-II

Converters: Principles of phase controlled converter operation - single phase halfwave converters - single phase semi converter and single phase full converters with R, RL types of load - single phase dual converter - three phase half wave converters - three phase full wave converters - threephase dual converter with R, L loads - effects of source and load inductance - pulse width modulation control for PF improvement.

UNIT-III

Inverters: Principle of inverter operation - single phase inverters- series, parallelinverters - Mc Murray Bedford half bridge inverters - three phase inverters (120,180 modes of operation) - voltage source inverters - current source inverters - pulse width modulated inverters.

UNIT-IV

Choppers: Principle of choppers - step up and step down choppers - differentclasses of choppercircuits and their analysis - Speed control of DC motors.

Cyclo converters: Principle and operation of single - phase and three phase cycloconverters andapplications.

UNIT-V

Voltage Control of Single Phase Inverters:single PWM- Multiple PWM – Sinusoidal PWM- modified PWM- Phase displacement Control- Advanced modulation techniques for improved performance- Trapezoidal, staircase, stepped, harmonic injection and delta modulation- Advantage- application

TEXT BOOKS:

1. Power Electronics, circuits, devices and applications by M.H. Rashid Pearson 3rd edition, 2005
2. Power Electronics by M.D.Singh and Khanchandani TMH, 2nd Edition

REFERENCE BOOKS:

1. Power Electronics by P.S. Bhimbra Khanna publications, 3rd Edition 2006
2. Power Electronics by W. Launder 2ndedition,1993
3. Industrial Electronics & Robotics by Shaler&C.Menamee

4. Power Electronics – by VedamSubramanyam, New Age International (P) Limited, 2nd edition 2006

L T P M C

EE314/1 – WIND AND SOLAR ENERGY SYSTEMS3 0 0 1003

UNIT-I

Renewable Energy Technologies:

Basic principles of Energy conversion: Heat Energy Conversion Principles – Mechanical Energy Principles

– Solar Radiation Conversion: Photovoltaic Conversion – Photo Electro Chemical Conversion – Solar Thermal Conversion – Fuel Cells – Basic Principles of Hydrogen – Oxygen fuel cell – factory effecting the Power output – Maximum Power output Bio Energy Conversion Process – Combustion and composting ofBio- Mass – Production of heat by bio-mass – Bio-logical Conversion into gaseous into liquid bio-fuels.

UNIT-II

Introduction to Solar Cells:

P-N Junction Under illumination: solar cell – generation of photo voltage – light generated current – I-V equation of solar cell – solar cell characteristics. Upper limits of cell parameters – short circuit current – open circuit voltage - Fill factor - efficiency –losses in solar cells – model of solar cell – effect of series – shunt Resistance on efficiency – effect solar radiation on efficiency -effect of temperature on efficiency – basic design aspects of solar cells.

UNIT-III

Thin film solar cell technologies:

Generic advantages of twin film technologies - materials for thin film technologies – thin film de position techniques – Common features thin film technologies.

Solar Photo Voltaic modules:

Solar PV modules from solar cells – series and parallel connection of cells – mismatch in series and parallel connection. Design and structure of PV modules: number of solar cells in a module – wattage of modules – fabrication of PV modules. PV module power output- I-V equation of P.V modules – ratings of

P.V modules- I-V and Power curves of module. DC – DC convertors used in Solar systems – maximum power point tracking algorithms.

UNIT-IV:

WIND ENERGY SYSTEMS:

History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions.

UNIT-V

Generation schemes with variable speed turbines: classification of schemes – operating area – Induction Generators-Doubly fed Induction generators-Equivalent circuits-Reactive power and harmonics- Double output system with VSI-Variable voltage, variable frequency generation-circuit model and steady state operation and characteristics- effect of wind generator on the network. Wind speed measurements- Wind speed statistics-site and turbine selection.

TEXT BOOKS:

1. Renewable Energy by Bent Sorensen, Academic Press, 4th edition.
2. Solar Photovoltaic fundamentals, Technology and applications, Chetan Singh Solanki, PHI Publications, 2nd edition
3. Wind Electrical Systems by S. N Bhadra, D. Kastha and S Banerjee, Oxford press publications

REFERENCE BOOKS:

1. Power plant technology by EL-Wakil, McGraw-Hill

2. Non-Conventional Energy Sources by G.D.Rai, Khanna Pub.
3. Renewable Energy Sources by John Twidell& Toney Weir : E&F.N. Spon
4. Renewable Energy Sources: Their impact on global warming and pollution by Abbasi&Abbasi –PHI

	L	T	P	M	C
EE314/2 – ELECTRICAL MACHINE DESIGN	**3**	**0**	**0**		**1003**

UNIT-I

Introduction

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

Transformers

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

UNIT-III

InductionMotors

Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of polyphase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

UNIT-IV

SynchronousMachines

Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, designof rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.**UNIT-V**

Computer aided Design (CAD):

Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to **c**omplex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.**Text books / References:**

1.A. K. Sawhney, "A Course in Electrical Machine Design",DhanpatRai and Sons, 1970.
2. M.G. Say, "Theory & Performance & Design of A.C. Machines", ELBS London.
3. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006.
4. K. L. Narang, "A Text Book of Electrical Engineering Drawings", SatyaPrakashan, 1969.
5. A. Shanmugasundaram, G. Gangadharan and R. Palani, "Electrical Machine Design Data Book", New Age International, 1979.
6. K. M. V. Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 2008.
7. Electrical machines and equipment design exercise examples using Ansoft's Maxwell 2D machine design package.

L T P M C

EE314/3 – ELECTRICAL ENERGY CONSERVATION AND AUDITING 3 0 0 1003

UNIT-I

Energy Scenario

Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.

UNIT-II

Basics of Energy and its various forms

Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.

UNIT-III

Energy Management & Audit

Definition, energy audit, need, types of energy audit. Energy management (audit) approachunderstanding energy costs, bench marking, energy performance, matching energy use torequirement, maximizing system efficiencies, optimizing the input energy requirements, fuel &energy substitution, energy audit instruments. Material and Energy balance: Facility as an energysystem, methods for preparing process flow, material and energy balance diagrams.

UNIT-IV

Energy Efficiency in Electrical Systems

Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

UNIT-V

Energy Efficiency in Industrial Systems

Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities in HVAC, Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Pumps and Pumping System: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Cooling Tower: Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities, assessment of cooling towers.

Text/Reference Books

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

2. Guide books for National Certification Examination for Energy Manager / Energy AuditorsBook-3, Electrical Utilities (available online)
3. S. C. Tripathy, “Utilization of Electrical Energy and Conservation”, McGraw Hill, 1991.

4. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

L T P M C

EE315/1 – DIGITAL SIGNAL PROCESSING 3 0 0 1003

UNIT – I

Discrete Signals and Systems: Introduction to digital signal processing,Advantages and applications, Discrete time signals, LTI system: Stability andcausality, Frequency domain representation of discrete timesignals and systems

UNIT – II

Z-Transforms: Z-transforms, Region of convergence, Z-transform theorems andproperties, Parseval's relation, Relation between Z-transform and Fourier transformof a sequence, Inverse Z transform using Cauchy's integration theorem, Partialfraction method, Long division method, Solution of differential equations using onesided Z-transform, Frequency response of a stable system.

UNIT – III

DFT And FFT: Discrete Fourier Series, Properties of DFS, Discrete FourierTransform, Properties of DFT, Linear convolution using DFT, Computations forevaluating DFT, Decimation in time FFT algorithms, Decimation in frequency FFTalgorithm, Computation of inverse DFT.

UNIT – IV

IIR Filter Design Techniques: Introduction, Properties of IIR filters, Design of DigitalButterworth and Chebyshev filters using bilinear transformation, Impulse invariancetransformation methods. Design of digital filters using frequency transformationmethod.

UNIT – V

FIR Filter Design Techniques: Introduction to characteristics of linear phase FIRfilters, Frequencyresponse, Designing FIR filters using windowing methods. Rectangular window, Hanning window, Hamming window, Generalised Hammingwindow, Bartlett triangular window, Comparison of IIR and FIR filters.

Realisation Of Digital Filters: Direct, Canonic, Cascade, Parallel and Ladderrealizations

TEXT BOOKS:

1. Lonnie C Ludeman, Fundamentals of Digital Signal Processing, John Wiley &Sons, 2003.
2. S K Mitra, Digital Signal Processing: A Computer Based Approach, 2nd Edition,TMH, 2003
3. Alan V Oppenheim and Ronald W Schafer, Digital Signal Processing, PearsonEducation/PHI, 2004.
4. P.RameshBabu, Digital Signal Processing, 2nd Edition, Scitech Publications, 2004.

