

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

(An Autonomous Institute affiliated to JNTUA, Ananthapuramu)

NAAC Accreditation with 'A' Grade, Permanent Affiliation Status from JNTUA

Pasupula Village, Nandikotkur Road, Kurnool – 518002, Andhra Pradesh, India,

www.gpcet.ac.in

CURRICULUM FRAMEWORK

UG - BACHELOR OF TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING

Under R19 Regulations

B. Tech. - Regular Four-Year Degree Program

(For batches admitted from the Academic Year 2019 - 2020)

&

B. Tech. - Lateral Entry Scheme

(For batches admitted from the Academic Year 2020 - 2021)

G.Pullaiah College of Engineering and Technology

(Autonomous)

(Approved by AICTE | NAAC Accreditation with 'A' Grade | Accredited by NBA (CSE, ECE & EEE) | Permanently Affiliated to JNTUA)

Nandikotkur Road, Venkayapalli (V), Kurnool - 518452, Andhra Pradesh

BACHELOR OF TECHNOLOGY

ACADEMIC REGULATIONS
GPCET - R19

B.Tech Regular Four Year Degree Programme
(for the batches admitted from the academic year 2019- 2020)
&
B.Tech (Lateral Entry Scheme)
(for the batches admitted from the academic year 2020 - 2021)

Preliminary Definitions and Nomenclature

AICTE: Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as Autonomous by University Grants Commission(UGC), New Delhi in concurrence with affiliating University (Jawaharlal Nehru Technological University Ananthapur).

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

Academic Council: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

Academic Year: It is the period necessary to complete an actual course of study within a year.
It comprises two main semesters i.e., (one odd and one even).

Branch: Means specialization in a program like B.Tech degree program in Civil Engineering, B.Tech degree program in Computer Science and Engineering etc.

Board of Studies (BOS): BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

Backlog Course: A course is considered to be a backlog course, if the student has obtained a failure grade in that course.

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry etc., are considered to be foundational in nature.

Commission: Means University Grants Commission (UGC), New Delhi.

Choice Based Credit System: The credit-based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

Certificate Course: It is a course that makes a student to have hands-on expertise and skills required for holistic development in a specific area/field.

Compulsory course: Course required to be undertaken for the award of the degree as per the program.

Internal Examination: It is an examination conducted towards sessional assessment.

Core: The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

Course: A course is a subject offered by a department for learning in a particular semester.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

Credit: A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial hour per week.

Credit point: It is the product of grade point and number of credits for a course.

Cumulative Grade Point Average (CGPA): It is a measure of cumulative performance of a student overall the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Curriculum: Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Department: An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff, and other resources in the process of study for a degree.

Detention in a Course: Student who does not obtain minimum prescribed attendance in a course shall be detained in that particular course.

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective and/or Open Elective.

Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal examinations and semester end examinations.

Grade: It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

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

Institute: Means G.Pullaiah College of Engineering and Technology, Kurnool unless indicated otherwise by the context.

Massive Open Online Courses (MOOC):MOOC courses inculcate the habit of self-learning. MOOC courses would be additional choices in all the elective group courses.

Minor: Minor are coherent sequences of courses which may be taken in addition to the courses required for the B.Tech degree.

Pre-requisite: A specific course or subject, the knowledge of which is required to complete before student register another course at the next grade level.

Professional Elective: It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Program: Means, UG degree program: Bachelor of Technology (B.Tech); PG degree program: Master of Technology (M.Tech) / Master of Business Administration (MBA).

Program Educational Objectives: The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

Project work: It is a design or research-based work to be taken up by a student during his/her final yearto achieve a particular aim. It is a credit-based course and is to be planned carefully by the student.

Registration: Process of enrolling into a set of courses in a semester of a program.

Regulations: The regulations, common to all B.Tech programs offered by Institute, are designated as "GPCET Regulations - R18" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 16 to 18 weeks of academic work equivalent to normally90 working days. Odd semester commences usually in July and even semester in December of every year.

Semester End Examinations: It is an examination conducted for all courses offered in a semester at the end of the semester.

Student Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioural.

University: Means Jawaharlal Nehru Technological University Ananthapur (JNTUA), Ananthapuramu.

G. Pullaiah College of Engineering and Technology

(Autonomous)

Academic Regulations

Regulations for Four Year Bachelor of Technology (B.Tech) Degree programme for the batches admitted from the academic year 2019-20

&

For B.Tech Lateral Entry batches admitted from the academic year 2020 -2021

1. 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. Pursues a course of study for not less than four academic years and in not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would not be counted in the maximum time permitted for graduation.

ii. Registers for 160 credits and secures all 160 credits.

iii. The student will be eligible to get Under graduate degree with honours or additional minor engineering if he/she completes an additional 20 credits

iv. A student will be permitted to register either for Honours degree or additional minor engineering but not both.

2. Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled.

3. Courses of study

The following courses of study are offered at present as specializations for the B. Tech. course

S.No.	Name of the Branch	Branch Code
1.	Civil Engineering	01
2.	Electrical and Electronics Engineering	02
3.	Mechanical Engineering	03
4.	Electronics and Communication Engineering	04
5.	Computer Science and Engineering	05

4. Credits:

i. *Credit:* A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture) or two hours of practical work/field work per week.

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

iii. *Choice Based Credit System (CBCS):* The CBCS provides choice for students to select from the prescribed courses.

iv. Each course is assigned certain number of credits based on following

	Semester	
	Periods / Week	Credits
Theory	03	03
Tutorial	01	01
Practical	03	1.5
Mini project/Internship	04	02
Project work Phase I/Phase II	04/16	02/08

5. Course Structure

Every course of the B.Tech program will be placed in one of the 8 categories with minimum credits as listed below.

S.No.	Category	Category Description	Abbreviated Category	Credits
1	Basic Sciences	Basic Science Courses	BS	21
2	Mandatory Courses	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge] (Non-Credit)	MC	0
3	Engineering Sciences	Engineering Science Courses including workshop, drawing, basics of electrical/mechanical/computer etc.	ES	18
4	Professional Core	Professional core courses	PC	71
5	Professional Electives	Professional Elective Courses relevant to chosen specialization/branch	PE	12
6	Open Electives	Open Subjects-Electives from other technical and / or emerging subjects	OE	12
7	Humanities & Social Sciences	Humanities and Social Sciences including Management courses	HS	13
8	Projects	Project work, Seminar and Internship in industry or elsewhere	PR	13
			Total	160

6. Weightage for course evaluation

6.1 Course Pattern

- The entire course of study is for four academic years. Semester pattern shall be followed in all years.
- A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.
- When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfillment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

6.2 Evaluation Process

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, Project Work Phase-1, Socially Relevant projects and Internships are evaluated for 100 marks each and Project Work Phase- 2 shall be evaluated for 200 marks.

- For theory subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
- For practical subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination.

6.3 Internal Examinations:

i. For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination consists of objective paper for 10 marks and subjective paper for 20 marks with duration of 1 hour 50 minutes (20 minutes for objective and 90 minutes for subjective paper)

Objective paper shall be for 10 marks. Subjective paper shall contain 5 questions of which a student has to answer 3 questions evaluated* for 20 marks

*Note: The subjective paper shall contain 5 questions of equal weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 20 marks, any fraction shall be rounded off to the next higher mark.

If the student is absent for the internal examination, no re-exam shall be conducted and internal marks for that examination shall be considered as zero.

First midterm examination shall be conducted for I, II units of syllabus and second midterm examination shall be conducted for III, IV and V units.

Final Internal marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage to the better mid exam and 20% to the other.

6.4 **End Examinations**:

End examination of theory subjects shall have the following pattern:

There shall be 6 questions and all questions are compulsory. Question I shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. There shall be 2 short answer questions from each unit. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them. Each of these questions from 2 to 6 shall cover one unit of the syllabus.

End examination of theory subjects consisting of two parts of different subjects, for eg: Electrical & Mechanical Technology, shall have the following pattern:

Question paper shall be in two parts viz., Part A and Part B with equal Weightage. In each part, there shall be 3 either-or type questions for 12, 12 and 11 marks.

Note: The answers for Part A and Part B shall be written in two separate answer books.

6.5 For practical subjects there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the laboratory shall be evaluated for 30 marks by the concerned laboratory teacher based on the regularity/record/ viva. The end examination shall be conducted by the concerned laboratory teacher and senior expert in the same subject of the department.

In a practical subject consisting of two parts (Eg: Electrical & Mechanical Lab), the end examination shall be conducted for 35 marks in each part. Internal examination shall be evaluated as above for 30 marks in each part and final internal marks shall be arrived by considering the average of marks obtained in two parts.

6.6 There shall be mandatory courses with zero credits. There shall be no external examination. However, attendance in the audit course shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a re-examination shall be conducted for failed candidates every six months/semester at a mutually convenient date of college/student satisfying the conditions mentioned in item 1 & 2 of the regulations.

6.7 For the subject having design and/or drawing, such as Engineering Drawing, the distribution shall be 30 marks for internal evaluation and 70 marks for end examination.

Day-to-day work shall be evaluated for 10 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 30 marks with consideration of 80% weightage to the better mid exam and 20% to the other for the finalization of Internal marks. The subjective paper shall contain 5 questions of equal weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 20 marks, any fraction (0.5 & above) shall be rounded off to the next higher mark. There shall be no objective paper in internal examination. The sum of day to day evaluation and the internal test marks will be the final sessional marks for the subject.

In the end examination pattern for Engineering Drawing there shall be 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing is mentioned along with the syllabus.

6.8 There shall be two comprehensive assessments, one at the end of IV Semester and the other at the end of VI Semester, with 100 objective questions for 100 marks on the subjects studied in the respective years. A student shall acquire 1 credit assigned to each of the comprehensive online examination when he/she secures 40% or more marks. In case, if a student fails in comprehensive online examination, he/she shall reappear/re-register by following a similar procedure adopted for the lab examinations.

6.9 There shall be an Open Elective/**Choice Based Credit Course (CBCC)** from V Semester, where in the students have to choose an elective offered by various departments including his/her own department.

6.10 **Minor in a discipline** (Minor degree/programme) concept is introduced in the curriculum for all conventional B. Tech programmes in which it offers a major. The main objective of Minor in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B. Tech. programme. In order to earn a Minor in a discipline a student has to earn 20 extra credits by studying four theory subjects and a minor discipline project.

a. Students who have a CGPA 8.5 (for SC/ST students CGPA 8.0) or above (up to II year-I semester) and without any backlog subjects will be permitted to register for Minor discipline programme. An SGPA and CGPA of 8.0 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Minor discipline registration active else Minor discipline registration will be cancelled.
b. Students aspiring for a Minor must register from **third** year **first** semester onwards and must opt for a Minor in a discipline other than the discipline he/she is registered in. However, Minor discipline registrations are not allowed in the **Fourth** year.
c. Students are not allowed to register and pursue more than two subjects in any semester. Students may register for minor discipline project from **third** year **first** semester onwards and may complete the same before **fourth** year **second** semester.
d. Each department enlisted a set of subjects from its curriculum which are core for the discipline without any prerequisites. The Evaluation pattern of theory subjects and minor discipline project work will be similar to the regular programme evaluation. The minor discipline project shall be evaluated by the committee consisting of Head of the Department along with the two senior faculty members of the department.
e. Students are not allowed to pursue minor discipline programme subjects under Self study and/or MOOCs manner.
f. Student may enlist their choices of Minor discipline programmes in order of preference, to which they wish to join. It will not be permissible to alter the choices after the application has been submitted. However,students are allowed to opt for only one Minor discipline programme in the order of preference given by the student.
g. Minimum strength for offering Minor in a discipline is considered as One-Fifth (i.e., 20% of the class) of the class size and Maximum size would be Four-Fifth of Class size (i.e., 80% of the class).
h. Completion of a Minor discipline programme requires no addition of time to the regular Four year Bachelors' programme. That is, Minor discipline programme should be completed by the end of final year B. Tech. program along with the major discipline.
i. The Concerned Head of the department will arrange separate course/class work and time table of the various Minor programmes. Attendance regulations for these Minor discipline programmes will be as per regular courses.
j. A Student registered for Minor in a discipline and pass in all subjects that constitute the requirement for the Minor discipline programme.No class/division (i.e., second class, fist class and distinction etc.) shall be awarded for Minor discipline programme.
k. This Minor in a discipline will be mentioned in the degree certificate as Bachelor of Technology in XXX with Minor in YYY. For example, Bachelor of Technology in **Computer Science & Engineering** with Minor in **Electronics & Communication Engineering**. The fact will also be reflected in the transcripts, along with the list of courses and a project taken for Minor programme with CGPA mentioned separately.

6.11 **Honors degree in a discipline:**

This concept is introduced in the curriculum for all conventional B. Tech. programmes. The main objective of Honors degree in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B. Tech. programme. In order to earn a Honors degree in his/her discipline, a student has to earn 20 extra credits by studying five advanced courses for 15 credits and by carrying out a mini project for 5 credits in the concerned branch of Engineering. In place of advanced courses, he/she can study equivalent MOOC courses available under SWAYAM platform, as decided by the University from time to time. The Evaluation pattern of theory subjects will be similar to the regular programme evaluation. The mini project shall be evaluated by the committee consisting of Head of the department, Supervisor and External examiner. Students aspiring for Honors degree must register from V semester onwards. However, Honors degree registrations are not

allowed before V semester and after VI semester. Student may register for mini project from V semester onwards and complete the same before VIII semester after completing at least two advanced courses or equivalent.

Procedure for Conduct and Evaluation of Honors degree Mini project:

- Out of a total of 100 marks for the Mini project, 30 marks shall be for Internal Evaluation and 70 marks for the End Semester Examination (Viva-voce). The Viva-Voce shall be conducted by a committee consisting of HOD, Project Supervisor and an External Examiner nominated by the University. The evaluation of project work shall be conducted at the end of the VIII semester. The Internal Evaluation shall be made by the departmental committee (Head of the Department and one senior faculty member of the Department and Supervisor).

  Students having a CGPA of 8.0 (for SC/ST students CGPA of 7.5) or above up to II year-I semester and without any backlog subjects will be permitted to register for degree with Honors. An SGPA and CGPA of 7.5 (for SC/ST students CGPA of 7.0) has to be maintained in the subsequent semesters without any backlog subjects in order to keep the degree with Honors registration live or else it will be cancelled.

6.12 A Socially relevant Project is introduced in IV & V/VI semesters for 1 credit in each semester. The student has to work on any socially relevant project and submit a report for evaluation. This shall be evaluated for 100 mark s in each of the above semesters by a committee consisting of Head of the department, Project mentor and one senior faculty member of the department. A student shall acquire 1 credit assigned, when he/she secures 40% or more marks for the total of 100 marks. In case, if a student fails, he/she shall resubmit the report. There shall be no external evaluation.

6.13 An Internship/Mini Project is introduced for 2 credits in the curriculum. The students need to take up the Internship during the break of end of VI Semester for a period of four weeks. The students who have not taken up the Internship may take up the Mini Project during the VII semester. The student who has taken up Internship shall submit a technical report along with internship certificate from the Internship organization in order to obtain the 2 credits. The organization in which the student wishes to carry out Internship need to be approved by Internal Department Committee comprising of Head of Department and 2 senior faculty. The evaluation of Mini Project shall be conducted at the end of the VII semester. The Internal Evaluation shall be made by the departmental committee (Head of the Department, two senior faculty members of the department and Supervisor), on the basis of project submitted by the student.

B. Tech Civil Engineering students need to take up the Mini project on Water Resource Engineering during the break of end of VI Semester for a period of four weeks for 2 credits. This shall be evaluated at the end of IV Year by a committee consisting of Head of Civil Engineering Department along with two senior faculty members of the department

6.14 **Procedure for Conduct and Evaluation of Project I:**

There shall be a presentation of Abstract of the main project in the VII Semester. After selecting the specific topic, the student shall collect the information and prepare a report, showing his/her understanding of the topic and submit the same to the department before presentation. The report and the presentation shall be evaluated by the departmental committee consisting of Head of the Department, Project supervisor and a senior faculty member. It shall be evaluated for 100 marks. A student shall acquire 2 credits assigned to the Project 1, when he/she secures 40% or more marks for the total of 100 marks. The Project 1 shall be evaluated at the end of VII semester by the department committee. There shall be no external evaluation for Project I. In

case, if a student fails in Project I, a re examination shall be conducted within a month. In case if he/she fails in the re examination also, he/she shall not be permitted to register for Project II. Further, such students shall reappear as and when VII semester supplementary examinations are conducted.

6.15 Procedure for Conduct and Evaluation of Project II:

Out of a total of 200 marks for the Project stage - II, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination (Viva-voce). The Viva-Voce shall be conducted by a committee consisting of HOD, Project Supervisor and an External Examiner. Project work shall start in VII semester and shall continue in the VIII semester. The evaluation of project work shall be conducted at the end of the VIII semester. The Internal Evaluation shall be made by the departmental committee (Head of the Department, two senior faculty members of the department and Supervisor), on the basis of two seminars given by each student on the topic of his/her project.

7. Attendance Requirements:

- A student shall be eligible to appear for University examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- 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.
- Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- 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.
- A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester when offered next.

8. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.7

8.1 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 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. In case of audit courses and technical seminar & comprehensive viva – voce he/she should secure 40% of the total marks.

8.2 A student shall be promoted from II to III year only if he/she fulfils the academic requirement of securing 40% of the credits in the subjects that have been studied up to III Semester from the following examinations.

One regular and two supplementary examinations of I Semester.
One regular and one supplementary examination of II Semester.
One regular examination of III semester.

8.3 A student shall be promoted from III year to IV year only if he/she fulfils the academic requirements of securing 40% of the credits in the subjects that have been studied up to V semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and four supplementary examinations of I Semester.

One regular and three supplementary examinations of II Semester.
One regular and two supplementary examinations of III Semester.
One regular and one supplementary examinations of IV Semester.
One regular examination of V Semester.

And in case if student is detained for want of credits for particular academic year by sections 8.2 and 8.3 above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V Semester or VII Semester as the case may be.

8.5 A student shall register and put up minimum attendance in all 160 credits and earn all the 160 credits. Marks obtained in all 160 credits shall be considered for the calculation of aggregate percentage of marks obtained.

8.6 Students who fail to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

9. Course Pattern:

(i) A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.

When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfillment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

(ii) **With–holding of Results**:

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

(iii) **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	S (Superior)	10
80-89	A (Excellent)	9
70-79	B (Very Good)	8
60-69	C (Good)	7
50-59	D (Average)	6
40-49	E (Below Average)	4
< 40	F (Fail)	0
Absent	Ab (Absent)	0

A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered. Same is the case with a student who obtains 'Ab' in end examination.

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

10. 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.,

$$\text{SGPA} = \frac{\sum_{i=1}^{n} C_i \times GP_i}{\sum_{i=1}^{n} C_i}$$

where, C_i is the number of credits of the ith subject and GP_i is the grade point scored by the student in the ith 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.,

$$\text{CGPA} = \frac{\sum_{j=1}^{m} SGPA_j \times TC_j}{\sum_{j=1}^{m} TC_j}$$

where "$SGPA_j$" is the SGPA of the jth semester and TC_j 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 SGPA the subjects in which the student is awarded Zero grade points will also be included.

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

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

11. 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	≥ 7.5
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 4.0 < 5.5

12. 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 II 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 by the College to evaluate the proposal submitted by the student and the committee shall decide whether or not to permit the student(s) to avail the Gap Year.

13. Transitory Regulations:

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfillment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, and they will be in the academic regulations into which they get readmitted.

Candidates who were permitted with Gap Year shall be eligible for rejoining into the succeeding year of their B. Tech from the date of commencement of class work, and they will be in the academic regulations into which the candidate is presently rejoining.

14. Minimum Instruction Days:

The minimum instruction days including exams for each semester shall be 90 days.

15. Medium of Instruction

The Medium of Instruction is **English** for all courses, laboratories, internal and external examinations, Comprehensive Viva-Voce and project reports.

16. Rules of Discipline

(i) Use of mobile phones with camera, in the campus is strictly prohibited.

(ii) Students shall behave and conduct themselves in a dignified and courteous manner in the campus/Hostels.

(iii) Students shall not bring outsiders to the institution or hostels.

(iv) Students shall not steal, deface, damage or cause any loss to the institution property.

(v) Students shall not collect money either by request or coercion from others within the campus or hostels.

(vi) Students shall not resort to plagiarism of any nature/extent. Use of material, ideas, figures, code or data without appropriate acknowledgement or permission of the original source shall be treated as cases of plagiarism. Submission of material, verbatim or paraphrased, that is authored by another person or published earlier by oneself shall also be considered as cases of plagiarism.

(vii) Use of vehicles by the students inside the campus is prohibited.

(viii) Any conduct which leads to lowering of the esteem of the organization is prohibited.

(ix) Any student exhibiting prohibited behaviour shall be suspended from the institute. The period of suspension and punishment shall be clearly communicated to the student. The student shall lose the attendance for the suspended period

(x) Dress Code

Boys : All the boy students should wear formal dresses. Wearing T-shirts and other informal dresses in the campus is strictly prohibited.

Girls : All the girls students shall wear saree/chudidhar with dupatta

17. ***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 Malpractice/Improper conduct**	**Punishment**
1	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cellphones, pager, palm computers or any other form of material concerned with or related to the course 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 course of the examination).	Expulsion from the examination hall and cancellation of the performance in that course 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 course.
3	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the 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 course only of all the students involved. In case of an outsider, he will be handed over to the police and a case shall be 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 course of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses 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 course and all other courses 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 course and all the other courses 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 forfeit 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 course and all other courses 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 shall be registered against them.
9	Leaves the exam hall taking away answer script or intentionally tears up the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from classwork and all end examinations. The continuation of the course by the

		candidate is subject to the academic regulations in connection with forfeiture of seat.
10	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses 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 S.No7 to S.No 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that course and all other courses 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 shall 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 for 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 shall be registered against him. The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination including practicals and project work of that semester/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 S.No 1 to S.No 12 items, it shall be reported to the college academic council for further action and 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.	

ACADEMIC REGULATIONS FOR B. TECH.(R19)
(LATERAL ENTRY SCHEME)

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2020-2021 and onwards)

1. Award of B.Tech. Degree

A student admitted in Lateral Entry Scheme (LES) will be declared eligible for the award of the B.Tech degree if he fulfills the following academic regulations:

a) Pursues a course of study for not less than three academic years and in not more than six academic years.

b) Registers for 120.5 credits and secures all *120.5* credits from II to IV year of Regular B. Tech. program.

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

(b) The regulations **3** to 7 are to be adopted as that of B. Tech. (Regular).

2. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.7

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 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. For the Seminar & Comprehensive viva-voce he should secure 40% in the internal evaluation.

ii. A student shall be promoted from third year to fourth year only if he fulfills the academic requirements of *40%* credits obtained till III-I from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and Two supplementary examinations of III semester.
One regular and one supplementary examinations of IV semester.
One regular examination of V semester.

And in case if student is already detained for want of credits for particular academic year , the student may make up the credits through supplementary exams of the above exams before the commencement of VII semester class work of next year.

3. Course Pattern

- The entire course of study is three academic years on semester pattern.
- A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

- When a student is detained due to lack of credits/shortage of attendance he may be re-admitted when the semester is offered after fulfillment of academic regulations, he shall be in the academic regulations into which he is readmitted.

