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 i^{th} subject and GP_i is the grade point scored by the student in the i^{th} course.

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

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

where "$SGPA_j$" is the SGPA of the j^{th} 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	Object Oriented Programming Through Java Laboratory	PC	0	0	4	2	30	70	100
A2016	Professional English Communication Skills	HS	0	0	2	1	30	70	100
A2033	Indian Constitution	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 Simulation Laboratory	PC	0	0	3	1.5	30	70	100
A2227	Electrical Drives Simulation Laboratory	PC	0	0	3	1.5	30	70	100
A2431	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**	**440**	**560**	**1000**

* 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	Electrical Design 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 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	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	Renewable Energy Sources	3-0-0	3	EEE
A2283	Electrical Measuring Instruments	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

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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.

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	Object Oriented Programming Through Java Laboratory	PC	0	0	4	2	30	70	100
A2020	Professional English Communication Skills Laboratory	HS	0	0	2	1	30	70	100
A2033	Indian Constitution	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 Simulation Laboratory	PC	0	0	3	1.5	30	70	100
A2227	Electrical Drives Simulation Laboratory	PC	0	0	3	1.5	30	70	100
A2431	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	440	560	1000

* 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 – 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	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

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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	Renewable Energy Sources	3-0-0	3	EEE
A2283	Electrical Measuring Instruments	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

COURSE STRUCTURE

V – SEMESTER

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	Object Oriented Programming Through Java Laboratory	PC	0	0	4	2	30	70	100
A2020	Professional English Communication Skills Laboratory	HS	0	0	2	1	30	70	100
A2033	Indian Constitution	MC	2	0	0	0	100*	0	100*
		TOTAL	17	00	12	21	270	630	900

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COURSE STRUCTURE

A2219 – POWER SYSTEM TRANSMISSION AND DISTRIBUTION

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 Transmission and Distribution systems. The objective of this course is to introduce the transmission line parameters, types of transmission lines and their performance analysis. This course also gives the emphasis on mechanical design of transmission lines, cables, insulators and sag. In addition this course also focuses on the concepts of distribution system, types of faults and protection. This course is used to solve the power system problems using computer methods.

Course Pre/corequisites

1. A2202 - Electrical Circuits – I
2. A2208 - Electro Magnetic Fields
3. A2214 - Electrical Power Generation

2. Course Outcomes (COs)

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

A2219.1 Apply the knowledge of electromagnetic fields to calculate the parameters of transmission lines and underground cables.

A2219.2 Analyze the performance of various transmission lines, underground cables and overhead insulators.

A2219.3 Design mechanical transmission lines using corona phenomenon, Sag and Tension.

A2219.4 Analyze the distribution system, types of faults and protective devices.

3. Course Syllabus

UNIT-I

Transmission Line Parameters: Types of Conductors – ACSR, Bundled and Stranded, Resistance for Solid Conductors, Skin Effect, Calculation of Inductance and Capacitance for Single Phase and Three Phase, Single and Double Circuit Lines, GMR & GMD, Symmetrical and Asymmetrical Conductor Configuration with and without Transposition, Effect of Ground on Capacitance.

UNIT-II

Performance of Transmission Lines: Classification of Transmission Lines, Equivalent Circuits – Nominal-T and Pie, Regulation and Efficiency of transmission Lines - Evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations, Surge Impedance and Loading, Wavelengths and Velocity of Propagation, Ferranti Effect and Charging Current.

UNIT-III

Mechanical Design of Transmission Lines:

Overhead Line Insulators - Types of Insulators, String Efficiency and Methods for Improvement, voltage distribution and calculation of string efficiency, Capacitance Grading and Static Shielding, **Corona -** Corona Phenomenon, Factors Affecting Corona, Critical Voltages, Power Loss and Radio Interference.

Sag and Tension Calculations - Sag and Tension with Equal and Unequal Heightsof Towers, Effect of Wind and Ice on Weight of Conductor.

UNIT-IV

Underground Cables: Types of Cables, Construction, Calculation of Insulation Resistance and Stress in Insulation, Capacitance of Single and 3-Core Belted Cables, Types of Grading.

UNIT-V

Faults and Protection of Distribution System: Objectives of distribution system, types of common faults, Protective Devices - Fuses, Circuit Auto reclosers, line sectionalizers and circuit breakers.

4. Books and Materials

Text Book(s)

1. C.L.Wadhwa, *Electrical Power Systems*, New Age International (P) Limited, 6th edition, 2010.
2. M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarti, *A Text Book on Power System Engineering*, Dhanpat Rai& Co Pvt. Ltd., 2003.

Reference Book(s)

1. D. P. Kothari and I. J. Nagrath, *Power System Engineering*, McGraw Hill Education (India) Pvt. Ltd., 2ndedition, 2008, 23rd reprint 2015.
2. V.K. Mehta and Rohit Mehta, *Principles of Power Systems*, 4threvised edition, S.Chand, reprint 2010.
3. TuranGonen, *Electric Power Distribution System Engineering*, McGraw Hill, 1986.

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COURSE STRUCTURE

A2220 – POWER ELECTRONICS

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 switched-mode converter circuits for controlling and converting electrical power with high efficiency. This course provides an introduction to the power electronics devices for the control, conversion of electrical power and their practical applications in power electronics. This course also focuses on the regulation of voltage, current and power using DC-DC converters, AC - DC rectifier, DC - AC inverter and AC - AC cycloconverter. In this course high power applications of power electronic devices by their switching and static characteristics are discussed. Further this course also focuses on harmonic reduction in the converters by employing PWM techniques. The converters discussed in this course will be applied in aerospace industry, commercial sector, industrial sector, domestic equipments, telecommunications, transportation and utility systems.

Course Pre/corequisites

A2408-Electronic Circuits-I

2. Course Outcomes (COs)

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

A2220.1 Illustrate the fundamental concepts and techniques used in power electronic circuits.

A2220.2 Analyze the performance and protection techniques of power electronic devices.

A2220.3 Analyze the operation and performance of AC-DC, DC-DC, DC-AC and AC-AC converters.

A2220.4 Design a suitable power electronic converter circuit for given applications.

A2220.5 Apply PWM techniques to improve the performance of DC-DC and DC-AC converters.

3. Course Syllabus

UNIT-I

Power Switching Devices : Classification of Switching Devices Based on Frequency and Power Handling Capacity,Power Diodes, TRIACs, GTOs, Power Transistor (BJT), Power MOSFET, Power IGBT I-V Characteristics,Silicon Controlled Rectifiers (SCR's)- Static Characteristics, Turn On and Turn Off Methods, Dynamic Characteristics of SCR, Two Transistor Analogy.

Triggering Circuits - R, RC, UJT, Series and Parallel Connections of SCR's, protection against dv/dt and di/dt, design of Snubber circuit, Ratings of SCR's, BJT, IGBT, numerical problems.

UNIT-II

Phase Controlled Converters: Phase Control Technique – Single Phase Line Commutated Converters – Mid Point and Bridge Connections – Half Controlled Converters, Fully Controlled Converters with Resistive, RL Loads and RLE Load– Derivation of Average Load Voltage and Current – Line Commutated

Inverters -Active and Reactive Power Inputs to the Converters without and with Free Wheeling Diode, Effect of Source Inductance – Numerical Problems.

Three Phase Line Commutated Converters – Three Pulse and Six Pulse Converters – Mid Point and Bridge Connections - Average Load Voltage with R and RL Loads – Effect of Source Inductance–Dual Converters (Both Single Phase and Three Phase) - Waveforms –Numerical Problems.

UNIT-III

Choppers: Basic chopper operation, control strategies, Step down and Step up choppers- Derivation of load voltage and load currents with R, RL and RLE loads, Chopper configurations. Power circuit of a Buck, Boost and Buck-Boost converters: Analysis and waveforms at steady state, numerical problems.

UNIT-IV

AC Voltage Controllers and Cycloconverters: Single phase AC voltage controllers - Two SCRs in anti-parallel with R and RL loads, derivation of rms load voltage and load current, numerical problems.

Cycloconverters - Single phase midpoint and Bridge type (step-up and step-down operations) with R and RL loads.

UNIT-V

Single Phase Inverters: Basic operation, voltage source inverters, basic series and parallel inverters, current source inverter, Single Phase Half and Full Bridge Inverters.

Voltage Control Techniques for Inverters: Pulse Width Modulation Control- Harmonic Reduction Techniques, Numerical Problems, Three- phase VSI in 120° And 180° Modes of Conduction.

4. Books and Materials

Text Book(s)

1. P.S.Bimbhra, *Power Electronics*, Khanna publishers, Delhi, 4th edition, 2008.
2. M.D.Singh and K. B. Khanchandani,*PowerElectronics*, McGraw Hill education (India) Pvt. Ltd., 2nd edition, 2007, 23rd reprint 2015.

Reference Book(s)

1. M H Rashid, *Power electronics: Circuits, Devices, and Applications*, Pearson education India, 3rdedition, 2009.
2. N Mohan and T M Undeland, *Power Electronics: Converters, Applications and Design*, John Wiley & Sons, 2ndedition, 2007.
3. P. C. Sen(2001), *Power Electronics*, Tata McGraw Hill publishing, 30th edition, New Delhi.

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COURSE STRUCTURE

A2221-ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

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 electrical measuring instruments used to measure electrical quantities. This course provides the information on analog and digital methods of measuring physical quantities. The minimisation of different errors and their effects in measuring instruments are discussed. Here the concepts of single phase and three phase circuits are discussed to determine the voltage, current, power and energy. Also, the concepts of bridges are discussed, which are used for the measurement of unknown resistance, inductance and capacitance. These electrical measuring instruments are used in domestic and industrial applications.

Course Pre/corequisites

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

2. Course Outcomes (COs)

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

A2221.1	Categorise various electrical instruments used for measuring electrical parameters.
A2221.2	Analyze the errors and compensations in various electrical measuring instruments
A2221.3	Measure current, voltage, power and energy in 1-phase and 3-phase circuits.
A2221.4	Estimate the unknown quantities of resistance, inductance and capacitance using bridges
A2221.5	Apply transducers, digital meters and CRO for measuring electrical parameters

3. Course Syllabus

UNIT-I

Introduction to Measuring Instruments: Classification of measuring instruments, Performance Characteristics- Static and Dynamic, types of errors and torques, ammeter and voltmeter-PMMC, MI and dynamometer instruments, expression for deflection and control torque, errors and compensation, extension of range of ammeters and voltmeters using shunts and series resistances.

UNIT-II

Potentiometers and Instrument Transformers: DC Crompton Potentiometers- Principle and operation, standardization, measurement of unknown resistance, voltage and current. AC potentiometers-polar and coordinate type, standardization and applications. Instrument transformers- CT and PT, ratio and phase angle error.

UNIT-III

Measurement of Power and Energy: Measurement of Power- Power measurements in DC and AC circuits. EDM wattmeter - construction, working, torque equation, shape of scale, errors &

compensations and LPF wattmeter. Measurement of three phase active and reactive power for balanced and unbalanced loads.

Measurement of Energy: Single phase induction type energy meter - construction, working, driving and braking torques, lag adjustment devices, errors & compensations. Three phase energy meter.

UNIT-IV

DC and AC Bridges: Measurement of Resistance- Methods of measuring low, medium, high resistance, Wheatstone bridge, carry foster, Kelvin's double bridge, loss of charge method, Measurement of Inductance- Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge; Measurement of Capacitance-Desauty's bridge, Schering bridge. Measurement of frequency: Wein's bridge.

UNIT-V

Transducers and Digital Measurements: Transducers: Classification, Principle of Operation of Resistive, Inductive, Capacitive Transducers, Characteristics and Choice of Transducers, LVDT, Strain Gauge and Gauge Factor.

Cathode ray oscilloscope: Cathode ray tube, time base generator, horizontal and vertical amplifiers, CRO probes, applications of CRO, measurement of phase and frequency, Lissajous patterns.