REFERENCE BOOKS:

1. Johnny R. Johnson, Introduction to Digital Signal Processing, PHI, 2001.
2. Andreas Antoniou, Digital Signal Processing,TMH, 2006.
3.JohnG.Proakis, Dimitris G Manolakis, digital Signal Processing: Principles, Algorithms and Applications, Pearson Education / PHI, 2003

L T P M C

EE315/2 – DEMAND SIDE ENERGY MANAGEMENT 3 0 0 1003

Unit – I

Energy Audit : Definitions-Need-concepts-Types of energy audit; Energy index –cost index – pieharts – Sankey diagrams.

Energy Economics: Introduction-Cost benefit risk analysis-Payback period-Straightline depreciation- Sinking fund depreciation—Reducing balance depreciation-Netpresent value method-Internal rate of returnmethod-Profitability index for benefitcost ratio.

Unit – II

Energy Conservation in Electric utilities and Industry: Electrical loadmanagement: Energy and load management devices-Conservation strategies;conservation in electric utilities and industry: Introduction- Energy conservation inutilities by improving load factor-Utility voltage regulation-Energy conservation in Industries-Power factor improvement.

Unit – III

Energy–efficient electric motors (EEMs) : Energy efficient motors-constructionand technical features- case studies of EEMs with respect to cost effectivenessperformance characteristics; Economics of EEMs andsystem life cycle-directsavings and payback analysis-efficiency factor or efficiency evaluation factor

Unit – IV

Electric Lighting: Introduction-Need for an energy management program-Buildinganalysis-Modification ofexisting systems-Replacement of existing systems-priorities:

Illumination requirement: Task lighting requirements-lighting levels-systemmodifications-non illumination modifications-lighting for non-task areas-reflectancesspace geometry; System elements.Light sources - characteristics of families of lamps-lamp substitution in existingsystems-selection of Higher efficiency lamps for a new system-Luminaries-ballastsenergy conservation in lighting.

Unit – V

Space Heating ,Ventilation, Air-Conditioning(HVAC) and Water Heating:

Introduction-Heating of buildings-Transfer of Heat-Space heating methodsVentilation and air-conditioning-Insulation-Cooling load-Electric water heatingsystems-Energy conservation methods.

TEXT BOOKS:

1. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGrawhillpublishing company ltd. New Delhi

2.Energy conversion systems by Rakosh Das Begamudre New age internationalpublishers

3. Energy efficient electric motors selection and application by John C.Andreas

L T P M C

EE315/3 – ELECTRICAL MATERIALS 3 0 0 1003

UNIT-I
CONDUCTING MATERIALS

Review of metallic conduction on the basis of free electron theory.Fermi-Dirac distribution – variation of conductivity with temperature and composition, materials for electric resistors- general electric properties; material for brushes of electrical machines, lamp filaments,fuses and solder.

UNIT-II
SEMICONDUCTORS

Mechanism of conduction in semiconductors, density of carriers in intrinsic semiconductors, the energy gap, types of semiconductors. Hall effect, compound semiconductors, basic ideas of amorphous and organic semiconductors.

UNIT-III
MAGNETIC MATERIALS

Classification of magnetic materials- origin of permanent magnetic dipoles, ferromagnetism, hard and soft magnetic materials, magneto materials used in electrical machines, instruments and relays.

UNIT-IV
DIELECTRICS INSULATING MATERIALS

DIELECTRICS: Dielectric, polarization under static fields- electronic ionic and dipolar polarizations,behavior of dielectrics in alternating fields, Factors influencing dielectric strength and capacitor materials.Insulating materials, complex dielectric constant, dipolar relaxation and dielectric loss. INSULATING MATERIALS: Inorganic materials (mica, glass, porcelain, asbestos), organic materials (paper, rubber, cotton silk fiber, wood, plastics and bakelite), resins and varnishes, liquid insulators (transformer oil) gaseous insulators (air,SF6 and nitrogen) and ageing of insulators.

UNIT-V
MATERIALS FOR SPECIAL APPLICATIONS

Materials for solar cells, fuel cells and battery.Materials for coatings for enhanced solar thermal energy collection and solar selective coatings, Cold mirror coatings, heat mirror coatings, antireflection coatings, sintered alloys for breaker and switch contacts.

TEXT/REFERENCE BOOKS

1. Electrical Engineering Materials Adrianus J Dekker, Phi Learning Publishers.
2. Electrical Properties of Materials, 8th Edition by Solymar, L, Oxford University PressNew Delhi.
3. Introduction to Electrical EngineeringMaterials 4th Edn. 2004 Edition by Indulkar C, S.Chand& Company Ltd-New Delhi.
4. Electrical and Electronic Engineering Materials by SK Bhattacharya, KhannaPublishers, New Delhi.

L T P M C

EE315/4 – UTILIZATION OF ELECTRICAL ENERGY 3 0 0 1003

UNIT – I

Electric Traction: Introduction- Systems of electric traction- comparison between DC and AC systems in
electric traction - mechanics of train movement- speed-time curves- effect of speed-acceleration anddistance on schedule- Power and energy output from driving axles- specific energy output- collectors -introduction to electric braking – comparison of electric and mechanic braking.

UNIT – II

Electric Heating: Introduction; Modes of heat transfer - Stefan's law –classification of electric heating methods- design of heating element - Construction and working of different types of induction furnaces -resistance furnace - Dielectric heating – arc furnaces .

UNIT – III

Welding: Introduction- Types of welding - resistance and arc welding -Characteristics of Carbon and metallic arc welding - comparison (Excluding electronic controls)- requirements of good weld- ultra sonic-electron beam-laser beam welding.

UNIT – IV

Illumination: Introduction- terms used in illumination-laws of illumination-Gas discharge lamps - Fluorescent lamps - Arc lamps - Filament lamps – comparison between filament and fluorescent lamps-square law methods of calculation – Factory lighting - flood lighting and street lighting-design of lighting schemes-introduction to Compact Fluorescent Lamps.

UNIT – V

Storage batteries: Applications-rating-classification-dry cell and wet cells-primary and secondary cells-charging and discharging of lead acid cells, trickle charging methods of charging lead acid batteries-overdischarging-common troubles with lead acid batteries and remedies-Nickel cadmium batteries.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U. S. Bhatnagar and A. Chakraborti, DhanpatRai& Co. Pvt. Ltd., 2001.
2. Utilization Electric Power and electric traction by J.B.Gupta, publishers-Katson books
3. Utilization, generation & conservation of electrical energy by Sunil S Rao, Khanna publishers.

Reference Books:

1. Generation, Transmission & Utilization Electric Power by A.T. Starr London,Pitman. 1953
2. Art and Science of Utilization of Electrical Energy by Partab H DhanpatRai and Sons, New Delhi. Second edition
3. Electrical Technology, volume-1 by B.L.Thereja,S.Chand&co publishers

	L	T	P	M	C
EE 351 LINEAR IC'S & PULSE CIRCUITS LAB	**0**	**0**	**3**	**100**	**1.5**

1. Design and Verification of AstableMultivibrator.
2. Design and Verification of MonostableMultivibrator.
3. Design and Verification of BistableMultivibrator
4. Design and Verification of Schmitt Trigger (using discrete components and using IC741).
5. Measurement of Op-amp Parameters.
6 Applications of Op-amp (Adder, Subtractor, Integrator, Differentiator).
7. Instrumentation Amplifier using Op-Amp.
8. Waveform Generation using Op-amp (Square, Triangular).
9. Design of Active Filters (LPF&HPF-First Order).
10. Application of 555 Timers (Astable, Monostable, Schmitt Trigger).0
11. PLL using 556.
12. Design of IC Regulator using 723.
13. Design of VCO using 566.
14. D-A Converter (R-2R Ladder).
15. Design of Miller and Bootstrap Sweep circuits.

NOTE: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination.