4. The regulations **9** to **10** are to be adopted as that of B. Tech. (Regular).

5. 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:

FirstClass with Distinction	70% and above	From the aggregate Marks secured for 120.5 Credits (i.e. II year to IV year)
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

6. The regulations **11** to **17** are to be adopted as that of B. Tech. (Regular). All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

GPCET
Pioneering Innovative Education

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

(An Autonomous Institute affiliated to JNTUA, Ananthapuramu)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

I SEMESTER (I YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2002	Mathematics-I	BS	3	1	0	4	30	70	100
A2005	Chemistry	BS	3	0	0	3	30	70	100
A2501	Computer Programming	ES	3	1	0	4	30	70	100
A2301	Engineering Graphics and computer aided drafting	ES	1	0	4	3	30	70	100
A2009	Chemistry Laboratory	BS	0	0	3	1.5	30	70	100
A2502	Computer Programming Laboratory	ES	0	0	3	1.5	30	70	100
A2302	Co-Engineering Laboratory	ES	0	0	3	1.5	30	70	100
	TOTAL		10	2	13	18.5	210	490	700

II SEMESTER (I YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2010	Mathematics-II	BS	3	1	0	4	30	70	100
A2004	Applied Physics	BS	3	0	0	3	30	70	100
A2503	Data Structures	ES	3	0	0	3	30	70	100
A2202	Electrical Circuits-I	ES	3	0	0	3	30	70	100
A2001	Communicative English	HS	2	0	0	2	30	70	100
A2006	Communicative English Laboratory	HS	0	0	2	1.5	30	70	100
A2008	Applied Physics Laboratory	BS	0	0	3	1.5	30	70	100
A2504	Data Structures Laboratory	ES	0	0	3	1.5	30	70	100
A2205	Electrical Circuits-I Laboratory	ES	0	0	3	1.5	30	70	100
	TOTAL		14	1	11	21	270	630	900

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PROGRAMMECURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH –ELECTRICAL AND ELECTRONICS ENGINEERING

III SEMESTER (II YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2015	Transform Techniques and Complex Variables	BS	3	0	0	3	30	70	100
A2207	Electrical Machines - I	PC	3	1	0	4	30	70	100
A2208	Electro Magnetic Fields	PC	3	1	0	4	30	70	100
A2209	Electrical Circuits - II	PC	3	0	0	3	30	70	100
A2408	Electronic Circuits-I	ES	3	0	0	3	30	70	100
A2210	Electrical Machines – I Laboratory	PC	0	0	3	1.5	30	70	100
A2211	Electrical Circuits and Simulation Laboratory	PC	0	0	3	1.5	30	70	100
A2409	Electronic Circuits-I Laboratory	ES	0	0	3	1.5	30	70	100
A2017	Quantitative Aptitude and Reasoning - I	BS	1	0	0	1	30	70	100
A2032	Human Values and Professional Ethics	MC	2	0	0	0	100*	0	100*
	TOTAL		18	02	09	22.5	270	630	900

IV SEMESTER (II YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2019	Managerial Economics & Financial Analysis	HS	3	0	0	3	30	70	100
A2212	Electrical Machines – II	PC	3	0	0	3	30	70	100
A2213	Control Systems	PC	3	0	0	3	30	70	100
A2214	Electrical Power Generation	PC	3	0	0	3	30	70	100
A2419	Electronic Circuits-II	ES	3	0	0	3	30	70	100
A2215	Control Systems Laboratory	PC	0	0	3	1.5	30	70	100
A2216	Electrical Machines – II Laboratory	PC	0	0	3	1.5	30	70	100
A2420	Electronic Circuits-II Laboratory	ES	0	0	2	1	30	70	100
A2018	Quantitative Aptitude and	BS	1	0	0	1	30	70	100

	Reasoning - II								
A2217	Socially Relevant Project-I	PW	0	0	2	1	100	0	100
A2218	Comprehensive Assessment-I	PC	0	0	0	1	100	0	100
A2031	Environmental Science	MC	2	0	0	0	100*	0	100*
		TOTAL	18	00	10	22	470	630	1100

* The marks for Audit Courses/Mandatory Courses are not considered for calculating SGPA.

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PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRICALAND ELECTRONICSENGINEERING

V SEMESTER (III YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2219	Power System Transmission and Distribution	PC	3	0	0	3	30	70	100
A2220	Power Electronics	PC	3	0	0	3	30	70	100
A2221	Electrical Measurements and Instrumentation	PC	3	0	0	3	30	70	100
	Professional Elective – I	PE	3	0	0	3	30	70	100
	Open Elective-I	OE	3	0	0	3	30	70	100
A2222	Power Electronics Laboratory	PC	0	0	3	1.5	30	70	100
A2223	Electrical Measurements and Instrumentation Laboratory	PC	0	0	3	1.5	30	70	100
A2509	JAVA Programming Laboratory	PC	0	0	4	2	30	70	100
A2020	Professional English Communication Skills	HS	0	0	2	1	30	70	100
A2033	Indian Constitution and Multiculturalism	MC	2	0	0	0	100*	0	100*
	TOTAL		17	00	12	21	270	630	900

VI SEMESTER (III YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2224	Power Semiconductor Drives	PC	3	0	0	3	30	70	100
A2225	Power System Analysis	PC	3	0	0	3	30	70	100
A2429	Microprocessors and Microcontrollers	ES	3	0	0	3	30	70	100
	Professional Elective –II	PE	3	0	0	3	30	70	100
	Open Elective –II	OE	3	0	0	3	30	70	100
A2226	Power Systems and Simulation Laboratory	PC	0	0	3	1.5	30	70	100
A2227	Power Semiconductor Drives Laboratory	PC	0	0	3	1.5	30	70	100
A2432	Microprocessors and Microcontrollers Laboratory	ES	0	0	2	1	30	70	100
A2228	Socially Relevant Project-II	PW	0	0	2	1	100	0	100
A2229	Comprehensive Assessment-II	PC	0	0	0	1	100	0	100
A2034	Gender Sensitization	MC	2	0	0	0	100*	0	100*

TOTAL	**17**	**00**	**10**	**21**	**410**	**490**	**900**

* The marks for Audit Courses/Mandatory Courses are not considered for calculating SGPA

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PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRICALAND ELECTRONICSENGINEERING

VII SEMESTER (IV YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2230	Power System Operation and Control	PC	3	0	0	3	30	70	100
A2231	Power System Protection	PC	3	0	0	3	30	70	100
A2232	Utilization of Electrical Energy	PC	2	0	0	2	30	70	100
	Professional Elective –III	PE	3	0	0	3	30	70	100
	Open Elective –III	OE	3	0	0	3	30	70	100
A2233	IoT Laboratory	PC	0	0	2	1	30	70	100
A2234	Power Systems Laboratory	PC	0	0	2	1	30	70	100
A2235	Mini-Project/Internship	PW	0	0	4	2	100	0	100
A2236	Project Work Phase - I	PW	0	0	4	2	100	0	100
	TOTAL		**14**	**00**	**12**	**20**	**410**	**490**	**900**

VIII SEMESTER (IV YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
	Professional Elective –IV	PE	3	0	0	3	30	70	100
	Open Elective –IV	OE	3	0	0	3	30	70	100
A2237	Project Work Phase - II	PW	0	0	16	8	60	140	200
	TOTAL		**06**	**00**	**16**	**14**	**120**	**280**	**400**

Professional Electives:

Professional Elective – 1	
Course Code	**Title of the Course**
A2251	Special Electrical Machines
A2252	Renewable Energy Sources
A2253	Advanced Control Systems

Professional Elective – 2	
Course Code	**Title of the Course**
A2254	Hybrid Electric Vehicles
A2255	Smart Grid Technology
A2256	Digital Control Systems

Professional Elective – 3	
Course Code	**Title of the Course**
A2257	FACTS and its Applications
A2258	High Voltage Engineering
A2259	PLC and its Applications

Professional Elective – 4	
Course Code	**Title of the Course**
A2260	HVDC Transmission
A2261	Electrical Distribution Systems
A2262	AI Techniques in Power Systems

Open Electives:

Course Code	Title of the Course	L-T-P	Credits	Offered by
A2181	Basic Civil Engineering	3-0-0	3	CE
A2182	Building Planning and Construction	3-0-0	3	CE
A2183	Disaster Management	3-0-0	3	CE
A2184	Water Resources Conservation	3-0-0	3	CE
A2281	Fundamentals of Electrical Engineering	3-0-0	3	EEE
A2282	Solar Energy and its Applications	3-0-0	3	EEE
A2283	Wind Energy and its Applications	3-0-0	3	EEE
A2284	Electrical Vehicles	3-0-0	3	EEE
A2381	Optimization Techniques	3-0-0	3	ME
A2382	Mechanical Technology	3-0-0	3	ME
A2383	Introduction to Automobile Systems	3-0-0	3	ME
A2481	Basic Electronics	3-0-0	3	ECE
A2482	Introduction to Communication Systems	3-0-0	3	ECE
A2483	Fundamentals of IoT	3-0-0	3	ECE
A2581	Basic Data Structures	3-0-0	3	CSE
A2582	Fundamentals of DBMS	3-0-0	3	CSE
A2583	Basics of Software Engineering	3-0-0	3	CSE
A2584	Python for Everyone	3-0-0	3	CSE
A2585	Computer Organization and Operating Systems	3-0-0	3	CSE
A2586	Fundamentals of Artificial Intelligence and Machine Learning	3-0-0	3	CSE
A2081	Management Science	3-0-0	3	H&S
A2082	Research Methodology	3-0-0	3	H&S
A2083	Intellectual Property Rights	3-0-0	3	H&S
A2084	National Service Scheme	3-0-0	3	H&S
A2085	Yoga	3-0-0	3	H&S
A2086	Design Thinking	3-0-0	3	H&S
A2087	Entrepreneurship Development	3-0-0	3	H&S

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
CURRICULUM STRUCTURE (2019-20)

ELECTRICAL AND ELECTRONICS ENGINEERING-EEE									
I Semester									
Course Code	**Course**	**Category**	**Periods per Week**			**Credits**	**Scheme of Examination Maximum Marks**		
			L	**T**	**P**		**Internal**	**External**	**Total**
A2002	Mathematics-I	BS	3	1	0	4	30	70	100
A2005	Chemistry	BS	3	0	0	3	30	70	100
A2501	Computer Programming	ES	3	1	0	4	30	70	100
A2301	Engineering Graphics and computer aided drafting	ES	1	0	4	3	30	70	100
A2009	Chemistry Lab	BS	0	0	3	1.5	30	70	100
A2502	Computer Programming Lab	ES	0	0	3	1.5	30	70	100
A2302	Co-Engineering Laboratory	ES	0	0	3	1.5	30	70	100
TOTAL			**10**	**2**	**13**	**18.5**	**210**	**490**	**700**
II Semester									
Course Code	**Course**	**Category**	**Periods per Week**			**Credits**	**Scheme of Examination Maximum Marks**		
			L	**T**	**P**		**Internal**	**External**	**Total**
A2010	Mathematics-II	BS	3	1	0	4	30	70	100
A2004	Applied Physics	BS	3	0	0	3	30	70	100
A2503	Data Structures	ES	3	0	0	3	30	70	100
A2202	Electrical Circuits-I	ES	3	0	0	3	30	70	100
A2001	Communicative English	HS	2	0	0	2	30	70	100
A2006	Communicative English Lab	HS	0	0	2	1.5	30	70	100
A2008	Applied Physics Lab	BS	0	0	3	1.5	30	70	100
A2504	Data Structures Lab	ES	0	0	3	1.5	30	70	100
A2205	Electrical Circuits-I Lab	ES	0	0	3	1.5	30	70	100
TOTAL			**14**	**1**	**12**	**21**	**270**	**630**	**900**

G.PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
Mathematics-I

Title of the Course :	**Mathematics-I**			
Branches for which this course is offered**:**	I.B.Tech I Sem (Common to all)	L	T	C
		3	1	4

Course Overview:
This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include:Solution of system of linear equations, Eigen values and Eigen vectors, Quadratic forms,Functions of single variable,Roll's theorem,legranges mean value theorem, cauchy mean value theorem,multivariable calculus, jacobian, maxima&minimaEvaluate the double and Triple integrals and its applicatons,Special functions.The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program

Course Objectives:
• To enlighten the concepts of calculus and linear algebra • To prepare the students with standard concepts and tools in mathematics • To develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes :	
After successful completion of the course , the student will be able to	
CO1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications
CO2	Interpret the Eigen values and Eigen vectors of matrix in terms of the transformation it represents in to a matrix Eigen value problem
CO3	Utilize mean value theorems to real life problems
CO4	familiarize with functions of several variables which is useful in optimization
CO5	Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
CO6	Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

Course Content:		
Unit-I	**Matrix Opreations And Solving Systems Of Linear Equations**	**Lecturer Hours:10Hrs**
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,		
Unit-II	**Quadratic forms and Mean Value Theorems**	**Lecturer Hours:8Hrs**
Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof).		
Unit-III	**Multivariable Calculus**	**Lecturer Hours:8Hrs**
Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers with three variables only.		
Unit-IV	**Double Integrals**	**Lecturer Hours:8Hrs**
Double integrals, change of variables ,change of order of integration, double integration in polar coordinates, areas enclosed by plane curves		
UNIT-V	**Multiple Integrals and Special Functions**	**Lecturer Hours:8Hrs**
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.		

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

2. Engineering Mathematics-I by by E. Rukmangadachari, E. Keshava Reddy, Pearson Publications

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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

CHEMISTRY

Title of the Course:	Chemistry				
Branches for which this course is offered:	I B.Tech I Sem (ECE & EEE) I B.Tech II Sem (CSE)	L 3	T 0	P 0	C 3

Course Overview

This course acquaint the students with different softening methods and develops the study of electrochemical cells, types of batteries and their applications , Interactions between them, emphasizing their properties and indicating some applications. It deals with more advanced topics, familiarises engineering material, their properties and applications which provides the student to impart knowledge on corrosion and its significance, to explain nano and Smart materials and their uses.

Course Objectives

- To instruct electrochemical energy systems and their applications.
- To impart knowledge on the basic concepts of bonding in different molecules.
- To familiarize various sources of polymers technology .
- To impart the knowledge in different instrumental methods.
- To introduce different types of nano-materials.
- To expose the students to latest instrumental techniques such as scanning electronic microscope (SEM) & transmission electron microscope (TEM) and colloidal chemistry.

Course Outcomes:

After successful completion of the course, the student will be able to

CO 1	To illustrate the molecular orbital energy levels for different molecular species and apply Schrödinger wave equation and particle in a box.
CO 2	To differentiate between pH metry Potentio metry and conductometric titrations.
CO 3	Explain the preparation properties and applications of polymers and describe the mechanism of conduction in conducting polymers.
CO 4	Understand the principles of different analytical instruments and explain their applications.
CO 5	Explain the concept of nano clusters nano wires and characterize the applications of SEM & TEM.
CO 6	Explain of different types of colloids ,their preparations , properties and applications

Course Content		
UNIT – I	**Structure and Bonding Models**	**Lecture Hours: 10**
Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2 , applications to hydrogen, particle in a box and their applications for conjugated molecules, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order, crystal field theory – salient features – energy level diagrams for transition metal ions – splitting in octahedral and tetrahedral environments, magnetic properties and colour, band theory of solids – band diagrams for conductors, semiconductors and insulators, role of doping on band structures		
UNIT – II	**Electrochemistry and Applications**	**Lecture Hours: 10**
Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems, concept of pH, pH meter and applications of pH metry (acid-base titrations), potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working and applications, photogalvanic cells with specific examples. Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, alkali metal sulphide batteries Secondary cells – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions, button cells. , Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.		
UNIT-III	**Polymer Chemistry**	**Lecture Hours: 10**
Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation. Plastomers: Thermoplastics and Thermosetting, Preparation, properties and applications of – Bakelite, urea-formaldehyde, Nylons. Elastomers: Buna-S, Buna-N–preparation, properties and applications. Conducting polymers – polyacetylene, polyaniline,– mechanism of conduction and applications.		
UNIT-IV	**Instrumental Methods and Applications**	**Lecture Hours: 10**
Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. Principle and applications of pH metry, potentiometer, conductometry, UV-spectroscopy, IR and NMR. Principles of Gas Chromatography (GC) and High Performance Liquid Chromatography (HPLC)		
UNIT – V	**Nano materials and Colloidal chemistry**	**Lecture Hours: 10**
Introduction to nano materials: Nano particles, nano clusters, (CNT's) and nano wires. Chemical synthesis of nano materials- Sol gel method. Characterization: principle and application of scanning electron microscope(SEM) and Transmission Electron Microscope(TEM). Introduction to colloidal chemistry - colloidal, Micelle formation, synthesis of colloids (any two methods with examples),properties and applications. .		

Text Books
1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013. 2.Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010. 3. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1/e Mc Graw Hill Education (India) Pvt Ltd, New Delhi 2016 4.B.K Sharma Engineering Chemistry, Krishna Prakashan, Meerut.
Reference Books
1. J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008. 2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007. 3. Ben L. Feringa and Wesley R. Browne, Molecular Switches, 2/e, Wiley-VCH, 2011

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

COMPUTER PROGRAMMING

Title of the course:	**COMPUTER PROGRAMMING**				
Branches for which this course is offered:	B.TECH I SEMESTER (Common to all branches)	L	T	P	C
		3	1	0	4

COURSE OVERVIEW :
• The course covers the basic programming and demonstrates fundamental programming techniques. • This course helps the students gaining the knowledge to write python language applications, mathematical and engineering problems. • Helps to undertake future courses that assume this programming language as a background in computer programming.

COURSE OBJECTIVES :
• Understand problem solving techniques using python • Understand representation of a solution to a problem • Understand the syntax and semantics of Python programming language • Understand the significance of Control structures • Learn the features of Python language

COURSE OUTCOMES:	
After successful completion of the course, the student will be able to	
CO1	Comprehend the fundamental concepts of computer hardware and problem solving abilities
CO2	Knowledge on the basic concepts of algorithms, flow charts and python programming
CO3	Ability to analyze the procedure for providing input and acquire output from the program along with implementation of control statements
CO4	Interpret the importance of functions in programming
CO5	Analyze and Modularize the problem and its solution by using functions.
CO6	Ability to relate the concepts of strings, files and preprocessors to the real world applications

Course Content:		
UNIT-I	**Introduction to Computers and Problem Solving Strategies**	**LECTURE HOURS: 8**
Introduction, Defining a Computer, History of Computers, Characteristics of Computers, Classification of Computers, Applications of Computers, Components and Functions of a Computer System, Concept of Hardware and Software, Central Processing Unit(CPU),I/O Devices, Computer Memory, Classification of Computer Software, Problem Solving Strategies, Program Design Tools.		

UNIT-II	Basics of Python Programming:	LECTURE HOURS: 10
Introduction to computer and python programming, History of python, Basics of python programming, python character set, tokens, data types, output function, multiple assignments, formatting numbers and strings **Operators and Expressions:** Arithmetic Operators, Comparison Operators, Assignment and In-place or Shortcut Operators, Unary Operators, Bitwise Operators, Shift Operators, Logical Operators, Membership Operators, Identity Operators, Operator Precedence and Associatively, Expressions in Python.		
UNIT-III	**Decision Control Statements and Sequences**	**LECTURE HOURS: 12**
Decision statements: Boolean type, Boolean operators, numbers, strings with Boolean operators, decision making statements, conditional expressions. **Loop control statements:** while loop, range function, for loop, nested loops, break and continue statements. **Data Structures:** Sequence, Lists, Tuples, Sets, Dictionaries. Functional Programming: filter(), map(), reduce() , Python Strings.		
UNIT-IV	**Functions and Modules**	**LECTURE HOURS: 10**
Functions: Basics of functions, syntax, use of a function, local and global scope of a variable, return statement, recursive functions, lambda functions, parameters and arguments in functions. **Modules:** The from…import statement, Name of Module, Making your own Modules, dir() function, The Python Module, Modules and Namespaces, Packages in Python, Standard Library modules, Globals(), Locals() and Reload(), Function Redefinition.		
UNIT-V	**Exception and File handling**	**LECTURE HOURS: 8**
Exceptions: Introduction, Handling Exceptions, Multiple Except Blocks, else Clause, Raising Exceptions, finally Block, Re-raising Exception. **File Handling:** Introduction, Need of file handling, text input and output files, seek function, binary files. Extracting data from a file and performing some basic operations on it.		

Text Books:	
1	Programming and problem solving with python by Ashok Namdev Kamthane,Amit Ashok Kamthane., McGraw-Hill Education
2	Python programming using problem solving approach by Reema Thareja, Oxford.

Reference Books:	
1	Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
2	Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015.
3	Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd edition, O'Reilly, 2016. Or http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

ENGINEERING GRAPHICS AND COMPUTER AIDED DRAFTING

Title of the Course:	**ENGINEERING GRAPHICS AND COMPUTER AIDED DRAFTING**				
Branches for which this course is offered:	I B.Tech I Sem (ECE & EEE) I B.Tech II Sem (CIV,MEC & CSE)	L	T	P	C
		1	0	4	3

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.

Course Outcomes:	
After successful completion of the course, the student will be able to	
CO1	Learning conventions of Drawing, which is an Universal Language Of Engineers. Also Interpret and Sketch the various curves which Including ellipse, parabola, hyperbola
CO2	Analyze and draft the orthographic projections of points and lines
CO3	Analyze and sketch the orthographic projections of planes and solids
CO4	Revise and Improve their visualization skills in the development of new products
CO5	Construct the isometric projection of an object employing orthographic projections
CO6	Drawing 2D and 3D diagrams of various objects

Practice	
S. No	**Title of the Experiment**
1	Introduction to engineering drawing: Principles of Engineering Graphics and their significance, Usage of Drawing instruments.
2	Lettering and dimensions
3	Conic sections- Ellipse (General methods only)
4	Conic sections- Parabola (General methods only)
5	Conic sections- Hyperbola (General methods only)
6	Principles of Orthographic Projections-Conventions.
7	Projections of Points
8	Projections of lines
9	Projections of lines inclined to one plane.
10	Projections of regular solids: Prism, Cylinder.
11	Projections of Pyramid, Cone
12	Development of surfaces of right regular solids: prism & Cylinder
13	Development of surfaces of right regular solids pyramid & Cone.
14	Isometric projections:Principles of Isometric projection, Isometric Scale
15	Isometric Views of Planes
16	Isometric Views of Simple solids –Prism & Cube
17	Isometric Views of Simple solids –Cylinder and Cone
18	Conversion of Isometric Views to Orthographic Views
19	Introduction to AutoCAD Software: The Menu System, Toolbars, Command Line, Status Bar, Shortcut menus (Button Bars)
20	Customization & CAD Drawing:, Setting of units and drawing limits, drawing simple figures.
21	Producing drawings by using Absolute coordinate input entry method to draw straight lines.
22	Producing drawings by using Relative coordinate input entry method to draw straight lines.
23	Producing drawings by using polar coordinate input entry method to draw straight lines.
24	Applying dimensions to objects.
25	Editing options.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

CHEMISTRY LAB

Title of the Course	Chemistry Lab				
Branches for which this course is offered:	I B.Tech I Sem (ECE & EEE) I B.Tech II Sem (CSE)	L 0	T 0	P 3	C 1.5

Course Overview:
• Will learn practical understanding of the redox reactions • Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineers these to suit diverse applications • Will learn practical understanding of Potentiometric titrations

Course Objectives:
• To familiarize the students with the basic concepts of Engineering Chemistry lab. • To train the students on how to handle the instruments. • To demonstrate the digital and instrumental methods of analysis. • To expose the students in practical aspects of the theoretical concepts.

Course Outcomes:	
After successful completion of the course, the student will be able to	
CO 1	Determine the cell constant and conductance of solutions
CO 2	Prepare advanced polymer materials
CO 3	Measure the strength of an acid present in secondary batteries
CO 4	pH metric titrations
CO 5	Verify Lambert-Beer's law
CO 6	Potentiometry - determination of redox potentials and emfs

List of Experiments
1. Determination of cell constant and conductance of solutions
2. Conductometric titrations of Strong acid Vs Strong base
3. pH metric titration of weak acid vs. strong base
4. Potentiometry - determination of redox potentials and emfs
5. Estimation of Ferrous Iron by Dichrometry
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a polymer
8. Adsorption of acetic acid by charcoal
9. Verify Lambert-Beer's law
10. Determination of copper by colorimetry
11. Thin layer chromatography
12. Identification of simple organic compounds by UV-Visible Spectral analysis
13. Preparation of nanomaterials
14. HPLC method in separation of gaseous and liquid mixtures

Reference Books
1. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers (2000).
2. N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat Rai Publishing Company (2007).

G.PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

(COMPUTER PROGRAMMING LAB)

Title of the course:	**COMPUTER PROGRAMMING LAB**				
Branches for which this course is offered:	B.TECH I SEMESTER (ALL BRANCHES)	L	T	P	C
		0	0	3	1.5

Title of the course:	**COMPUTER PROGRAMMING LAB**
Branches for which this course is offered:	B.TECH I SEMESTER(Common to all branches)

COURSE OBJECTIVES :
• Demonstrate the use of problem solving techniques. • Illustrate the Python programming constructs through simple programs • To train solving computational problems • To elucidate solving mathematical problems using Python programming language

COURSE OVERVIEW :
• This lab helps the students gaining the knowledge to write python language applications, mathematical and engineering problems • Helps the students to apply python programming libraries in solving the computational problems.