4. Books and Materials

Text Book(s)

1. A.K.Sawhney, *A course on Electrical and Electronics Measurements &Instrumentation,* DhanpatRai and Co. Publishers, 19th edition, 2015
2. J.B.Gupta, *A course on Electrical and Electronics Measurements & Instrumentation*, S.K. Kataria publishers, 14th edition, 2014.

Reference Book(s)

1. U.A.Bakshi, A.V.Bakshi, *Electrical measurements and Instrumentation*, Technical publications, 1st edition, 2009.
2. E.W.Golding&F.C.Widdis, *Electrical Measurements and Measuring Instruments*, Wheeler publishers, 5th edition, 1997.
3. H S Kalsi, *Electronic Instrumentation*, Tata McGraw-Hill, 3rd edition, 2010.

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COURSE STRUCTURE

A2222 – POWER ELECTRONICS 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 objective of this course is to analyse the performance characteristics of SCR. The performance characteristics of AC-DC, DC-AC, DC-DC and AC-AC converters at different load conditions are analysed. This lab course also helps the students to design power electronic converters using MATLAB simulation.

Course Pre/corequisites

1. A2409 Electronic Circuits-I Laboratory
2. A2220 Power Electronics

2. Course Outcomes (COs)

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

A2222.1 Analyze the performance characteristics of SCR firing and commutation circuits.

A2222.2 Plot the performance characteristics of AC-DC, DC-AC, DC-DC and AC-AC converters with R and RL Loads.

A2222.3 Apply the knowledge of MATLAB to plot the characteristics of full converter, inverter and forced commutation circuits

3. Course Syllabus

List of Experiments:

1. Gate firing circuits for SCRs
2. Single phase A.C. Voltage controller with R and RL loads
3. Single phase fully controlled bridge converter with R and RL loads
4. Forced commutation circuits
5. DC Jones Chopper
6. Single phase parallel inverter with R and RL loads
7. Single phase cycloconverter with R and RL loads
8. Single phase half controlled bridge converter with R and RL loads
9. Three phase half controlled bridge converter with R load
10. Single phase series inverter with R and RL loads
11. Single phase bridge converter with R and RL loads
12. Single phase dual converter with R and RL loads
13. MATLAB simulation of single phase full converter using RLE loads and single phase AC
14. Voltage Controller using RLE loads
15. MATLAB simulation of Resonant pulse commutation circuit and Buck chopper
16. MATLAB simulation of Single phase inverter with PWM control

4. Laboratory Equipment/Software/Tools Required

1. SCR Firing Circuit Trainer Kit
2. Single Phase Half Controlled Bridge Converter Power Circuit Trainer Kit
3. Single Phase Fully Controlled Bridge Converter Power Circuit Trainer Kit
4. Forced Commutation Circuit Trainer Kit
5. Single Phase AC Voltage Controller Trainer Kit
6. Single Phase cycloconverter Power Circuit Trainer Kit
7. DC Jones Chopper Power Circuit Trainer Kit
8. Single Phase Series Inverter Power Circuit with Firing circuit Kit
9. Single Phase Parallel Inverter Power Circuit with Firing Circuit Kit
10. Single Phase Dual Converter Power Circuit with Firing Circuit Module
11. Three Phase Half Controlled Bridge Converter Power Circuit Trainer Kit
12. MATLAB 9.0 Simulation Software

5. Books and Materials

Text Book(s)

1. P S Bimbhra**,** *Power Electronics***,**Khanna Publishers, Delhi, 4th edition, 2008.
2. M. D. Singh and K.B. Khanchandani,*PowerElectronics*,McGraw Hill education (India) Pvt. Ltd., 2nd edition, 2007, 23rd reprint 2015.

Reference Book(s)

1. N Mohan and T M Undeland, *Power Electronics: Converters, Applications and Design*, John wiley& Sons, 2nd edition, 2007.
2. M H Rashid, *Power electronics: circuits, devices, and applications*, Pearson Education India, 3rd Edition, 2009.
3. P.C.Sen, *Power Electronics*, 30th edition, Tata McGraw Hill publishing, New Delhi, 2001.

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COURSE STRUCTURE

A2223 – ELECTRICAL MEASUREMENTS AND INSTRUMENTATION 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 Course is for providing the basic concepts of measuring the different electrical parameters with precision& calibration of different types of instruments and also to impart knowledge on the working of the different types of measuring instruments. This course is designed to measure Resistance, Inductance and Capacitance of different ranges using bridge circuits. In this course the calibration of PMMC, MI, Electrodynamometer and energy meters done. Applications of this course are: Monitoring of processes and operations, control of processes and operations and experimental engineering analysis.

Course Pre/corequisites

1. A2202 - Electrical Circuits -I
2. A2209- Electrical Circuits-II
3. A2221 - Electrical Measurements and Instrumentation

2. Course Outcomes (COs)

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

A2223.1 Estimate resistance, inductance and capacitance of electrical circuits using bridges and dielectric strength of transformer oil

A2223.2 Calculate the percentage error of various measuring instruments, LVDT, and resistance strain gauge

A2223.3 Evaluate 3-Φ active power and reactive power of different loads.

A2223.4 Calibrate single phase energy meter and DC Crompton potentiometer.

3. Course Syllabus

1. Kelvin's Double Bridge – Measurement of very low Resistance values – Determination of Tolerance.
2. Schering Bridge for measurement of Capacitance values.
3. Anderson Bridge for measurement of Inductance values.
4. Crompton D.C. Potentiometer – Calibration of PMMC Voltmeter
5. Dielectric Oil Testing Using H.T. Testing Kit
6. LVDT Characteristics and Calibration
7. Resistance Strain Gauge – Strain Measurement and Calibration
8. Calibration of Single-Phase Energy Meter using Phantom loading method with RSS meter as standard
9. Power Measurement by 3-Voltmeter Method
10. Power Measurement by 3-Ammeter Method

11. Measurement of 3 Phase Reactive Power with Single-Phase Wattmeter.
12. Measurement of 3 Phase Power with Two Watt Meter Method (Balanced &Un balanced).

4. Laboratory Equipment/Software/Tools Required

1. Kelvin's Double Bridge
2. Schering Bridge
3. Anderson Bridge
4. Crompton D.C. Potentiometer
5. H.T. Oil Testing Kit
6. LVDT
7. Resistance Strain Gauge
8. Single-Phase Energy Meter

5. Books and Materials

Text Book(s) :

1. A.K.Sawhney, *A Course in Electrical & Electronic Measurement & Instruments*, 19th edition, DhanpatRai& Co. publications, New Delhi,2011.

Reference Book(s)

1. J.B.Gupta,*Electronics and Electrical Measurements and Instrumentation*, 10th edition, S.K.Kataria sons, New Delhi,2010.
2.E.W.Golding,F.C.Widdis,*Electrical Measurements and Measuring Instruments*,5thedition, Wheeler publishing, New Delhi,2010.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2509 –OBJECT ORIENTED PROGRAMMING THROUGH JAVA 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 course provides hands on experience in applying object oriented concepts using Java. The learner will be able to practically handle problems related to arrays, Strings, interfaces, inheritance, packages, exception handling, multithreading, files and swings and give effective solution programmatically. This helps the students to choose their career as software engineers.

Course Pre/corequisites

1. A2501- Computer Programming
2. A2505- Object Oriented Programming Using Java

2. Course Outcomes (COs)

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

A2509.1	Design solutions for the problems of general purpose applications using object oriented concepts.
A2509.2	Generate reusable code using inheritance, user defined packages and interface
A2509.3	Write robust and efficient code using exception handling and multithreading concepts
A2509.4	Implement collection frameworks and file handling techniques to store and retrieve data
A2509.5	Design user interface using swings

3. Course Syllabus

Lab Experiments:

1. Installation of Java software and study of any integrated development environment. Learn to compile, debug and execute java programs.

Arrays

2. Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read, display it only if it is not a duplicate of any number already read. Display the complete set of unique values input after the user enters each new value.

Inheritance

3. Write a java program to create a super class called Figure that receives the dimensions of two dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub classes override area(s) so that it returns the area of a rectangle and triangle respectively.

4. Develop a java application for Banking transactions by using inheritance concept.

5. Develop a java application for Daily Attendance by using the concept Dynamic Binding.

Interfaces

6. Create an interface for stack with push and pop operations. Implement the stack in two ways: fixed size stack and Dynamic stack (stack size is increased when stack is full).

7. Develop a java application for ticket reservation by using the concept of polymorphism.

Exception Handling

8. Write Java program(s) which uses the exception handling features of the language, creates exceptions and handles them properly, uses the predefined exceptions, and create own exceptions.

Multithreading

9. Write a Java program that creates three threads. First thread displays “Good Morning” every one second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.

10. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

Files

11. Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by .part<n> where n is the sequence number of the part file.

12. Write a java program to find and replace pattern in a given file.

Collection Frameworks:

13. Implement collection frameworks to retrieve data.

Event Handling:

14. Write a java program to handle mouse events.
15. Write a java program to handle keyboard events.

Swings:

16. Develop a swing program for waving a Flag using applets and threads.

17. Using swings design a simple calculator which performs all arithmetic operations. The interface should look like the calculator application of the operating system. Handle the exceptions if any.

18. Write a java program that allows conduction of object type examination containing multiple choice questions, and true/false questions. At the end of the examination when the user clicks a button the total marks have to be displayed in the form of the message.

4. Laboratory Equipment/Software/Tools Required

1. Open source Java Tool kit: JDK 8 and above versions

5. Books and Materials

Text Book(s)

1. Herbert Schildt. *Java the Complete Reference*. MC GRAW HILL Education, 9th Edition,2016.

Reference Book(s)

1. T. V. Suresh Kumar, B.Eswara Reddy and P.Raghavan. *Programming with Java.* Pearson, 2011.

2. Paul Deitel and Harvey Deitel. *Java – How to Program.* Pearson, 2nd Edition, 2012.

3.Kathy Sierra and Bert Bates. *Head First Java.* O'Reilly,2nd Edition, 2005.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2020 – PROFESSIONAL ENGLISH COMMUNICATION SKILLS

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	1	30	70	100

1. Course Description

Course Overview

With increased globalization and rapidly changing industry expectations, employers are looking for the wide cluster of skills to cater to the changing demand. The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

Course Pre/co requisites

1. A2001- Communicative English
2. A2006- Communicative English Lab

2. Course Outcomes (COs)

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

A2020.1 Recall vocabulary and enhance accuracy in grammar
A2020.2 Understand and communicate effectively in speaking and in writing
A2020.3 Apply language structures to construct good relations.
A2020.4 Identify and develop effective technical writing skills
A2020.5 Determine and develop personal presentation techniques
A2020.6 Design necessary skills to deliver presentation confidently for improving in respective domains.

3. Course Syllabus

UNIT I: COMMUNICATION SKILLS:

1. Reading Comprehension –General and Technical 2. Listening Comprehension

3. Vocabulary Development 4. Common Errors.

UNIT II: WRITING SKILLS:

1. Technical Report writing 2. Resume Preparation 3. E-mail Writing

UNIT III: PRESENTATION SKILLS:

1. Oral presentation 2. Power Point Presentation 3. Poster presentation

UNIT IV: GETTING READY FOR JOB:

1 Debates 2 Group discussions 3 Job Interviews

UNIT V: INTERPERSONAL SKILLS:

1. Time Management 2. Problem Solving & Decision Making 3. Etiquettes-Telephone and email etiquette.

4. Books and Materials

Text Books:

1. Rizvi, M. Ashraf, *Effective Technical Communication*. Noida: McGraw-Hill Education. 2009.

Reference Books:

1. Dhanavel, S P, *English for Communication Skills for Students of Science and Engineers*. New Delhi: MittalBooks India. 2009.
2. Lewis, Norman,*Word Power made Easy*. Haryana: Penguin Random House India. 2009.
3. Mohan, Krishna and N P Krishna, *Speaking English Effectively.* India: MacMillan.2009.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2033 – INDIAN CONSTITUTION

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 in such a way that it gives an overview of Indian Constitution. This course provides the knowledge on importance of constitution, structure of executive,legislature and judiciary, central and state relation financial and administration.