		L	T	P	M	C
EE 352	**POWER ELECTRONICS LAB**	**0**	**0**	**3**	**100**	**1.5**

LIST OF EXPERIMENTS:

1. Static characteristics of SCR, Triac
2. Characteristics of MOSFET & IGBT
3. Gate triggering methods for SCR's (R, R-C, UJT)
4. Single phase fully controlled rectifier with R, RL & RLE load (with orwithout feedback diode)
5. Characteristics of Jone's chopper
6. Voltage commutated DC chopper
7. Characteristics of single – phase modified series inverter
8. Characteristics of single - phase parallel inverter with R & RL loads
9. Characteristics of single - phase cyclo-converter (Center tapped or Bridge)
10. Study of single - phase full wave McMurray Bedford inverter
11. Single phase dual converter with R & RL loads (Circulating and non circulating modes)
12. Three phase fully/half controlled rectifier with R, RL and RLE loads
13. Speed control of Universal motor
14. Characteristics of PWM converter
15. Characteristics of Morgan's chopper
16. Characteristics of PWM inverter
17. Converter based DC motor control
18. Inverter based Induction motor control

Note: Minimum of ten experiments have to be performed and recorded by thecandidate toattain eligibility for University Examinations

	L	T	P	M	C
EE353 CONTROL SYSTEMS LAB	**00**	**3**	**100**		**1.5**

LIST OF EXPERIMENTS:

1. Time response of second order systems
2. Characteristics of synchros.
3. Effect of feedback on D.C servomotor.
4. Transfer function of D.C motor
5. Effect of P, PD, PID controller on a second order system
6. Simulation of transfer functions using operational amplifier
7. Lag and lead compensation – Magnitude and phase plot
8. Transfer function of D.C generator
9. Temperature controller using PID
10. Characteristics of magnetic amplifier
11. Characteristics of A.C servo motor
12. Stepper motor control
13. D.C. position control
14. P, PI, PD, PID control using Op-Amps.
15. Frequency response of first and second order systems.

Note: Minimum of ten experiments have to be performed and recorded by thecandidate toattain eligibility for University Examinations

	L	T	P	M	C
EE354 SYSTEMS ENGINEERING WORKSHOP0	**0**	**3**	**100**		**2**

Module-1

Introduction to systems engineering system, modelling methodology of systems, and introduction to RFLPframework.

Introduction to Electrical systems designing. Modelling and simulation of Digital Gate logic circuits, studyingof behaviours, tuning, value changing and analysis of graphs.

Designing of Machine Circuits, Asynchronous Machine simulation (Squirrel cage, wound rotor), synchronous Machine Simulation (Permanent Magnet Motor, Electrically Excited, Reluctance Motor.

Module-2

Modelling and simulation of Machine Circuits, Dc machines simulation (Permanent Magnet Motor,Electrically Excited, Series Excited), Transformers etc. studying of behaviours, tuning, value changing and analysis of graphs.

Simulation of various Power Electronics Circuits and Battery Modules.

Module-3

Introduction to Requirement design, functional design, logical design and physical design by taking a use case of steering wheel servo system,Industrial Robot,Washing Machine,Elevator and Car Door Mechanism.

ACHARYA NAGARJUNA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2019
ELECTRICAL & ELECTRONICS ENGINEERING
III/IV B.TECH -SEMESTER II

III/IV B.TECH -SEMESTER II

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	EE 321	Power Systems - II	PC	3	0	0	40	60	3
2	EE 322	Power Systems Operation and Control	PC	3	0	0	40	60	3
3	EE 323	Electrical Measurements & Instrumentation	PC	3	0	0	40	60	3
4	EE 324	Professional Elective Course II	PEC	3	0	0	40	60	3
5	EE 325	Job oriented course II	JOC	3	0	0	40	60	3
6	EE 361	Simulation of Electrical systems Lab - I	PC	0	0	3	40	60	1.5
7	EE 362	Electrical Measurements & Instrumentation Lab	PC	0	0	3	40	60	1.5
8	EE 363	Soft Skills Lab	PC	0	0	3	40	60	1.5
9	EE 364	Mobile App Development	SKILL	0	0	3	40	60	2
Total Credits									**21.5**

Professional Elective Course II

EE324/1 HVDC Transmission
EE324/2 Digital Control Systems
EE324/3 Computer Architecture

Job oriented course II

EE325/1 AI Techniques
EE325/2 Industrial Electrical Systems

Open Elective Course (Note: Offered to other Branches)
EE325/3: Renewable Energy Sources
EE325/4: Power Plant Engineering

		L	T	P	M	C
EE 321	**POWER SYSTEMS - II**	**3**	**0**	**0**	**100**	**3**

UNIT – I

Representation of power systems: One line diagram - Impedance and Reactancediagrams – per unit quantities - changing the base - selection of base - per-unit impedances of three winding transformers - Advantages of per-unit computations.
Y Bus formation by inspection method.

UNIT – II

Load Flows:

Introduction – nonlinear equations - solutiontechniques using Gauss iterative, Gauss Seidal and Newton Raphson (rectangular and polar) methods using bus admittance matrix - acceleration of convergence - development of flow charts for load flow problems - comparison of different load flow methods. Data preparation for load flow program

UNIT – III

Symmetrical Faults: Transients in RL series circuit - short-circuit currents andreactances of synchronous machines - internal voltages of loaded machines under transient conditions - selection of circuit breakers

Symmetrical components and Networks: Introduction – operator 'a' – resolution ofthree unbalanced phasors into symmetrical components - power in terms of symmetrical components.

UNIT – IV

Unsymmetrical Faults: Single line to ground - line to line and double line to groundfaults on an unloaded alternator. Unsymmetrical faults on power systems - single line to ground line to line and double line to ground faults. Interpretation of the interconnected sequence networks.

Unsymmetrical series impedance - sequence impedances and sequence networks of unloaded generators, circuit elements. Positive negative and zero sequence networks.

UNIT – V

Power system stability: Introduction – steady state stability, Transient stability,Review of machine swing equation - Equal area criterion of stability – applications. Step by step solution of the swing curve - factors affecting steady state and transient stabilities.

Text Books:

1) Elements of power system analysis by W D Stevenson Jr Fourth Edition TMH International student edition
2) Modern power system analysis by D.P. Kothari and I.J. Nagrath , TMH 3rd edition
3) Electrical power systems by C.L. Wadhwa, New age International (P) Limited
4) Power system analysis by TK Nagsarkar and Sukhija, Oxford press

Reference Books:

1) Power system stability by KimbarkVol – I Willey Publications , Inc
2) Power system stability and control by P. Kundur , TMH
3) A. R. Bergen and V. Vittal; "Power System Analysis", Pearson Publication.

	L	T	P	M	C
EE 322 POWER SYSTEM OPERATION AND CONTROL	**3**	**0**	**0**	**100**	**3**

UNIT – I

Economic operation of power systems: Economic dispatch in thermal power station: Heat rate curves - cost curves - incremental fuel and production costs -economic distribution of load between units without consideration to line losses. Transmission line losses as a function of plant generation - calculation of loss coefficients - optimum generation allocation between thermal plants.Optimal unit commitment-Dynamic programing

UNIT – II

Load frequency control: Importance of keeping voltage and frequency constant in a power system - Load frequency control (LFC) single area case - the P-δloop: Schematic of load frequency and AVR of a synchronous generator – mathematical modelling of generator, loads, prime mover and speed governor for LFC & corresponding block diagram representation - LFC block diagram of an isolated power system - steady state analysis - dynamic response. LFC for two area systems - automatic generation control (AGC) scheme – AGC in a single area and two area systems - block diagram representation.

UNIT – III

Power flow control: Control of power into a network-specification of bus voltage-capacitor banks-control by transformers.

Reactive power control in synchronous generators: The role of excitation system- exciter, generator and sensor models - simplified AVR block diagram -steady state response for a step change in terminal voltage.

UNIT – IV

Real time control of power system: Computer control of power systems-Energy control centre-various levels

State estimation:power system state estimation- weighted least square estimation- Maximum likelihood concepts-matrix formulations.

UNIT – V

Contingency analysis: Adding and removing of lines-Piece wise solution of interconnected power system-Analysis of single contingencies-Analysis of multiple contingencies contingency analysis by d.c model.