COURSE OUTCOMES:	
After successful completion of the course, the student will be able to	
CO1	Design solutions to mathematical problems & Organize the data for solving the problem
CO2	Understand and implement modular approach using python
CO3	Learn and implement various data structures provided by python library including string, list, dictionary and its operations etc
CO4	Understands about files and its applications.
CO5	Develop real-world applications, files and exception handling provided by python
CO6	Select appropriate programming construct for solving the problem

Course Content:		
TASK-1		**PRACTICAL HOURS: 2**
a). Python Program to Calculate the Average of Numbers in a Given List. b). Python Program to Exchange the Values of Two Numbers Without Using a Temporary Variable. c). Python Program to Read a Number n and Compute n+nn+nnn. d). Python Program to Check Whether a Number is Positive or Negative		
TASK-2		**PRACTICAL HOURS: 2**
a) Accept a number and display its factorial b) Accept a multi digit number and display its sum c) Accept n numbers and display big number out of them d) Accept n numbers and display big and next biggest number e) Accept n and display prime number or not		
TASK-3		**PRACTICAL HOURS:2**
a). Write a Python Program to find the longest common prefix string amongst an array of strings. b). Write a Python Program to Check if a Number is a Perfect Number. c). Write a Python Program to Check if a Number is a Strong Number. d). Write a Python Program to Generate Random Numbers from 1 to 20 and append them to the List.		
TASK-4		**PRACTICAL HOURS: 2**
a). Write a Python Program to Form a New String where the First Character and the Last Character have been Exchanged. b). Write a Python Program to Count the Number of Vowels in a String. c). Write a Python Program to Take in a String and Replace Every Blank Space with Hyphen. d). Write a Python Program that Displays which Letters are Present in both the Strings		
TASK-5		**PRACTICAL HOURS: 2**
Accept 50 student details(sno,name,m1,m2,m3) of a class and display the details along with their total and average marks. Also display the student's name and highest average, student's name with highest m1, highest m2 and highest m3.		
TASK-6		**PRACTICAL HOURS: 2**
From a class of 50 students, some appeared for JEE mains, Deemed exam and some for EAMCET exam. There are students who attended more than one examination. List out the students who answered only JEE mains, only Deemed and only advanced. Also list out the students who answered all.		
TASK-7		**PRACTICAL HOURS: 2**

If we list all the natural numbers below 10 that are multiples of 3 or 5, we get 3, 5, 6 and 9. The sum of these multiples is 23. Write a Python program to find the sum of all the multiples of 3 or 5 below 1000.

TASK-8		**PRACTICAL HOURS: 2**

Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
By considering the terms in the Fibonacci sequence whose values do not exceed four million, write a program to find the sum of the even-valued terms.

TASK-9		**PRACTICAL HOURS: 2**

A palindrome number reads the same both ways. The largest palindrome made from the product of two 2-digit numbers is $9009 = 91 \times 99$. Write a program to find the largest palindrome made from the product of two 3-digit numbers.

TASK-10		**PRACTICAL HOURS: 2**

The following iterative sequence is defined for the set of positive integers:
$n \rightarrow n/2$ (n is even)
$n \rightarrow 3n + 1$ (n is odd)
Using the rule above and starting with 13, we generate the following sequence: $13 \rightarrow 40 \rightarrow 20 \rightarrow 10 \rightarrow 5 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$
It can be seen that this sequence (starting at 13 and finishing at 1) contains 10 terms. Although it has not been proved yet (Collatz Problem), it is thought that all starting numbers finish at 1.
Write a program to find the starting number, under one million, produces the longest chain.

TASK-11		**PRACTICAL HOURS: 2**

Given the following information, you may prefer to do some research for yourself.

- 1 Jan 1900 was a Monday.
- Thirty days for September, April, June and November.
- All the rest have thirty-one days and on leap years, twenty-nine days.
- A leap year occurs on any year evenly divisible by 4, but not on a century unless it is divisible by 400.

Write a program to find how many Sundays fell on the first of the month during the twentieth century (1 Jan 1901 to 31 Dec 2000).

TASK-12		**PRACTICAL HOURS: 2**

A perfect number is a number for which the sum of its proper divisors is exactly equal to the number. For example, the sum of the proper divisors of 28 would be $1 + 2 + 4 + 7 + 14 = 28$, which means that 28 is a perfect number.
A number n is called deficient if the sum of its proper divisors is less than n and it is called abundant if this sum exceeds n.
As 12 is the smallest abundant number, $1 + 2 + 3 + 4 + 6 = 16$, the smallest number that can be written as the sum of two abundant numbers is 24. By mathematical analysis, it can be shown that all integers greater than 28123 can be written as the sum of two abundant numbers. However, this

upper limit cannot be reduced any further by analysis even though it is known that the greatest number that cannot be expressed as the sum of two abundant numbers is less than this limit.
Write a program to find the sum of all the positive integers which cannot be written as the sum of two abundant numbers.

TASK-13		**PRACTICAL HOURS: 2**

Starting with the number 1 and moving to the right in a clockwise direction a 5 by 5 spiral is formed as follows:
21 22 23 24 **25**
20 **7** 8 **9** 10
19 6 **1** 2 11
18 **5** 4 **3** 12
17 16 15 14 **13**

TASK-14		**PRACTICAL HOURS: 2**

The decimal number, 585 = 1001001001_2 (binary), is palindrome in both bases.
Write a program to find the sum of all numbers, less than one million, which are palindrome in base 10 and base 2.

TASK-15		**PRACTICAL HOURS: 2**

Write a program to ensure that the first and last names of people begin with a capital letter in their passports. For example, mohan kumar should be capitalized correctly as Mohan Kumar.
Given a full name, your task is to *capitalize* the name appropriately.

TASK-16		**PRACTICAL HOURS: 2**

The professor is conducting a course on Discrete Mathematics to a class of N students. He is angry at the lack of their discipline, and he decides to cancel the class if there are less than K students present after the class starts. Given the arrival time of each student, your task is to find out if the class gets cancelled or not.

TASK-17		**PRACTICAL HOURS: 2**

The prime 41, can be written as the sum of six consecutive primes:
41 = 2 + 3 + 5 + 7 + 11 + 13.
This is the longest sum of consecutive primes that adds to a prime below one-hundred. The longest sum of consecutive primes below one-thousand that adds to a prime, contains 21 terms, and is equal to 953. Write a program to find which prime, below one-million, can be written as the sum of the most consecutive primes.

TASK-18		**PRACTICAL HOURS: 2**

Given a dictionary and a character array, write a program to print all valid words that are possible using characters from the array. Note: Repetitions of characters is not allowed.
Examples: Input : Dict = ["go","bat","me","eat","goal","boy", "run"]
arr = ['e','o','b', 'a','m','g', 'l']

Output : go, me, goal.

TASK-19		**PRACTICAL HOURS: 2**

Write a Python program to write data into a file
Write a Pytnon program to read the content of accepted file
Write a Python program to read last n lines of a file.
Write a Pytnon program to read a file and list out number of words, lines and characters present in it.

TASK-20		**PRACTICAL HOURS: 2**

Write a Python program to copy the contents of a file to another file.
Merge two files and write the content into third file
Read the CSV file and display its statistics

TASK-21		**PRACTICAL HOURS: 2**

In a row of dominoes, A[i] and B[i] represent the top and bottom halves of the i-th domino. (A domino is a tile with two numbers from 1 to 6 - one on each half of the tile.)
We may rotate the i-th domino, so that A[i] and B[i] swap values. Return the minimum number of rotations so that all the values in A are the same, or all the values in B are the same. If it cannot be done, return -1.

TASK-22		**PRACTICAL HOURS: 3**

Kiran and Ramu take turns playing a game, with Kiran starting first. Initially, there is a number N on the chalkboard. On each player's turn, that player makes a *move* consisting of:

- Choosing any x with 0 < x < N and N % x == 0.
- Replacing the number N on the chalkboard with N - x.

Also, if a player cannot make a move, they lose the game.
Return True if and only if Kiran wins the game, assuming both players play optimally.

TASK-23		**PRACTICAL HOURS: 3**

On an infinite plane, a robot initially stands at (0, 0) and faces north. The robot can receive one of three instructions:

- "G": go straight 1 unit;
- "L": turn 90 degrees to the left;
- "R": turn 90 degress to the right.

The robot performs the instructions given in order, and repeats them forever.
Return true if and only if there exists a circle in the plane such that the robot never leaves the circle.

Text Books:	
1	Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd edition, O'Reilly, 2016. Or http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
2	Algorithmic Problem Solving with Python, John B. Schneider ,Shira Lynn Broschat, Jess Dahmen
3	Think in Python, Allen Downey, Green Tea Press, Needham, Massachusetts

Reference Books:	
1	Paul Barry, "Head First Python a Brain Friendly Guide" 2nd Edition, O'Reilly, 2016
2	Dainel Y.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

CO-ENGINEERING LABORATORY

Title of the Course:	**CO-ENGINEERING LABORATORY**				
Branches for which this course is offered:	I B.Tech I Sem (ECE & EEE) I B.Tech II Sem (CIV,MEC & CSE)	L	T	P	C
		0	0	3	1.5

Course Objectives:
• understand the basics of resistor and capacitor codes • To introduce students to the basic theory of power semiconductor devices and passive components, their practical applications in power electronics. • To provide strong foundation for further study of power electronic circuits and systems. • To familiarize the characteristics operations, calibrations and applications of the oscilloscope • to analyse and interpret test results and measurements on electric circuits, in terms of theoretical models, to predict the performance of electric circuits from device characteristics and to design an electronic printed circuit board for a specific application using industry standard software • To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Course Outcomes:	
After successful completion of the course, the student will be able to	
CO1	To acquire the knowledge about the characteristics and working principles of semiconductor diodes, Bipolar Junction Transistor
CO2	Analysis of Single Phase AC Circuits, the representation of alternating quantities and determining the power in these circuits
CO3	Able to Measure the amplitude and frequency utilizing oscilloscope and analyze the fabrication processes of printed circuit boards
CO4	Apply wood working skills in real world applications. Build different parts with metal sheets in real world applications
CO5	Apply fitting operations in various applications
CO6	Apply different types of basic electric circuit connections

S. No	Title of the Experiment
1	• Passive Electronic Components • Color code for resistors • Coding for capacitors • Prototyping aids
2	• Active Electronic Components • Power sources
3	• Cathode Ray Oscilloscope (CRO) • Multi meters • DC Power Source • Signal Generator
4	• Printed Circuit Board • Soldering Practice (Soldering & De soldering)
5	**Fitting Trade -** To make a L- fit from the given M.S Flat material piece.
6	**Carpentry Trade -** To make a cross lap joint as per specification.
7	**Tin Smithy –** To make a open scoop with the given sheet metal
8	**Foundry:** To prepare a sand mould using a single piece pattern.
9	Residential house wiring using fuse, switch, indicator, lamp and energy meter
10	Tube light wiring
11	Go Down Wiring
12	Stair case wiring

G.PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
Mathematics-II

Title of the Course :	**Mathematics-II**				
Branches for which this course is offered**:**	I.B.Tech II Sem (Common to CE,EEE,ME & ECE)	L	T	P	C
		3	1	0	4

Course Overview:
This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: Linear Differential Equations of Higher Order, Equations Reducible to Linear Differential Equations and Applications, Partial Differential Equations – First order, Multivariable Calculus (Vector differentiation &Integration).The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Objectives:
• To educate the learners in the concept of differential equations and multivariable calculus. • To develop the mathematical skills from this course provides necessary base for the program. • To provide the learners with basic concepts and techniques at intermediate level to lead them into advanced level by handling various real world applications.

Course Outcomes :	
After successful competion of the course , the student will be able to	
CO1	Apply the mathematical principles to solve second and higher order differential equations
CO2	Analyze the non- homogeneous linear differential equations along with method of variation of parameters
CO3	Apply the concept of higher order differential equations to the various streams like Mass spring system and L-C-R Circuit problems
CO4	Apply a range of techniques to find solutions of standard PDEs and basic properties of standard PDEs
CO5	Analyze the vector calculus involving divergence, curl and their properties along with vector identities
CO6	Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals.

Course Content:		
Unit-I	**Linear Differential Equations of Higher Order**	**Lecturer Hours:8Hrs**
Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.		
Unit-II	**Equations Reducible to Linear Differential Equations and Applications**	**Lecturer Hours:10Hrs**
Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, Applications: Mass spring system and L-C-R Circuit problems.		
Unit-III	**Partial Differential Equations – First order**	**Lecturer Hours:8Hrs**
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.		
Unit-IV	**Multivariable Calculus (Vector differentiation)**	**Lecturer Hours:8Hrs**
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.		
UNIT-V	**Multivariable Calculus (Vector integration)**	**Lecturer Hours:8Hrs**
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).		

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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

APPLIED PHYSICS

Title of the Course	Applied Physics				
Branches for which this course is offered	I B.Tech I Sem (CSE) and I B.Tech II Sem (ECE &EEE)	L	T	P	C
		3	0	0	3

Course Overview

There has been an exponential growth of knowledge in the recent past opening up new areas and challenges in the understanding of basic laws of nature. This helped to the discovery of new phenomena in macro, micro and nano scale device technologies. The laws of physics play a key role in the development of science, engineering and technology. Sound knowledge of physical principles is of paramount importance in understanding new discoveries, recent trends and latest developments in the field of engineering. To keep in pace with the recent scientific advancements in the areas of emerging technologies, the syllabi of engineering physics has been thoroughly revised keeping in view of the basic needs of all engineering branches by including the topics like physical optics, properties of dielectric and magnetic materials, electromagnetic theory, fiber optics, semiconductors, superconductivity are introduced.The applications of nanomaterials relevant to engineering branches are to be familiarized.

Course Objectives

- To impart knowledge in basic concepts of physical optics along with its engineering applications
- To interpret the significant concepts of dielectric and magnetic materials which leads to potential applications in the emerging micro devices
- To disseminate the basic concepts of electromagnetic waves and its propagation in optical fiber along with its engineering applications
- To analyze the importance of semiconductors in the functioning of electronic devices
- To summarize the properties of superconductors along with their applications
- To familiarize the applications of nanomaterials relevant to engineering branches

Course Outcomes	
After Successful completion of the course, the student will able to	
CO1	**Interpret** the properties of light waves and its interaction of energy with the matter
CO2	**Explain** the principles of physics in dielectrics and magnetic materials
CO3	**Apply** electromagnetic wave propagation in different guided media
CO4	**Calculate** conductivity of semiconductors
CO5	**Interpret** the difference between normal conductor and super conductor
CO6	**Demonstrate**the application of nanomaterials

Course Content			
Unit-I	**Physical Optics**	**Lecture Hours**	**8**
Interference: Superposition principle-Interference of light-Theory of Interference fringes-necessary conditions for Interference -Interference in thin films by reflection -Newton's Rings-Determination of Wavelength-Engineering applications of Interference **Diffraction**-Fraunhofer Diffraction-Single slit Diffraction -Diffraction Grating – Grating Spectrum -Determination of Wavelength-Engineering applications of Diffraction **Polarization**-Polarization by birefringence-Nicol's Prism--Half wave and Quarter wave plate- Engineering applications of Polarization.			
Unit-II	**Dielectrics and Magnetics**	**Lecture Hours**	**12**
Dielectrics: Introduction to Dielectrics--Electric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations-Electronic and ionic polarizations with mathematical Derivations-orientation polarization(quantitative) - Frequency dependence of polarization-Lorentz(internal) field-Claussius -Mosotti equation-Applications of Dielectrics . **Magnetics**:Introduction to Magnetics-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials-Weiss theory of ferromagnetism (qualitative)-Hysteresis-soft and hard magnetic materials-Ferrites-Applications of magnetic materials.			
Unit-III	**Electromagnetic Waves and Fiber Optics**	**Lecture Hours**	**10**
Electromagnetic Waves : Divergence of Electric and Magnetic Fields-Gauss theorem for divergence-Curl of Electric and Magnetic Fields-Stokes theorem for curl- Maxwell's Equations- Electromagnetic wave propagation (conducting and non-conducting media)-Poynting's Theorem. **Fiber Optics**: 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 - importance of V number-Medical Applications-Fiber optic Sensors-Block Diagram of Fiber optic Communication.			
Unit-IV	**Semiconductors**	**Lecture Hours**	**8**
Origin of energy bands - Classification of solids based on energy bands – Intrinsic semi - conductors –carrier concentration of charge carriers-Fermi energy – Electrical conductivity - extrinsic semiconductors - P-type & N-type - carrier concentration of charge carriers - Dependence of Fermi energy on carrier concentration and temperature- Direct and Indirect band gap semiconductors-Hall effect- Hall coefficient - Applications of Hall effect - Drift and Diffusion currents - Continuity equation - Applications of Semiconductors.			
Unit-V	**Superconductors and Nano materials**	**Lecture Hours**	**8**
Superconductors:Superconductors-Properties-Critical parameters of Superconductors-Meissner effect-BCS Theory- AC & DC Josephson Effect -Types of Superconductors-SQUID-Applications. **Nano materials:**Introduction-significance of nanoscale**-**Basic Principles of Nano materials – Properties of nanomaterials: optical, mechanical thermal and magnetic materials-Synthesis of nanomaterials: Top-down and bottom-up approach methods-Ball milling-chemical vapour deposition method-Characterization of nanomaterials: X-ray diffraction method (XRD)-Scanning Electron Microscope (SEM) - Applications of Nano materials.			

Text Books	
1	M.N. Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy "A Text book of Engineering Physics"-S.Chand Publications,11th Edition 2019
2	B.K.Pandey an S.Chaturvedi, "Engineering Physics",Cengage Laerning,2012
References	
1	David J.Griffiths, "Introduction to Electrodynamics"- 4/e, Pearson Education,2014
2	P.K.Palaniswamy, "Engineering Physics" Scitech Publications,2011
3	Shatendra Sharma,Jyotsna Sharma, "Engineering Physics" Pearson Education,2018
4	T Pradeep "A Text book of Nano Science and Nano Technology"- Tata Mc GrawHill 2013

G.PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

DATA STRUCTURES

Title of the course:	**Data Structures**				
Branches for which this course is offered:	I B.Tech II SEMESTER	L	T	P	C
	(Common to all branches)	3	0	0	3

COURSE OVERVIEW :
• This course covers general purpose data structures and algorithms. • Topics covered include space and time complexity, analysis, static data and dynamic data structures.

COURSE OBJECTIVES:
• Understand problem solving techniques • Understand representation of a solution to a problem • Understand the syntax and semantics of programming language • Understand the significance of Control structures • Learn the features of language

COURSE OUTCOMES:	
After successful completion of the course, the student will be able to	
CO1	Learn to choose appropriate data structure as applied to specified problem definition.
CO2	Design and analyze linear and non-linear data structures.
CO3	Design algorithms for manipulating linked lists, stacks, queues, trees and graphs in python
CO4	Demonstrate advantages and disadvantages of specific algorithms and data structures
CO5	Develop a base for advanced computer science study.
CO6	Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.

Course Content:		
UNIT-I	**Introduction to Problem Solving Using C**	**LECTURE HOURS: 12**
Introduction: Structure of C Program, Identifiers, Basic data types, Variables, Constants, I/O functions , Operators, Selection Statements – if and switch statements, Repetition statements – while, for, do-while statements, other statements related to looping – break, continue, goto, Arrays – Concepts, using arrays in C, array applications, two – dimensional, arrays, multidimensional arrays, Functions, Strings, Pointers.		

UNIT-II	Linear Data Structures	LECTURE HOURS: 14
Stacks: Introduction-Definition-Representation of Stack-Operations on Stacks- Applications of Stacks. **Queues**: Introduction, Definition- Representations of Queues- Various Queue Structures- Applications of Queues.		
UNIT-III	**Linked lists:**	**LECTURE HOURS: 14**
Definition- Single linked list- Circular linked list- Double linked list- Circular Double linked list- Application of linked lists		
UNIT-IV	**Sorting and Searching:**	**LECTURE HOURS: 12**
Sorting: Bubble Sort, Selection Sort, Insertion Sort, Shell Sort, Merge Sort, Quick Sort, time complexity **Search**: Sequential Search, Binary Search, Hashing, time complexity		
UNIT-V	**Trees and Graphs:**	**LECTURE HOURS: 12**
Trees: examples, vocabulary and definitions, Priority Queues with Binary Heaps, Binary Tree Applications, Tree Traversals, Binary Search Trees, AVL Tree. **Graph:** Vocabulary and definitions, Applications: BFS and DFS.		

Text Books:	
1	Classic Data Structures, Second Edition by Debasis Samanta, PHI.
2	Ron S.Gottfried, Programming with C, (TMH – Schuam Outline Series) 3rd Edition - 2011.

Reference Books:	
1	B.W. Kernignan and Dennis M.Ritchie, The C Programming Language, (PHI), 2nd Edition 2003.
2	Jean Paul Tremblay and Paul G.Sorenson[2007], An Introduction to DataStructures With Applications, TMH
3	Fundamentals of Data Structures in C – Horowitz, Sahni, Anderson- Freed, Universities Press, Second Edition

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ELECTRICAL CIRCUITS-I

Title of the Course :	**ELECTRICAL CIRCUITS-I**				
Branches for which this course is offered:	**I B,Tech II Sem**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Overview:
This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes Single phase circuits, magnetic circuits, theorems, resonance and locus diagrams and two port networks.

Course Objectives:	
To make the student learn about	
1	Basic characteristics of R,L,C parameters and Network reduction techniques, star to delta and delta to star transformations
2	The concepts of real power, reactive power, complex power, phase angle and phase difference in AC circuits.
3	Series and parallel resonances, bandwidth, current locus diagrams.
4	Network theorems and their applications.
5	How to compute two port network parameters.

Course Outcomes:	
After successful completion of the course, the student will be able to	
CO1	Solve Electrical circuits with minimum complexity and the concepts of magnetic circuits will be used to understand the static induced E.M.F principle of Transformers.

CO2	Differentiate the Active power and the role of reactive power in a electrical system for single phase and three phase systems which is the basis to analyze a complex Power system.
CO3	Analyze series and parallel resonance circuits and current locus diagrams.
CO4	Solve an Electrical circuit with minimum complexity by using various theorems and their applications.
CO5	Determine various network parameters for different two port networks.

Course Content:

Unit - I	**UNIT- I INTRODUCTION TO ELECTRICAL & MAGNETIC CIRCUITS**	**Lecture Hours:**	**10**

Electrical Circuits: Circuit Concept, R, L and C Parameters - Independent and Dependent Voltage and Current Sources -Source Transformation, Voltage - Current Relationship for Passive Elements (For Different Input Signals: Square, Ramp, Saw Tooth, Triangular. Kirchhoff's Laws, Network Reduction Techniques: Series, Parallel, Series Parallel, Star-to-Delta or Delta-to-Star Transformation. Examples

Magnetic Circuits: Faraday's Laws of Electromagnetic Induction, Concept of Self and Mutual Inductance, Dot Convention, Coefficient of Coupling, Composite Magnetic Circuit-Analysis of Series and Parallel Magnetic Circuits, MMF Calculations.

Unit - II	**UNIT- II SINGLE PHASE A.C CIRCUITS**	**Lecture Hours**	**12**

R.M.S, Average Values and Form Factor for Different Periodic Wave Forms: Sinusoidal Alternating Quantities. Phase and Phase Difference, Complex and Polar Forms Of Representations, j-Notation, Steady State Analysis of R, L and C (In Series, Parallel and Series Parallel Combinations) With Sinusoidal Excitation, Concept of Power Factor, Concept of Reactance, Impedance, Susceptance and Admittance-Real and Reactive Power and Complex Power. Examples.

Unit - III	**LOCUS DIAGRAMS & RESONANCE**	**Lecture Hours**	**12**

Series R-L, R-C, R-L-C and Parallel Combination with Variation of Parameters. Resonance: Series, Parallel Circuits, Concept of Bandwidth and Q Factor.

Unit - IV	**NETWORK THEOREMS**	**Lecture Hours**	**12**

Thevenin's, Norton's, Maximum Power Transfer, Millman's Theorems, Tellegen's, Superposition, Reciprocity and Compensation Theorems for D.C And Sinusoidal Excitations.

Unit - V	TWO PORT NETWORKS	Lecture Hours	12
Two Port Network Parameters: Impedance, Admittance, Transmission and Hybrid Parameters and their Relations. Concept of Transformed Network, Two Port Network Parameters Using Transformed Variables.			

Text Books:	
1	Electrical Circuit Theory and Technology 4th Edition, John Bird, Rovtledge/T&F, 2011.
2	Network Analysis 3rd Edition, M.E Van Valkenberg, PHI.
References Books:	
1	Circuit Theory (Analysis & Synthesis) 6th Edition, A. Chakrabarti, Dhanpat Rai & Sons, 2008.
2	Electric Circuits by N.Sreenivasulu, REEM Publications.
3	Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
4	Circuits & Networks by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY

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COMMUNICATIVE ENGLISH

Title of the Course:	Communicative English				
Branches for which this course is offered:	I B.Tech I Sem (CIV,MEC & CSE) I B.Tech II Sem (ECE & EEE)	L	T	P	C
		2	0	0	2

Course Overview

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- ➢ Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- ➢ Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- ➢ Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- ➢ 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.