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:

A2033.1 Understand historical background of the constitution making and its importance for building a democratic India.

A2033.2 Explain the role of President and Prime Minister.

A2033.3 Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

A2033.4 Understand the value of the fundamental rights and duties for becoming good citizen of India

A2033.5 Analyze the decentralization of power between central, state and local self-government.

A2033.6 Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

3. Course Syllabus

UNIT - I

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

UNIT - II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, Prime Minister and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions.

UNIT - III

State Government and its Administration: Governor - Role and Position – Chief Minister and Council of ministers, State Secretariat: Organization, Structure and Functions.

UNIT - IV

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

UNIT - V

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

4. Books and Materials

Text Book(s)

1. Durga Das Basu, *Introduction to the Constitution of India*, Prentice Hall of India Pvt. Ltd. New Delhi.
2. SubashKashyap, *Indian Constitution*, National Book Trust.

Reference Book(s)

1. A. Siwach, *Dynamics of Indian Government & Politics*.
2. D.C. Gupta, *Indian Government and Politics*.
3. H.M.Sreevai, *Constitutional Law of India*, 4thedition in 3 volumes (Universal Law Publication)

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

VI – SEMESTER

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

VI SEMESTER (III-II Sem)									
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	Electrical Drives Simulation Laboratory	PC	0	0	3	1.5	30	70	100
A2431	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	440	560	1000

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2224 – POWER SEMICONDUCTOR DRIVES

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 an extension of power electronics applied to electric drives. It covers the advanced speed control techniques using power electronic converters that are used in industry. This course deals with single phase and three phase converter based DC motor control, Chopper based control of DC motors, Induction motor based control methods with stator, rotor control and synchronous motor control techniques. The AC and DC drives studied in this course are applied in transport system, paper industry, textile mills and robotics.

Course Pre/corequisites

1. A2220 - Power Electronics
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

A2224.1	Identify a suitable electric drive system for desired application.
A2224.2	Apply 1-phase & 3- phase controlled converters for speed control operation of DC drives.
A2224.3	Apply the knowledge of DC-DC Converter and dual converter for speed and torque control of DC Drives.
A2224.4	Apply the knowledge of AC voltage controller and cyclo-converter to control the speed of an induction motor and synchronous motor.

3. Course Syllabus

UNIT-I

Converter fed DC Motors: Classification of electrical drives, dynamic control of a drive system, stability analysis, Introduction to thyristor controlled drives, single phase, three phase semi and fully controlled converters connected to D.C separately excited motor and D.C series motors. Speed and torque equations and characteristics.

UNIT-II

Four Quadrant Operations of DC Drives: Introduction to four quadrant operation – motoring operations, electric braking – plugging, dynamic and regenerative braking operations. Four quadrant operation of D.C motors by dual converters – closed loop operation of dc motor (block diagram only)

UNIT-III

Chopper fed DC Motors: Single quadrant, two quadrant and four quadrant chopper fed DC separately excited motor and DC series motor – continuous current operation – output voltage and current wave forms – speed and torque equations – speed torque characteristics.

UNIT-IV

Control of Induction Motors: Stator voltage control of induction motor.ac voltage controllers- speed torque characteristics - stator frequency control. Voltage source and current source inverter - PWM control – comparison of VSI and CSI operations –closed loop operation of induction motor drives (block diagram only) – principles of vector control method. Static rotor resistance control–slip power recovery – V/F control of induction motor and speed torque characteristics.

UNIT-V

Control of Synchronous Motors: Separate &self-control of synchronous motors – operation of self-controlled synchronous motors by VSI and CSI cycloconverters. load commutated CSI fed synchronous motor- speed torque characteristics– closed loop control operation of synchronous motor drives (block diagram only), introduction to variable frequency control.

4. Books and Materials

Text Book(s)

1. G K Dubey,*Power semiconductor controlled drives*, Prentice Hall, 1995.
2. B.K.Bose, *Modern Power Electronics and AC Drives*, PHI, 2002.

Reference Book(s)

1. MD Singh and K B Khanchandani,*Power Electronics*, Tata McGraw-Hill Publishing company,2008.
2. M.H.Rashid,*Power Electronic Circuits, Devices and applications*, PHI,2005.
3. VedamSubramanyam,*Electric drives Concepts and Applications*, Tata McGraw Hill Publications, 2nd Edition, 2011.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2225 – POWER SYSTEM 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

In recent days the usage of electrical energy has drastically increased. It is very easy to analyse, control and monitor electrical power with the help of computer application. The objective of this course is to deal with different computer methods to control the power systems. The concepts of Y_{bus}, Z_{bus}, load flow studies, short circuit analysis and power flow studies are discussed. It also deals with steady state and transient stability analysis of power systems. The concepts acquired in this course will help in studying SCADA and automation of electrical energy.

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:

A2225.1 Apply computational methods to determine transmission line parameters.

A2225.2 Apply load flow methods to examine the load flow studies.

A2225.3 Analyze symmetrical and unsymmetrical power system faults.

A2225.4 Apply the methods to improve the steady state and transient stability of power systems.

3. Course Syllabus

UNIT-I

Power System Network Matrices: Graph theory: definitions, bus incidence matrix, and formation of y_{bus} by direct and singular transformation methods. formation of z_{bus}: partial network, algorithm for the modification of z_{bus} matrix for addition branch and link. modification of z_{bus} for the changes in network.

UNIT-II

Power Flow Studies-I: Necessity of power flow studies – data for power flow studies – derivation of static load flow equations – load flow solutions using gauss seidel method, acceleration factor, load flow solution - algorithm and flowchart - numerical problems (max. 3 - buses) determination of bus voltages (one iteration only) and finding line flows / losses for the given bus voltages.

UNIT-III

Power Flow Studies-II: Newton Raphson method in rectangular and polar co-ordinates form- load flow solution derivation of Jacobian elements, algorithm and flowchart. Decoupled and fast decoupled methods. Comparison of different methods – dc load flow.

UNIT-IV

Short Circuit Analysis: Per-unit system: reactance diagrams power system (single line diagrams). 3 ϕ fault analysis: short circuit current and MVA calculations, application of series reactors.

Symmetrical Components: Transformation, positive, negative and zero sequence components, voltages, currents and impedances. Sequence networks: positive, negative and zero sequence networks.

Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedances.

UNIT-V

Power System Stability Analysis: Elementary concepts of steady state, dynamic and transient stabilities. description of steady state stability power limit, transfer reactance, synchronizing power coefficient, power angle curve and determination of steady state stability and methods to improve steady state stability - swing equation derivation, solution, determination of transient stability by equal area criterion, application of equal area criterion, critical clearing angle calculation. Methods to improve stability.

4. 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.

Reference Book(s)

1. M A Pai, *Computer Techniques in Power System Analysis,* Tata McGraw-hill 2nd edition, 2005.
2. S. Sivanagaraju and B. V.Rami Reddy, *Power Systems Analysis,* University science press, 2nd edition, 2011.
3. HadiSaadat, *Power Systems Analysis,* McGraw-Hill higher education, 2nd edition.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2429 – MICROPROCESSORS AND MICROCONTROLLERS

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 an introduction to microprocessors, microcontrollers and their architectures. Focus is on 8086 microprocessor which includes internal architecture, pin diagram, instruction set, register organization, addressing modes, assembly language programming and etc. It also emphasizes on MSP430 microcontroller, on-chip peripherals and data communication protocols. This course is accompanied by a laboratory course directly linked to the lecture topics for hands-on learning of the material. This course will be useful to students as a first level course for embedded systems.

Course Pre/Corequisites

A2419 Electronic Circuits-II

2. Course Outcomes (COs)

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

A2429.1 Analyze 8086 microprocessor and MSP430 microcontroller architectures

A2429.2 Develop programs using 8086 microprocessor and MSP430 microcontroller

A2429.3 Make use of peripherals of MSP430 to interface I/O devices

A2429.4 Apply serial communication protocols for interfacing serial devices.

A2429.5 Design embedded applications using MSP430 microcontroller

3. Course Syllabus

UNIT-I

8086 Microprocessor: Introduction-8086 features, architecture, register organization, flag register, pin diagram, timing and control signals, system timing diagrams, memory segmentation, memory organization and memory banks accessing. Interrupt structure of 8086 and interrupt vector table.

UNIT-II

8086 Assembly Language Programming: Instruction formats -addressing modes-instruction set of 8086, assembler directives- macros and procedures - sorting, multiplication, division, multi-byte arithmetic, code conversion, string manipulation instructions-simple ALPs.

UNIT-III

MSP430 Microcontroller: Low power risk MSP430 features, block diagram, MSP430g2x53–block diagram, memory address space, register set, addressing modes, instruction set, on-chip peripherals (analog and digital).

UNIT-IV

MSP430 Peripherals: I/O ports and pull up/down resistors concepts, interrupts and interrupt programming, watchdog timer, system clocks, low power modes, activities standby current consumption. Timer& real time clock (RTC), PWM control, ADC and comparator.

UNIT-V

MSP430 Serial Communication: Serial communication basics, synchronous/asynchronous interfaces. UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI using MSP430.

4. Books and Materials

Text Book(s)

1.A.K.Ray and Bhurchandi,*Advanced Microprocessors and Peripherals*, 3rdedition, TMH publications

2. John H. Davies,*MSP430 microcontroller basics,* 1stedition, Newnes publication, 2008

Reference Book(s)

1. N. Senthil Kumar, M. Saravanan and S. Jeevanathan,*Microprocessor and Microcontrollers,* 1st edition, Oxford publishers, 2010

2.Lyla B. Das.*The X86 Microprocessors, Architecture, Programming and Interfacing,* Pearson publications, 2010

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2226 – POWER SYSTEMS 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 student will be able to learn model of transmission lines, Ferranti effect, Formation of Y & Z bus, Load flow analysis, Short circuit analysis and solution of swing equation.

Course Pre/requisites

A2225 - Power System Analysis

2. Course Outcomes (COs)

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

A2226.1 Develop a program to simulate Ferranti effect

A2226.2 Develop a program to model transmission lines

A2226.3 Develop a program for formation Y-Bus and Z-Bus

A2226.4 Develop a program for load flow solution

A2226.5 Develop a program for short circuit analysis

A2226.6 Develop a Simulink model for evaluating transient stability

3. Course Syllabus

1. MATLAB program to simulate Ferranti effect
2. MATLAB program to model transmission lines
3. Formation of Y - Bus using Software Simulation
4. Formation of Z - Bus using Software Simulation
5. Gauss – Seidel Load Flow Analysis using Software Simulation
6. Fast Decoupled Load Flow Analysis using Software Simulation
7. LG Fault analysis using Software Simulation
8. LLG Fault analysis using Software Simulation
9. Simulink model for evaluating transient stability of single-machine connected to infinite bus
10. Solution of Swing equation –using Software Simulation

4. Laboratory Equipment/Software/Tools Required

1. MATLAB SOFTWARE

5. Books and Materials

Text Book(s)

1. I.J.Nagrath&D.P.Kothari, *Modern Power system Analysis*, Tata McGraw-Hill publishing company, 4th edition, 2011.

Reference Book(s)

1. Y. Kirani Singh, B. Chaudhuri, *MatlabProgramming* ,PHI learning pvt. ltd.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2227 – ELECTRICAL DRIVES 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

2. Course Description

Course Overview

The objective of this course is to analyse the performance characteristics of electrical drives. The performance characteristics of DC motor drives, induction motor drives fed with various types of converters are analysed. This lab course also helps the students to design electrical drives using MATLAB simulation.