TEXT BOOKS:

1) Modern power system analysis by D.P. Kothari & I.J. Nagrath McGraw Hill 3rdedition,2003
2) Electric Energy systems Theory – by O.I.Elgerd, Tata McGraw-hill Publishing Comapany Ltd., Second edition 1983
3) Electrical power systems by C.L. Wadhwa, New age International (P) Limited
4) Understanding FACTS by Naran G. Hingorani, L. Gyugyi, 1st edition, 2001,Standard Publishers Distributors

Reference Books:

1) Elements of power system analysis by W D Stevenson Jr Fourth Edition TMH International student edition
2) Economic operation of interconnected systems by L.K.Kirchmeyer Wiley Eastern Ltd
3) Power system analysis by H. Saadat , McGraw Hill, 2nd edition
4) Power System Analysis Operation and Control by A Chakrabarti, SunitaHalder, PHI, 2007
5) Computer modeling of Electrical power systems by J.Arrillaga, N. A. Watson,second Edition2003, John Wiley & Sons, Ltd.
6) Power system control- technology by TorstenCegrell, Prentice Hall international series in systems & control engineering

	L	T	P	M	C
EE323 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION	**3**	**0**	**0**	**100**	**3**

UNIT - I

Instruments: Classification of instruments – Construction and principle of operationof Permanent magnet moving coil - moving iron – dynamometer – induction type of instruments. Measurement of current, voltage, power, energy and reactive power in single phase and three phase circuits.

UNIT – II

Construction and principle of operation of Power factor meters – frequency meters and synchroscope.

Magnetic Measurements: Ballistic galvanometer –- B-H loop – flux meter –measurement of permeability.

Oscilloscope: Basic operation – deflection mechanism – time base circuits -vertical amplifiers - alternate and chop modes - applications.

UNIT – III

Instrument Transformers: CTs, PTs principle of operation – errors - testing.

Bridges: Measurement of inductance, capacitance and resistance by bridgemethods - Maxwell's - Anderson's - Wien's - Schering's - Heaviside's - Campbell's - Kelvin's double bridge. Measurement of high resistance by Price's guard wire, loss of charge methods.

UNIT – IV

Digital Instruments: Principle of operation of DVM's – display devices LEDs andLCDs

Transducers: Principles - LVDT – frequency and power transducers

UNIT – V

Measurement of Non electrical quantities with electrical transducers: Velocity,acceleration, Force, Torque, flow, temperature thermistor – thermo couple, displacement & strain.Data recorders, data acquisition systems.

Text Books:

1. Electrical & Electronic Measurement & Instruments by A.K.ShawneyDhanpatRai& Co 17th edition 2000.
2. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition, Wheeler Publishing, 1999.

Reference books:

1. Electrical Measurements – by Buckingham and Price, Prentice – Hall, 1961
2. Electrical Measurements by Harris John Wiley
3. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers.

	L	T	P	M	C
EE 324/1 HVDC TRANSMISSION	**3**	**0**	**0**	**100**	**3**

UNIT-I

General considerations of AC and DC transmission: Introduction – economic advantages of DC overAC transmission - types of DC links - brief description of the layout of a bipolar HVDC link - technical advantages of DC over AC transmission - application of DC transmission system - planning and moderntrends in DC transmission - brief summary of the technical details of HVDC projects in India.

UNIT-II

Converter Circuits: Properties of converter circuits - different kinds of arrangements - choice of converterconfiguration analysis of bridge converters with grid control with and without overlap angle - complete characteristics of 6 pulse and 12 pulse converters - operation as an inverter - converter parameters andcharacteristics - values of transformer secondary currents - converter equations.

UNIT-III

Protection: Converter faults - short circuit current - arc back currents - short circuit currents in rectifier andinverter - protection against over currents - DC smoothing reactors,- bypass valves - DC circuit breakers.protection against over voltages –surge arresters.

UNIT-IV

Converter and HVDC system Control:

Principles of DC link control - converter control characteristics - firing angle control - current and extinction angle control - effect of source inductance – starting and stopping of DC link - the four operating modes of the DC link – CG, AC, AG, CV - power control - sources of reactive power - reactive power requirements insteady state - reactive power control. Introduction to HVDC simulator.

UNIT-V

Power Flow Analysis in AC/DC systems: Modeling of DC links - solution of DC load flow .

Harmonics and Filters: Generation of harmonics - characteristic and uncharacteristic harmonics - adverseeffects of harmonics - calculation of voltage and current harmonics. The impedance loci; Methods of reducing the harmonics –AC tuned and high pass filters - DC filters - telephonic interference.

TEXT BOOKS:

1. HVDC power transmissions systems: Technology and system interactions by K.R. Padiyar New age International (P) Ltd.
2. HVDC transmission by J. Arrillaga, Peter Peregrinus

REFERENCE BOOKS:

1. Direct Current transmission by E.W.Kimbark, John Wiley
2. Power Transmission by Direct Current by E.Uhlmann, Springer-Verlag
3. HVDC power converters and systems by B.J.Cory and Mc Donald
4. EHVAC and HVDC transmission engineering and practice by S. Rao

5. HVDC transmission by Adamson and Hingorani

	L	T	P	M	C
EE 324/2 DIGITAL CONTROL SYSTEMS	**3**	**0**	**0**	**100**	**3**

UNIT – I

SAMPLING AND Z-PLANE ANALYSIS

Introduction, sample and hold operations, Sampling theorem, Reconstruction of original sampled signal tocontinuous-time signal.

REVIEW OF Z-TRANSFORMS:

Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis ofsampled – data systems, mapping between s-plane and z-plane: Primary strips and Complementary Strips.

UNIT – II

State Space Analysis: State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods forComputation of State Transition Matrix, Discretization of continuous time state – space equations.

Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observabilityconditions for Pulse Transfer Function.

UNIT – III

Stability Analysis: Stability Analysis of closed loop systems in the Z-Plane. Jury stablility test – StabilityAnalysis by use of the Bilinear Transformation and Routh Stability criterion. Stability analysis using Liapunov theorems.

UNIT – IV

Design Of Discrete Time Control System By Conventional Methods: Design of digital control based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers. Design digital control through deadbeat response method.

UNIT – V

State Feedback Controllers And Observers: Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula. State Observers – Full order and Reducedorder observers.

Linear Quadratic Regulators: Min/Max principle, Linear Quadratic Regulators

TEXT BOOKS:

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.
2. Digital Control and State Variable Methods by M.Gopal, TMH
3. Discrete-Time Control systems - K. Ogata, Pearson Education

REFERENCE BOOKS:

1. Digital Control Engineering, M. Gopal Wiley Eastern
2. Modern control engineering by K.Ogata, PHI

	L	T	P	M	C
EE 324/3 COMPUTER ARCHITECTURE	**3**	**0**	**0**	**100**	**3**

UNIT – I

Basic Structure of Computers, Functional units, software, performance issues software, machine instructions and programs, Types of instructions, Instruction sets: Instruction formats, Assembly language, Stacks, Ques, Subroutines.

UNIT – II

Processor organization, Information representation, number formats.

UNIT – III

Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating point formats Control Design, Instruction sequencing, Interpretation, Hard wired control - Design methods, andCPU control unit. Microprogrammed Control - Basic concepts, minimizing microinstruction size,multiplier control unit. Microprogrammed computers - CPU control unit

UNIT – IV

Memory organization, device characteristics, RAM, ROM, Memory management, Concept of Cache& associative memories, Virtual memory.
System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfaces

UNIT – V

Concept of parallel processing, Pipelining, Forms of parallel processing, interconnect network

Text/Reference Books:

1. V.CarlHammacher, “Computer Organisation”, Fifth Edition.
2. A.S.Tanenbum, “Structured Computer Organisation”, PHI, Third edition
3. Y.Chu, "Computer Organization and Microprogramming”, II, Englewood Chiffs, N.J., Prentice Hall Edition
4. M.M.Mano, “Computer System Architecture”, Edition
5. C.W.Gear, “Computer Organization and Programming”, McGraw Hill, N.V. Edition
6. Hayes J.P, “Computer Architecture and Organization”, PHI, Second edition

	L	T	P	M	C
EE 325/1 AI TECHNIQUES	**3**	**0**	**0**	**100**	**3**

UNIT – I

Artificial Neural Network: Concept – evolution – basic models – Notation andterminology – training
Supervised learning Network: Introduction – Perceptron networks – Adaptivelinear neuron – Multiple adaptive linear neurons – Back propagation network – radialbasis network

UNIT–II

Associative Memory Networks: Training algorithms for pattern association – Autoassociative memorynetwork – Bidirectional associative memory – Hopfield networks– Iterative auto associative memory networks – Temporal associative memorynetwork
Unsupervised learning networks: Fixed weight competitive nets – Kohenenself-organizing feature maps – learning vector quantization – counter propagationnetworks – Adaptive resonance theory network.