Course Outcomes:

After successful completion of the course, the student will be able to

CO 1	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
CO 2	Apply grammatical structures to formulate sentences and correct word forms
CO 3	Analyze discourse markers to speak clearly on a specific topic in informal discussions
CO 4	Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.

CO 5	Create a coherent paragraph interpreting a figure/graph/chart/table
CO 6	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English

Course Content		
UNIT – I		**Lecture Hours: 10**
Listening: Listening for comprehension. **Speaking:** Introducing oneself and describing people, places and objects. **Reading:** Skimming and scanning a piece of information. **Writing:** Paragraph writing (introduction and summarizing the points) **Grammar and Vocabulary:** Types of Sentences (Syntax): Parts of Speech (noun, adjectives, verbs, adverbs). One word Substitutes		
UNIT – II		**Lecture Hours: 10**
Listening: Listening for purpose. **Speaking:** Short structured talks on specific topics. **Reading:** Identifying and recognizing verbal techniques to link the ideas in a paragraph together. **Writing:** Mechanics of paragraph writing **Grammar and Vocabulary:** Conjunctions and Prepositions. Words often confused		
UNIT-III		**Lecture Hours: 10**
Listening: Listening for global comprehension. **Speaking:** Discussing and reporting on specific topics **Reading:** Reading for comprehension. **Writing:** Summarizing - identifying main idea/s (paraphrasing, avoiding redundancies) **Grammar and Vocabulary:** Tenses; Concord; Parallelism. Synonyms		
UNIT-IV		**Lecture Hours: 08**
Listening: Predicting conversations/ transactional dialogues (without/ with video). **Speaking:** Role plays (formal and informal). **Reading:** Interpreting the graphic elements in the texts. **Writing:** Information transfer, Letter Writing (formal and informal) **Grammar and Vocabulary:** degrees of comparison; use of antonyms.		
UNIT – V		**Lecture Hours: 08**
Listening: Listening Comprehension. **Speaking:** Formal oral presentations. **Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics. Technical Report Writing **Grammar and Vocabulary:** Spotting the errors. Idioms and Phrases		

Reference Books

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

Sample Web Resources

Grammar/Listening/Writing
1-language.com
http://www.5minuteenglish.com/

https://www.englishpractice.com/

Grammar/Vocabulary
English Language Learning Online
http://www.bbc.co.uk/learningenglis
h/ http://www.better-english.com/
http://www.nonstopenglish.com
https://www.vocabulary.com/
BBC Vocabulary
Games Free Rice
Vocabulary Game

Reading
https://www.usingenglish.com/comprehension/
https://www.englishclub.com/reading/short-
stories.htm https://www.english-online.at/

Listening
https://learningenglish.voanews.com/z/3613
http://www.englishmedialab.com/listening.html

Speaking
https://www.talken
glish.com/
BBC Learning English – Pronunciation
tips Merriam-Webster – Perfect
pronunciation Exercises

All Skills https://www.englishclub.com/
http://www.world-english.org/
http://learnenglish.britishcouncil.org/

Online Dictionaries

Cambridge dictionary online

MacMillan dictionary

Oxford learner's dictionaries

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
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COMMUNICATIVE ENGLISH LAB

Title of the Course:	Communicative English I Lab				
Branches for which this course is offered::	I B.Tech I Sem (CIV,MEC & CSE) I B.Tech II Sem (ECE & EEE)	L	T	P	C
		0	0	3	1.5

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

.**Course Objectives:**
• students will be exposed to a variety of self instructional, learner friendly modes of language learning • students will cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc. • students will learn better pronunciation through stress, intonation and rhythm • students will be trained to use language effectively to face interviews, group discussions, public speaking • students will be initiated into greater use of the computer in resume preparation, report writing, format making etc • Become active participant in the learning process and acquire proficiency in spoken English • Speak with clarity and confidence thereby enhances employability skills.

Course Outcomes:	
CO 1	Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
CO 2	Apply communication skills through various language learning activities
CO 3	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
CO4	Evaluate and exhibit acceptable etiquette essential in social and professional settings
CO 5	Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.
CO 6	Improve upon speaking skills over telephone, role plays and public speaking

COMMUNICATIVE ENGLISH LAB	
UNIT I	1. Phonetics for listening comprehension of various accents 2. Reading comprehension 3. Describing objects/places/persons
UNIT II	1. JAM 2. Small talks on general topics 3. Debates
UNIT III	1. Situational dialogues – Greeting and Introduction 2. Summarizing and Note making 3. Vocabulary Building
UNIT IV	1. Asking for Information and Giving Directions 2. Information Transfer 3. Non-verbal Communication – Dumb Charade
UNIT V	1. Oral Presentations 2. Précis Writing and Paraphrasing 3. Reading Comprehension and spotting errors

Suggested Software:

1. Kvan Advanced Communication Skills.

References:

1. A Textbook of English Phonetics for Indian Students, T. Balasubramanian, Macmillan, 2012.
2. Effective Technical Communication, M. Ashraf Rizvi The McGraw-Hill Companies,2007.
3. A Hand book for English Laboratories, E. Suresh Kumar, P. Sreehari, Foundation Books,2011

Sample Web Resources

1. https://learningenglish.voanews.com/z/3613
2. http://www.englishmedialab.com/listening.html
3. Merriam-Webster – Perfect pronunciation
4. https://www.usingenglish.com/comprehension/
5. https://www.englishclub.com/reading/short-stories.htm https://www.english-online.at/
6. 1-language.com
7. http://www.5minuteenglish.com/

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
APPLIED PHYSICS LAB

Title of the Course	Apllied Physics Lab				
Branches for which this course is offered	I B.Tech I Sem (CSE) I B.Tech II Sem (EEE&ECE)	L	T	P	C
		0	0	3	1.5

Course Overview

There has been an exponential growth of knowledge in the recent past opening up new areas and challenges in the understanding of basic laws of nature. This helped to the discovery of new phenomena in macro, micro and nano scale device technologies. The laws of physics play a key role in the development of science, engineering and technology. Sound knowledge of physical principles is of paramount importance in understanding new discoveries, recent trends and latest developments in the field of engineering. To keep in pace with the recent scientific advancements in the areas of emerging technologies, the syllabi of engineering physics lab has been thoroughly revised keeping in view of the basic needs of all engineering branches.

Course Objectives

The main objective of this lab is the student

- Will recognize the important of optical phenomenon like Interference and diffraction.
- Will understand the role of optical fiber parameters and signal losses in communication.
- Will recognize the importance of energy gap in the study of conductivity and hall effect
  in a semiconductor
- Will understand the applications of B- H curve.
- Will acquire a practical knowledge of studying the Dielectric constant and dipole moment of molecules
- Will recognize the application of laser in finding Measurement of magnetic susceptibility
- Will determine the thickness of the paper using wedge shape method

Course Outcomes

After Successful completion of the course, the student will able to

CO1	**Operate** optical instruments like microscope and spectrometer and **understand** the concepts of interference by finding thickness of paper, radius of curvature of Newton's rings
CO2	**interpret** the concept of diffraction by the determination of wavelength of different colours of white light and dispersive power of grating
CO3	**demonstrate** the importance of dielectric material in storage of electric field energy in the capacitors
CO4	**plot** the intensity of the magnetic field of circular coil carrying current with varying distance and B-H curve
CO5	**evaluate** the acceptance angle of an optical fiber and numerical aperture
CO6	**determine** the resistivity of the given semiconductor using four probe method, the band gap of a semiconductor and identify the type of semiconductor using Hall effect

Course Content	
Experiment No	Name of the Experiment
1	Determine the thickness of the paper 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	Diffraction due to single slit
5	Dispersive power of a diffraction grating
6	Dielectric constant and dipole moment of molecules
7	Magnetic field along the axis of a circular coil carrying current
8	To determine the self-inductance of the coil (L) using Anderson's bridge
9	B-H Curve
10	To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
11	Measurement of magnetic susceptibility by Gouy's method
12	Hall effect
13	To determine the resistivity of semiconductor by Four probe method
14	To determine the energy gap of a semiconductor
15	Measurement of resistance with varying temperature

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

G.PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY
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DATA STRUCTURES LABORATORY

Title of the course:	**DATA STRUCTURES LABORATORY**				
Branches for which this course is offered:	B.TECH II SEMESTER	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVE:
• To strengthen the ability to identify and apply the suitable data structure for the given real world problem

COURSE OVERVIEW:
• Implement linear and non linear data structures. • Analyze various algorithms based on their time complexity. • Choose appropriate data structure and algorithm design method for a specific application. • Identify suitable data structure to solve various computing problems.

COURSE OUTCOMES:	
After successful completion of the course, the student will be able to	
CO1	Learn to choose appropriate data structure as applied to specified problem definition.
CO2	Design and analyze linear and non-linear data structures.
CO3	Design and implement algorithms for manipulating linked lists, stacks, queues, trees and graphs in python
CO4	Implement recursive algorithms as they apply to trees and graphs.
CO5	Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures
CO6	Implement operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.

Course Content:		
TASK-1	**Introduction**	**PRACTICAL HOURS: 2**
Write a program to sort the number of elements using sorting by exchange. Write a program to sort the characters in a string using sorting by exchange.		
TASK-2		**PRACTICAL HOURS: 2**

Write a program to sort numbers using insertion sort. Write a program to sort the elements of an array using Selection Sort.		
TASK-3		**PRACTICAL HOURS:2**
Write a program to implement heap sort.		
TASK-4		**PRACTICAL HOURS: 3**
Write a program to search a mobile number in a list of students using linear search.		
TASK-5		**PRACTICAL HOURS: 3**
Write a program to search a mobile number using Binary Search and compare with linear search with time complexity.		
TASK-6		**PRACTICAL HOURS: 3**
Write a program to convert infix expression to postfix expression and evaluate postfix expression.		
TASK-7		**PRACTICAL HOURS: 3**
Write a program to implement stack, queue, circular queue using arrays and linked lists on employee details.		
TASK-8	**Linked List, Stack, Queue**	**PRACTICAL HOURS: 3**
Write a program to perform the operations creation, insertion, deletion, and traversing a singly linked list on student structures with members student roll no, name and total marks.		
TASK-9		**PRACTICAL HOURS: 3**
Write a program to perform the operations creation, insertion, deletion, and traversing a Doubly linked list.		
TASK-10		**PRACTICAL HOURS: 3**
Write a program to remove duplicates from ordered and unordered arrays.		
TASK-11		**PRACTICAL HOURS: 3**
Write a program to implement quick sort using non-recursive and recursive approaches. Use randomized element as partitioning element.		
TASK-12		**PRACTICAL HOURS: 3**
Write a program for tic-tac-toe game.		

TASK-13		**PRACTICAL HOURS:3**
Write a program to perform operations creation, insertion, deletion and traversing on a binary search tree.		
TASK-14		**PRACTICAL HOURS: 3**
Write a program to implement depth first search and breadth first search on graphs.		
TASK-15		**PRACTICAL HOURS: 3**
Write a program to perform different operations on Red Black trees.		
TASK-16		**PRACTICAL HOURS: 3**
Write a program to implement external sorting.		
TASK-17		**PRACTICAL HOURS: 3**
Write a program to perform different operations of B Tree.		

Text Books:	
1	Problem Solving with Algorithms and Data Structures Using Python by David L. Ranum, Bradley N. Miller
2	Python Data Structures and Algorithms by Benjamin Baka, Packt Publishing Ltd

Reference Books:	
1	Think Python, How to Think Like a Computer Scientist
2	Python 3 Object-oriented Programming - Second Edition by Dusty Phillips

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Title of the Course :	**ELECTRICAL CIRCUITS-I LAB**				
Branches for which this course is offered:	**II Semester (EEE)**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

Course Overview:
This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes Single phase circuits, magnetic circuits, theorems, resonance and locus diagrams and two port networks.

Course Objectives:	
To make the student learn about:	
1	Experimental verification of theorems
2	Experimental verification of Resonance phenomenon
3	Drawing current locus diagrams
4	Practical determination of two port network parameters
5	Practical implementation of active and reactive power measurement techniques

Course Outcomes:	
After successful completion of the course, the student will be able to	
CO1	Verification of theorems like Norton's Theorem, Thevenin's theorem, super position theorem, maximum power transfer theorem experimentally and theoretically.
CO2	Evaluate the frequency responses at which series and parallel resonance occurs in a given circuit

CO3	Calculate the impedance and admittance parameters along with transmission parameter for a given circuit.
CO4	Measure the active and reactive power for star and delta connected balanced loads
CO5	Assess the value of 3 phase power for unbalanced loads employing two wattmeter method

List of Experiments:

1) Verification of Thevenin's and Norton's Theorems

2) Verification of Superposition Theorem and Maximum Power Transfer Theorem

3) Verification of Compensation Theorem

4) Verification of Reciprocity, Millmann's Theorems

5) Locus Diagrams of RL and RC Series Circuits

6) Series and Parallel Resonance

7) Determination of Self, Mutual Inductances and Coefficient of Coupling

8) Z and Y Parameters

9) Transmission and Hybrid Parameters

10) Measurement of Active Power for Star and Delta Connected Balanced Loads

11) Measurement of Reactive Power for Star and Delta Connected Balanced Loads

12) Measurement of 3-Phase Power by Two Wattmeter Method for Unbalanced Loads

COURSE STRUCTURE

III - SEMESTER

PROGRAMMECURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH –ELECTRICAL AND ELECTRONICS ENGINEERING

III SEMESTER (II YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2015	Transform Techniques and Complex Variables	BS	3	0	0	3	30	70	100
A2207	Electrical Machines - I	PC	3	1	0	4	30	70	100
A2208	Electro Magnetic Fields	PC	3	1	0	4	30	70	100
A2209	Electrical Circuits - II	PC	3	0	0	3	30	70	100
A2408	Electronic Circuits-I	ES	3	0	0	3	30	70	100
A2210	Electrical Machines – I Laboratory	PC	0	0	3	1.5	30	70	100
A2211	Electrical Circuits and Simulation Laboratory	PC	0	0	3	1.5	30	70	100
A2409	Electronic Circuits-I Laboratory	ES	0	0	3	1.5	30	70	100
A2017	Quantitative Aptitude and Reasoning - I	BS	1	0	0	1	30	70	100
A2032	Human Values and Professional Ethics	MC	2	0	0	0	100*	0	100*
	TOTAL		18	02	09	22.5	270	630	900

COURSE STRUCTURE
A2015- TRANSFORM TECHNIQUES AND COMPLEX VARIABLES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: Theory of transforms (Laplace transforms, Fourier transforms and Z-transforms) and Fourier series, complex functions and differentiation, complex integration, power series expansion of complex function and single variable, residue theorem and evaluation of integrals by unit circle, semi-circle. The mathematical skills developed through this course form a necessary base to analyze and design problems encountered in their Engineering specialization.

Course Pre/corequisites

1. A2002 -Mathematics-I
2. A2010 -Mathematics-II

2. Course Outcomes (COs)

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

A2015.1 Apply Laplace transforms to solve ordinary differential equations

A2015.2 Build Fourier series and Fourier transforms of a given function.

A2015.3 Test for analyticity of complex functions in the given domain

A2015.4 Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours

A2015.5 Evaluate improper integrals of complex functions using Residue theorem.

3. Course Syllabus

UNIT-I

Laplace Transforms

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function. Differentiation and integration of transform – Application of Laplace transforms to ordinary differential equations of first and second order.

UNIT-II

Fourier Series &Fourier Transforms

Fourier Series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic continuation – Half-range Fourier sine

and cosine expansions- Parseval's formula- Complex form of Fourier series. Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

UNIT-III

Z Transforms Functions of Complex Variables

Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

Functions of Complex Variables

Analyticity of functions of a complex variable, Cauchy-Riemann equations in Cartesian and polar form (without proof), harmonic and conjugate harmonic functions, Milne-Thomson method.

UNIT-IV

Complex Integration Power Series

Complex integration: Line integral in complex plane, Cauchy's integral theorem and Cauchy's integral formula (without proof), Zeros and singularities of analytic function. Complex power series: Taylor's series, Laurent's series.

UNIT-V

The Calculus of Residues

Residue-Evaluation of residue by Laurent series- Residue theorem, Evaluation of real definite integrals of the form.

(i) $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$ (ii) $\int_{-\infty}^{\infty} f(x)dx.$

4. Books and Materials

Text Book(s)

1. B.S.Grewal, *Higher Engineering Mathematics*, 43rd edition, Khanna Publishers, New Delhi, 2014.
2. T.K.V.Iyengar,B.Krishna Gandhi, S.Ranganatham, M.V.S.S.N.Prasad,*Engineering Mathematics*, 2003.Vol-II, &Vol-IV,6th revised Edition, S.Chand& Company Pvt.Ltd, 2014.

Reference Book(s)

1. B.V.Ramana, *Higher Engineering Mathematics*, 23rd Reprint, Tata Mc-Graw Hill Education Private Limited, New Delhi, 2015.

COURSE STRUCTURE

A2207– ELECTRICAL MACHINES – I

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course is to familiarize the students about the importance of AC and DC electrical machines. This course deals with the principle, construction and operation of DC Generator,DC Motor, single phase and three phase transformers. The different testing techniques of dc machines and transformers are discussed. The DC machines and transformers studied in this course are applied in domestic and industrial systems.

Course Pre/corequisites

A2208-ElectroMagnetic Fields

2. Course Outcomes (COs)

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

A2207.1 Apply the principles of AC and DC machines to identify a suitable electrical machine for a given application.

A2207.2 Deduce the emf / Voltage equations of DC Machines and single phase transformers.

A2207.3 Analyze the various characteristics of DC Machines, single phase and three phase transformers.

A2207.4 Test the performance of DC Machines and Single phase transformers.

A2207.5 Apply suitable test to control the speed of DC motor.

3. Course Syllabus

UNIT-I

D.C. Generators – Principle of Operation – Constructional Features –Windings– E.M.F Equation– Armature Reaction-Commutation, Types of generators– Build-Up of E.M.F - Critical Field Resistance and Critical Speed - Load Characteristics of Shunt, Series and Compound Generators.- Applications

UNIT-II

D.C. Motors – Principle of Operation – Back E.M.F.–Torque Equation – Characteristics of Shunt, Series and Compound Motors- Applications.

Testing of D.C.Machines and Speed Control of DC Motors: Speed Control of D.C. Shunt motors-3 and 4 point Starters- Losses and Efficiency.

Methods of Testing – Direct, Indirect – Brake Test – Swinburne's Test – Hopkinson's Test – Field's Test.

UNIT-III

Single Phase Transformers: Principle, Construction and operation -Types of transformers-Emf Equation - Operation on No Load and on Load - Phasor Diagrams. Equivalent Circuit - Losses and Efficiency-Regulation. All Day Efficiency.

UNIT-IV

Testing of Transformers: OC and SC Tests - Sumpner's Test-Parallel Operation of transformers with Equal and Unequal Voltage Ratios - Auto Transformers-Applications.

UNIT-V

Three Phase Transformers: Three phase transformer connections - Y/Y,Y/Δ, Δ/Y,Δ/Δ, open-Δ, Three-winding transformers-tertiary windings, Scott connection.

4. Books and Materials

Text Book(s)

1. P.S. Bimbhra, *Electrical Machines*,Khanna Publishers, 7th edition, 2011.
2. J.B.Gupta, Kataria,*Theory and performance of Electrical Machines*, S. K. & Sons Publications-2013.

Reference Book(s)

1. B.L. Theraja and A.K.Theraja, *Electrical Technology*, S.Chand Publications, Volume-II, 2006.
2. D.P.Kothari and I.J. Nagrath, *Electric Machines,* McGraw Hill Education (India) Pvt. Ltd., 4th Edition, 2010, 16th Reprint 2015.
3. AshfaqHussain, *Electrical Machines*, Dhanpat Rai & Co, 2nd Edition, 2005.

COURSE STRUCTURE
A2208– ELECTROMAGNETIC FIELDS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

The purpose of this course is to familiarize the students about electric and magnetic fields. This course deals with the fundamentals of electrostatics, magneto statics and time varying fields. Here the behaviour of static fields, magnetic fields, properties of dielectrics, magnetic materials, time-varying Fields and wave propagation are discussed. This course also emphasizes the practical applications of electromagnetic in Power Systems and Electrical Machines.

Course Pre/corequisites

1. A2002-Mathematics-I
2. A2004-Appled Physics
3. A2010-Mathematics-II
4. A2202-Electrical Circuits-I

2. Course Outcomes (COs)

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

A2208.1 Apply orthogonal coordinate systems for Electric and magnetic fields over the distribution of charge.

A2208.2 Analyse the charge configurations of Electric and Magnetic fields using Coulombs law, Gauss's law, Biot-Savart's Law, Ampere's circuital Law and Poynting theorem.

A2208.3 Evaluate the capacitance, Inductance and Magnetic forces for various conductors in Electromagnetic fields.

A2208.4 Investigate the behaviour of Electric and Magnetic Fields in Static and Time Varying Fields by Maxwell's equations.

A2208.5 Analyse the plane wave equation in free space, dielectrics and conductors.

3. Course Syllabus

UNIT-I

Introduction to Coordinate Systems and Electro Static Fields

Types of Coordinate systems, Del operator, Dot and Cross products, divergence and Stokes Theorems. Coulomb's Law- Electric Field Intensity (EFI) and its applications - Work done - Electric Potential due to point, line and volume charges - Potential gradient.

Gauss's law and its applications-Laplace's and Poison's equations- Electric dipole- Dipole moment- Potential and EFI due to an electric dipole.

UNIT-II

Conductors, Dielectrics and Capacitance

Behaviour of conductors in an electric field- Polarization- Conductor and free space,Conductor and Dielectric, Dielectric and Dielectric boundary conditions. Capacitance of parallel plate, spherical, co-axial cable and composite parallel plate capacitors – Energy stored and energy density in a static electric field – Conduction and Convention current densities – Ohm's law in point form – Equation of continuity.

UNIT-III

Static Magnetic Fields and Force in Magnetic Fields

Biot-Savart's law, MFI due to a long straight finite, infinite and Circular Loop current carrying conductors- Maxwell's second Equation, div(B)=0. Ampere's circuital law and its applications– Point form of Ampere's circuital law.

Magnetic force - Lorentz force equation – Force on a long straight and two longstraightparallel current carrying conductors – Magnetic dipole and dipole moment– Torque on a current loop placed in a magnetic field.

UNIT-IV

Magnetic Potential and Inductance

Scalar Magnetic Potential and Laplace's Equation for Scalar Magnetic Potential, Vector Magnetic Potential and Poisson's Equation for magnetic field.

Self and Mutual inductance – Neumann's formula – determination of self inductance of a solenoid and a Toroid -Mutual inductance between a straight, long wire and a square loop wire in the same plane – energy stored and density in a magnetic field.

UNIT-V

Maxwell's Equations and Electromagnetic Wave Propagation

Faraday's laws of electromagnetic induction and its integral and point forms. Statically and dynamically induced E.M.F's – Modified Maxwell's equations for time varying fields – Displacement current.

Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane waves in free space, and plane waves in good conductors, Poynting vector and Poynting Theorem.

4. Books and Materials

Text Book(s)

1. Matthew N.O.Sadiku ,S.V.Kulkarni, *Electro Magnetic Fields*, 4th edition,Oxford Publications India,2005. New Delhi.
2. S.Sivanagaraju, C.SrinivasaRao, *Electromagnetic Fields,* New Age publishers, 2008.

Reference Book(s)

1. WilliamH.Hayt, John.A.Buck,Engineering Electromagnetics,7thedition,Tata McGraw Hill Companies, 2006, New Delhi.
2. John. D. Kraus, D.A. Fleish, Electromagnetics with Applications, 5thedition,TataMcGraw-Hill, 1997 New Delhi, India.
3. K.A. Gangadhar, Electromagnetic Field Theory, Khanna Publications, 2003.

COURSE STRUCTURE

A2209 –ELECTRICAL CIRCUITS – II

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The objective of this course is to familiarise the students about electrical circuits and develop their analytical skills. This course deals with the concepts of loop and nodal analysis. It introduces the analysis of transient and steady state response of circuits with DC and AC excitations. This course also deals with the analysis of three phase circuits, Fourier Transforms and filters. The concepts discussed in this course are applied to electrical equipment's used for domestic and industrial purpose.

Course Pre/corequisites

1. A2202 - Electrical Circuits – I

2.Course Outcomes (COs)

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

A2209.1 Analyze three phase circuits to determine line voltages, line currents, phase voltages and phase currents.

A2209.2 Apply differential equation and Laplace transform techniques fortransientresponse of series and parallel RLC circuits.