Course Pre/corequisites

1. A2220Power Electronics
2. A2222 Power Electronics Laboratory
3. A2224 Power Semiconductor Drives

3. Course Outcomes (COs)

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

A2227.1 Apply the knowledge of MATLAB and analyze the performance characteristics of DC and AC drives.

A2227.2 Evaluate the performance characteristics of inverter fed induction motor drive using MATLAB.

A2227.3 Analyze the performance of electrical drives and design specifications.

3. Course Syllabus

List of Experiments:

1. Simulation of Three phase voltage source converter with space vector PWM simulation using MATLAB
2. Simulation of Speed control of DC Motor using BJT-H bridge simulation using MATLAB
3. Simulation of Three phase thyristor converter simulation using MATLAB
4. Simulation of Three phase three level PWM converter simulation using MATLAB
5. Simulation of Three phase space – vector PWM converter simulation using MATLAB
6. Simulation of Chopper fed DC motor drive simulation using MATLAB Gate firing circuits for SCRs
7. Simulation of v/f control of induction motor drive using DC link converter
8. Simulation of three phase rectifier fed separately excited DC motor drive
9. Simulation of induction motor and DC motor from direct power supply with using any power electronic converter
10. Simulation of Six pulse cycloconverter fed induction motor drive.

4. Laboratory Equipment/Software/Tools Required

1. MATLAB 9.0 Simulation Software

5. Books and Materials

Text Book(s)

1. G. K. Dubey,*Power semiconductor controlled drives*, Prentice Hall of India, 1995.
2. B.K.Bose, *Modern Power Electronics and AC Drives*, PHI, 2002.

Reference Book(s)

1. M H Rashid, *Power electronics: circuits, devices, and applications*, Pearson Education India, 3rd Edition, 2009.
2. Troy Siemers,*An Introduction to Matlab and Mathcad, APEX Calculus,* 2011.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2431 – MICROPROCESSORS AND MICROCONTROLLERS 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 provides the students with the knowledge of assembly language programming – arithmetic operations, logical operations, string operations, code conversion and sorting using Emu8086 Emulator. It also provides the knowledge of embedded C programming – GPIO ports, low power modes, interrupts, PWM and interfacing potentiometer using Code Composer Studio on MSP430 microcontroller.

Course Pre/Corequisites

1. A2402 – Digital Logic Design
2. A2429 – Microprocessors and Microcontrollers

2. Course Outcomes (COs)

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

A2431.1 Develop assembly language programs using EMU8086 emulator.

A2431.2 Execute 8086 ALPs for arithmetic, logical, string, call operations.

A2431.3 Build programs of MSP430 using embedded C.

A2431.4 Interface LEDs, push buttons, potentiometer to MSP430.

A2431.5 Test and debug 8086 ALPs and MSP430 embedded C programs.

3. Course Syllabus

PART A: List of Assembly Language Programs using 8086 Microprocessor

1. Programs using arithmetic and logical operations
2. Programs using string operations and Instruction prefix: Move block, reverse string, sorting, string comparison
3. Programs for code conversion
4. Multiplication and division programs
5. Sorting and multi byte arithmetic
6. Programs using CALL and RET instructions

PART – B: List of Embedded C Programs using MSP430 Microcontroller

1. Interfacing and programming GPIO ports in C using MSP430 (blinking LEDs , push buttons)
2. Usage of low power Modes: measure the active mode and standby mode current
3. Interrupt programming examples through GPIOs
4. PWM generation using Timer on MSP430 GPIO
5. Interfacing potentiometer with MSP430

6 PWM based Speed Control of Motor controlled by potentiometer connected to MSP430 GPIO

7 Using ULP advisor in Code Composer Studio on MSP430

8 Low Power modes and Energy trace++: Compute Total Energy, and Estimated lifetime of an AA battery.

4. Laboratory Equipment/Software/Tools Required

1. Computers installed with operating systems
2. 8086 Emulator software
3. Code Composer Studio Software
4. MSP430 G2 Launch Pad with USB Cable

5. Books and Materials

Reference Books

1. A.K.Ray and Bhurchandi, *Advanced Microprocessors and Peripherals*, 3rd edition, TMH Publications.
2. John H. Davies, *MSP430 microcontroller basics*, 1st edition, Newnes Publication, 2008.

Other References

1. https://www.tutorialspoint.com/assembly_programming/assembly_tutorial.pdfhttps://e2e.ti.com/cfs-file/__key/communityserver-wikis-components-files/00-00-00-02-51/ Embedded-System-Design-using-MSP430-Launchpad-Development-Kit.pdf

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2034 – GENDER SENSITIZATION

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

The main objective of this course is to develop students' sensibility with regard to issues of gender in contemporary India and to provide a critical perspective on the socialization of men and women. It also introduces students to information about some key biological aspects of genders to expose the students to debates on the politics and economics of work. This course helps the students to reflect critically on gender violence.

Course Pre/corequisites

This course has no pre requisites

2. Course Outcomes (COs)

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

A2034.1	Develop a better understanding of important issues related to gender in contemporary India
A2034.2	Sensitize to basic dimensions of the biological, sociological, psychological and legal aspects of gender
A2034.3	Acquire insight into the gendered division of labour and its relation to politics and economics
A2034.4	Equip to work and live together as equals
A2034.5	Develop a sense of appreciation of women in all walks of life

3. Course Syllabus

UNIT I

Understanding Gender: Gender: Why should we study it Socialization: Making Women, Making Men Introduction, preparing for Woman hood, growing up Male, First lessons in Caste, Different Masculinities

UNIT II

Gender and Biology: Missing Women: Sex Selection and its consequences Declining Sex Ratio, Demographic Consequences Gender Spectrum: Beyond the Binary Two or Many? Struggles with Discrimination, Additional Reading: Our Bodies, Our Health.

UNIT III

Gender and Labour: Housework: The Invisible Labour "My Mother Doesn't Work". "Share the Load", Women's Work: Its Politics and Economics Fact and Fiction, Unrecognized and Unaccounted work

UNIT IV

Issues of Violence: Sexual Harassment: Say No! Sexual Harassment, not Eve-Teasing-Coping with Everyday Harassment Domestic Violence: Speaking Out Is Home a Safe Place? -When Women Unite [Film], Rebuilding Lives Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life….."

UNIT V

Gender Studies: Knowledge: Through the Lens of Gender Point of View, Gender and the Structure of Knowledge. Who's History? Questions for Historians and Others Reclaiming a Past, Writing other Histories.

4. Books and Materials

Text Book(s)

1. A. Suneeta, Uma Bhrugubanda,*Towards a world of equals: A Bilingual Textbook on gender*

Reference Book(s)

1. Sen, Amartya. "More thanone Million Women are Missing." New York ReviewofBooks 37,20(20 December1990).print

2. TripiLahiri, BytheNumbers: Where Indian Women Work, Women's Studies Journal(14November2012)<http://blogs.wsj.com/Indiareal time/2012/11/14/by-the-numberswhere-Indian-Women-work/>

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,*Electrical Machines*, 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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 energy and 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

2. 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.

A2253.5 Evaluate 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 Characteristics and mathematical models to describe vehicle performance. Energy Use in Conventional Vehicles and Energy Savings Potential of Hybrid Drive trains.

UNIT-II

Hybrid Electric Drive-Trains: Basic concept of hybrid traction, introduction to various hybrid drive train topologies, 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 GRID TECHNOLOGY

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 to smart 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. Janaka Ekanayake, 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

1. 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

2. 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)

1. K. Ogata (2011),*Discrete-Time Control systems*, 2nd edition, Pearson Education / Prentice Hall of India, New Delhi.
2. Kuo (2003), *Digital Control Systems,* 2nd edition, Oxford University Press, New Delhi.

Reference Book(s)

1. J. Nagrath, M. Gopal (2011), *Control Systems Engineering*, 5th edition, New Age International (P) Ltd, New Delhi.
2. M. Gopal (2009), *Digital Control and State Variable Method*, 3rd edition, Tata McGraw-Hill Companies, New Delhi.
3. N. K. Sinha (2008), *Control Systems*, 3rd edition, New Age International Limited Publishers, New Delhi.

OPEN ELECTIVES

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRICAL AND ELECTRONICS ENGINEERING

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	Renewable Energy Sources	3-0-0	3	EEE
A2283	Electrical Measuring Instruments	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

COURSE STRUCTURE
A2181 – BASIC CIVIL 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

This course is designed to impart the basic knowledge about civil engineering to the students of other branches of engineering. The course includes materials for construction, basic surveying and other basic concepts of irrigation, water supply and geotechnical engineering. It provides the significance of the civil engineering profession satisfying societal needs.

Course Pre/corequisites

The course has no specific prerequisite and co requisite

2. Course Outcomes (COs)

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

A2181.1 Classify various materials and components used in building construction

A2181.2 List out different domains like Structural, Transportation and Geotechnical Engineering in Civil engineering stream

A2181.3 Identify types of soils and foundations for various structures

A2181.4 Measure the linear and angularparameters using concepts of surveying

A2181.5 Develop water supply system for domestic and irrigational needs

3. Course Syllabus

UNIT I

Introduction to civil engineering & construction materials: Importance and scope of civil engineering, characteristics, types and their uses of stones, bricks, timber and cement

UNIT II

Survey and highway engineering: Definition and classification of surveying, linear and angular measurements, leveling-modern instruments

UNIT III

Modes of transportation: classification of highways - classification of pavements, curves, super elevation

UNIT IV

Geotechnical engineering: Origin of soil, types of soil, bearing capacity of soil, types of foundation, shallow and deep

UNIT V

Irrigation and water supply: Definition and classification of irrigation, irrigation structures, dams, weirs, cross drainage works, canal drops and quality of water-treatment methods

4. Books and Materials

Text Book(s)

1. B C Punmia, Ashok K Jain, Arun K Jain. *Basic Civil Engineering*, Laxmi Publications (P) Ltd,1st edition, 2003.
2. G K Hiraskar,*Basic Civil Engineering,* DhanpatRai Publication, 1st edition, 2004.

Reference Book(s)

1. K.R. Arora. *Soil Mechanics and Foundation Engineering*, Standard Publishers and Distributors, Delhi, 7th edition 2014.
2. B C PunmiaLal,*Irrigation and Water Power Engineering*, Laxmi Publications Pvt. Ltd., New Delhi, 16th edition, 2005.
3. Abe Kruger,*Green Building*,5th edition, 2012.

COURSE STRUCTURE
A2182 – BUILDING PLANNING AND CONSTRUCTION

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 the course is to learn about building by-laws laid by planning authorities, apply the principles and methods to be followed in constructing various components of abuilding& understand about masonry types in brick and stone construction. This course provides sequential approach towards constructional activities like flooring, carpentry, plumbing and electrical works etc.

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:

A2182.1 Plan buildings by adhering to laws laid by regulatory bodies

A2182.2 Classify different masonry types of brick and stones used in construction

A2182.3 Select appropriate floors and roofs for a proposed building

A2182.4 Identify building materials which can be employed in construction

A2182.5 Make use of damp proofing techniques to prevent ingress of water in buildings

3. Course Syllabus

UNIT I

Residential Buildings: Introduction,Different types of residential buildings- Detached house, Semi- detached house, Row house or chawls, Block of flats or terrace house, Duplex type houses, Selection of site for residential building, Factors effecting the selection of site, Components of building, By-laws and Regulations, Orientation of buildings-factors effecting orientation, C.B.R.I suggestions for obtaining optimum orientation.

UNIT II

Masonry: Stone Masonry-Definitions of terms used in masonry, Materials for stone masonry, Classifications of stone masonry, Dressing of stones. Brick Masonry- Introduction, Types of bricks, bonds in brick work, Comparison of brick masonry and stone masonry. Composite masonry-Introduction, Stone composite masonry, Brick-stone masonry, Concrete masonry, Hollow clay blocks masonry, Reinforced brick masonry.