UNIT- III

Fuzzy logic: Classical sets – fuzzy sets – classical relations – fuzzy relations –tolerance and equivalence relations – Membership functions – fuzzification –Membership value assignments – Defuzzification – Fuzzyarithmetic – Fuzzymeasures – Fuzzy rule base and approximate reasoning – fuzzy decision making.

UNIT – IV

Hybrid fuzzy neural networks: Hybrid system – fuzzy logic in learning algorithms -fuzzy neurons – Neuralnetworks as pre-processors, post processors, tuners – FNNarchitecture based on back propagation – ANFIS

UNIT – V

Genetic algorithms-introduction-encoding-fitness function-reproduction operators
Genetic modelling-genetic operators-cross over and mutation-generational cycleconvergence of genetic algorithm

TEXT BOOK:

1. Principles of soft computing by S.N.Sivanandam, S.N.Deepa, John Wiley India –2007
2. Fuzzy logic and Neural networks: Basic concepts and applications byChennakesava R Alavala, New Age International (P) Ltd., 2008
3. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications byRajasekharan and Pai – PHI Publication.

REFERENCE BOOKS:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education,2002.
2. Neural Networks – Simon Hakins , Pearson Education
3. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
4. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

	L	T	P	M	C
EE 325/2 INDUSTRIAL ELECTRICAL SYSTEMS	**3**	**0**	**0**	**100**	**3**

UNIT I

Electrical System Components

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices

UNIT II

Residential and Commercial Electrical Systems

Types of residential and commercial wiring systems, general rules and guidelines for installation,load calculation and sizing of wire, rating of main switch, distribution board and protection devices,earthing system calculations, requirements of commercial installation, deciding lighting scheme andnumber of lamps, earthing of commercial installation, selection and sizing of components.

UNIT III

Illumination Systems Understanding various terms regarding light, lumen, intensity, candle power, lampefficiency,specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various
illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and theiroperation, energy saving in illumination systems, design of a lighting scheme for a residential andcommercial premises, flood lighting.

UNIT IV

Industrial Electrical Systems I

HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting ofmotors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factorcorrection – kVAR calculations, type of compensation, Introduction to PCC, MCC panels.Specifications of LT Breakers,MCB and other LT panel components.

UNIT V

Industrial Electrical Systems II

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPSand Battery Banks, Selection of UPS and Battery Banks.

Text/Reference Books

1. S.L. Uppal and G.C. Garg, “Electrical Wiring, Estimating &Costing”, Khanna publishers, 2008.
2. K. B. Raina, “Electrical Design, Estimating & Costing”, New age International, 2007.
3. S. Singh and R. D. Singh, “Electrical estimating and costing”, DhanpatRai and Co., 1997.
4. Web site for IS Standards.
5. H. Joshi, “Residential Commercial and Industrial Systems”, McGraw Hill Education, 2008.

L T P M C

EE325/3 - RENEWABLE ENERGY SOURCES 3 0 0 100 3

UNIT-I

Principle of Renewable Energy: Comparison of renewable and conventional energy sources - Ultimate energy sources - natural energy currents on earth -primary supply to end use - Spaghetti & Pie diagrams -energy planning – energy efficiency and management.

UNIT-II

Solar Radiation: Extra-terrestrial solar radiation - terrestrial solar radiation – solar thermal conversion -solar thermal central receiver systems - photovoltaic energy conversion - solar cells – 4 models.

UNIT-III

Wind energy: Planetary and local winds - vertical axis and horizontal axis wind mills - principles of windpower - maximum power - actual power - wind turbine operation - electrical generator.

UNIT-IV

Energy from Oceans: Ocean temperature differences - principles of OTEC plant operations - wave energy
- devices for energy extraction – tides - simple single pool tidal system.

UNIT-V

Geothermal energy: Origin and types - Bio fuels – classification – direct combustion for heat and electricitygenerator - anaerotic digestion for biogas – biogas digester - power generation.

TEXT BOOKS:

1. Renewable Energy Sources by John Twidell& Toney Weir : E&F.N. Spon
2. Renewable Energy Sources: Their impact on global warming and pollution by Abbasi&Abbasi –PHI

REFERENCE BOOKS:

1. Power plant technology by EL-Wakil, McGraw-Hill
2. Non-Conventional Energy Sources by G.D.Rai, Khanna Pub.

	L	T	P	M	C
EE325/4–POWER PLANT ENGINEERING	**3**	**0**	**0**	**100**	**3**

UNIT I
COAL BASED THERMAL POWER PLANTS
Rankine cycle – improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers,Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling,Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.

UNIT II
DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS
Otto, Diesel, Dual &Brayton Cycle – Analysis &Optimisation. Components of Diesel and Gas Turbine powerplants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III
NUCLEAR POWER PLANTS
Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium-Uraniumreactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT IV
POWER FROM RENEWABLE ENERGY
Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal,Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V
ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS
Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relativemerits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

TEXT / REFERENCE BOOKS:

1. Nag. P.K., “Power Plant Engineering”, Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.
2. Generation of Electric Power by B.R. Gupta S. Chand & Company Ltd
3. Generation distribution and utilization of electrical energy by C.L.Wadhwa, New Age Internations (P) Limited, 2005 Reference
4. Electrical power systems by C.L. Wadhwa, New age International (P) Limited 3rd edition
5. Modern power system analysis by D.P. Kothari & I.J. Nagrath McGraw Hill 3rdedition,2003
6. Electric power transmission and distribution by Sivanagaraju and Satyanarayana, Pearson Education

	L	T	P	M	C
EE 361 SIMULATION OF ELECTRICAL SYSTEMS LAB -I	**0**	**0**	**3**	**100**	**1.5**

LIST OF EXPERIMENTS:

1. Simulation of a single-phase full-bridge converter with different loads
2. Simulation of static characteristics of SCR
3. Simulation of a resonant pulse commutation circuit and buck chopper
4. Simulation of an AC voltage controller with various loads
5. Simulation of single-phase inverter with PWM control
6. Modelling of transformer
7. Simulation of three phase $180^0$and also 120^0conduction mode of an inverter
8. Simulation of single phase dual converter in circulating and non-circulating mode.
9. Simulation of voltage/load /current commutation of a chopper.
10. Transfer function analysis of a given circuit
11. State model representation of transfer functions
12. Plotting of Bode, Nyquist and root-locus plots for transfer functions
13. Steady state and Transient analysis of RLC circuits
14. Time response analysis of second order system.
15. Effect of P, PI, and PID controllers for a second order system.

Note: A minimum of 10 experiments are to be completed.

Simulation is to be carried out with the following software PSPICE/ MATLAB/ MiPower/ PSIM/ PSCAD/EMTP.

	L	T	P	M	C
EE 362ELECTRICAL MEASUREMENTS LAB	**0**	**0**	**3**	**100**	**1.5**

LIST OF EXPERIMENTS:

1. Calibration and testing of single – phase energy meter
2. Kelvin's Double Bridge – Measurement of resistance – Determination of tolerance
3. Schering Bridge – capacitance measurement and tan δ measurement
4. Anderson Bridge – inductance measurement
5. Measurement of 3-phase active and reactive power in three phase circuits.
6. Measurement of 3-phase power using 3-Voltmeter and 3-Ammmeter methods
7. Measurement of frequency using CRO
8. Measurement of strain using strain gauge
9. Tracing of B-H curve using CRO
10. LVDT characteristics, calibration and displacement measurement.
11. Energy meter calibration by phantom loading
12. Frequency measurement by Wein's Bridge
13. Measurement of earth resistance by earth resistance tester & fall of potential method
14. Measurement medium resistance using Wheatstone Bridge
15. Testing of current transformer.
16. Measurement of dielectric strength of transformer oil by transfer oil testing kit
17. Fault identification and location in underground cables

Note: Minimum of ten experiments have to be performed and recorded by thecandidate to attain eligibility for University Examinations

	L	T	P	M	C
EE 363SOFT SKILLS LAB	**0**	**0**	**3**	**100**	**1.5**

Unit I Self-Development

Introduction to soft skills, Self-Management: Self-Evaluation, Self-Discipline, Self-Criticism, Self-awareness, Self-Esteem, Positive Thinking, Perceptions and Attitudes, Values and Belief Systems, Personal success factors, Handling failure, Knowing Yourself, identifying one‘s strengths and weaknesses, SWOT analysis, Career Planning & Goal setting

Unit II Presentation & Public Speaking

Presentation skills: Professional Presentation, Nature of Oral Presentation, Planning a Presentation, Preparing the Presentation, Delivering the Presentation.