A2209.3 Design a low pass filter, high pass filter, band pass filter and attenuators for given circuit parameters.

A2209.4 Develop a dual circuit, cutest and tie set matrices for a given circuit.

3. Course Syllabus

UNIT-I

D.C Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits -Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms.

UNIT-II

A.C Transient Analysis: Transient Response of R-L,R-C, R-L-C Series Circuits -Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms.

UNIT-III

Three Phase Circuits: Phase Sequence- Star and Delta Connection-Relation between Line and Phase Voltages and Currents in Balanced Systems-Analysis of Balanced and unbalanced Circuits-Measurement of Active and Reactive Power in Balanced and Unbalanced - Loop Method- Application

of Millman's Theorem- Star Delta Transformation Technique – for balanced and unbalanced circuits, Measurement of Active and reactive Power- Single wattmeter and two wattmeter method.

UNIT-IV

Graph Theory: Definitions – Graph – Tree, Basic Cutset and Basic Tieset Matrices for Planar Networks – Loop and Nodal Methods of Analysis of Networks, Duality & Dual Networks.

UNIT-V

Filters and attenuators: Low Pass, High Pass, Band Pass and Band stop filters – RC, RL filters, Constant K filters, m derived filters and composite filter design.

Attenuators: Symmetrical Attenuators, T, ∏ Attenuators, Bridged T type and Lattice Attenuators.

4. Books and Materials

Text Book(s)

1. John Bird, *Electrical Circuit Theory and Technology*, ELSEVIER, 4th edition, 2010.
2. M.E Van Valkenburg, *Network Analysis*,Pearson Education, 3rd edition, 2015.

Reference Book(s)

1. A. Chakrabarti, *Circuit Theory (Analysis & Synthesis),*DhanpatRai& Co.,6th edition, 2008.
2. N.Sreenivasulu,*Electric Circuits* by, REEM Publications Pvt. Ltd., 2012
3. William Hayt, Jack E. Kemmerly and Steven M. Durbin, *Engineering circuit analysis*McGrawHill Education (India) Pvt. Ltd., 6th edition, 2013.

COURSE STRUCTURE

A2408 – ELECTRONIC CIRCUITS-I

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides fundamentals of electronics and an understanding of a range of discrete semiconductor devices, including design, construction and testing of experimental electronic devices. This course makes the students, get expertise in analysing principle of operation of p-n junction diode, special diodes, rectifiers, BJT and FET. This course provides comprehensive understanding of number systems, Boolean algebra, logic gates, minimization techniques, combinational and sequential logic.

Course Pre/corequisites

1. A2004–Applied Physics

2. Course Outcomes (COs)

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

A2408.1 Analyze the operation and characteristics of diodes and transistors.

A2408.2 Analyze various applications of diodes and transistors.

A2408.3 Make use of Boolean algebra postulates to minimize Boolean functions.

A2408.4 Construct and analyze various combinational and sequential circuits used in digital systems.

3. Course Syllabus

UNIT-I

Diode: Formation, forward and reverse bias, V-I characteristics, application as a switch,V-I characteristics of Zener diode, Zener diode as a regulator.

Rectifiers: Construction, operation of Half wave, Full wave and Bridge rectifier.

UNIT-II

Transistors: formation, types, configurations, applications of BJT, FET, MOSFET.

Amplifiers: Basics, different types of amplifiers and their applications in public addressing systems.

UNIT-III

Number systems: Review of number systems and their conversions, representation of negative numbers, binary codes.

UNIT- IV

Boolean algebra: Theorems and properties, canonical and standard forms of SOP/POS form, digital logic gates, universal gates.

UNIT-V

Combinational circuits: basic logic gates, adders, subtractors, multiplexers and comparators.

Sequential circuits: SR, JK, T, and D latches and flip-flops.

4. Books and Materials

Text Book(s)

1. J. Millman, C. Halkias, *Electronic Devices and Circuits*, TMH, 4th edition, 2010.
2. M. Morris Mano, Michael D. Ciletti, *Digital Design*, 4th edition, Pearson Education/PHI, India, 2008.

Reference Book(s)

1. R.L. Boylestad and Louis Nashelsky, *Electronic Devices and Circuits*, Pearson Publications, 9th edition, 2006.
2. J.B.Gupta, *Electronic Devices and Circuits*, 3rd edition, S.K.Kataria& Sons, 2008.

COURSE STRUCTURE

A2210– ELECTRICAL MACHINES-I LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

The purpose of this course is to familiarize the students about different types of DC Machines. This course deals with the testing and performance of different DC Machines. Here the DC machines with different speed control techniques are tested. These machines are applied in different domestic and industrial sectors.

Course Pre/corequisites

1. A2202 - Electrical Circuits-I
2. A2207 - Electrical Machines-I

2. Course Outcomes (COs)

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

A2210.1 Determine the critical field resistance and critical speed of a DC Shunt generator.

A2210.2 Plot the characteristics of DC shunt, Series and Compound generators using load test.

A2210.3 Test the performance of a given DC motor using suitable technique.

A2210.4 Apply suitable test to calculate the losses for a given DC machine.

3. Course Syllabus

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

4. Laboratory Equipment/Software/Tools Required

1. DC shunt generator
2. DC shunts motor
3. DC series generator
4. DC compound generator
5. DC Compound motor

5. Books and Materials

Text Book(s) :

1. P.S. Bimbhra "*Electrical Machinery*: Khanna Publishers, 7th Edition, 2011.

Reference Book(s)

1. B.L. Theraja and A.K.Theraja, "*Electrical Technology*: ,S.Chand Publications,Volume II,2006.
2. AshfaqHussain*"Electrical Machines"*DhanpatRai& Co, 2nd Edition, 2005.

COURSE STRUCTURE

A2211 –ELECTRICAL CIRCUITS AND SIMULATION LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

The purpose of this course is to familiarize the students about simulation programming of electrical circuits. This course deals with simulation programming of DC circuits, transient & frequency response of DC / AC circuits, network theorems, filters and measurement of power using the PSPICE software.

Course Pre/corequisites

1. A2202 - Electrical Circuits-I
2. A2209 - Electrical Circuits-II

2. Course Outcomes (COs)

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

A2211.1 Analyze RL and RC series circuits, 3 phase balanced and unbalanced system and power system network using PSPICE programming.

A2211.2 Test the transient response of DC & AC series RLC circuits using PSPICE programming.

A2211.3 Design the dual network, low pass and high pass filter using PSPICE programming.

A2211.4 Simulate a given DC circuit using PSPICE programming.

3. Course Syllabus

1. Simulation of DC Circuits using PSPICE
2. Duality of networks using PSPICE
3. Transient response of AC networks for RL and RC circuits using PSPICE
4. DC Transient Response using PSPICE
5. Frequency Response of RLC Series Circuits using PSPICE
6. Analysis of RL and RC Series Circuits for AC & DC Excitation
7. Analysis of Three Phase Balanced systems using PSPICE
8. Analysis of Three Phase Unbalanced systems using PSPICE
9. Analysis of Power System Network (Consists of Generator Transmission Line and Load)using PSPICE
10. Simulation of Super Position Theorem using PSPICE
11. Design Low Pass and High Pass Filters

4. Laboratory Equipment/Software/Tools Required

1. PSPICE Software

5. Books and Materials

Text Book(s)

1. Dr. A.S. Aravinda Murthy, *Fundamentals of Electrical circuits with PSPICE*, Sanguine Technical publishers, Bengaluru, 2009.
2. K.M.Soni,*Circuits and Systems*, S.K. Kataria&Sons publishers of Engineering and Computer Books, New Delhi, July 2008

Reference Book(s)

1. A.Chakrabarti,*Circuit Theory (Analysis and synthesis)*, DhanpatRai& Co ltd, Newdelhi, 2013

COURSE STRUCTURE

A2409 – ELECTRONIC CIRCUITS - I LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	4	0	0	56	2	30	70	100

1. Course Description

Course Overview

This laboratory course provides the students an electrical model for various semiconductor devices. In this course students can find and plot V-I characteristics of all semiconductor devices and learn the practical applications of the devices. This laboratory course introduces LabVIEW graphical programming. This course deals with graphical programming of logic gates, universal logic gates, multiplexers, adders and flip-flops using NI LabVIEW software.

Course Pre/co requisites

1. A2004–Applied Physics
2. A2008 – Applied Physics Laboratory
3. A2401 – Electronic Devices and Circuits
4. A2408 – Electronic Circuits-I

2. Course Outcomes (COs)

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

A2409.1	Analyze the description of CRO and Function generator panels.
A2409.2	Determine cut-in, break-down voltages, static and dynamic resistances from V-I characteristics of electronic devices.
A2409.3	Measure the ripple content present in rectifiers using with and without filters.
A2409.4	Make use of small signal analysis to plot the characteristics of BJT and FET.
A2409.5	Make use of Lab VIEW software to construct combinational and sequential circuits.
A2409.6	Test and Debug the combinational and sequential circuits using LabVIEW Software.

3. Course Syllabus

1. Electronic Workshop Practice: Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.
4. P-N Junction Diode Characteristics
5. Zener Diode Characteristics
6. Half-wave and Full-wave Rectifier without and with C-filter
7. BJT Characteristics (CE Configuration)

8. FET Characteristics (CS Configuration)
9. Introduction to NI Lab VIEW
10. Realization of logic gates.
11. Realization of Boolean function using basic gates and using Universal gates.
12. Implementation and verification of multiplexers.
13. Implementation and verification of half adder, full adder and parallel adder.
14. Design and verification of Flip-flops.

4. Laboratory Equipment/Software/Tools Required

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators, Digital Multimeters
4. Decade Résistance Boxes, Decade Capacitance Boxes
5. Ammeters (Analog or Digital) , Voltmeters (Analog or Digital)
6. Bread Boards
7. Computers installed with operating systems
8. NI LabVIEW Software

5. Books and Materials

Text Book(s)

1. J. Millman, C. Halkias, *Electronic Devices and Circuits*, TMH, 4th edition, 2010.
2.M. Morris Mano, Michael D. Ciletti, *Digital Design*, 4th edition, Pearson Education/PHI, India, 2008

Reference Book(s)

1. R.L. Boylestad and Louis Nashelsky, *Electronic Devices and Circuits*, Pearson Publications, 9th edition, 2006.
2. https://www.ni.com/getting-started/labview-basics/
3. https://www.pearson.ch/download/media/9780130153623.pdf

COURSE STRUCTURE

A2017 –QUANTITATIVE APTITUDE AND REASONING – I

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	0	14	0	0	1	30	70	100

1. Course Description

Course Overview

The purpose of this course is to familiarize the students in quantitative and logical reasoning methods. The course introduces the fundamentals to enhance the quantitative and logical ability of students. The course also improves the problem-solving skills of the students. The logical and quantitative techniques are mainly useful in competitive level.

Course Pre/corequisites

This course has no specific prerequisite and corequisite.

2. Course Outcomes (COs)

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

A2017.1 Identify the problems by applying mathematical fundamentals

A2017.2 Apply the suitable logical methods to solve the problems

A2017.3. Solve the various problems by using quantitative mathematical fundamentals

A2017.4 Analyse the comprehensive data with logical ability

3. Course Syllabus

UNIT-I

Coding, decoding and blood relations

Coding and Decoding: Coding and Decoding, Arrow Method, Chinese coding, Series, Analogy, Odd man out.

Blood Relations: Introduction, Direct, Puzzle and Coded models.

UNIT-II

Direction sense and data arrangement

Direction Sense: Introduction, Distance method, Facing Method and Shadow Method.

Data Arrangements**:** Linear Arrangement, Circular Arrangement, Multiple Arrangements.

UNIT-III

Syllogism, Clocks and Calendars

Syllogisms**:** Introduction, Tick-Cross method, Inferential Technique, Venn-Diagram method.

Clocks: Introduction, Finding angle between hands of clock, Gain/Loss of Time, Finding time, Gain or loss of time.

Calendar: Calendars method- 1, Calendars method -2.

UNIT-IV

Number system

Number System: Numbers, decimal fraction, surds and indices, remainder theorem, last digit, trailing of zeros and HCF and LCM.

UNIT-V

Ratios, percentages, Profit and Loss

Percentages: Fundamentals of Percentage, Percentage change, successive percentage.

Ratio and Proportion: Ratio, Proportion, Variations, Problems on Ages

Partnership, Profit and Loss: Basic terminology in profit and loss, Types of partnership, Problems related to partnership.

4. Books and Materials

Text Book(s)

1. R.S. Aggarwal(2017),*Quantitative Aptitude for competitive examinations,* latest edition, S.Chand publishers.
2. Dinesh Khattear, *Quantitative Aptitude, vol-I*,Pearson Education.
3. Arun Sharma, *How to prepare for quantitative aptitude,* Mcgraw Hill Publishers.

COURSE STRUCTURE

A2032 – HUMAN VALUES AND PROFESSIONAL ETHICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	0	100*	0	100*

1. Course Description

Course Overview

This course has a significant role to play in the betterment of our society through ethics and values. It enables the student to understand the human values and their role in personal life and professional life to transform individuals with laws and conventions, and then aspiration to live an ethical life for benefit of the society and organization.

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2032.1 Apply human values and ethics in professional life.

A2032.2 Develop the moral ideals to maintain good relationships with people.

A2032.3 Solve environmental related problems by keeping health of human being into consideration.

A2032.4 Make use of the fundamental rights and human rights in life for individual dignity

A2032.5 Build the sound health system both physically and mentally by practicing yoga, karate, sports etc.

3. Course Syllabus

UNIT-I

Introduction and basic concepts of society, family, community, and other community-based organizations, dynamics and impact, human values, gender justice.

Channels of youth moments for national building - NSS & NCC, philosophy, aims & objectives; emblems, flags, mottos, songs, badge etc. roles and responsibilities of various NSS functionaries. Nehru Yuva Kendra (NYK), activities – socio cultural and sports.

UNIT-II

Fundamental rights and fundamental duties,human rights, consumer awareness and the legal rights of the consumer, RTI.

Youth and crime, sociological and psychological factors influencing youth crime, peer mentoring in preventing crimes, awareness about anti-ragging, cybercrime and its prevention, role of youth in peace-building and conflict resolution, role of youth in nation building.

UNIT-III

Environment issues, conservation, enrichment and sustainability, climate change, waste management, natural resource management (rain water harvesting, energy conservation, waste land development, soil conservations and afforestation). Health, hygiene & sanitation, health education, food and nutrition, safe drinking water, sanitation, swatch bharatabhiyan.

UNITI-V

Disaster management, role of youth in disaster management. Home nursing, first aid, civil/ self-defense, civil defense services, taekwondo, Judo, karate etc.

Gender sensitization, understanding gender – gender inequality –challenges – domestic violence, initiatives of government – schemes, law; initiates of NGOs – awareness, movement.

UNIT-V

Physical education, games and sports, Biological basis of physical activity, benefits of exercise, physical, psychological, social, respiration, blood circulation. Yoga, protocol, postures, asanas, pranayama, kriyas, bandhas and mudras.

4. Books and Materials

Text Book(s):

1. Mike Martin and Roland Scherzinger, *Ethics in Engineering,* New York, McGraw Hill, 1996.
2. A.S. Chauhan, Society *and Environment,* Jain Brothers Publications, 6th Edition, 2006

Reference Book(s)

1. Govindarajan. M, Natarajan. S, Senthil Kumar. V.S, *Engineering Ethics*, Prentice Hall of India, 2004
2. Charles D Fleddermann, *Engineering Ethics*, New Jersey Prentice Hall, 2004 (Indian Reprint).
3. John R Boatright*, Ethics and the Conduct of Business*,New Delhi, Pearson Education, 2003

COURSE STRUCTURE

IV - SEMESTER

PROGRAMMECURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRICAL AND ELECTRONICS ENGINEERING

IV SEMESTER (II YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2019	Managerial Economics & Financial Analysis	HS	3	0	0	3	30	70	100
A2212	Electrical Machines – II	PC	3	0	0	3	30	70	100
A2213	Control Systems	PC	3	0	0	3	30	70	100
A2214	Electrical Power Generation	PC	3	0	0	3	30	70	100
A2419	Electronic Circuits-II	ES	3	0	0	3	30	70	100
A2215	Control Systems Laboratory	PC	0	0	3	1.5	30	70	100
A2216	Electrical Machines – II Laboratory	PC	0	0	3	1.5	30	70	100
A2420	Electronic Circuits-II Laboratory	ES	0	0	2	1	30	70	100
A2018	Quantitative Aptitude and Reasoning - II	BS	1	0	0	1	30	70	100
A2217	Socially Relevant Project-I	PW	0	0	2	1	100	0	100
A2218	Comprehensive Assessment-I	PC	0	0	0	1	100	0	100
A2031	Environmental Science	MC	2	0	0	0	100*	0	100*
	TOTAL		18	00	10	22	470	630	1100

* The marks for Audit Courses/Mandatory Courses are not considered for calculating SGPA

COURSE STRUCTURE
A2019 – MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course is designed in such a way that it gives an overview of concepts of managerial economics financial analysis. Managerial economics enables students to understand micro environment in which markets operate how price determination is done under different kinds of competitions. Financial analysis gives clear idea about concepts and conversions accounting procedures along with introducing students to fundamentals of ratio analysis and interpretation of financial statements.

Course Pre/corequisites

There are no prerequisites and corequisites for this course.

2. Course Outcomes (COs)

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

A2019.1 Analyze the concepts of managerial economics and financial accounting to make better decisions in the organization

A2019.2 Analyze the demand, production, cost and break even to know interrelationship among variables and their impact

A2019.3 Classify the market structure to decide the fixation of suitable price

A2019.4 Apply capital budgeting techniques to select best investment opportunity

A2019.5 Analyze and prepare financial statements to assess financial health of business

3. Course Syllabus

UNIT I

Managerial Economics: Definition, nature and scope of managerial economics, relation with other disciplines –demand analysis: types, determinants, laws, GST-implications.

Elasticity of Demand: Types, measurement and significance, methods of demand forecasting.

UNIT II

Production function: Isoquants and Isocosts, MRTS, least cost combination of inputs.Laws of production.

Cost & Break Even Analysis: Cost concepts, break-even analysis (BEA)-determination.

UNIT III

Market structures: Types of competition, features of perfect competition, monopoly and monopolistic competition, oligopoly.

Pricing: Objectives, policies, methods, cross subsidization.

UNIT IV

Capital: Significance, types, components, factors, methods and sources of raising finance. **Capital Budgeting:** Nature and scope, features, methods - payback method, accounting rate of return (ARR), net present value, profitability index, internal rate of return.

UNIT V

Accounting Principles: Concepts, conventions, double entry book keeping, journal, ledger, trial balance- final accounts with simple adjustments.

Financial Analysis through Ratios: Importance, types- liquidity ratios, activity ratios, turnover ratios and profitability ratios.

4. Books and Materials

Text Book(s)

1. A.R. Aryasri, *Managerial Economics and Financial Analysis*, TMH, India, 2011.

Reference Book(s)

1. Varshney&Maheswari, *Managerial Economics*, Sultan Chand, 2003.
2. Ambrish Gupta, *Financial Accounting for Management: An Analytical Perspective*, 4th edition, pearson education, New Delhi, 2011.

COURSE STRUCTURE

A2212 – ELECTRICAL MACHINES – II

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course is helpful in designing of traction systems. The purpose of this course is to familiarize the students about the importance of AC electrical machines. This course deals with the principle, construction and operation of Three phase induction motors, Alternators and Synchronous motors. Here the performance characteristics of various AC machines are discussed. The concepts of AC machines discussed in this course are applied in domestic and industrial systems.

Course Pre/co requisites

1. A2208-ElectroMagnetic Fields
2. A2207- Electrical Machines-I
3. Electrical Circuits –I

2. Course Outcomes (COs)

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

A2212.1 Apply the principles of AC machines to identify a suitable electrical machine for a given application.

A2212.2 Deduce the power and torque equations of Induction motors and synchronous machines.

A2212.3 Analyze the various characteristics of induction motors and synchronous machines.

A2212.4 Test the performance of induction motors and synchronous machines.

A2212.5 Apply a suitable test to control speed of Induction motors.

3. Course Syllabus

UNIT-I

Three-Phase Induction Motors: Constructional Details-Production of Rotating Magnetic Field - Principle of Operation –Slip - Rotor Parameters at Standstill and under running conditions –Power flow diagram.

UNIT-II

Performance of Induction Motors: Characteristics, starting and speed control of three phase induction motors: Torque Equation – Torque-Slip Characteristic – Crawling and Cogging- -Circle

Diagram-No Load and Blocked Rotor Tests-Predetermination of Performance, Starting methods and speed control of induction motor- Applications.

UNIT-III

Three phase Alternators: Principle, Construction and operation,types, Windings and Factors, E.M.F Equation, Armature Reaction, Synchronous Reactance and Impedance, Load Characteristics, Phasor Diagram.

UNIT-IV

Regulation of Alternator: Voltage Regulation Methods, Two Reaction Theory –Determination of Xd and Xq (Slip Test) -Power Flow Equation in Alternators – Synchronizing Power and Torque. Parallel Operation and Load Sharing – Effect of Change of Excitation and Mechanical Power Input – Synchronizing Alternators with Infinite Bus Bars.

UNIT-V

Synchronous Motors: Theory of Operation – Phasor diagram – Power Flow Equations in Synchronous Motors- Variation of Current and Power Factor with Excitation – V and Inverted V Curves – Synchronous Condensers – Hunting, and Methods to Eliminate Hunting – Starting Methods of Synchronous Motor.

4. Books and Materials

Text Book(s)

1. P.S. Bimbhra"*Electrical Machinery*: Khanna Publishers, 7th edition, 2011.
2. J.B.Gupta,Kataria "*Theory and performance of Electrical Machines*" S.K.SonsPublications,January2013.

Reference Book(s):

1. U.A. Bakshi and M.V.Bakshi, "*Electrical Machines-III*",Technical Publications, 2nd edition, July 2010.
2. D.P.Kothari and I.J. Nagrath"*Electric Machines*" McGraw Hill Education (India) Pvt. Ltd., 4th edition, 2010, 16th Reprint 2015.
3.Ashfaq Hussain"*ElectricalMachines*"DhanpatRai& Co, 2nd edition, 2005.

COURSE STRUCTURE

A2213 – CONTROL SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course is to familiarize the students about the different control systems applied to electrical systems. This course deals with the types of control systems, mathematical modeling of physical systems, time response analysis, frequency response analysis and its stability techniques. It also covers the state space analysis of linear systems. The main applications of control systems are in automation industry, Robotics, Space Technology and Ship stabilization systems.

Course Pre/corequisites

1. A2002- Mathematics-I

2. Course Outcomes (COs)

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

A2213.1	Determine the transfer function of a given system using different techniques.
A2213.2	Analyze the response of a given system in time and frequency domains.
A2213.3	Test the stability,observability and controllability of a given system.
A2213.4	Apply suitable technique for calculating the gain margin and phase margin of a given system.

3. Course Syllabus

UNIT – I

Introduction: Open loop and closed loop systems and their differences, different examples of control systems, effect of feedback on gain, sensitivity and stability.

Mathematical Modelling of Physical Systems: Transfer function of translational and rotational mechanical systems, Force (Torque)-Voltage and Force (Torque)-Current analogies, block diagram reduction techniques, signal flow graphs and Mason's gain formula, transfer function of armature controlled, field controlled D.C servo motors, transfer function of A.C. Servo motor.

UNIT – II

Time Response Analysis: Standard test signals, unit impulse and step response of first order systems,unit step response of second order system, time response specifications, steady state errors and error constants, dynamic error coefficients, effects of proportional, derivative, proportional derivative, proportional integral and PID controllers.

UNIT – III

Stability Analysis: Introduction to stability, necessary and sufficient conditions for stability, Routh's stability criterions and its limitations, relative stability.

The Root Locus Concept: Root locus concept, rules to construct root locus, graphical determination of 'k' for specified damping ratio, relative stability, effect of adding zeros and poles to transfer function on root locus.

UNIT – IV

Frequency Domain Analysis: Introduction, frequency domain specifications, correlation between time and frequency responses, stability analysis from Bode plot and Nyquist plot, calculation of gain margin and phase margin, determination of transfer function from Bode diagram.

Compensators: Lag, lead, lead - lag networks.

UNIT – V

State Space Analysis: Concept of state, state variables and state model, physical, phase and canonical variable representation of state models, derivation of transfer function from state models, diagonalization, solving the time invariant state equations, state transition matrix and its properties, concepts of controllability and observability.

4. Books and Materials

Text Book(s)

1. I J Nagrath and M Gopal, *Control System Engineering,* New Age International Publication,5th edition, 2007.
2. Katsuhiko Ogata. *Modern Control Engineering*, Prentice Hall of India, 5th edition, 2010.