UNIT III

Floors and Roofs: Ground Floor-Components of a floor, Materials used for floor construction, Different types of flooring, Upper floors- Introduction, Steel joist and stone or precast concrete Slab floor, Jack arch floors, Reinforced cement concrete floors, Ribbed or hollow tiled flooring, Precast concrete floors, Timber floors, Types of roofs- pitched roofs, Single roofs, Double or purlin roofs, Trussed roofs.

UNIT IV

Doors and Windows: Introduction, Frame, Shutters, Head, Sill, Horn, Rebate, Location of doors and windows, Size of doors and windows, Types of doors, Classifications of doors- Arrangement of components, Method or manner of construction, working Operations, Metal doors, Types of windows, Classifications of windows, Ventilators, Fixtures and fastenings, installing door and window frames.

UNIT V

Damp proofing: Introduction, causes of dampness on buildings, Effects of dampness on buildings, Precautions, Materials used for damp proofing, Methods of damp proofing, DPC treatment in building problems, Fire hazards, Fire resisting properties of common building materials.

4. Books and Materials

Text Book(s)

1. Kumara Swamy N &KameswaraRao A, *Building planning and Drawing*, Charotar Publishers, 6th Edition, 1998
2. B.C. Punmia, Ashok Kr. Jain, Arun Kr. Jain, *Building Construction*, Laxmi Publications, 10th Edition, 2008

Reference Book(s)

1. S.K. Duggal, *Building Materials*, New Age International Publishers, 4th Edition, 2010
2. D.N. Ghose, *Materials of construction*, Tata-McGraw-Hill Publishing Company Limited,1st Edition, 1989
3. Sushil Kumar Sushil Kumar, (2003), *Engineering Materials*, Metropolitan Book Co., Private Ltd., New Delhi.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2183 – DISASTER MANAGEMENT

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 knowledge on environmental hazards and disasters. The syllabus includes the basics of endogenous and exogenous hazards and gives a suitable picture on the different types of hazard and disasters. This course will enable the student to apply different management techniques to the hazards and disasters.

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:

A2183.1 Classify different kind of hazards/disasters and their effects on environment

A2183.2 Analyze the causes of hazards/disasters which effects human life

A2183.3 Apply disaster management through engineering applications

A2183.4 Apply suitable mitigation measures to minimize the effects of hazards and disasters

3. Course Syllabus

UNIT I

Environmental Hazards &Disasters: Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental, Disasters and Environmental stress, Concept of Environmental Hazards, Environmental, stress & Environmental Disasters, Different approaches & relation with human Ecology, Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

UNIT II

Types of Environmental hazards & Disasters: Types of Environmental hazards & Disasters: Natural hazards and Disasters, Man induced hazards & Disasters, Natural Hazards- Planetary Hazards/ Disasters, Extra Planetary Hazards/ disasters, Planetary Hazards- Endogenous Hazards – Exogenous Hazards.

UNIT III

Endogenous Hazards: Endogenous Hazards, Volcanic Eruption, Earthquakes, Landslides, Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes, Hazardous effects of volcanic eruptions, Environmental impacts of volcanic eruptions, Earthquake Hazards/ disasters, Causes of Earthquakes, Distribution of earthquakes, Hazardous effects of earthquakes, Earthquake Hazards in India, Human adjustment, perception & mitigation of earthquake.

UNIT IV

Exogenous hazards/ disasters: Exogenous hazards/ disasters, Infrequent events, Cumulative atmospheric hazards/disasters Infrequent events: Cyclones, Lightning, Hailstorms Cyclones: Tropical cyclones & Local storms, Destruction by tropical cyclones & local storms (causes, distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters: - Floods- Droughts, Cold waves, Heat waves. Floods: - Causes of floods, Flood hazards India, Flood control measures (Human adjustment, perception & mitigation). Droughts: - Impacts of droughts, Drought hazards in India, Drought control measures, Extra Planetary Hazards/ Disasters, Man induced Hazards /Disasters, Physical hazards/ Disasters-Soil Erosion

UNIT V

Soil Erosion: Mechanics & forms of Soil Erosion, Factors & causes of Soil Erosion, Conservation measures of Soil Erosion. Chemical hazards/ disasters, Release of toxic chemicals, nuclear explosion, Sedimentation processes. Sedimentation processes: - Global Sedimentation problems- Regional Sedimentation problems, Sedimentation & Environmental problems, Corrective measures of Erosion & Sedimentation. Biological hazards/ disasters: - Population Explosion.

4. Books and Materials

Text Book(s)

1. Rajib Shah, *Disaster Management*, Universities Press, India, 2nd Edition, 2003
2. Tushar Bhattacharya, Disaster Science and Management, TMH Publications, 1st Edition, 2012

Reference Book(s)

1. Donald Hyndman & David Hyndman, *Natural Hazards & Disasters*, Cengage Learning, 4th Edition, 2013
2. R.B. Singh (Ed), *Disaster Management*, Rawat Publication, New Delhi, 1st Edition, 2006
3. Kates, B.I & White, *The Environment as Hazards*, G.F, Oxford Publishers, New York, 1978.

COURSE STRUCTURE
A2184 – WATER RESOURCES CONSERVATION

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 introduces the great need to conserve and plan the water resources in more efficient way because of urbanization and depletion of water resources. The course content enables the students to learn water hydrology, importance of water conservation and methods to conserve water resources.

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:

A2184.1 Interpret ground and surface water utilization for conservation of water resources

A2184.2 Apply the concepts of artificial ground water recharge to increase ground water level

A2184.3 Make use of the concepts of harvesting for preservation of water

A2184.4 Utilize new technologies like ion exchange and UV radiation techniques to recycle and reuse waste water

A2184.5 Plan efficient use of water resources with minimum energy

3. Course Syllabus

UNIT I

Ground and surface water utilization- Hydrologic cycle, water budget, ground water level fluctuations and environmental influence.

UNIT II

Artificial ground water recharge- Concept and methods of artificial ground water recharge mounds & induced recharge, wastewater recharge for reuse, water spreading, farm ponds and percolation tanks.

UNIT III

Water harvesting- Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, and check dams

UNIT IV

Reuse & recycle of waste water-Types of reuse, application of treated waste water, purity of reclaimed water, guidelines and regulations, new technologies used in recycling of waste water.

UNIT V

Watershed management- Concept of watershed management, policies and decision making, Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

4. Books and Materials

Text Book(s)

1. Ramakrishnan S. *Ground water*, Sci -Tech Publications, 2nd edition, 2010.
2. B.C. Punmia&Pande B.B. Lal, *Irrigation and Water Power Engineering*; Laxmi Publications pvt. Ltd., New Delhi.

Reference Book(s)

1. S.N. Chatterjee,*Water Resources, Conservation and management*, Atlantic Publishers, 1st edition, 2018.
2. Murthy J.V.S, *Watershed Management*, New Age International Publishers, 2nd edition, 2017.
3. Murthy V.V.N*, Land and Water Management*, Kalyani Publications, 1st edition, 2018.

COURSE STRUCTURE
A2281 – FUNDAMENTALS OF ELECTRICAL 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

This course is to familiarize the students about the basics of electrical engineering, circuit theory and electrical machines. This course introduces the fundamental concepts, basic knowledge of electrical quantities, network theorems for the analysis of basic DC and AC circuits. It also deals with the working principle, construction and operation of DC machines and AC machines. These machines are used in domestic and industrial applications.

Course Pre/corequisites

The course has no specific prerequisite and corequisite.

2. Course Outcomes (COs)

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

A2281.1 Apply network reduction techniques and knowledge of alternating quantities to calculate current, voltage and power for complex circuits.

A2281.2 Analyze the electrical circuits using nodal analysis, mesh analysis and network theorems.

A2281.3 Demonstrate the working principle and operation of DC machines, AC machines and single-phase transformers.

A2281.4 Test the Performance of DC machines, AC machines and single-phase transformers.

3. Course Syllabus

UNIT I

DC Circuits: Circuit Concept, Types of Network Elements, ohm's Law, types of Sources Voltage - Current Relationship for Passive element (R,L&C), Kirchhoff's Laws, Network Reduction Techniques: Series, Parallel, combination of Series and Parallel, Delta - Star Transformation, loop and Nodal Analysis.

Network Theorems: Thevenin's, Norton's, Superposition and Maximum Power Transfer Theorems (DC Excitation only).

UNIT II

AC Circuits: Representation of alternating quantities, peak, average, RMS, form factor and peak factor for sinusoidal wave form. J-notation, Analysis of single-phase AC circuits consisting of Pure R, L& C circuits, Combination of RL,RC, and RLC (only series) circuits.

UNIT III

D.C Generators: Constructional details of D.C. generator, Principle of Operation of D.C. generators, Types of D.C Generators, E.M.F Equation.

D.C Motors: Principle of Operation of DC Motors, Back emf, Torque Equation, Swinburne's test, speed control of DC motors by armature and field control methods.

UNIT IV

1-phase Transformers: Principle of Operation, Constructional Details, E.M.F. equation, Losses and efficiency, OC& SC Tests.

UNIT V

3-Phase Induction Motors: Principle of Operation, Types of induction motors, Slip, Torque equation, Torque-Slip characteristics.

3-phase Alternators: Principle of Operation-Constructional Details-EMF Equation.

4. Books and Materials

Text Book(s)

1. V.K. Mehta and Rohith Mehta, "*Basic electrical engineering*", S. Chand publishers, 14th edition.
2. M.S. Naidu and S. Kamakshaiah, "*Introduction to Electrical Engineering*", Tata McGraw Hill Publishers, 1st edition, 2004.

Reference Book(s)

1. A Sudhakar, Shyammohan S Palli, "*Circuits and Networks*", Tata McGraw-Hill, 4th edition.
2. D. C. Kulshreshtha," *Basic Electrical Engineering"*, McGraw Hill, 2009.
3. L. S. Bobrow, "*Fundamentals of Electrical Engineering"*, Oxford University Press, 2011.

COURSE STRUCTURE

A2282 – RENEWABLE ENERGY SOURCES

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 various Power Generation Systems. The primary objective of this course is to introduce solar energy, its radiation, collection, storage and application. It also deals with production of quality of energy, types of generation plants and their principles of operation, methods of energy storage and economics of generation.

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2282.1 Apply the principles of Renewable energy sources for the construction of Power generating station.

A2282.2 Analyze the various energy conversion systems and their limitations.

A2282.3 Analyze Renewable energy sources for various environmental conditions

A2282.4 Analyze the generation principles and operation of variety of sources of energy

3. Course Syllabus

UNIT I

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

UNIT II

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

Wind Energy & Bio Mass: 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 IV

Other Sources of 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 V

Energy Storage and Economy: Energy Storage - Energy in Transportation - Magneto hydrodynamic Power Generation- Hydrogen Economy

4. Books and Materials

Text Book(s)

1. G.D. Rai, *Non-Conventional Energy Sources*, Khanna Publishers, 4th edition 2008.
2. JhonTwidell and tony Weir, *Renewable Energy Resources*, 2nd edition, Taylor and Francis Group,2006.

Reference Book(s)

1. Twidell&Weir, *Renewable Energy Sources*, Tata McGraw Hill Education Private Limited, New Delhi, 4th edition 2009.
2. S. N. Bhadra, D. Kastha& S. Banerjee, *Wind Electrical Systems* – Oxford University Press,2013.

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COURSE STRUCTURE

A2283 – ELECTRICAL MEASURING INSTRUMENTS

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 electrical measuring instruments used to measure electrical quantities. The minimization of different errors and their effects in measuring instruments are discussed. Here the concepts of single phase and three phase circuits are discussed to determine the voltage, current, power and energy. Also, the concepts of bridges are discussed, which are used for the measurement of unknown resistance, inductance and capacitance. These electrical measuring instruments are used in domestic and industrial applications.

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2283.1 Categorise various electrical instruments used for measuring electrical parameters.

A2283.2 Design appropriate arrangement for extension of range in measuring instruments.