Public Speaking, Group discussion, Interview preparation, Book Review and PPT (a review on any book in form of PPT 5 slides)

Unit III Writing Skills

Business Writing: Letter writing, Writing Formal Letters, Technical Report Writing, Memo, Notices/Circulars Agenda and Minutes of a Meeting, E-Mail, Job Application, Preparation of CV and Resume writing.

Unit IV Stress and Time Management

Introduction, Stress in Today‘s Time: Identify the Stress Source, Signs of Stress, Ways to Cope with Stress : Healthier Ways to Combat Stress, Steps to be Taken in the Organizations : Open communication, Time Management, Working towards Your Goals, Smart Work, Prioritize your Tasks,4 Ds of Decision Making

Unit V Ethics, Etiquette and Mannerism

Professional Etiquette: Etiquette at Meetings, Etiquette at Dining. Involuntary Awkward Actions, Public Relations Office(PRO)‘s Etiquettes, Technology Etiquette : Phone Etiquette, Email Etiquette, Social Media Etiquette, Video Conferencing Etiquette, Interview Etiquette, Dressing Etiquettes : for Interview, offices and social functions, Ethical Values: Importance of Work Ethics, Problems in the Absence of Work Ethics.

	L	T	P	M	C
EE 364MOBILE APP DEVELOPMENT	**0**	**0**	**3**	**100**	**2**

LIST OF EXPERIMENTS

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Develop an application that makes use of databases.
4. Develop an application that makes use of Notification Manager
5. Develop a native application that uses GPS location information
6. Implement an application that for basic calculator
7. Implement an application that creates an alert upon receiving a message
8. Write a mobile application that makes use of RSS feed
9. Develop a mobile application to send an email.
10. Develop a Mobile application for simple needs (Mini Project)

REFERENCES:

1. Build Your Own Security Lab, Michael Gregg, Wiley India

ACHARYA NAGARJUNA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2019
ELECTRICAL & ELECTRONICS ENGINEERING
IV/IV B.TECH -SEMESTER I

IV/IV B.TECH -SEMESTER I

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	EE 411	Electric Drives	PC	3	0	0	40	60	3
2	EE 412	Computer methods in Power Systems	PC	3	0	0	40	60	3
3	EE 413	Power System Protection	PC	3	0	0	40	60	3
4	EE 414	Professional Elective Course III	PEC	3	0	0	40	60	3
5	EE 415	Open elective Course	OEC	3	0	0	40	60	3
6	EE 416	Industrial Management and Entrepreneur Development	BS	0	0	3	40	60	3
7	EE 451	Power Systems Lab	Skill oriented course	0	0	3	40	60	2
8	EE 452	Industrial/Research Internship (2 Months) after 3rd Year	MC	0	0	3	40	60	3
Total Credits									**23**

Professional Elective Course III

EE414/1 FACTS Controllers
EE414/2 Machine learning
EE414/3 High Voltage Engineering

Open Elective Course (Note: Offered to other Branches)
EE415/1: Electric& Hybrid vehicles
EE415/2: Renewable Energy Sources
EE415/3 : Utilization of Electrical Energy

R-19 Regulations	L	T	P	M	C
EE 411ELECTRIC DRIVES	3	0	0	100	3

UNIT – I

Introduction: Electric drives - advantages of electric drive - Type of electric drives - components ofelectric drives - Status of dc and ac drives.

Dynamics of Electric Drives: Fundamental torque equations - Speed torque conventions and multi quadrant operation - Equivalent values of drive parameters - Components of load torques - some common load torques - Nature and classification of load torques

Control of Electric Drives: Modes of operation - Speed control and drive classification - closed-loop control of drives.

UNIT - II

DC motor Drives: DC motors and their performance – Starting - methods of braking - speed control - Methods of armature voltage control - Transformer and uncontrolled rectifier control.

Chopper fed DC Drives: Control of separately excited dc motors - Chopper control of series motor.

UNIT - III

Controlled Rectifier fed DC Drives: Single phase fully and half controlled rectifier control of separately excited dc motor - Three phase fully and half controlled rectifier control of separately excited dc motor - Dual converter control of separately excited dc motor - comparison of conventionaland static Ward-Leonard schemes - Rectifier control of dc series motor.

UNIT – IV

Induction motor drives: Three phase induction motors - Operation with unbalanced source voltages and single phasing - Operation with unbalanced rotor impedances – Starting – braking - transient analysis - Speed control - pole amplitude modulation - stator voltage control - Variable frequency control from voltage and current sources - Eddy current drives - rotor resistance control - slip power recovery - Variable speed constant frequency generation.

UNIT – V

Synchronous motor drives: Synchronous motors - Operation and fixed frequency supply -Synchronous variable speed drives - braking of synchronous motor. Switched reluctance motor drives
- brush less dc motors - stepper motors – variable reluctance motor.

Text Books:

1. Fundamentals of Electric drives by G.K. Dubey, Narosa, 2001
2. Electric drives by Nisit K De and P.K. Sen, PHI 2006

Reference Books:

1. Power Semiconductor controlled drives by G.K. Dubey , PH,1989
2. Power semiconductor drives by S.B. Dewan, G.R. Selmon&Straughen ,John Wiley, 1984
3. Thyristorised power controllers by GK Dubey SR Doradla, New Age

R-19 Regulations **L T P M C**
EE 412 COMPUTER METHODS IN POWER SYSTEMS **3 0 0 100 3**

UNIT – I

Incidence & Network Matrices: Element-node incidence matrix - reduced incidence matrix or bus incidence matrix - basic loop incidence matrix - augmented loop incidence matrix - basic cut setincidence matrix - augmented cut set incidence matrix - branch path incidence matrix - concept of primitive network - primitive impedance and admittance matrices with and without mutual coupling -network performance equations - formation of network matrices using singular & non-singular transformation.

UNIT – II

Algorithm for formation of network matrices & short circuit studies: Formation of bus admittance and bus impedance matrices and respective algorithms - modifications of bus impedance and admittance matrices for changes in the networks with and without mutual coupling - representation of three phase network elements for balanced and unbalanced systems - short circuit calculations for symmetrical and unsymmetrical faults using bus impedance matrix. Data preparationfor short circuit program

UNIT – III

Formulation of Load Flow Problem: Newton Raphson (rectangular and polar) methods using bus admittance matrix - Fast decoupled method - development of flow charts for load flow problems - comparison of different load flow methods. Data preparation for load flow program

UNIT – IV

Formulation of Transient Stability Problem: Representing synchronous machine by constant voltage behind transient reactance (d- axis) and network by steady state equations - alternating solution approach for transient stability solving algebraic equations and differential equations alternately - numerical stability aspects of different integration schemes - combined solution approach. Flow chart for digital simulation of transient stability problem.

UNIT – V

Z-BUS methods in Contingency Analysis: Adding and removing multiple lines (current injectionmethods), piece wise solution of interconnected systems, analysis of single and multiple contingencies, external system representation for fault and contingencies by Ward and REI approaches.

Text Books:

1. Computer methods in Power System Analysis by Stagg, G.W. & El-Abiad TMH
2. Computer Techniques in Power System Analysis by M.A. Pai , TMH 2005
3. Power System Stability & Control by P. Kundur , TMH 1998
4. Advanced Power System Analysis and Dynamics by L.P. Singh Wiley Eastern Ltd., New Delhi 3rd edition 1993

Reference Books:

1. Electric Energy systems Theory – by O.I.Elgerd, Tata McGraw-hill Publishing Comapany Ltd., Second edition 1983
2. Control and stability of Power Systems by Anderson &Fouad, Iowa state university press
3. Modern power system analysis by Nagrath&Kothari TMH 3rd edition

R-19 Regulations	L	T	P	M	C
EE 413 POWER SYSTEM PROTECTION	3	0	0	100	3

UNIT – I

Protective Relays: Introduction - basic requirement of protective relaying - zones of protection –primary and backup protection - classification of relays - attracted armature, balanced beam, inductiondisc, thermal relays. Buchholz's relay.