Reference Book(s)

1. A. Nagoor Kani. *Control Systems Engineering*, RBA publications, 2nd edition, 2009.
2. B. C. Kuo and Farid Golnaraghi. *Automatic Control Systems*, John Wiley, 8th edition, 2003.

COURSE STRUCTURE

A2214 - ELECTRICAL POWER GENERATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course is to familiarize the students about the different types of electrical power generations. This course introduces the layout, components and operating principles of different power generating stations. The course also deals with the process of energy conversion of electrical power from conventional sources and non-conventional sources. The course also deals with the economic aspects of power generation and different tariff methods. This course is applied in industrial sector and domestic sector to define the tariff for the usage of electrical energy.

Course Pre/co requisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2214.1 Apply the knowledge of conversion of energy for different energy sources to generate electrical power.

A2214.2 Draw the layouts of different electrical power generating systems.

A2214.3 Select the optimal location for the establishment of different electrical power plants.

A2214.4 Analyze the base load and peak load conditions to select suitable generating stations.

A2214.5 Compare different types of tariffs suitable for different loads.

3. Course Syllabus

UNIT-I

Thermal Power Generation: Block Diagram of Thermal Power Station (TPS) showing paths of Coal, Steam, Water, Air, Ash and Flue Gases, Brief Description of TPS Components - Economizers, Boilers, Super Heaters, Turbines, Condensers, Chimney and Cooling Towers.

UNIT-II

Hydro & Nuclear Power Generation:

Hydro Power - Selection of Site, Classification, Layout, Description of Main Components.

Nuclear Power - Nuclear Fission and Chain Reaction, Nuclear Fuels, Principle of Operation of Nuclear Reactor, Reactor Components - Moderators, Control Rods, Reflectors and Coolants, Radiation Hazards- Shielding and Safety Precautions, Types of Nuclear Reactors and Brief Description of PWR, BWR and FBR.

UNIT-III

Solar Power Generation: Role and Potential of Solar Energy Options, Principles of Solar Radiation, Flat Plate and Concentrating Solar Energy Collectors, Different Methods of Energy Storage, PV Cell-V-I Characteristics.

UNIT-IV

Wind Power Generation: Role and potential of Wind Energy Option, Horizontal and Vertical Axis Wind Mills, Performance Characteristics- Power- Speed & Torque- Speed Characteristics, Pitch & Yaw Controls, Economic Aspects.

UNIT-V

Economic Aspects of Power Generation:

Load Curve, Load Duration and Integrated Load Duration Curves-Load Demand, Diversity, Capacity, Utilization and Plant Use Factors, Numerical Problems, Costs of Generation and their division into Fixed, Semi-Fixed and Running Costs, Methods of determining Depreciation.

Tariff Methods - Desirable Characteristics of a Tariff Method, Flat Rate, Block-Rate, Two-Part, Three –Part, and Power Factor Tariff Methods.

4. Books and Materials

Text Book(s)

1. M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarti, *A Text Book on Power System Engineering*, DhanpatRai& Co Pvt. Ltd., 2003.
2. G.D. Rai, *Non-Conventional Energy Sources*, Khanna Publishers, 2000.

Reference Book(s)

1. C.L.Wadhwa, *Electrical Power Systems*, New Age International (P) Limited, 6th edition, 2010.
2. V.K. Mehta and Rohit Mehta, *Principles of Power Systems*, 4th Revised edition, S.Chand& COMPANY LTD., Reprint 2010.
3. S.N.Singh, *Electrical Power Generation, Transmission and Distribution*, PHI, 2003.

COURSE STRUCTURE
A2419 – ELECTRONIC CIRCUITS-II

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course deals with linear and non-linear applications of operational amplifier. It covers the design and analysis of frequency selective and tuning circuits like oscillators, active filters and their use in communication applications. With modern digitization advantages we need to work with digital data and hence digital ICs play a crucial role in connecting physical world to the more sophisticated digital world. It deals with classification of signals and systems in continuous and discrete time domains. The Fourier, Laplace transform representation of signals and systems are also covered in detail.

Course Pre/co requisites

1. A2002 Mathematics-I
2. A2408 Electronic Circuits- I

2. Course Outcomes (COs)

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

A2419.1 Analyze the characteristics and applications of operational amplifier.

A2419.2 Construct different active filters and oscillator circuits using op-amp and make use of IC 555 and PLL effectively in communication systems.

A2419.3 Analyze the concepts of combinational and sequential logic circuits and use them in the design of latches, counters using digital IC's.

A2419.4 Distinguish between different signals and systems.

A2419.5 Analyze different signals by using an appropriate transform

.

3. Course Syllabus

UNIT-I

Basics of Op-amp: Characteristics of ideal and practical op-amps, block diagram of Op-Amp, op-amp characteristics - DC and AC characteristics, pin configuration of IC-741 Op-amp and its features, open-loop and closed loop configurations

Op-amp Applications-I: AC amplifier, instrumentation amplifier using transducer bridge, differentiator and integrator.

UNIT-II

Op-amp Applications-II: Introduction, 1st order LPF, HPF filters, band pass, band reject and all pass filters. Oscillator types and principle of operation- RC, wien, and quadrature type.

Timers and PLL: Introduction to IC 555 timer, functional diagram, monostable, astable operations, Introduction, Schematic diagram, principles and description of individual blocks of analog IC565.

UNIT-III

Binary Systems and Gate Level Minimization: Digital Systems, number base conversions, octal and hexadecimal numbers, the map method, four variable map, logic gates.

Combinational & Sequential Circuits: Code converters, decoders, encoder, priority encoder, multiplexers, demultiplexers, 2-bit comparator circuit. Latches, flip-flops their conversions.

UNIT-IV

Classification of Signals: Continuous time and discrete time, analog and digital, periodic and aperiodic, energy and power, even and odd, causal and non-causal, deterministic and random, unit Impulse, Step, ramp and parabolic signals, time shifting, time scaling, time reversal and combined operations on signals.

UNIT-V

Classification of Systems: Continuous time and discrete time, analog and digital, instantaneous and dynamic, causal and non-causal, linear and non-linear, time-invariant and time varying, stable and unstable, invertible and non-invertible.

Continuous Time Fourier Transform and Laplace Transform: Fourier transform of different signals, relation between Laplace and Fourier transform, forward and inverse transform, region of convergence.

4. Books and Materials

Text Book(s)

1. D. Roy Chowdhury, *Linear Integrated Circuits*, New Age International (p) Ltd, 2nd edition, 2003. Education, 2007
2. M.Morris Mano &Micheal D. Ciletti*Digital Design*, Pearson, 5th edition, 2013.
3. A.V. Oppenheim, A.S. Willsky and S.H. Nawab. *Signals and Systems*, Pearson Education, 2nd edition, 1997.

Reference Book(s)

1. Ramakanth A. Gayakwad, *Op-Amps and Linear ICs*, PHI, 4th edition, 1987.
2. R.D. Sudhakar Samuel, *Digital Logic Design*, Elsevier.
3. A.Anand Kumar. *Signals and Systems*, Prentice Hall of India, 2012.

COURSE STRUCTURE

A2215 - CONTROL SYSTEMS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

The purpose of this course is to familiarize the students about different control techniques applied to electrical systems. This course deals with characteristics of AC servo motor, DC servo motors, synchros and magnetic amplifier. This course also deals with Time response of second order system, Programmable Logic Controller, Transfer Function of DC Machine, Effect of P,PD, PI, PID Controller on a Second Order System and Lag and Lead compensators. It also discusses the MATLAB software to simulate and analyze the systems.

Course Pre/corequisites

1. A2213 - Control Systems

2. Course Outcomes (COs)

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

A2215.1 Plot the characteristics of AC servo motor, DC servo motor, synchros and magnetic amplifier.

A2215.2 Determine the transfer function of DC machine and time domain specifications of second order system.

A2215.3 Analyze the different logic gates using Programmable Logic Controller

A2215.4 Analyze the stability of given system in time domain and frequency domain using MATLAB software.

A2215.5 Test the effect of P, PD, PI, PID controller on a second order system.

3. Course Syllabus

1. Time Response of Second order system
2. Characteristics of Synchros
3. Programmable Logic Controller
4. Effect of Feedback on DC Servomotor
5. Transfer Function of DC Generator
6. Effect of P,PD, PI, PID Controller on a Second order system
7. Temperature Controller Using PID
8. Characteristics of Magnetic Amplifiers
9. Characteristics of AC Servomotor

10. Linear System Analysis (Time Domain Analysis, Error Analysis) using MATLAB
11. Stability Analysis (Bode, Root Locus, Nyquist Plot)of Linear Time Invariant System using MATLAB

Additional experiments:

12. State Space Model for Classical Transfer Function Using MATLAB-Verification.
13. Latching Control Circuit using PLC Kit
14. Block in Parallel Connection using PLC Kit
15. Normally Closed Contact in Series Connection using PLC Kit
16. Entry/Exit Control of the Underground Car Park using PLC Kit
17. Daily Production Record (16-bit Counting Up Latched Counter) using PLC Kit

4. Laboratory Equipment/Software/Tools Required

1. Synchros Kit
2. AC servo motor
3. DC servo motor
4. Programmable Logic Controller Kits
5. Temperature Controller Using PID
6. P,PD, PI, PID Controller Kit
7. Magnetic Amplifier
8. Linear Control System Kit

5. Books and Materials

Text Book(s)

1.I J Nagrath and M Gopal,*Control System Engineering,* New Age International Publication,5th edition, 2007.

2. John W Webb &Ronald A Reis,*Programmable Logic Controllers-Principles and applications*, PHI Learning Private Limited,Eastern Economy Edition,2009.

Reference Book(s)

1. A.NagoorKani,Control *Systems Engineering*, RBA publications, 2nd edition,2009.

2. B.C.Kuo and FaridGolnaraghi,*Automatic Control Systems*, John Wiley, 8th edition,2003.

3. KatsuhikoOgata,*Modern Control Engineering*, Prentice Hall of India, 5th edition,2010.

COURSE STRUCTURE

A2216–ELECTRICAL MACHINES-II LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

The purpose of this course is to familiarize the students about different types of AC Machines. This course deals with the testing and performance of different AC Machines. Also the performance and calculating the parameters of a single phase transformer is carried out. These machines are applied in different domestic and industrial sectors.

Course Pre/co requisites

1. A2202 - Electrical Circuits-I
2. A2207 - Electrical Machines-I
3. A2212 - Electrical Machines-II

2. Course Outcomes (COs)

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

A2216.1 Test the performance of 1 phase Transformer, 3 phase induction motor and synchronous motor by conducting suitable test.

A2216.2 Determine circuit parameters of a 1 phase Transformer, 3 phase induction motor and synchronous motor by conducting suitable test.

A2216.3 Apply Scott connection for the conversion of a 3 phase to 2 phase systems.

A2216.4 Determine the regulation of a 3 phase alternator and 1 phase transformer by conducting suitable test.

A2216.5 Test the parallel operation and polarity test of a single phase transformer.

3. Course Syllabus

1. O.C & S.C Tests on Single phase Transformer.
2. Sumpner's Test on a pair of identical single phase Transformers.
3. Scott Connection of Transformers.
4. No-Load & Blocked Rotor Tests on Three Phase Induction Motor.
5. Regulation of Three phase Alternator by Synchronous Impedance & M.M.F Method.
6. Determination of X_d and X_q of a salient Pole Synchronous Machine.
7. V and Inverted V Curves of Three Phase Synchronous Motor.
8. Separation of Core Losses of a Single Phase Transformer.
9. Brake Test on Three Phase Induction Motor.
10. Parallel operation of single phase Transformers.
11. Regulation of Three phases Alternator by Z.P.F & A.S.A Methods.
12. Polarity Test on Single Phase Transformer.

4.Laboratory Equipment/Software/Tools Required

1. Single phase Transformer
2. Three phase Transformer
3. Single Phase Induction Motor
4. Three Phase Induction Motor
5. Three phase Alternator
6. Three Phase Synchronous Motor

5.Books and Materials

Text Book(s) :

1. P.S.Bimbhra "*Electrical Machinery*: Khanna Publishers, 7th Edition, 2011.

Reference Book(s):

1. B.L.Theraja and A.K.Theraja, "*Electrical Technology*: ,S.Chand Publications,Volume II,2006.
2. Ashfaq Hussain "*Electrical Machines*" Dhanpat Rai& Co, 2nd Edition, 2005.

COURSE STRUCTURE

A2420 – ELECTRONIC CIRCUITS-II LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

This laboratory course deals with the design and applications of operational amplifier and other analog integrated circuits. More focus is given to the implementation of op-amp configurations, linear and nonlinear applications of op-amps and active filter synthesis. It also deals with the concepts of specialized ICs like 555 timer and 565 PLL. It deals with classification of signals and systems in continuous and discrete time domains.

Course Pre/co requisites

1. A2002 Mathematics-I
2. A2419 Electronic Circuits-II

2. Course Outcomes (COs)

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

A2420.1 Implement different configurations of operational amplifiers.

A2420.2 Construct and analyze various active filters using op-amp.

A2420.3 Design and draw the internal structure of various logic gates.

A2420.4 Analyze the generation ofoperations of various signals and sequences using MATLAB.

3. Course Syllabus

1. Construct and test the performance of
a) Unity gain amplifier
b) Non – Inverting amplifier
c) Inverting amplifier
2. Design of Astable multivibrator as a square wave generator.
3. Design and analyze the practical differentiator.
4. Design and analyze the practical integrator.
5. Design and analyze the practical integrator.
6. Design and analyze the 1st order low pass and high pass filters and plot the frequency responses.
7. Realization of logic gates.
8. 3X8 Decoder – 74138.
9. 8X1 Multiplexer – 74151.
10. D – Flip-flop – 7474.
11. Generation of Various signals and Sequences Such as Unit Impulse, Unit Step, Square, Saw Tooth, Triangular, Sinusoidal, Ramp, Sinc.
12. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
13. Convolution between Signals and Sequences.

4.Laboratory Equipment/Software/Tools Required

1. Analog Discovery2 Kit with PC, USB Cable.
2. Analog IC's: TL082, 741C, 555 and 565.
3. Xilinx ISE 9.2isoftware.
4. Computer loaded with Windows XP, MATLAB software.

5. Books and Materials

Text Book(s) :

1. D. Roy Chowdhury, *Linear Integrated Circuits*, New Age International (p) Ltd, 2nd edition, 2003. Education, 2007
2. M.Morris Mano &Micheal D. Ciletti*Digital Design*, Pearson, 5th edition, 2013.
3. A.V. Oppenheim, A.S. Willsky and S.H. Nawab. *Signals and Systems*, Pearson Education, 2nd edition, 1997.

Reference Book(s)

1. Ramakanth A. Gayakwad, *Op-Amps and Linear ICs*, PHI, 4th edition, 1987.
2. R.D. Sudhakar Samuel, *Digital Logic Design*, Elsevier.
3. A.Anand Kumar. *Signals and Systems*, Prentice Hall of India, 2012.

COURSE STRUCTURE

A2018 –QUANTITATIVE APTITUDE AND REASONING – II

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	0	14	0	0	1	30	70	100

1. Course Description

Course Overview

The purpose of this course is to familiarize the students in quantitative methods. The course introduces the fundamentals to enhance the quantitative ability of students. The course also improves the problem-solving skills of the students. The logical and quantitative techniques are mainly useful in competitive level.

Course Pre/corequisites

This course has no specific prerequisite and corequisite.

2. Course Outcomes (COs)

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

A2018.1 Identify the problems by applying mathematical fundamentals.

A2018.2 Apply the suitable logical method to solve the problems.

A2018.3. Solve the various problems by using quantitative mathematical fundamentals.

A2018.4 Analyse the comprehensive data with logical ability.

3. Course Syllabus

UNIT-I

Averages, Allegation and mixtures

Average, Mixtures and Allegation: Averages, Weighted average, Difference between mixture and alligation,%of mixture,3 mixtures allegation, removal, and replacement.

UNIT-II

Time and work, pipes, and cisterns

Time and Work: Introduction, alternative approach, work and wages, chain rule, fraction of work, efficiency, leaving and join, group of persons.

Pipes and Cisterns: Introduction, filling and emptying, alternative taps.

UNIT-III

Time, Speed and Distance

Time speed and distance: introduction, late /early/usual time, average speed, relative speed, chasing, Races and games.

Problems on trains: introduction, relative speed, average speed, chasing, crossing problems.

Boats and streams: introduction, down steam and upstream, average speed, relative speed.

UNIT-IV

Permutations, Combinations and Probability

Permutation and Combination: Fundamentals counting principle, Definition of Permutation, Seating arrangement, Problems related to alphabets, Rank of the word, Problems related to numbers, Circular permutation, Combination.

Probability: Introduction, coins, dice, cards, Colour balls.

UNIT-V

Mensuration

Introduction, 2-D and 3-D areas and volumes, Inner and Outer circle problems.

4. Books and Materials

Text Book(s)

1. R.S.Aggarwal (2017), *Quantitative Aptitude for competitive examinations,* latest edition,S.Chand publishers.

2. Dinesh Khattear ,*Quantitative Aptitude, vol-I*, Pearson Education.

3.Arun Sharma, *How to prepare for quantitative aptitude,* McGraw Hill Publishers.

COURSE STRUCTURE
A2031-ENVIRONMENTAL SCIENCE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	0	100*	0	100*

1. Course Description

Course Overview

This course is designed to create environmental awareness and consciousness among the present generation to become environmental responsible citizens. This course covers multidisciplinary nature of environmental studies, Natural Resources: Renewable and non-renewable resources; Ecosystems; Biodiversity and its conservation; Environmental Pollution; Social Issues and the Environment. Manufacture of Eco-friendly products, awareness on environment to the people; Human Population and the Environment; pollution control acts and Field Work. This course is divided into five chapters for convenience of academic teaching followed by field visits.

Course Pre/corequisites

This course has no pre/co-requisites.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to

A2031.1- Solve environmental problems through higher level of personal involvement and interest.
A2031.2- Apply ecological morals to keep up amicable connection among nature and human beings.
A2031.3- Recognize the interconnectedness of human dependence on the earth's ecosystems.
A2031.4- Apply environmental laws for the protection of environment and wildlife.
A2031.5- Influence society in proper utilization of goods and services.

3. Course Syllabus

Unit -I

Introduction: Environment Definition, The multidisciplinary nature of environmental studies, Scope and importance-Need for public awareness.

Natural Resources: Classification of resources: Renewable and Non-renewable resources. Forest resources: Uses and over exploitation of forests. Dams and their effects on forest and tribal people. Water resources: Use and over utilization of surface and ground water, conflicts over water. Food resources: Problems with Chemical fertilizers and pesticides. . Energy resources: Renewable energy resources: solar energy, wind energy and geothermal energy. Role of individual in conservation of natural resources

Unit – II

Ecosystems: Ecosystem Definition. Structure of an ecosystem: Producers, Consumers and Decomposers. Function of ecosystems: Food chains, food webs and energy flow in an ecosystem. Ecological pyramids: Pyramid of number, Pyramid of biomass and Pyramid of energy. Introduction ,

types ,characteristic features ,structure and function of the following ecosystem. A)Forest ecosystem B) Dessert system C)Aquatic ecosystems(ponds, rivers ,ocean, estuaries).

Biodiversity and Its Conservation: Introduction and definition. Levels of biodiversity**,** Bio geographical classification of India, Values of biodiversity (Consumptive value, productive value ,Social ,ethical and aesthetic value) Hot spots and Threats to biodiversity. In-situ and Ex-situ conservation of biodiversity.

Unit –III

Environmental Pollution: Definition, causes, effects and control measures of Air Pollution, Water pollution, Soil pollution, Nuclear hazards, Global warming, Acid rains and Ozone layer depletion. Role of an individual in prevention of pollution. Solid waste management and Disaster management: floods, earthquakes, cyclone and landslides.

Unit –IV

Social Issues and the Environment: Concept of sustainable development: Sustainable development goals. Threats to sustainability: Population explosion, crazy consumerism. Water conservation, Rainwater harvesting and environmental ethics. Environment Protection Act (Air, water, soil and wild life protection act)-Public awareness.

Unit –V

Human population and the Environment: Population growth, variation, value education-HIV/AIDS-women and child welfare-Role of IT in environment and human health. Fieldwork-visit to a local area to document environmental assets.

- Visit to local polluted site – Urban/Rural/Industrial /Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystem – pond, river, estuaries

4. Books and Materials

Text Books:

1. Anubha Kaushik, C.P. Kaushik,*Environmental Studies*, 4th edition, New age international publishers, 2014.
2. Anil K DE*., Environmental Chemistry*, New Age International Publication, 9th Edition

Reference Books:

1. Erach Bharucha, *Textbook of Environmental Studies for Undergraduate Courses*. 1st edition, Universities press, 2005.
2. Benny joseph,*Environmental studies*, 3rd edition, McGraw Hill Education (India) Private Limited, 2018.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRICALAND ELECTRONICSENGINEERING

VII SEMESTER (IV YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2230	Power System Operation and Control	PC	3	0	0	3	30	70	100
A2231	Power System Protection	PC	3	0	0	3	30	70	100
A2232	PLC and its Applications	PC	3	0	0	3	30	70	100
	Professional Elective –III	PE	3	0	0	3	30	70	100
	Open Elective –III	OE	3	0	0	3	30	70	100
A2233	Power Systems Laboratory	PC	0	0	2	1	30	70	100
A2234	Mini-Project/Internship	PW	0	0	4	2	100	0	100
A2235	Project Work Phase - I	PW	0	0	4	2	100	0	100
		TOTAL	**14**	**00**	**12**	**20**	**410**	**490**	**900**

VIII SEMESTER (IV YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
	Professional Elective –IV	PE	3	0	0	3	30	70	100
	Open Elective –IV	OE	3	0	0	3	30	70	100
A2236	Project Work Phase - II	PW	0	0	16	8	60	140	200
		TOTAL	**06**	**00**	**16**	**14**	**120**	**280**	**400**

* The marks for Audit Courses/Mandatory Courses are not considered for calculating SGPA

PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRICAL AND ELECTRONICS ENGINEERING

Professional Electives:

Professional Elective – 1	
Course Code	**Title of the Course**
A2251	Special Electrical Machines
A2252	Renewable Energy Resources
A2253	Advanced Control Systems

Professional Elective – 2	
Course Code	**Title of the Course**
A2254	Hybrid Electric Vehicles
A2255	Smart Grid Technology
A2256	Digital Control Systems

Professional Elective – 3	
Course Code	**Title of the Course**
A2257	FACTS and its Applications
A2258	High Voltage Engineering
A2259	Utilization of Electrical Energy

Professional Elective – 4	
Course Code	**Title of the Course**
A2260	HVDC Transmission
A2261	AI Techniques in Power Systems
A2262	Industrial Automation and Control

Open Electives:

Course Code	Title of the Course	Offered by
A2181	Basic Civil Engineering	CE
A2182	Building Planning and Construction	CE
A2183	Disaster Management	CE
A2184	Water Resources Conservation	CE
A2281	Fundamentals of Electrical Engineering	EEE
A2282	Renewable Energy Sources	EEE
A2283	Electrical Measuring Instruments	EEE
A2381	Optimization Techniques	ME
A2382	Mechanical Technology	ME
A2383	Introduction to Automobile Systems	ME
A2481	Basic Electronics	ECE
A2482	Introduction to Communication Systems	ECE
A2483	Fundamentals of IoT	ECE
A2484	Introduction to Embedded Systems	ECE
A2485	CISCO Networking	ECE
A2581	Basic Data Structures	CSE
A2582	Fundamentals of DBMS	CSE
A2583	Basics of Software Engineering	CSE
A2584	Python for Everyone	CSE
A2585	Computer Organization and Operating Systems	CSE
A2586	Fundamentals of Artificial Intelligence and Machine Learning	CSE
A2587	Fundamentals of Web Technologies	CSE
A2081	Research Methodology	H&S
A2082	Intellectual Property Rights	H&S
A2083	National Service Scheme	H&S
A2084	Yoga	H&S
A2085	Design Thinking	H&S
A2086	Management Science	H&S
A2087	Entrepreneurship Development	H&S

COURSE STRUCTURE

VII – SEMESTER

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COURSE STRUCTURE

A2230 – POWER SYSTEM OPERATION AND CONTROL

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course is to enable the student to acquire knowledge on optimum generation allocation, hydrothermal scheduling, modelling of turbines and generators, load frequency control in single area and two area systems. Reactive power compensation in power systems, Power system operation in competitive environment. This course is used to solve the power system problems using computer methods.