A2283.3 Analyze the errors and compensations in various electrical measuring instruments

A2283.4 Measure current, voltage, power and energy in 1-phase and 3-phase circuits.

A2283.5 Estimate the unknown quantities of resistance, inductance and capacitance using bridges

3. Course Syllabus

UNIT I

Measuring Instruments: Classification, deflecting, control and damping torques, Ammeters and Voltmeters,PMMC, moving iron and dynamometer type instruments, expression for the deflecting torque and control torque, Errors and compensations, extension of range using shunts and Series resistance.

UNIT II

Potentiometers: Principle and operation of D.C. Crompton's potentiometer, standardization, Measurement of unknown resistance, current, voltage.

UNIT III

Measurement of Power: Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer Wattmeter's', expression for deflecting and control torques, Extension of range of wattmeter using instrument transformers, Measurement of active and reactive powers in balanced and unbalanced systems.

UNIT IV

Measurement of Energy: Single phase induction type energy meter, driving and braking torqueserrors and compensations, testing by phantom loading. Three phase energy meters.

UNIT V

DC Bridges: Method of measuring low, medium and high resistance, Whetstone's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance, loss of charge method, megger method.

AC Bridges: Measurement of Inductance, Maxwell's Bridge, Anderson's Bridge. Measurement of Capacitance, Desauty's Bridge, Schering Bridge.

4. Books and Materials

Text Book(s)

1. A.K. Sawhney, A course on Electrical and Electronics Measurements & Instrumentation, DhanpatRai and Co. Publishers, 19th edition, 2015.
2. J.B. Gupta, A course on Electrical and Electronics Measurements & Instrumentation, S.K. Kataria publishers, 14thedition, 2014.

Reference Book(s)

1. U.A. Bakshi, A. V. Bakshi, Electrical measurements and Instrumentation, Technical publications, 1st edition, 2009.
2. E. W. Golding & F.C. Widdis, Electrical Measurements and Measuring Instruments, Wheeler publishers, 5th edition, 1997.
3. H S Kalsi, Electronic Instrumentation, Tata McGraw-Hill, 3rd edition, 2010.

COURSE STRUCTURE

A2381 – OPTIMIZATION TECHNIQUES

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 modelling and optimization of the problems with limited resources. It provides the tools and techniques to solve the real-world problems by finding the optimal solutions to the models subject to constraints of time, labour, money, material and other resources. This course helps students in better decision making regarding optimum usage of available resources.

Course Pre/corequisites

The course has no specific prerequisite and Corequisite

2.Course Outcomes (COs)

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

A2381.1 Apply various Operations Research models and methods to real world problems.

A2381.2 Solve Linear Programming, assignment, sequencing, game theory, queuing, transportation and project management problems for optimum solution.

A2381.3 Evaluate various alternatives available to find optimal solution for real world problems.

A2381.4 Choose the best strategies to maximize the profit or minimize loss in the presence of a competitor.

A2381.5 Decide the best operating policy for the efficient use of resources.

3. Course Syllabus

UNIT I

Operations Research: Scope, O.R models, Linear Programming - Formulation, graphical method, simplex method, big -M method and special cases.

UNIT II

Assignment Model: Formulation, optimal solution by Hungarian method, maximization problem, balanced and unbalanced problems, restriction models.

Sequencing Models: Introduction, Johnson's Rule, processing n jobs through two machines, processing n jobs through three machines and processing n jobs through m machines.

UNIT III

Transportation Problem: Introduction, finding initial basic feasible solutions, optimality test, alternate solutions and unbalanced transportation problem.

UNIT IV

Game Theory: Introduction, minimax (maximin) method of optimal strategies, saddle point, value of the game, rectangular games without saddle point, dominance principle, graphical method.

Queuing Theory: Introduction, terminology, single channel models with finite queue length and non-finite queue length.

UNIT V

Introduction to Project Management: Terminology, methods of finding critical path -critical path method (CPM), project evaluation and review technique (PERT) - probability of completing the project within scheduled time and crashing.

4. Books and Materials

Text Book(s)

1. S.D. Sharma, *Operations Research*, New Delhi: Kedarnath Publications, 2017
2. S.R. Yadav and A.K. Malik, *Operations Research*, New Delhi: Oxford University Press, 2014.

Reference Book(s)

1. HamdyAbdelazizTaha,*Operations Research*: *an Introduction*, 9thedition, Pearson, Boston,2015.
2. Prem Kumar Gupta & D S Hira*, Operations Research*, Revised edition, New Delhi: S. Chand Publishing, 2015.

COURSE STRUCTURE

A2382– MECHANICAL TECHNOLOGY

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 knowledge to select the required material for different engineering applications. It also deals with basic concepts of internal combustion engines, compressors, power transmission systems and welding processes. The student will be able to apply the knowledge of engines, materials and welding processes which can be used in domestic and industrial applications.

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2382.1 Identify the types of engines and their cycles.

A2382.2 Classify the reciprocating air compressors and their working principles.

A2382.3 Discus the constructional features of domestic refrigeration and air conditioning systems.

A2382.4 Inspect the mechanism of power transmission elements of various engineering systems.

A2382.5 Select suitable engineering materials and welding methods for real time applications.

3. Course Syllabus

UNIT I

I.C. Engines: working principle, 4 stroke and 2 stroke engines, comparison.

UNIT II

Reciprocating Air compressors: Description and working of single stage and multistage reciprocating air compressors – inter cooling.

UNIT III

Refrigeration Systems: Study of household refrigerator, window air conditioner, split air conditioner ratings and selection criteria of above devices

UNIT IV

Transmission of power: Belt, Rope, Chain and gear drive.

UNIT V

Engineering materials and welding processes: Engineering materials, properties of materials, gas welding, arc welding, soldering and brazing.

4. Books and Materials

Text Book(s)

1. R.S Khurmi& JS Gupta, *Thermal Engineering*, New Delhi S Chand, 2012.
2. P.L. Ballaney, *Refrigeration and Air Conditioning,* 2nd edition, 2012.

Reference Book(s)

1. R.K. Jain and S.C. Gupta, *Production Technology*, New Delhi, Khanna Publishers,2012.
2. S.N. Lal, Elements *of Mechanical Engineering*, Cengage Learning, 2013.

COURSE STRUCTURE

A2383 – INTRODUCTIONTO AUTOMOBILE 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

This course provides a broad knowledge about the automobile mechanisms like transmission, final drive, braking system, front axle, steering, frame and chassis. It also covers emission and electrical systems used in automobiles. This knowledge will be helpful to the student in co-relating various systems with each other and understanding the individual systems in a better manner while using them in daily life.

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2383.1 Identify the different parts of the automobile systems used in daily life.

A2383.2 Analyze brakes, steering, axles, suspension and frames of an engine for better performance.

A2383.3 Inspect the mechanism of power transmission elements, and applications of various engineering systems.

A2383.4 Compare the significance of various engines in terms of their performance.

A2383.5 Classify various electrical systems that are used for efficient functioning of automobiles.

3. Course Syllabus

UNIT I

Introduction- History, Industrial revolution, Development in automobile industry, leading manufacturers.

UNIT II

Classification of vehicles: On the basis of load, wheels, final drive, fuel used, position of engine and steering transmission, body and load, layout of an automobile chassis function of major components of a vehicle such as frame, transmission (clutch and gearbox), braking system, types of suspension, principle and its components.

UNIT III

Introduction to thermodynamics: First and second laws of thermodynamics, Otto cycle, diesel cycle. Types of automotive fuels, properties of fuels, air requirement for complete combustion of fuel.

Introduction to IC engines: Concept of two stroke and four stroke petrol and diesel engines and their applications to automobiles, various terms, specification of automobile engines.

UNIT IV

Emissions from automobiles – Pollution standards national and international, pollution control techniques, multipoint fuel injection for SI engines- common rail diesel injection, emissions from alternative energy sources– hydrogen, biomass, alcohols, LPG, CNG.

UNIT V

Electrical system- Charging circuit, generator, current and voltage regulator, starting system, Bendix drive, mechanism of solenoid switch, lighting systems, horn, wiper, fuel gauge, oil pressure gauge, engine temperature indicator.

4. Books and Materials

Text Book(s)

1. Kirpal Singh, Automotive *Mechanics – Vol. 1 & Vol. 2*, Standard Publishers Distributors, 13th edition, 2013
2. R.S Khurmi& JS Gupta, Thermal Engineering, New Delhi S. Chand, 2012.

Reference Book(s)

1. PL Ballaney, *Thermal Engineering*, New Delhi, Khanna Publishers,2013.
2. M.L. Mathur, F.S. Mehta and R.P. Tiwari, Elements of Mechanical Engineering, New Delhi, Jain Brothers,2013

COURSE STRUCTURE
A2481 – BASIC ELECTRONICS

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 analyzing principle of operation of p-n junction diode, special diodes, rectifiers, BJT and FET.

Course Pre/corequisites

A1003 –Engineering Physics

2. Course Outcomes (COs)

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

A2481.1 Analyze the operation and characteristics of diodes and transistors.

A2481.2 Analyze various applications of diodes and transistors.

A2481.3 Make use of Boolean algebra postulates to minimize boolean functions.

A2481.4 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, 9thedition, 2006.
2. J.B. Gupta, *Electronic Devices and Circuits*, 3rd Edition, S.K. Kataria& Sons, 2008.

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COURSE STRUCTURE

A2482 – INTRODUCTION TO COMMUNICATION 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

This course provides the basic concepts of communication systems such as signals, modulation, demodulation and multiplexing. This course also provides different modulation techniques used in analog and digital communication systems. In this course, students also learn about the operation of AM and FM receivers.

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:

A2482.1 Analyze the operation of basic communication system.

A2482.2 Compute the Fourier transform, energy and power of communications signals.

A2482.3 Compare the performance of different modulation schemes used in communication systems

A2482.4 Differentiate time division and frequency division multiplexing techniques.

A2482.5 Select an appropriate modulation technique while designing a communication system.

3. Course Syllabus

UNIT I

Operations on signals: Fourier series, Fourier transform, Energy, Power, Bandwidth, Sampling.

Communication Systems: Components, Analog and digital messages, channel effect, signal to noise ratio and capacity.

UNIT II

Modulation and Detection: Definition, transmission, multiplexing, demodulation.

Amplitude Modulation: Time domain representation, spectrum of AM, single tone AM, modulation and demodulation of DSB, DSBSC, SSB, VSB.

UNIT III

Angle Modulation: Phase modulation, Frequency Modulation.

Pulse Modulation: Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM) and Pulse Position Modulation (PPM).

UNIT IV

Digital Modulation schemes: ASK, FSK, PSK, M-ary PSK, QPSK.

UNIT V

Receivers and Multiplexing:AM receiver, FM receiver, Frequency-Division Multiplexing (FDM),

Time-Division Multiplexing (TDM).

4. Books and Materials

Text Book(s)

1. Simon Haykin and Michael Moher. *Introduction to Analog and Digital Communications*, JOHN WILEY & SONS, INC., 2nd edition, 2007.
2. B.P. Lathi and Zhi Ding. *Modern Digital and Analog Communication Systems*, Oxford University Press, 4th edition, 2010.

Reference Book(s)

1. Sham Shanmugam. *Digital and Analog Communication Systems*, Wiley-India edition,2006.
2. A. Bruce Carlson, and Paul B. Crilly. *Communication Systems,An Introduction to Signalsand Noise in Electrical Communication*, McGraw-Hill International Edition,5th edition, 2010.
3. Herbert Taub and Donald L Schilling. *Principles of Communication Systems*, Tata McGraw-Hill,3rd edition,2009.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2483 – FUNDAMENTALS OF IOT

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 covers the development of internet of things (IoT) products and services including devices for sensing, actuation, processing and communication. This course helps the students to describe the technology around the Internet of Things (IoT). In this course students' study, python concepts, how to interface I/O devices, sensors using Arduinouno and raspberry pi. This course has simple examples with integration of techniques turned into an application.