UNIT – II

Over current – under voltage - directional and non-directional relays.Distance relays – impedance, reactance, mho and off set mho relays.

Differential relays - circulating current and opposite voltage differential scheme. Negative sequencerelays.

UNIT – III

Switchgear: Elementary principles of arc phenomenon - arc quenching - interruption of capacitive currents and low current chopping - resistance switching - recovery and restriking voltages. Principles of operations of various types of circuit breakers - air break – oil filled - air blast -vacuum and SF6 circuit breakers. Rating, testing and specifications of circuit breaker.

UNIT – IV

Protection of alternators, transformers and transmission lines: Differential protection for generators, transformers and transmission lines - field suppression of alternator - over current and distance protection for feeders - Translay relay.

Grounding: Neutral grounding - solid grounding - resistance and reactance grounding - Arc suppression coil.

Power System Earthing: Objectives – definitions - tolerable limits of body currents - soil resistivityand earth resistance.

UNIT – V

Static Relays: Introduction – basic component of static relays. Comparators – amplitude and phasecomparators. Over current relays – instantaneous over current relay – inverse time over current relays
– differential relays.

TEXT BOOKS:

1. Power System Protection and Switchgear by B.Ram – Tata Mc-Graw Hill Pub 2001
2. Electrical power systems by C.L. Wadhwa, New age International (P) Limited
3. Fundamentals of Power System Protection by Y.G. Paithankar&S.R.Bhide, PHI, 2003

REFERENCE BOOKS:

1. Power system protection Static relays by T.S. Madhava Rao TMH 2nd edition 1981
2. The Art and Science of protective relaying by Mason Wiley Eastern Ltd
3. Power system protection and switchgear by B. Ravindranath, Chander Willy Eastern Ltd 1992
4. Switchgear and protection by Sunil S. Rao Khanna Publications.

R-19 Regulations	L	T	P	M	C
EE 414/1 FACTS CONTROLLERS	3	0	0	100	3

UNIT-I

FACTS Concept and General system Considerations:

Power Flow in AC system - definitions on FACTS - Basic types of FACTS Controllers. Converters for Static Compensation – Basic concept of voltage-sourced converters. Single phase, three phase full wave bridge converters operation, Transformer connections for 12 pulse 24 and 48 pulse operation.

UNIT-II

Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, and comparison of current source converters with voltage source converters.

UNIT-III

Static Shunt Compensators:

SVC and STATCOM - Operation and Control of TSC, TCR, STATCOM - Comparison between SVC and STATCOM - STATCOM for transient and dynamic stability enhancement.

UNIT-IV

Static Series Compensation:

GCSC, TSSC, TCSC and SSSC - Operation and Control - External System Control for series compensators - SSR and its damping - Static Voltage and Phase Angle Regulators - TCVR and TCPAR - Operation and Control.

UNIT-V

UPFC and IPFC:

The unified Power Flow Controller – Operation - Comparison with other FACTS devices - control of P and Q - Dynamic Performance - Special Purpose FACTS controllers -Interline Power flowController - Operation and Control.

TEXT BOOKS:

1. Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, 2000 by N.G. Hingorani&L.Gyugyi
2. FACTS Controllers in power transmission and Distribution, K.R.Padiyar, New Age Int. Publisher, 2007

REFERENCE BOOKS:

1. Power Electronics by Ned Mohan et. al , John Wiley & sons
2. Reactive Power Control in Electric Systems by T.J.E. Miller , John Wiley & sons
3. Introduction to FACTS controllers by Kalyan K Sen, Mey Ling Sen – John Wiley 2009

R-19 Regulations	L	T	P	M	C
EE 414/2 MACHINE LEARNING	3	0	0	100	3

UNIT-I Introduction to ML: Introduction; Types of Machine Learning – Supervised, Unsupervised, Reinforcement; Process of Machine Learning; Machine Learning vs AI; Machine Learning vs Deep Learning.

UNIT-II Supervised Learning-1: Linear Regression: Introduction to Simple Linear Regression; Simple Linear Regression in Python; Multiple Linear Regressions; Multiple Linear Regression in Python; Industry Relevance of Linear Regression. Logistic Regression: Univariate Logistic Regression; Multivariate Logistic Regression – Model Building; Multivariate Logistic Regression – Model Evaluation; Lgistic Regression - Industry Applications. Decision Trees: Introduction to Decision Trees; Algorithms for Decision Tree; Construction, Truncation and Pruning.

UNIT-III Supervised Learning-2: Naive Bayes: Bayes Theorem and Its Building Blocks; Naive Bayes for Categorical Data; Naive Bayes for Text Classification. Support Vector Machine (SVM): SVM - Maximal Margin Classifier; SVM - Soft Margin Classifier; Kernels. Ensembles methods: Bagging & boosting, AdaBoost; Gradient Boosting; Random Forests.

UNIT-IV Unsupervised Learning-1: Feature selection: K-Nearest Neighbors - Computational geometry, K-Nearest Neighbour algorithm, Aspects to consider while designing K-Nearest Neighbour. Dimensionality Reduction: Principal Component Analysis (PCA); Singular Value Decomposition (SVD); t-Distributed Stochastic Neighbor Embedding (t-SNE).

UNIT-V Unsupervised Learning-2: Clustering: Introduction to Clustering; Different clustering methods (Distance, Density, and Hierarchical); K Means Clustering; Executing K Means in Python; constructing a hierarchical cluster; Case Study (Clustering/Anomaly/Fraud Detection).

TEXT BOOKS:

1. Machine Learning, Tom Mitchell, McGraw Hill, 1997, ISBN: 978-0070428072

2. Python Machine Learning, Sebastian Raschka and VahidMirjalili, ISBN: 978-1783555130

3. Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, AurélienGéron, ISBN: 978-1491962299

REFERENCE BOOKS:

1. Pattern Recognition and Machine Learning, Christopher M. Bishop, ISBN: 978-0387310732

2. The Hundred-Page Machine Learning Book, AndriyBurkov, ISBN: 978-1999579500 3. Understanding Machine Learning: From Theory to Algorithms, ShaiShalev-Shwartz and ShaiBenDavid. VFSTR 111 Source

R-19 Regulations	L	T	P	M	C
EE 414/3 HIGH VOLTAGE ENGINEERING	3	0	0	100	3

UNIT-I

Generation of Impulse Voltages: Standard specifications - standard wave shapes for testing - properties of double exponential wave shapes - approximate estimate of wave shape control resistors -Multistage impulse generator - Energy of impulse generator.

Generation Of Impulse Currents: Standard specifications - analysis of impulse current generator.

UNIT-II

Generation Of High D.C And A.C Voltages: Principle of Voltage Doubler circuit - Cockcroft- Walton cascade arrangement and its Mathematical analysis - cascade connection of transformers - Resonant transformers - Tesla coil.

UNIT-III

Measurement Of High Voltages: General concepts of High voltage measurements - voltage Dividers (Resistive, Inductive and Capacitive) for impulse measurement. High speed Oscilloscope - peak voltmeter and Sphere gap. Use of fiber optics in H.V measurement of high voltage DC - Layout of high voltage lab.

UNIT-IV

Corona: Corona - factors affecting corona - critical voltages and power loss - Radio interference dueto Corona.

High Voltage Testing Techniques: Testing of insulators – Bushings - isolators and CB's - Testing of transformers, Fault detection using Wavelets-theoretical aspects.

UNIT-V

Numerical Methods for Electrical Field Computation: Finite difference method - Finite element method - charges simulation methods - Boundary element methods.

TEXT BOOKS:

1. High Voltage Engineering fundamentals by Kuffel, E, Zaengl W.S, Kuffel J (2^{nd}ed.) BurrerworthsHsinemann
2. High Voltage Engineering by M.S. Naidu &V.Kamaraju, TMH
3. High voltage engineering by CL Wadhwa, New age International.

REFERENCE BOOKS:

1. High Voltage Laboratory techniques by J.D. Craggs&Meak Butter Worths scientific publications, London.
2. Extra High Voltage Engineering by Rakesh Das Begamudre, New Age International
3. High Voltage measurement techniques by Schawab, M.I.T Press Cambridge, Massachusetts
4. Transformers – BHEL 2^{nd} edition, TMH
5. Finite elements for electrical engineers by silvester and peter, Cambridge University press 3^{rd} edition, 1996

R-19 Regulations	L	T	P	M	C
EE 415/1 ELECTRIC& HYBRID VEHICLES	3	0	0	100	3

Unit I
Introduction:
Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization,transmission characteristics, mathematical models to describe vehicle performance.

Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energysupplies.

Unit II
Hybrid Electric Drive-trains:
Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flowcontrol in hybrid drive-train topologies, fuel efficiency analysis.

Unit III
Electric Trains
Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives,Configuration and control of Permanent Magnet Motor drives, Configuration and control of SwitchReluctance Motor drives, drive system efficiency.

Unit IV
Energy Storage
Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching theelectricmachine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing thepower electronics, selecting the energy storage technology, Communications, supporting subsystems

UNIT V
Energy Management Strategies
Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

Text / References:

1. C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives”, John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, “Hybrid Electric Vehicles: Energy Management Strategies”, Springer, 2015.
3. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design”, CRC Press, 2004.
4. T. Denton, “Electric and Hybrid Vehicles”, Routledge, 2016.

R-19 Regulations	L	T	P	M	C
EE 415/2 RENEWABLE ENERGY SOURCES	3	0	0	100	3

UNIT-I

Principle of Renewable Energy: Comparison of renewable and conventional energy sources - Ultimate energy sources - natural energy currents on earth - primary supply to end use - Spaghetti & Pie diagrams - energy planning - energy efficiency and management.

UNIT-II

Solar Radiation: Extra-terrestrial solar radiation - terrestrial solar radiation - solar thermal conversion - solar thermal central receiver systems - photovoltaic energy conversion - solar cells – 4 models.

UNIT-III

Wind energy: Planetary and local winds - vertical axis and horizontal axis wind mills - principles of wind power - maximum power - actual power - wind turbine operation - electrical generator.

UNIT-IV

Energy from Oceans: Ocean temperature differences - principles of OTEC plant operations - wave energy - devices for energy extraction – tides - simple single pool tidal system.

UNIT-V

Geothermal energy: Origin and types - Bio fuels – classification - direct combustion for heat and electricity generator - anaerobic digestion for biogas - biogas digester - power generation.

TEXT BOOKS:

1. Renewable Energy Sources by John Twidell& Toney Weir : E&F.N. Spon
2. Renewable Energy Sources: Their impact on global warming and pollution by Abbasi&Abbasi – PHI

REFERENCE BOOKS:

1. Power plant technology by EL-Wakil, McGraw-Hill
2. Non-Conventional Energy Sources by G.D.Rai, Khanna Pub.

R-19 Regulations	L	T	P	M	C
EE 415/3 UTILIZATION OF ELECTRICAL ENERGY	3	0	0	100	3

UNIT – I

Electric Traction: Introduction- Systems of electric traction- comparison between DC and AC systems in electric traction - mechanics of train movement- speed-time curves- effect of speed- acceleration and distance on schedule- Power and energy output from driving axles- specific energy output- collectors - introduction to electric braking – comparison of electric and mechanic braking.

UNIT – II

Electric Heating: Introduction; Modes of heat transfer - Stefan's law -classification of electric heating methods- design of heating element - Construction and working of different types of induction furnaces - resistance furnace - Dielectric heating - arc furnaces .

UNIT – III

Welding: Introduction- Types of welding - resistance and arc welding - Characteristics of Carbon and metallic arc welding - comparison (Excluding electronic controls)- requirements of good weld- ultra sonic-electron beam-laser beam welding.

UNIT – IV

Illumination: Introduction- terms used in illumination-laws of illumination-Gas discharge lamps - Fluorescent lamps - Arc lamps - Filament lamps – comparison between filament and fluorescent lamps-square law methods of calculation - Factory lighting - flood lighting and street lighting-design of lighting schemes-introduction to Compact Fluorescent Lamps.

UNIT – V

Storage batteries: Applications-rating-classification-dry cell and wet cells-primary and secondary cells-charging and discharging of lead acid cells, trickle charging-methods of charging lead acid batteries-over discharging-common troubles with lead acid batteries and remedies-Nickel cadmium batteries.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U. S. Bhatnagar and A. Chakraborti, DhanpatRai& Co. Pvt. Ltd., 2001.
2. Utilization Electric Power and electric traction by J.B.Gupta, publishers-Katson books
3. Utilization, generation & conservation of electrical energy by Sunil S Rao, Khanna publishers.

Reference Books:

1. Generation, Transmission & Utilization Electric Power by A.T. Starr London, Pitman. 1953

2. Art and Science of Utilization of Electrical Energy by Partab H DhanpatRai and Sons, New Delhi. Second edition

R-19 Regulations **L T P M C**

EE 416 Industrial Management and Entrepreneur Development **3 0 0 100 3**

UNIT -I

Forecasting: Techniques of Forecasting, methods of forecasting, moving average, least squares, simple exponential smoothing, linear regression, correlation coefficient, problems. Entrepreneurial Development: Entrepreneurship, Qualities of Entrepreneur, Role of Entrepreneur, Expectations of Entrepreneur, SSI, Registration of SSI.

UNIT – II

Materials Management and MRP: Functions of materials management, purpose of inventories, types of inventories, EOQ, EPQ, Buffer stock, Reserve stock, Safety stock, relevant costs in inventory control, ABC and VED analysis,Single period inventory model.

Materials requirement planning (MRP): Importance of MRP, MRP system inputs and outputs, bill of materials, Source Selection, Vendor rating.

UNIT – III

General Management: Principles of scientific management, Principles of general management, Levels of Management, Managerial skills, brief treatment of managerial functions: planning, organizing, staffing, directing, coordinating and controlling.

Forms of Business Organization: Salient features of sole proprietorship, partnership, Joint Stock Company: private limited and public limited companies.

UNIT – IV

Marketing Management: Concept of selling and marketing – differences, functions of marketing, market research, Purchasing methods, selection of vendor, advertising and sales promotion methods, distribution channels-types, product life cycle.

Financial Management: Functions of finance, simple and compound interest, depreciation, common methods of depreciation: straight line method, declining balance method, sum of years digits method, Types of depreciation, Cash flow diagram.

UNIT-V

Personnel Management: The personnel Management function, Training and Development, recruitment, selection, performance appraisal, Styles of Leader ship, Theories of Motivation.Job Design and Analysis: Job design, Approaches of Job design, Job enrichment, Techniques of Job enrichment, Job Analysis,job description, job specification

TEXT BOOKS:

1. KK Ahuja, Industrial Management, Vol. I & II, DhanpatRai, 1978.
2. E.PaulDegarmo, John R Chanda, William G Sullivan, Engineering Economy, Mac Millan Publishing Co, 1979

REFERENCE BOOKS:

1. Philip Kotler, Marketing Management, 11th Edition, Pearson Education, 2004.
2. P. Gopalakrishnan, Hand Book of Materials Management, PHI, 1999

R-19 Regulations	**L**	**T**	**P**	**M**	**C**
EE 451 Power Systems Lab	**0**	**0**	**3**	**100**	**2**

LIST OF EXPERIMENTS:

1. Characteristics of over current relay & Earth fault relay
2. Characteristics of over voltage / under voltage relay
3. Characteristics of differential relay
4. Characteristics of definite time reverse power relay
5. Characteristics of negative sequence relay
6. Sequence impedances of alternator
7. Harmonic analysis using power network analyzer
8. Characteristics of distance relays
9. Power factor correction of induction motor
10. Determination of Transmission line parameters
11. Regulation and efficiency of transmission line including Ferranti effect
12. Reactive power control by tap changing transformers
13. Sequence impedances of transformer
14. Grading of Insulators
15. Develop a program for Y_{bus} by inspection
16. Develop a program for Z_{bus} using Z_{bus} building algorithm
17. Develop a program for Load flow analysis by Gauss - Seidel method
18. Develop a program for load flow analysis by Newton - Raphson method
19. Develop program for load flow analysis by FDLP method.

Note: Minimum of ten experiments have to be performed and recorded by the candidate to attain eligibility for University Examinations

ACHARYA NAGARJUNA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f.
2019ELECTRICAL & ELECTRONICS ENGINEERING
IV/IV B.TECH -SEMESTER II

IV/IV B.TECH -SEMESTER II

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		
				L	T	P	Internal	External	Credits
1	EE 461	Project Work	Project	0	0	0	50	100	08
2	EE 462	Seminar	Seminar	0	0	0	50	0	02
3	EE 463	MOOCS	MOOC	0	0	0	100	0	02
Total Credits									**12**