Course Pre/corequisites

1. **A2219** - Power System Transmission and Distribution
2. **A2225**– Power System Analysis

2. Course Outcomes (COs)

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

A2230.1 Develop the mathematical models of turbines and governors

A2230.2 Analyse the Address the Load Frequency Control problem

A2230.3 Design shunt and series compensation helps in reactive power control.

A2230.4 Analyse the issues concerned with power system operation in competitive environment.

3. Course Syllabus

UNIT-I

Economic Operation: Optimal Operation of Thermal Power Units, - Heat Rate Curve – Cost Curve – Incremental Fuel and Production Costs, Input-Output Characteristics, Optimum Generation Allocation with Line Losses Neglected. Optimum Generation Allocation Including the Effect of Transmission Line Losses – Loss Coefficients, General Transmission Line Loss Formula.

UNIT-II

Hydrothermal Scheduling: Optimal Scheduling of Hydrothermal System: Hydroelectric Power Plant Models, Scheduling Problems-Short Term Hydrothermal Scheduling Problem. Modeling of Turbine: First Order Turbine Model, Block Diagram Representation of Steam Turbines and Approximate Linear Models. Modeling of Governor: Mathematical Modeling of Speed Governing System – Derivation of Small Signal Transfer Function – Block Diagram.

UNIT-III

Load Frequency Control: Necessity of Keeping Frequency Constant. Definitions of Control Area – Single Area Control – Block Diagram Representation of an Isolated Power System – Steady State Analysis – Dynamic Response – Uncontrolled Case. Load Frequency Control of 2-Area System – Uncontrolled Case and

Controlled Case, Tie-Line Bias Control. Proportional Plus Integral Control of Single Area and Its Block Diagram Representation, Steady State Response – Load Frequency Control and Economic Dispatch Control.

UNIT-IV

Reactive Power Control: Overview of Reactive Power Control – Reactive Power Compensation in Transmission Systems – Advantages and Disadvantages of Different Types of Compensating Equipment for Transmission Systems; Load Compensation – Specifications of Load Compensator, Uncompensated and Compensated Transmission Lines: Shunt and Series Compensation.

UNIT-V

Power System Operation in Competitive Environment: Introduction – Restructuring models – Independent System Operator (ISO) – Power Exchange - Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of Inter zonal/Intra zonal Congestion - Electricity Price Volatility Electricity Price Indexes – Challenges to Electricity Pricing – Construction of Forward Price Curves – Short-time Price Forecasting

4. Books and Materials

Text Book(s)

1. AbhijitChakrabarti and SunitaHalder, *Power System Analysis Operation and Control*, PHI Learning Pvt. Ltd., 3rd Edition, 2010.

2. D.P.Kothari and I.J.Nagrath, *Modern Power System Analysis*, Tata McGraw Hill Publishing Company Ltd., 3rd Edition, 2003, Ninth Reprint 2007.

Reference Book(s)

1. D.P. Kothari and I. J. Magrath, *Power System Engineering*, McGraw Hill Education (India) Pvt. Ltd., 2nd edition, 2008, 23rd reprint 2015.
2. J. Duncan Glover and M.S.Sharma, Thomson, *Power System Analysis and Design*, 3rd Edition, 2008.
3. P Kundur, *Power System Stability and Control*, Tata McGraw Hill, 1994, 5th Reprint, 2008.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2231 – POWER SYSTEM PROTECTION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course is to enable the student to acquire knowledge on Power System Protection. The objective of this course is to introduce the different types of electromagnetic relays and microprocessor based relays, protection of Generators protection of Transformers, protection of feeders and lines, the technical aspects involved in the operation of circuit breakers and Generation of over voltages and protection from overvoltages.

Course Pre/corequisites

1. A2202- Electrical Circuits – I
2. A2209- Electrical Circuits – II
3. A2219 - Power System Transmission and Distribution

2. Course Outcomes (COs)

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

A2231.1 Realize the basic requirements of relays as primary and backup protection along with their constructional details.

A2231.2 Analyze the static and microprocessor based relays along with their specifications advantages and disadvantages.

A2231.3 Interpret the various techniques involves in the generator and transformer protection against faults in the system.

A2231.4 Explain the techniques involves in the protection of feeders and transmission lines

A2231.5 Understand the fundamental principles of circuit breakers along with their ratings and specifications

A2231.6 Describe the causes for over-voltages in power system and also explain the various protective schemes for the protection from over-voltages.

3. Course Syllabus

UNIT-I

Relays: Electromagnetic Relays - Basic Requirements of Relays – Primary and Backup Protection - Construction Details of – Attracted Armature, Balanced Beam, Inductor Type and Differential Relays – Universal Torque Equation – Characteristics of Over Current, Direction and Distance Relays. Static Relays – Advantages and Disadvantages – Definite Time, Inverse and IDMT. Static Relays – Comparators –

Amplitude and Phase Comparators. Microprocessor Based Relays – Advantages and Disadvantages – Block Diagram for Over Current (Definite, Inverse and IDMT) and Distance Relays and Their Flow Charts.

UNIT-II

Protection of Generators & Transformers: Protection of Generators against Stator Faults, Rotor Faults and Abnormal Conditions. Restricted Earth Fault and Inter-Turn Fault Protection. Numerical Problems on percentage winding unprotected. Protection of Transformers: Percentage Differential Protection, Numerical Problems on Design of CT Ratio, Buchholtz Relay Protection, Numerical Problems.

UNIT-III

Protection of Feeders &Lines: Protection of Feeder (Radial & Ring Main) Using Over Current Relays. Protection of Transmission Line – 3 Zone Protection Using Distance Relays. Carrier Current Protection. Protection of Bus Bars.

UNIT-IV

Circuit Breakers: Elementary Principles of Arc Interruption, Restriking Voltage and Recovery Voltage - Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB Ratings and Specifications: Types and Numerical Problems. – Auto Reclosures. Description and Operation of Following Types of Circuit Breakers: Minimum Oil Circuit Breakers, Air Blast Circuit Breakers, Vacuum and SF6 Circuit Breakers.

UNIT-V

Over Voltages in Power Systems: Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages - Valve Type and Zinc-Oxide Lighting Arresters - Insulation Coordination–BIL.

4. Books and Materials

Text Book(s)

1. Badri Ram, D.N Viswakarma,*Power System Protection and Switchgear*, Badri Ram, D.N Viswakarma, TMH Publications, 2011
2. Switchgear and Protection, Sunil S Rao, Khanna Publishers, 1992

Reference Book(s)

1. Transmission network Protection, Y.G. Paithankar ,Taylor and Francis,2009.
2. Power system protection and switch gear, BhuvaneshOza, TMH, 2010.
3. Electrical Power Systems, C.L.Wadhwa, New Age international (P) Limited, Publishers, 2012.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2232 – PLC and Its Applications

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course is aimed at industrial engineers and technicians who need to maintain Programmable Logic Controller systems and who are likely to carry out fault finding. The course provides detailed grounding in PLC concepts such as inputs/outputs, ladder logic and fault finding, which is essential for maintaining uptime and performance of machines/processes.

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Course Pre/corequisites

1. A2213 -Control Systems

2. Course Outcomes (COs)

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

A2232.1 It is to provide and ensure a comprehensive understanding of using personal computers in measurement and control instrumentation.

A2232.2 Learn the process of collecting information/ data through PC from real world sources.

A2232.3 Learn remote and networked data acquisition and operating system.

A2232.4 Learn programmable logic controllers, and its application.

3. Course Syllabus

UNIT-I

PLC system Basic & applications, PLC modules, I/O module, Communication module, PID module, Input analog and digital devices, Output analog and digital devices

UNIT-II

PLC Timer Functions , PLC Counter Function, Study of PLC Arithmetic functions, Study of PLC Logic functions, PLC Ladder Logic Diagram, Advanced PLC Functions like Skip Master Control Relay.

UNIT-III

PLC Registers: Characteristics of Registers, module addressing, holding registers, input registers output registers

Ladder diagrams for process control: Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system**.**

UNIT-IV

PLC applications: Bottling filling plant, Material handling elevator, 2-axis robot with sequencer control, Level control, trouble shooting.

UNIT-V

Introduction to DCS: Concept of DCS , Hierarchy of DCS, Function of each level of DCS

Introduction to supervisory Control and Data Acquisition system (SCADA):, Computer Process interface for Data Acquisition and control – Computer control loops– Supervisory Digital Control (SCADA) - introduction and brief history of SCADA – SCADA Hardware and software – Landlines for SCADA – use of modems in SCADA – SCADA with LAN

4. Books and Materials

Text Book(s)

1. Programmable Logic Controllers – Principles and Applications, John. W. Webb Ronald A Reis, Fourth edition, Prentice Hall Inc., New Jersey, 1998.
2. Computer Control of Processes – M. Chidambaram. Narosa 2003

Reference Book(s)

1. Introduction to Programmable Logic Controllers - Gary Dunning Thomson Delmar Learning Second Edition Second reprint 2003.
2. PC Based Instrumentation and Control Third Edition by Mike Tooley; Elsevier.N. K. Sinha (2008), *Control Systems*, 3rd edition, New Age International Limited Publishers, New Delhi.
3. 3. PC Interfacing and Data Acquisition Techniques for Measurement, Instrumentation and Control. By Kevin James; Elsevier.
4. Practical Data Acquisition for Instrumentation and Control Systems by John Park and Steve Mackay.
5. Programmable Logic Controllers, Second edition, Frank D. Petruzella, Mc Graw Hill, New York, 1997.

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COURSE STRUCTURE

A1230 – POWER SYSTEM LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The objective of this course is to analyse the subtrasient reactance of synchronous machine and LG, LL, LLG, LLLG faults. The equivalent circuit of three winding transformer are analysed. The characteristics of over voltage relay, IDMT over Current relay and Negative Sequence relays are evaluated.

Course Pre/corequisites

1. A1224 - Power System Analysis
2. A1227- Power System Protection

2. Course Outcomes (COs)

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

A1230.1 Determine the positive, negative and zero sequence impedances of cylindrical rotor synchronous machine

A1230.2 Carry out the fault analysis for various types of faults involving LG, LL, LLG and LLLG Faults

A1230.3 Evaluate characteristics of Over Voltage Relay and IDMT over Current Relay.

A1230.4 Evaluate characteristics of Negative Sequence Relay, Percentage biased Differential Relay

3. Course Syllabus

1. Determination of Sequence Impedances of Cylindrical Rotor Synchronous Machine.
2. Fault Analysis – I

   LG Fault

   LL Fault

3. Fault Analysis – II
   - LLG Fault
   - LLLG Fault
4. Determination of Sub transient reactance of salient pole synchronous machine.
5. Fault Analysis – III
   - LLG Fault (with fault impedance)
   - LLLG Fault (with fault impedance)
6. Equivalent circuit of three winding transformer.
7. Characteristics of Over Voltage Relay(Microprocessor Type)
8. Characteristics of IDMT Over Current Relay(Electro Magnetic Type)

9. Negative Sequence Relay
10. Percentage biased Differential Relay

4. Laboratory Equipment/Software/Tools Required

1. Cylindrical Rotor Synchronous Machine
2. Three winding transformer
3. Salient pole synchronous machine
4. Over Voltage Relay Kit
5. IDMT Over Current Relay kit
6. Negative Sequence Relay kit
7. Differential Relay kit

5. Books and Materials

Text Book(s) :

1. Grainger and Stevenson, *Power Systems Analysis*,TataMcGraw-hill, 2005.
2. I.J.Nagrath and D.P.Kothari, *Modern Power system Analysis* Tata McGraw-Hill, 2nd edition, 2003.
3. Badri Ram, D.N Viswakarma, Power *System Protection and Switchgear*, MH Publications, 2011.
4. Sunil S Rao, *Switchgear and Protection*, Khanna Publishers, 1992.

Reference Book(s)

1. 1 M A Pai, *Computer Techniques in Power System Analysis* Tata McGraw-hill 2nd edition, 2005.
2. C.L.Wadhwa, Electrical *Power Systems*, New Age international (P) Limited, Publishers, 2012.

PROFESSIONAL ELECTIVE-1

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2251 – SPECIAL ELECTRICAL MACHINES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course is to deal with the special machines used in control and industrial applications. This course covers principle, construction, operation and performance of switched reluctance motors, stepper motors, permanent magnet dc motors, linear motors and servo motors. These machines are specially designed for specific industrial purposes, electrical vehicles and wind energy conversion systems.

Course Pre/corequisites

1. A2202 - Electrical Circuits-I
2. A2207 - Electrical Machines-I
3. A2212 - Electrical Machines-II

2. Course Outcomes (COs)

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

A2251.1 Analyse the performance of switched reluctance motors, stepper motors, permanent magnet dc motors linear motors and servo motors

A2251.2 Deduce the emf and torque equations of stepper motor, servo motor, reluctance motor and BLDC motor.

A2251.3 Apply speed control techniques for switched reluctance motors, stepper motors, Permanent magnet dc motors linear motors and servo motors.

A2251.4 Plot the characteristics of switched reluctance motors, stepper motors,Permanent magnet dc motors linear motors and servo motors.

3. Course Syllabus

UNIT-I

Stepper Motor: Introduction, variable reluctance stepper motor, permanent magnet stepper motor, hybrid stepper motor, windings in stepper motors, torque equation, characteristics of stepper motor, open – loop control of stepper motor, closed – loop control of stepper motor, applications of stepper motor.

UNIT-II

Switched Reluctance Motors: Construction, principle of working, basics of SRM analysis, constraints on pole arc and tooth arc, torque equation and characteristics, power converter circuits, control of SRM, rotor position sensors, current regulators, sensor less control of SRM.

Permanent magnet DC (PMDC) motor, Brushless permanent magnet DC (BLDC) Motors.

UNIT-III

Permanent Magnet Synchronous Motor: Construction, principle of operation, EMF equation, torque equation, comparison of conventional and PMSM, control of PMSM.

Synchronous Reluctance Motor (SRM)**:** principle**,** construction and working of SRM.

UNIT-IV

Single Phase Special Electrical Machines: Repulsion motor, hysteresis motor, single phase reluctance motor.

Servo Motors: DC servo motors, AC servo motors.

UNIT-V

Linear Electrical Machines: Linear induction motor, linear synchronous motor, DC linear motor, linear reluctance motor, linear levitation machines.

4. Books and Materials

Text Book(s)

1. K.Venkataratnam,*Special electrical machines*, University press.
2. E.G.Janardhanan,*Special electrical machines*,PHI learning private limited,2014.

Reference Book(s)

1. S.K.Bhattacharya,*ElectricalMachines*, McGraw Hill education (India) Pvt. Ltd., 4th edition, 2014, 3rdreprint 2015.
2. AshfaqHussain, *Electrical Machines*, DhanpatRai& Co, 2ndedition, 2005
3. R.K.Rajput ,*Electrical Machines*, Laxmipublications,5thedition.2008

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COURSE STRUCTURE

A2252 – RENEWABLE ENERGY RESOURCES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1.Course Description

Course Overview

The purpose of this course is to enable the student to acquire knowledge expected to identify the new methodologies / technologies for effective utilization of renewable energy sources. The objective of this course is to introduce solar radiation and its environmental impact on power, various collectors used for storing solar energy, various applications in solar energy. This course also gives the emphasis about the wind energy, ocean energy, biomass and its economic aspects. In addition this course also focuses on the concepts of geothermal energy with other energy sources. This course is used to advance economic development, improve energy security, improve access to energyand mitigate climate change.

Course Pre/corequisites

1. A2004 - Applied Physics
2. A2214 - Electrical Power Generation

2.Course Outcomes (COs)

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

A2252.1 Apply the principles of Renewable energy resources for the construction of Power generating station.

A2252.2 Analyse various harvesting techniques and energy storage methods in renewable energy systems for different applications.

A2252.3 Analyse Renewable energy systems for various environmental conditions.

A2252.4 Categorize various energy conversion systems and their limitations.

3. Course Syllabus

UNIT-I

Principles of Solar Radiation: Role and potential of new and renewable source, Environmental impact of solar power, physics of the sun, the solar constant, extra-terrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-II

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

UNIT-III

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles.

Tidal And Wave Energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-IV

Solar Energy Storage And Applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating /cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT-V

Direct Energy Conversion: Need for DEC, limitations, principles of DEC and different types of Energy Conversions

Magneto Hydro Dynamics (MHD): Principle of working of MHD Power plant, performance and limitations.

Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

4. Books and Materials

Text Book(s)

1. Tiwari and Ghosal/ Narosa, Renewable *energy resources*, second edition (2008), McGraw Hill Company, New Delhi.

2. G.D.Rai, *Non-Conventional Energy Sources*, fourth edition (2009), Khanna Publishers, New Delhi.

Reference Book(s)

1.Twidell& Weir, Renewable *Energy Sources*, fourth Edition (2009), Tata McGraw Hill Education Private Limited, New Delhi.

2. S.P. Sukhatme, *Solar Energy*, Third Edition (2010), Tata McGraw Hill Education Private Limited, New Delhi.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2253 – ADVANCED CONTROL THEORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course is to familiarize the students about the application of control theory. This course mainly discusses the physical systems using mathematical modelling, controllability &observability of the system, state feedback controllers and observers of the system. Here in this course the nonlinear systems behaviour and its stability analysis are discussed. These concepts mainly used in optimal-tuning nonlinear PID control of hydraulic systems and the neural predictive control of combustor acoustic of gas turbines.

Course Pre/corequisites

1. A2213 -Control Systems
2. A2010 -Mathematics-II

1. Course Outcomes (COs)

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

A2253.1 Develop the mathematical model of linear/non-linear systems in state space.

A2253.2 Investigate the controllability/observability of a given system.

A2253.3 Analyze stability of linear / Non-linear systems using various methods.

A2253.4 Design state feedback controller and optimal controller for a given system.

A2253.5Evaluate the stability of the given system by Lyapunov criterion.

3. Course Syllabus

UNIT-I

Mathematical Preliminaries: Vectors & vector spaces, linear combinations and bases, linear transformations and matrices, scalar product and norms, Eigen values, Eigen vectors and a canonical form representation of linear operators.

UNIT-II

Controllability and Observability: Tests for controllability and observability for continuous time systems – Time varying case, minimum energy control, time invariant case, Principle of Duality, Controllability and observability of state models in Jordan canonical form. Effect of state feedback on controllability and observability.

UNIT-III

State Feedback Controllers and Observers: Design of State Feedback Controllers through Pole placement, Full-order observer and reduced-order observer. State estimation through Kalman Filters.

UNIT-IV

Analysis of Nonlinear Systems: Introduction to nonlinear systems, Types of nonlinearities, Concept of describing functions, Derivation of describing functions for Dead zone, Saturation, backlash, relay with dead zone and Hysteresis Jump Resonance. Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, Singular points, Phase plane analysis of nonlinear control systems.

UNIT-V

Stability Analysis: Lyapunov's stability and Lypanov's instability theorems. Direct method of Lypanov for Linear and Nonlinear continuous time autonomous systems.

4. Books and Materials

Text Book(s)

1. K. Ogata (2011), *Modern Control Engineering*, Prentice Hall, 5th Edition, 2010.
2. M. Gopal,*Modern Control System Theory,* New Age International Publishers, Revised 2nd edition, 2005.

Reference Book(s)

1. I.J.Nagarath and M.Gopal, *Control Systems Engineering*, New Age InternationalPublishers, 5th Edition, 2007, Reprint 2012.
2. D.RoyChoudhury, *Modern Control Engineering,*PHI Learning Private Limited, 9thPrinting, January 2015.
3. A.Nagoorkani,*Advanced Control Theory,* CBS Publishers &DistributorsPvt.Ltd, 3rdEdition, 2017.

PROFESSIONAL ELECTIVE-2

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2254-HYBRID ELECTRIC VEHICLES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course is to familiarize the students about the importance of hybrid electric vehicles. This course introduces the fundamental concepts, principles, analysis and design of hybrid electric vehicles. Here various types of energy storage devices along with energy management' strategies are discussed. The concepts of hybrid electric train and energy efficiency analysis of electric trains are discussed. The concepts studied in this course help the students in designing hybrid electric vehicles.

Course Pre/corequisites

1. A2207 - Electrical Machines-I
2. A2212 - Electrical Machines-II
3. A2220 - Power Electronics

2. Course Outcomes (COs)

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

A2254.1 Analyze the topologies used for design of hybrid electric vehicles.

A2254.2 Apply the concepts of power electronics & drives to control hybrid electric vehicles.

A2254.3 Analyze power flow control and various energy storage components used for hybrid electric vehicles.

A2254.4 Demonstrate different configurations, techniques and sizing of components used in hybrid electric vehicles.

3. Course Syllabus

UNIT-I

Introduction: Hybrid Electric Vehicle- Comparison with Conventional Vehicles, History of electric vehicles, social and environmental importance of hybrid and electric vehicles. Vehicle Power Plant and Transmission Characteristicsand mathematical models to describe vehicle performance.Energy Use in Conventional Vehicles and Energy Savings Potential of Hybrid Drivetrains.

UNIT-II

Hybrid Electric Drive-Trains: Basic concept of hybrid traction, introduction to various hybrid drivetraintopologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis-pre-transmission and post-transmission.

UNIT-III

Design of Hybrid and Electric Vehicles: Definition of hybridness, Hybrid design philosophy,Hybridness: parallel hybrid, series, mixed and range extender (plug-in) hybrids, Range extender, Optimization and hybridness, Battery power and electric motor power.

UNIT-IV

Control System for Electric and Hybrid Electric Vehicles: Function of Control System in HEVs and EVs, Elementary of Control Theory, Overview of Control System: The Electronic Control Unit (ECU)
Control Area Network, Control Variables

UNIT-V

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Hybridization of different energy storage devices, energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies.

4. Books and Materials

Text Book(s)

1. C. Mi, M. A. Masrur and D. W. Gao, *Hybrid Electric Vehicles*: *Principles and Applications with Practical Perspectives*, John Wiley &sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, *Hybrid Electric Vehicles*: *Energy Management Strategies*, Springer, 2015.

Reference Book(s)

1. A. E. Fuhs, *Hybrid Vehicles and the Future of Personal Transportation*, CRC Press, 2009
2. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, *Modern Electric, Hybrid Electric, and Fuel CellVehicles*: Fundamentals, Theory, and Design, CRC press, 2004.
3. 2. IqbalHussain, *Electric & Hybrid Vehicles – Design Fundamentals*, Second Edition, CRC press, 2011.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2255 – SMART GRIDTECHNOLOGY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course is to enable the students to acquire knowledge of design of smart grid and control and its applications. The objective of this course is to make the students understand the emergency of converting the conventional grids to smart grid. Here in this course the Architecture, Tools, Techniques and Communication Technologies for Smart Grid are discussed. Here the concepts of Load Frequency Control in Micro Grid System and Reactive Power Control in Smart Grid are explained.

Course Pre/corequisites

1. A2214 - Electrical Power Generation
2. A2219 - Power Systems-II
3. A2221 - Electrical Measurements & Instrumentation

2. Course Outcomes (COs)

After completion of the course, the learner will be able to

A2255.1	Demonstrate the need of converting conventional grid to Smart Grid.
A2255.2	Assess the role of automation in Transmission and Distribution.
A2255.3	Apply Evolutionary Algorithms for the Smart Grid.
A2255.4	Analyse various Methods used for information security on smart grid
A2255.5	Analyse Voltage and Frequency control techniques in Micro Grids.

3. Course Syllabus

UNIT-I

Introduction to Smart Grid: Introduction tosmart grid - working definitions of smart grid and associated concepts – smart grid functions – traditional power grid and smart grid – new technologies for smart grid – advantages – Indian smart grid – key challenges for smart grid.

UNIT-II

Smart Grid Architecture: Components and architecture of smart grid design – review of the proposed architectures for smart grid. the fundamental components of smart grid designs – transmission automation – distribution automation – renewable integration

UNIT-III

Tools and Techniques for Smart Grid: Computational techniques – static and dynamic optimization techniques – computational intelligence techniques – evolutionary algorithms – artificial intelligence techniques.

UNIT-IV

Communication Technologies and Smart Grid: Introduction to communication technology – synchro-phasor measurement units (PMUS) – wide area measurement systems (WAMS)- introduction to internet of things (IOT)- applications of iot in smart grid

UNIT-V

Control of Smart Power Grid System: Load frequency control (LFC) in micro grid system – voltage control in micro grid system – reactive power control in smart grid. case studies andtest beds for the smart grids.

4. Books and Materials

Text Book(s)

1. JanakaEkanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, *Smart Grid,* Wiley publications, 2012, reprint 2015.
2. James Momoh, Wiley, *Smart Grid: Fundamentals of Design and Analysis*, IEEE press., 2012,reprint 2016.