Course Pre/corequisites

The course has no specific prerequisite and corequisites.

2.Course Outcomes (COs)

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

A2483.1 Analyze IoT applications using IoT enablers and connectivity layers, components.

A2483.2 Distinguish sensors and actuators in terms of their functions and applications.

A2483.3 Interface I/O devices, Sensors using Arduino UNO.

A2483.4 Develop Raspberry Pi Interfacing programs using python concepts.

A2483.5 Apply Raspberry Pi and Arduino Uno programming for IoT bases projects

3. Course Syllabus

UNIT I

Introduction to IoT: Characteristics of IoT, Applications of IoT, IoT categories, IoT enablers and connectivity layers, IoT components.

UNIT II

Sensors and Actuators: Sensors-definition, characteristics of sensor, classification of sensors, Actuators-definition, types of Actuators.

UNIT III

Programming with Arduino: Introduction to Arduino UNO, Arduino IDE, Basic commands, Serial commands. LED Interface, Switch Interface, Serial Interface, temperature Sensor Interface

UNIT IV

Python: Overview of Python, features, comments, variables, operators, data types, If statement, functions, for loop, while loop, strings, lists, tuples, dictionaries.

UNIT V

Programming with Raspberry Pi: Introduction to Raspberry Pi, Installation of raspbian OS, connecting to laptop, terminal commands, LED Interface, Button Interface, DHT sensor interface.

4. Books and Materials

Text Book(s)

1. Jeeva Jose. *Internet of Things,* 1st edition, Khanna Book Publishing, 2019
2. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahindra Swain. *Internet of Things with Raspberry Pi and Arduino,* 1st edition, CRC Press, 2019

Reference Book(s)

1. Vijay Madisetti, ArshdeepBahga. *Internet of Things — A hands on Approach*, 1st Edition, University Press, 2014
2. Adrian McEwen, Hakim Cassimally. *Designing the Internet of Things*, 1st edition, John Wiley and Sons, 2014.

COURSE STRUCTURE
A2581 –BASIC DATA STRUCTURES

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 provide insight in organizing data types logically to access and configure the data. The concepts of linear and non-linear data structure algorithms are discussed. It improves the problem-solving ability of a learner to a great extent which can be applied in various fields of engineering.

Course Pre/Corequisites

The course has no specific prerequisite and co-requisites.

2. Course Outcomes (Cos)

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

A2581.1 Analyze the time and space complexities of algorithms

A2581.2 Apply various operations on linear data structures

A2581.3 Design searching and sorting techniques for a given application

A2581.4 Develop nonlinear programming for optimization techniques

3. Course Syllabus

UNIT I

Introduction and Overview: Definition, Concepts of Data Structures, Overview and Implementation of Data Structures.

UNIT II

Linear Data Structures: 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: Definition, Single linked list, Circular linked list, Double linked list, Circular Double linked list, Application of linked lists.

UNIT IV

Sorting and Searching: Sorting- Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Time complexity. Searching - Sequential Search, Binary Search, time complexity.

UNIT V

Trees and Graphs: Trees- Examples, Vocabulary and Definitions, Binary Tree Applications, Tree Traversals, Binary Search Trees. Graphs- Vocabulary and Definitions, Applications: BFS and DFS.

4. Books and Materials

Text Book(s)

1. Debasis Samanta. *Classic Data Structures*. Second Edition, PHI, 2014.

Reference Book(s)

1. G A VijayalakshmiPai. *Data Structures and Algorithms*. TMH, 2008.
2. Horowitz, Sahni and Anderson Freed. *Fundamentals of Data Structures in C*. 2nd edition, Universities Press, 2012.

COURSE STRUCTURE
A2582 – FUNDAMENTALS OF DBMS

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 enlightens the learners with the fundamentals of database and its applications. It covers various data models, Entity Relationship diagrams, SQL queries and indexing techniques. The learners of this course can choose the domain of Data Engineering and can opt their carrier path in database administration or data analytics.

Course Pre/Corequisites

The course has no specific prerequisite and co-requisites.

2. Course Outcomes (COs)

A2582.1	Apply suitable data models for given application
A2582.2	Design database using integrity constraints and ACID properties
A2582.3	Construct optimized SQL queries to solve real time problems
A2582.4	Apply suitable normal form to eliminate data redundancy
A2582.5	Choose appropriate index structure to improve performance

3. Course Syllabus

UNIT I

Introduction: Basics of Database System Applications, Principle of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages - DDL, DML, ER diagrams.

UNIT II

Relational Model: Fundamentals of Relational Model - Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Views, ACID Properties.

UNIT III

SQL: Basic SQL Queries, Introduction to Sub queries, Correlated Sub queries, Set - Comparison Operators, Aggregate Operators, NULL values, logical operators, Joins.

UNIT IV

Normalizations: Redundancy Issues, Decompositions, Functional Dependencies, various Normal Forms.

UNIT V

Data on External Storage: File Organization and various indexing structures.

4. Books and Materials

Text Book(s)

1. Raghurama Krishnan, *Johannes Gehrke, Database Management Systems,* McGraw-Hill Education, 3rd edition, 2014.

Reference Book(s)

1. A. Silberschatz, H.F. Korth, Sudarshan, Database *System Concepts*, McGraw Hill, 6th edition, 2012.
2. RamezElmasri, Shamkat B. Navathe, *Database Systems,* Pearson Education, 6th edition 2009.

COURSE STRUCTURE
A2583 – BASICS OF SOFTWARE 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

This course deals with engineering principles and programming languages applied in software development. These principles include analyzing user requirements, designing, building, and testing software. The knowledge acquired through this course is used to handle big projects efficiently with minimizing cost and reduced complexity.

Course Pre/Corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

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

A2583.1 Apply the phases of software development life cycle in application development

A2583.2 Identify software requirements for construction

A2583.3 Design requirement engineering process for change management

A2583.4 Apply the design concepts for design models

A2583.5 Construct the various testing techniques for software systems

3. Course Syllabus

UNIT I

Introduction: Software engineering and process models: Introduction, changing nature of software, software myths.

UNIT II

Process Models: Waterfall model, incremental process models, evolutionary process models, The unified process, agile process models.

UNIT III

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, The software requirements document.

UNIT IV

Requirement Engineering Process: Feasibility studies, requirements elicitation and analysis, requirement validation, requirement management.

UNIT V

Design: Design process and design quality, design concepts-abstraction, information hiding, functional independence, refactoring, modularity, refinement, design classes, design model.

Testing: Testing strategies-A Strategic approach to software testing, test strategies for conventional software, white box testing, black box testing, validation testing, system testing.

4. Books and Materials

Text Book(s)

1. Roger S. Pressman, *Software Engineering*, A Practitioner's Approach, McGraw Hill, International Edition, 8thedition, 2015.

Reference Book(s)

1. Sommerville, *Software Engineering*, Pearson education, 7th edition, 2008.

COURSE STRUCTURE

A2584 –PYTHON FOR EVERYONE

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 provide the fundamentals of Python language. It covers data types, operators, control statements, data structures, functions, modules, exception handling and file handling concepts. This course helps the student in selecting a domain path leading to software engineering in the segment of Artificial intelligence, Data Science and IoT.

Course Pre/Corequisites

The course has no specific prerequisite and corequisite.

2. Course Outcomes (COs)

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

A2584.1 Apply the basic constructs of Python to solve problems

A2584.2 Organize lists, tuples and dictionaries appropriately to solve complex problems

A2584.3 Build functions to increase code reusability

A2584.4 Implement modular programming for organized software development

A2584.5 Make use of exception handling for robust programming

3. Course Syllabus

UNIT I

Introduction to python programming: History of python, Basics, python character set, tokens, data types, input and output functions, formatting numbers and strings, Operators.

Control statements: Decision making statements, Loop control statements, nested loops, break and continue statements.

UNIT II

Data Structures: Sequence, Lists, Tuples, Sets, Dictionaries. Functional Programming: filter (), map (), reduce () , Python Strings.

UNIT III

Functions- Basics of functions, syntax, local and global scope of a variable, Recursions, lambda functions, parameters and arguments in functions.

UNIT IV

Modules: The from…import statement, Making your own Modules, dir() function, The Python Module, Modules and Namespaces, Packages, Standard Library modules.

UNIT V

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.

4. Books and Materials

Text Book(s)

1. Ashok NamdevKamthane, Amit Ashok Kamthane. *Programming and problem solving with python.* McGraw-Hill Education, 2018.

Reference Book(s)

1. Martin C.Brown. *The Complete Reference: Python*. McGraw-Hill, 2018.
2. ReemaThareja. *Python programming using problem solving approach*. Oxford, 2019.

COURSE STRUCTURE

A2585 – COMPUTER ORGANIZATION AND OPERATING 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

This course is a combination of computer organization and operating system concepts. It provides the concepts of Computer Architecture and Organization which focuses on register transfers, micro-operations and computer arithmetic concepts. Operating Systems covers the basic operating system abstractions, mechanisms, and their implementations. The learner of this course can choose his/her carrier as system architect or as system programmer.

Course Pre/Corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

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

A2585.1 Analyze the fundamentals of computer organization in designing a system

A2585.2 Apply the concepts of programming language to solve system problems

A2585.3 Make use of the Operating Systems design structure and its services for system programming

A2585.4 Develop Process Scheduling algorithms and Inter-Process Communication systems for resource management

A2585.5 Classify memory management techniques and virtual memory mechanisms for apt implementations

3. Course Syllabus

UNIT I

Basic Computer Organization and Design: Instruction codes, computer registers, computer instructions, timing and control, instruction cycle, memory reference instructions, input/output and interrupt, complete computer description, design of basic computer.

UNIT II

Programming the Basic Computer: Introduction, machine language, assembly language, the assembler, programming arithmetic and logic operations.

UNIT III

Operating Systems: Introduction, What operating systems do, operating system -structure, operations, services, user operating system interface, system calls, types of system calls.

UNIT IV

Process Management: Process concept, process scheduling, scheduling criteria, scheduling algorithms, operations on processes, inter process communication, examples of ipc systems, process synchronization, critical section problem, semaphores, and monitors.

UNIT V

Memory Management: Main memory-background, swapping, contiguous memory allocation, segmentation, paging, virtual memory-background, demand paging, page replacement, allocation of frames.

Deadlocks: System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

4. Books and Materials

Text Book(s)

1. M. Morris Mano, *Computer system architecture*, Pearson Education, 5th edition, 2016.

Reference Book(s)

1. Willam Stallings, *Computer Organization and Architecture Designing for Performance*, Pearson, PHI, 6th edition, 2010.
2. Silberschatz, Galvin and Gagne, *Operating System Concepts*, 9th edition, 2013, Wiley India edition.

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COURSE STRUCTURE

A2586 – FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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 the insight of basic Artificial Intelligence concepts along with fundamentals of machine learning, deep learning and neural networks. It covers math-heavy topics, such as regression and classification illustrated by Python examples. In addition, it also focuses on AI with search techniques and machine learning types. This course helps the students to choose their career path in trending Artificial Intelligence related technologies.

Course Pre/Corequisites

The course has no specific prerequisite and co-requisites.

2. Course Outcomes (COs)

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

A2586.1 Analyze different fields in which AI is applied

A2586.2 Apply suitable search strategies in finding better solution for a given problem

A2586.3 Identify linear regression with single and multiple variables

A2586.4 Perform predictive analysis using decision trees and random forest classifier

A2586.5 Implement deep learning neural network models with TensorFlow

3. Course Syllabus

UNIT I

Principles of Artificial Intelligence: Introduction, Fields and Applications of Artificial Intelligence, AI Tools and Learning Models, The Role of Python in Artificial Intelligence

UNIT II

AI With Search Techniques: Introduction, heuristics, Uniformed and informed search strategies, Pathfinding with the A* Algorithm.

UNIT III

Regression: Introduction, Linear Regression with One Variable, Linear Regression with Multiple Variables, Polynomial and Support Vector Regression.