Reference Book(s)

1. Clark W.Gellings, *The Smart Grid – Enabling Energy efficiency and demand response,* CRC Press, Taylor & Francis group, first indian reprint. 2015.
2. Lars Torsten Berger, Krzysztof Iniewski, *Smart Grid – Applications, Communications, and Security,* Wiley, 2012, reprint 2015.
3. Cobus Strauss, *Practical Electrical Network Automation and Communication Systems,*Elsvier, 2003.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2256 – DIGITAL CONTROL SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

3. Course Description

Course Overview

The purpose of this course is to familiarize the students about the application of control systems. The objective of this course is to design and analysis of digital control systems. The students will gain familiarity with sampling, quantization and z-transforms used to analyze and design digital control systems. Also the concepts of, state space analysis and stability analysis in digital domain are explained. Digital control systems techniques are mainly used in Radar, Economic Systems and Biological Systems etc.

Course Pre/corequisites

1. A2213 -Control Systems
2. A2010 -Mathematics-II

4. Course Outcomes (COs)

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

A2256.1 Apply the Sampling and reconstruction theory in A/ D &D/A Conversion.

A2256.2 Solve the given differential equations using Z- transforms.

A2256.3 Analyse the given discrete time system in frequency domain and Z domain.

A2256.4 Design a given discrete time system in Z – Plane and state space representation.

A2256.5 Investigate the Stability of the closed loop systems using Z- transforms.

3. Course Syllabus

UNIT-I

Sampling and Reconstruction: Introduction, Examples of Data control systems, Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.

UNIT-II

Z – Transforms: Introduction, Linear difference equations, pulse response, Z - transforms, Theorems of Z - Transforms, the inverse Z - transforms, Modified Z – Transforms.

UNIT-III

Z - Plane Analysis of Discrete - Time Control System: Z - Transform method for solving difference equations, Pulse transforms function, block diagram analysis of sampled data systems, mapping between S - plane and Z - plane.

UNIT-IV

State Space Analysis: State Space Representation of discrete time systems, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations.

UNIT-V

Stability Analysis: Mapping between the S - Plane and Z – Plane, Primary strips and Complementary Strips, Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z - Plane. Jury stability test, Stability Analysis by Bilinear Transformation and Routh Stability criterion.

4. Books and Materials

Text Book(s)

3. K. Ogata (2011),*Discrete-Time Control systems*, 2nd edition, Pearson Education / Prentice Hall of India, New Delhi.
4. Kuo (2003), *Digital Control Systems,* 2nd edition, Oxford University Press, New Delhi.

Reference Book(s)

6. J. Nagrath, M. Gopal (2011), *Control Systems Engineering*, 5th edition, New Age International (P) Ltd, New Delhi.
7. M. Gopal (2009), *Digital Control and State Variable Method*, 3rd edition, Tata McGraw-Hill Companies, New Delhi.
8. N. K. Sinha (2008), *Control Systems*, 3rd edition, New Age International Limited Publishers, New Delhi.

PROFESSIONAL ELECTIVE-3

Professional Elective – 3	
Course Code	**Title of the Course**
A2257	FACTS and its Applications
A2258	High Voltage Engineering
A2259	Utilization of Electrical Energy

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COURSE STRUCTURE

A2257 – FACTS and its Applications

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

5. Course Description

Course Overview

The purpose of this course is to familiarize the students about the application of power systems. The objective of this course is to design and analysis of FACTS devices. The student will understand the fundamentals of FACTS controllers, importance of controllable parameters and types of FACTS controllers and their benefits. Also the concepts of, functioning and control of STATCOM, SVC and UPQC and their comparison.

Course Pre/corequisites

1. Power Electronics
2. Power System Transmission and Distribution

6. Course Outcomes (COs)

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

A2257.1To understand the fundamentals of FACTS Controllers, Importance of controllable parameters and types of FACTS controllers and their benefits.

A2257.2 To understand basic concepts of voltage and current source converters.

A2257.3 Compare the static shunt and static series compensators.

A2257.4 Analyse the working principle of operation of Unified Power Flow Controller.

3. Course Syllabus

UNIT-I

CONCEPTS OF FLEXIBLE AC TRANSMISSION SYSTEMS

Transmission line Interconnections, Power flow in parallel lines, Mesh systems, Stability considerations, Relative importance of controllable parameters, Basic types of FACTS controllers, Shunt controllers, Series controllers, Combined shunt and series controllers, Benefits of FACTS.

UNIT-II

VOLTAGE AND CURRENT SOURCED CONVERTERS

Concept of Voltage Sourced Converters, Single Phase Full Wave Bridge Converter, Three Phase Full Wave Bridge Converter. Concept of Current Sourced Converters, Thyristor based converters (Rectifier Operation), Current Sourced Converter with Turn off Devices, Current Sourced –vs- Voltage Sourced Converters.

UNIT-III

STATIC SHUNT COMPENSATORS

Objectives of Shunt Compensation, Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, Improvement of Transient Stability, Power Oscillation Damping.The Thyristor-Contolled and Thyristor-Switched Reactor (TCR andTSR).Basic Operating Principle of Switching Converter Type VAR Generators. Basic principle of operation ofSVC and STATCOM.Comparison Between STATCOM and SVC.

UNIT-IV

STATIC SERIES COMPENSATORS

Objectives of Series Compensation, Concept of Series Capacitive Compensation Voltage Stability, Improvement of Transient Stability, Power Oscillation Damping, Subsynchronous Oscillation Damping. Basic principle of operation of Thyristor Controlled Type Series Capacitor (GCSC), Thyristor Switched Series Capacitor (TSSC), Thyristor-Controlled Series Capacitor(TCSC). Basic Operating Control Schemes for GCSC, TSSC, and TCSC. Switching Converter Type Series Compensators, The Static Synchronous Series Capacitor(SSSC), Transmitted Power Versus Transmission Angle Characteristic, Control Range and VA Rating.

UNIT-V

POWER FLOW CONTROLLERS

The Unified Power Flow Controller-Basic Operating Principles, Conventional Transmission Control Capabilities, Independent Real and Reactive Power Flow Control. Control Structure, Basic Control System for P and Q Control.Generalized and Multifunctional FACTS Controllers.

4. Books and Materials

Text Book(s)

1. Understanding FACTS – Concepts and technology of Flexible AC Transmission systems, Narain G. Hingorani, Laszlo Gyugyi, IEEE Press, WILEY, 1st Edition, 2000, Reprint 2015.

2. FACTS Controllers in Power Transmission and Distribution, Padiyar K.R., New Age International Publishers, 1st Edition, 2007

Reference Book(s)

1. Flexible AC Transmission Systems: Modelling and Control, Xiao – Ping Zhang, Christian Rehtanz, Bikash Pal, Springer, 2012, First Indian Reprint, 2015.

2. FACTS – Modelling and Simulation in Power Networks, EnrigueAcha, Claudio R. Fuerte – Esquival, Huge Ambriz – perez, Cesar Angeles – Camacho, WILEY India Private Ltd., 2004, Reprint 2012.

COURSE STRUCTURE

A2258 –HIGH VOLTAGE ENGINEERING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course to familiarize the students about the application of electrical phenomena in various mediums at high voltage. This course deals with different mediums of insulation, break down of insulation, generation and measurement of high DC and AC voltage, testing of insulation under all types of conditions at high AC and DC voltages. This course helps in design of advanced high voltage equipment's for various industrial applications.

Course Pre/corequisites:

1. A2206 – Electro Magnetic Fields
2. A2219 - Power System Transmission and Distribution

2. Course Outcomes (COs)

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

A2258.1 Analyse the breakdown mechanisms of solids liquids and Gases

A2258.2 Design the insulation for power system components.

A2258.3 Analyse and calculate the circuit parameters involved in generation of high voltages.

A2258.4 Measure the alternating signals, impulse high voltage signals, dielectric loss andpartial discharge.

3. Course Syllabus

UNIT-I

Introduction: Introduction to ac and dc impulse voltages and their use, problems in dealing with high voltages.

Breakdown in Gases: Elementary ideas on ionization by electron collision, townsend mechanism, townsend first and second ionization coefficients, paschen law, breakdown in non-uniform fields and corona discharges, vacuum breakdown mechanisms.

UNIT-II

Breakdown In Liquids: Fundamentals of insulating oils, conduction and breakdown in pure and commercial liquids.

UNIT-III

Breakdown in Solids: Fundamentals of solid insulating materials intrinsic, electromechanical and thermal breakdown, breakdown in simple and composite dielectrics, types of insulating

materials, temperature classification, factor affecting dielectric strength, insulation design ofrotating machines, transformers, transmission lines, switch gear, etc.

UNIT-IV

Generation of High Voltages: Generation of high voltages, testing transformers in cascade, series resonant circuits and their advantages, half and full wave rectifier circuits, voltage doubler and cascade circuits, electrostatic generator, characteristics parameters of impulse voltages, single stage impulse generator circuits, multistage impulse generation circuits.

UNIT-V

Measurement of High Voltages: Measurement of direct, alternating and impulse voltages by electrostatic voltmeters, sphere gap, uniform field gap, ammeter in series with high voltage resistors and voltage divider non-destructive high voltage tests: loss in a dielectric and its measurement, dielectric loss measurement by Schering bridge, partial discharges at alternating voltages, external and internal partial discharges and discharge measurements.

4. Books and Materials

Text Book(s)

1. M.S.Naidu and V. Kamaraju,*High Voltage Engineering*, TMH Publications, 4th edition, 2009
2. E.Kuffel, W.S. Zaengl J. Kuffel, *High Voltage Engineering: Fundamentals*, Elsevier, 2nd edition, 2005

Reference Book(s)

1. C.L.Wadhwa, *High Voltage Engineering,*New age internationals (p) limited, 1997
2. RavindraArora, Wolfgang Mosch, *High Voltage Insulation Engineering,* Newage international (p) limited, 1995.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2259 –UTILISATION OF ELECTRICAL ENERGY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course is to enable the student to acquire knowledge on the utilization of electrical energy. This course deals with the fundamentals of illumination, laws of illumination, classification, application for various lighting schemes, electric heating and welding. Here the concepts of electric traction, study of traction equipment, mechanics of train movement and associated calculations are discussed. This courseis helpful in designing of traction systems.

Course Pre/co requisites

1. A2205 - Electrical Machines-I
2. A2210 - Electrical Machines-II

2. Course Outcomes (COs)

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

A1252.1 Analyse various illumination systems, heating and welding techniques.

A1252.2 Analyse the torque- speed characteristics, speed-time characteristics and specificenergy consumption of electric locomotive

A1252.3 Apply suitable braking technique to control the speed locomotive.

A1252.4 Apply the power factor improvement and load factor improvement techniques foreffective usage of electrical energy.

3. Course Syllabus

UNIT-I

Illumination: Definition–laws of illumination–polar curves – calculation of MHCP and MSCP. lamps: incandescent lamp, sodium vapour lamp, fluorescent lamp, CFL and LED. Requirement of good lighting scheme – types, design and calculation of illumination. Street lighting and factory lighting.

UNIT-II

Electrical heating & welding: Methods of electric heating – resistance, arc, induction and dielectric heating and its applications.

Electric welding: Types – resistance, electric arc, gas welding. ultrasonic, welding electrodes ofvarious metals, defects in welding.

Electrolysis - faraday's laws, applications of electrolysis, power supply for electrolysis.

UNIT-III

Electric Traction – I: Introduction –traction systems, systems of electric traction- advantages of electric traction, special features of traction motors - the locomotive – wheel arrangement and riding qualities – transmission of drive – characteristics and control of locomotives - systems of track electrification – dc equipment – ac equipment – electric braking with dc motors and with ac motors – control gear – auxiliary equipment – track equipment and collector gear – conductor-rail equipment – overhead equipment – calculation of sags and tensions – collector gear for overhead equipment.

UNIT-IV

Electric Traction – II: Types of services – urban – sub-urban and main line services, speed-time curves of different services – trapezoidal and quadrilateral speed-time curves – tractive effort, power, specific energy consumption- factors affecting specific energy consumption, mechanics of train movement - adhesive weight and coefficient of adhesion.

UNIT-V

Economic aspects of utilising electrical energy: Power factor improvement, load factor improvement, off peak loads- use of exhaust steam, waste heat recovery, pit head generation, diesel plant, general comparison of private plant and public supply- initial cost and efficiency, capitalization of losses, choice of voltage.

4. Books and Materials

Text Book(s)

1. E. Openshaw Taylor and V. V. L. Rao, *Utilization of Electric Energy*, Universities press, 2009
2. J.B. Gupta, *Utilization of Electric Power and Electric Traction,*Kataria and sons, Delhi.

Reference Book(s)

1. C.L Wadhwa, *Generation, Distribution and Utilization of Electrical Energy*, Wiley eastern limited, 1993.
2. R.K. Rajput, *Utilization of Electrical Power*, Laxmi publications.

PROFESSIONAL ELECTIVE-4

Professional Elective – 4	
Course Code	**Title of the Course**
A2260	HVDC Transmission
A2261	AI Techniques in Power Systems
A2262	Industrial Automation and Control

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COURSE STRUCTURE

A2260 HVDC TRANSMISSION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course is to enable the student to acquire knowledge on High Voltage Power Transmission and its applications. The objective of this course is to introduce Technical and economic aspects of HVAC and HVDC transmission and their comparison,Static power converters, Control of HVDC converter systems, Origin, effects, classification and elimination of harmonics, the occurrence of faults, and transients in HVDC system and their protection.

Course Pre/corequisites

1. A2219- Power Electronics

2. Course Outcomes (COs)

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

A2260.1 Understand the concept of HVDC Transmission system over the existing AC transmission and Basic principle and operation of different HVDC converters.

A2260.2 Analyze and apply the different power Converters and control methods to control the transmission system and distribution system.

A2260.3 Design filters to eliminate the harmonics to improve the power quality.

A2260.4 Analyze different faults in HVDC system.

3. Course Syllabus

UNIT-I

Introduction To HVDC Transmission: HVDC Transmission: Technical And Economical Comparison of HVAC and HVDC Transmission, Types of DC Links, Power Handling Capabilities of HVDC Lines, static Conversion Principles, Static Converter Configuration.

UNIT-II

Static Power Converter Analysis: Static Power Converters: 3-Pulse, 6-Pulse & 12-Pulse Converters, Converter Station and Terminal Equipment, Commutation Process, Rectifier and Inverter Operation, Equivalent Circuit for Rectifier, Inverter and HVDC Link- Special Features of Converters.

UNIT-III

Control of HVDC Converter Systems: Control of HVDC Converter Systems: Principle of DC Link Control – Constant Current, Constant Extinction Angle and Constant Ignition Angle Control and Voltage Dependent Current Control. Individual Phase Control and Equidistant Firing Angle Control.

UNIT-IV

Harmonics and Filters: Origin of Harmonics in HVDC Systems, Classification of Harmonics, Elimination of Harmonics, Suppression Methods, Harmonic Instability Problems, Design of HVDC AC & DC Filters.

UNIT-V

Transients, Faults and Protection Of HVDC Systems: Origin of over Voltages in HVDC Systems, Over Voltages due to DC and AC Side Line Faults - Converter Faults, Over Current Protection- Valve Group and DC Line Protection. Over Voltage Protection of Converters, Surge Arresters etc

4. Books and Materials

Text Book(s)

1. K.R.Padiyar, *HVDC Power Transmission Systems*, 3rd Edition, New Age International publishers, 2015

2. S.Kamakshaiah, V.Kamaraju*, HVDC Transmission*, McGraw Hill Education (India) Pvt. Ltd., 2011.

Reference Book(s)

1. E. W. Kimbark, *Direct Current Transmission*, Vol. 1, Wiley, 1971

2.Jos Arrillaga ,*High Voltage Direct Current Transmission*, IEE Power and Energy series 29, 2nd Edition, 1998

3. S.Rao, *EHV-AC, HVDC Transmission & Distribution Engineering*, Khanna Publishers, 4th Edition, 2008**.**

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COURSE STRUCTURE

A2261 - INDUSTRIAL AUTOMATION AND CONTROL

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The aim of this course is to introduce students with present industrial automation scenario in India. The broad knowledge of essential component of present Industrial Automation industry such as Programmable Logic Controller(PLC),Distributed Control System(DCS), Supervisory Control and Data Acquisition(SCADA),industrial drives,human machine interface will enable the students to maintain the above automation control systems used in the present industry .Thus ,this course is very important for students who want to use their knowledge of electronic engineering for working in industrial automation sector.

Course Pre/corequisites:

1. A219 - Power Electronics
2. A2211 - Control System

2. Course Outcomes (COs)

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

A2261.1	Describe working of various blocks of basic industrial automation system
A2261.2	Connect the peripherals with the PLC
A2261.3	Use various PLC functions and develop small PLC programmes
A22614	Summarize Distributed Control System and SCADA system
A2261.5	Use various industrial motor drives for the Industrial Automation

3. Course Syllabus

UNIT -I

Need and benefit of automation, PLC system: applications of PLC, PLC modules, I/O module, Communication module, PID module, Input analog and digital devices, Output analog and digital devices.

UNIT- II

PLC registers: PLC timer function, PLC counter function, PLC simple arithmetic and logical functions, PLC ladder logic diagram, Advanced PLC functions like SKIP, MASTER CONTROL RELAY, JUMP with non return, jump with return, Sequencer function

UNIT- III

PLC applications: Bottling filling plant, Material handling elevator, 2-axis robot with sequencer control, Level control, troubleshooting

UNIT -IV

Introduction to DCS: Concept of DCS, hierarchy of DCS, function of each level of DCS, Introduction to supervisory Control and Data Acquisition system (SCADA), SCADA Architecture, Interfacing SCADA with PLC

UNIT- V

Induction motor drive: V/F Control, Direct torque control, Stepper motor drives, AC and DC Servo motor drives, DC motor drives

4. Books and Materials

Text Books:

1. Webb John W. and Reis A. Ronald, "Programmable Logic Controllers Principles and applications" PHI , New Delhi, Latest edition

2 . Bolton W, "Programmable Logic Controllers" Elsevier India Pvt. Ltd. New Delhi

3 .John R Hackworth, "Programmable Logic Controllers" Pearson education New Delhi, Latest edition 4 .C. D. Johnson, "Process Control Instrumentation" John Wiley & Sons

Reference Books:

1. Liptak, "Instrumentation Engineering Handbook" Chilton Book Company, Latest edition

2 .Popovic & Bhatkar, "Distributed Computer Control for Industrial Automation" CRC Press, New Delhi, Latest edition

3. Krishna Kant, "Computer Based Industrial Control" PHI, New Delhi, Latest edition

4. Rashid M. H, "Power Electronics – Circuits, Devices and Applications" PHI / Pearson Education.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2262– AI TECHNIQUES IN POWER SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The purpose of this course is to analyze the techniques of AI for engineering applications of power systems. This course includes the concepts of Biological & Artificial Neuron models, learning processes, Multi-layer Perceptron model using Back propagation Algorithm, fuzzy logics and genetic algorithms. This course addresses proper techniques for designing Neural networks for artificial intelligence, logic circuits, and covers concepts of fuzzy logic applications. Artificial Intelligence is a powerful technology suitable for various power system applications like load forecasting, load flow studies, economic load dispatch, Load frequency control.

Course Pre/corequisites

1. A2229 –Power System Operation and Control
2. A2228 – Neural Networks and Fuzzy Logic

2. Course Outcomes (COs)

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

A2262.1 Understand the fundamental concepts of Artificial neural networks, Fuzzy logic and Genetic Algorithms- genetic operations and genetic mutations.

A2262.2 Study different learning rules, architectures like Multi – layer Perceptron model using Back propagation algorithm, Self – organizing Map, Hopfield network.

A2262.3 Analyze the fuzzy sets and evaluate the fuzzy logic system with fuzzification, rule base and defuzzification methods.

A2262.4 Develop Fuzzy logic control andgenetic algorithm for applications in electrical engineering

A2262.5 Apply appropriate AI techniques for solving power system problems.

3. Course Syllabus

UNIT-I

Artificial Neural Networks: Introduction-Models of Neural Network – Architectures – Knowledge representation – Artificial Intelligence and Neural networks – Learning process – Error correction learning – Hebbian learning – Competitive learning – Boltzman learning – Supervised learning – Unsupervised learning – Reinforcement learning – learning tasks.

UNIT-II

ANN Paradigms : Multi – layer perceptron using Back propagation Algorithm-Self – organizing Map – Radial Basis Function Network – Functional link, network – Hopfield Network.

UNIT-III

Fuzzy Logic: Introduction – Fuzzy versus crisp – Fuzzy sets – Membership function – Basic Fuzzy set operations – Properties of Fuzzy sets – Fuzzy cartesian Product – Operations on Fuzzy relations – Fuzzy logic – Fuzzy Quantifiers – Fuzzy Inference – Fuzzy Rule based system – Defuzzification methods.

UNIT-IV

Genetic Algorithms: Introduction, Genetic Algorithms, Procedure of Genetic Algorithms, Genetic Representations, Initilization and Selection, Genetic Operators - Crossover, Mutation, Working of Genetic Algorithms, Swarm intelligence algorithm - PSO, Evolutionary Programming, The Working of Evolutionary Programming.

UNIT-V

Applications of AI Techniques: Load forecasting – Load flow studies – Economic load dispatch – Load frequency control – Single area system and two area system, Stability, Reactive power control .

4. Books and Materials

Text Book(s)

1. S.Rajasekharan and G. A. V. Pai, *Neural Networks, Fuzzy Logic, Genetic Algorithms: Synthesis and Applications,* PHI, New Delhi, 2003.

2. Yegnanarayana. B, "*Artificial Neural Networks*", Prentice Hall of India Private Ltd., New Delhi, 1999.

Reference Book(s)

1. SimonHaykins, *Neural Networks: A comprehensive Foundation*, Pearson Edition, 2003.

2. J.MZurada, *Introduction to Artificial Neural Systems*, Jaico publishing house, Bombay, 1992.

3. Kevin Warwick, Arthur Ekwue and Raj Aggarwal, *Artificial Intelligence Techniques in Power Systems*, IEE Power Engineering Series, UK, 1997.

4. S.N.Sivanandam, S.Sumathi, S.N.Deepa, *Introduction to Neural Networks using MATLAB 6.0*, TMH, 2006.

5. G. J. Klir and T. A. Folger, "Fuzzy sets, Uncertainty and Information"-PHI, Pvt.Ltd,1994.

6. BartKosko, *Neural Networks and Fuzzy Logic System,* Prentice Hall, 1992.

7. D. E. Goldberg," Genetic Algorithms"- Addison Wesley 1999.

OPEN ELECTIVES

COURSE STRUCTURE

A30518– Fundamentals of Web Technologies

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	2	14	0	28	2	40	60	100

1. Course Description

Course Overview

This course makes the students to practice the principles of creating an effective web page and learn the language of the web with HTML and CSS. It Develop skills in analysing the usability of a web site and how to plan and conduct user research related to web usability.

Course Pre/corequisites

A30509 Web Technologies

2. Course Outcomes (COs)

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

A30518.1 Apply the principles of creating an effective web page.

A30518.2 Apply the elements of design with regard to the web.

A30518.3 Create the language of the web: HTML and CSS.

A30518.4 Develop skills in analyzing the usability of a web site.

A30518.5 Understand how to plan and conduct user related to web usability.

3. Course Syllabus

1. **BASICS IN WEB DESIGN**: Brief History of Internet, What is World Wide Web, Why create aweb site and Standards, Public demand requirement.
2. **WEB DESIGN PRINCIPLES**: Basic principles involved in developing a web site, PlanningProcess, rules of web designing, Page design, Home Page Layout and Design Concept.
3. **INTRODUCTION TO HTML**: Introduction to HTML , HTML Documents, Basic structure of an HTML document , Creating an HTML document ,Mark up Tags and Heading-Paragraphs
4. **INTRODUCTION TO ELEMENTS OF HTML**: Working with Text, Working with Lists, Tables and Frames Working with Hyperlinks, Images and Multimedia, Forms and controls.
5. **INTRODUCTION TO CASCADING STYLE SHEETS**: Concept of CSS , Creating Style Sheet , CSS Properties , CSS Styling(Background, Text Format, Controlling Fonts) and block elements and objects ,Lists and Tables CSS Id and Class ,Box Model

4. Laboratory Equipment/Software/Tools Required

Dream Weaver, MySQL or Equivalent, Apache Server, WAMP/XAMPP

5. Books and MaterialsText Book(s)

1. Deitel and Deitel and Nieto, *Internet and World Wide Web - How to Program*‖, Prentice Hall, 5th Edition, 2015.

Reference Book(s)

1. Chris Bates, *Web Programming – Building Intranet Applications*, 3rd Edition, WileyPublications, 2014.