UNIT IV

Classification: The Fundamentals of Classification, Classification with Support Vector Machines, Introduction to Decision Trees, Random Forest Classifier.

UNIT V

Machine Learning with Neural Networks: Machine Learning Types, TensorFlow for Python, Introduction to Neural Networks, Deep Learning.

4. Books and Materials

Text Book(s)

1. Zsolt Nagy, *Artificial Intelligence and Machine Learning Fundamentals*, Packtpublishing, 2018.

Reference Book(s)

1. Dr. DheerajMehrotra, *Basics of Artificial Intelligence & Machine Learning*, Notion Press, 1st edition 2019.
2. Neil Wilkins, *Artificial Intelligence: An Essential Beginner's Guide to AI, Machine Learning, Neural Networks, Deep Learning*, Bravex Publications, 2019.

COURSE STRUCTURE

A2081 – MANAGEMENT SCIENCE

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 primary objective of this course is to provide the knowledge of Management in Success of Business. Further, students will be able to apply the Concepts, Theories, Principles of Management in various functional areas of an organization such as in Designing organization structures for managing the operations, Human Resource, Marketing and Production Departments. The student will able to evaluate cost and time of each business project by using PERT and CPM techniques and also formulate the new strategies that enhance competitive edge.

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2081.1 Apply the concepts, theories, and principles of management in professional life.

A2081.2 Design suitable organization structure for managing the operations in the organization.

A2081.3 Apply principles of management to the various functional areas of an organization such as Human Resource, Marketing and Production.

A2081.4 Evaluate cost and time of each business project by using PERT and CPM techniques.

A2081.5 Formulate the new strategies that enhance competitive edge.

3. Course Syllabus

UNITI

Introduction to Management: Concept-Nature and Importance of Management, Functions-Evaluation of Scientific Management, Modern Management-Motivation Theories-Leadership Styles-Decision Making Process-Designing Organization Structure-Principles and Types of Organization.

UNITII

Operations Management: Plant location and Layout, Methods of production, Work-Study-Statistical Quality Control through Control Charts, Objectives of Inventory Management, Need for Inventory Control -EOQ&ABC Analysis (Simple Problems)

Marketing Management: Meaning, Nature, Functions of Marketing, Marketing Mix, Channels of distribution - Advertisement and Sales Promotion - Marketing Strategies - Product Life Cycle.

UNITIII

Human Resource Management: Significant and Basic functions of HRM-Human Resource Planning (HRP), Job evaluation, Recruitment and Selection, Placement and Induction-Wage and

Salary administration, Employee Training and development – Methods - Performance Appraisal - Employee Grievances - techniques of handling Grievances.

UNITIV

Strategic Management: Vision, Mission, Goals and Strategy- Corporate Planning Process-Environmental Scanning-SWOT analysis-Different Steps in Strategic Formulation, Implementation and Evaluation.

Project Management: Network Analysis-PERT, CPM, Identifying Critical Path-Probability-Project Cost Analysis, Project Crashing.

UNITV

Contemporary Management Issues & Practices: Basic concepts of MIS-Materials Requirement Planning (MRP),Just-In-Time (JIT)System, Total Quality Management(TQM)-Six Sigma and Capability Maturity Models (CMM) evies, Supply Chain Management, Enterprise Resource Planning (ERP), Performance Management, Business Process Outsourcing(BPO), Business Process Re-Engineering, Bench Marking, and Balance Score Card.

4. Books and Materials

Text Book(s)

1. A.R Aryasri, *Management Science,*4th edition, New Delhi: Tata McGraw Hill, 2013.

Reference Book(s)

1. Ashima B. Chhalill, P. Vijaya Kumar, N. AppaRaohalill, '*Introduction to Management Science*', 1stedition, New Delhi: Cengaage, 2012.
2. Vijay Kumar &Apparo: *Introduction to Management Science*, New DelhiCengage, 2011.

COURSE STRUCTURE
A2082 – RESEARCH METHODOLOGY

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 primary objective of this course is to have a general understanding of statistics as applicable to business and its use in areas of engineering research. The Course addresses the methods of research with an emphasis on various stages that are necessary to obtain and process information to enable well informed decision-making. It allows the students to grasp and comprehend the methods and techniques used in research and provide with the knowledge and skill to undertake research.

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2082.1 Interpret the importance of literature survey to identify the research problem.

A2082.2 Develop suitable research methodologies to conduct engineering research.

A2082.3 Apply the principles of research to gather the required data from various sources.

A2082.4 Evaluate the gathered data by using appropriate statistical techniques.

A2082.5 Prepare and present the research report effectively with the help of visual aids.

3. Course Syllabus

UNIT I

Research Methodology: Objectives and Motivation of Research, Types of Research, Research Approaches, Significance of Research, Research Methods verses Methodology, Research and Scientific Method, Important of Research Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general, Defining the Research Problem: Definition of Research Problem, Problem Formulation, Necessity of Defining the Problem, Technique involved in Defining a Problem.

UNITII

Literature Survey: Importance of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Information through Internet. Literature Review: Need of Review, Guidelines for Review, Record of Research Review.

UNITIII

Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, developing a Research Plan, Design of Experimental Set-up, Use of Standards and Codes.

UNITIV

Data Collection: Collection of primary data, Secondary data, Data organization, Methods of data grouping, Diagrammatic representation of data, Graphic representation of data. Sample Designedfor sampling, some important sampling definitions, Estimation of population, Role of

Statistics for Data Analysis, Parametric V/s Non-Parametric methods, Descriptive Statistics, Measures of central tendency and Dispersion, Hypothesis testing, Use of Statistical software. Data Analysis: Deterministic and random data, Uncertainty analysis, Tests for significance: Chi-square, student's t-test, Regression modeling, Direct and Interaction effects, ANOVA, F-test, Time Series analysis, Autocorrelation and Autoregressive modeling.

UNIT V

Research Report Writing: Format of the Research report, Synopsis, Dissertation, Thesis its Differentiation, References/Bibliography/Webliography, Technical paper writing/Journal report writing, making presentation, Use of visual aids. Research Proposal Preparation: Writing a Research Proposal and Research Report, Writing Research Grant Proposal.

4. Books and Materials

Text Book(s)

1. O.R Krishnaswami and M. Ranganatham, *"Methodology of Research in Social Sciences",* Mumbai: Himalaya Publishing House, ISBN 81-8318-454-5, 2005.

Reference Book(s)

1. C.R Kothari, *Research Methodology, Methods & Technique*; Hyderabad: New Age International Publishers, 2004.
2. R. Ganesan, *Research Methodology for Engineers*, New Delhi: MJP Publishers, 2011.
3. RatanKhananabis and SuvasisSabha, *Research Methodology*, Universities Press, Hyderabad, 2015.
4. Y. P. Agarwal, *Statistical Methods: Concepts, Application and Computation*, Sterling Publications Pvt., Ltd., New Delhi, 2004.

COURSE STRUCTURE
A2083– INTELLECTUAL PROPERTY RIGHTS

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 primary objective of the course is to have a general understanding of the basics of Intellectual Property Rights, Copy Right Laws, Trade Marks and Issues related to Patents.The Course addresses the means of innovations with an emphasis on trade secret that are necessary to obtain IPR through protect their innovations. It also encourages the students to take up innovations and establish start-ups.

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2083.1 Analyze ethical and professional issues which arise in the intellectual property law context.

A2083.2 Apply intellectual property law principles (including copyright, patents, designs and trademarks) to real problems.

A2083.3 Analyze the social impact of intellectual property law and policy.

A2083.4 Make use of copyrighted material so that it does not obstruct the progress of human knowledge

A2083.5 Analyze IPR policies before filing patentable inventions and discoveries.

3. Course Syllabus

UNITI

Introduction to Intellectual Property: Introduction, Types of Intellectual Property, International Organizations, Agencies and Treaties, Importance of Intellectual Property Rights.

UNITII

Trade Marks: Purpose and Function of Trade Marks, Acquisition of Trade Mark Rights, Protectable Matter, Selecting and Evaluating Trade Mark, Trade Mark Registration Processes.

UNITIII

Law of Copy Rights: Fundamental of Copy Right Law, Originality of Material, Rights of Reproduction, Rights to Perform the Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice of Copy Right, International Copy Right Law. Law of Patents: Foundation of Patent Law, Patent Searching Process, Ownership Rights and Transfer.

UNITIV

Trade Secrets: Trade Secrete Law, Determination of Trade Secrete Status, Liability for Misappropriations of Trade Secrets, Protection for Submission, Trade Secrete Litigation. Unfair Competition: Misappropriation Right of Publicity, False Advertising.

UNITV

New Developments of Intellectual Property: New Developments in Trade Mark Law; Copy Right Law, Patent Law, Intellectual Property Audits. International overview on Intellectual Property, International – Trade Mark Law, Copy Right Law, International Patent Law, International Development in Trade Secrets Law.

4. Books and Materials

Text Book(s)

1. K Bansal& P Bansal, *Fundamentals of Intellectual Property for Engineers,* BS Publications, ISBN: 9788178002774, 8178002779, Edition: 2013.

Reference Book(s)

1. Deborah E. Bouchoux, *Intellectual Property: The Law of Trademarks Copyrights Patents and Trade Secrets*, 4th Edition, New Delhi: Cengage India, 2015, ISBN:9788131528976.
2. PrabuddhaGanguli, *Intellectual Property Rights– Unleashing the Knowledge Economy,* McGraw Hill Education; 1st Edition, 1st July 2017.
3. Integrating Intellectual Property Rights and Development Policy: *Report of the Commission on Intellectual Property Rights,* London September 2002 (web source: http://www.iprcommission.org/papers/pdfs/final_report/ciprfullfinal.pdf).

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COURSE STRUCTURE
A2084 –NATIONALSERVICE SCHEME

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 main objectives of National Service Scheme (NSS) are : understand the community in which they work, understand themselves in relation to their community, identify the needs and problems of the community and involve them in problem-solving, develop among themselves a sense of social and civic responsibility, utilize their knowledge in finding practical solutions to individual and community problems, develop competence required for group-living and sharing of responsibilities, gain skills in mobilizing community participation, acquire leadership qualities and democratic attitudes, develop capacity to meet emergencies and natural disasters and, practice national integration and social harmony

Course Pre/corequisites

This course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2084.1 Classify the organizational structure of NSS and its activities.

A2084.2 Identify the methods of mobilization and importance of youth Leadership.

A2084.3 Develop a sense of social and civic responsibility and provide solutions to individual and community problems

A2084.4 Recognize the need for lifelong learning capabilities with the concepts of volunteerism and its functions.

A2084.5 Develop capacity to meet emergencies and natural disasters

3.Course Syllabus

UNIT I

Introduction and Basic Concepts of NSS - History, philosophy, aims & objectives of NSS, Emblem, flag, motto. Song, badge etc., Organizational structure, rules and responsibilities of various NSS functionaries.

UNIT II

NSS Programmes and Activities - Concept of regular activities, special camping, Day Camps, Basis of adoption of village/slums. Methodology of conducting Survey, Financial pattern of the scheme, Other youth prog. /schemes of Goal, Coordination with different agencies, Maintenance of the Diary.

UNIT III

Understanding Youth - Definition, profile of youth. categories of youth, Issues, challenges and opportunities for youth, Youth as an agent of social change.

Importance and Role of Youth Leadership -Meaning and types of leadership, Qualities of good leaders; traits of leadership, Importance and rule of youth leadership

UNIT IV

Community Mobilization- Mapping of community stakeholders, Designing the message in the context of the problem and the culture of the Community, Identifying methods of mobilization.

UNIT V

Volunteerism and Shramdan: Indian Tradition of volunteerism, Needs & Importance of volunteerism, Motivation and Constraints of Volunteerism, sharamadan as a part of Volunteerism.

4. Books and Materials

Reference Book(s)

1. KhwajalaGhulamaSaiyidain, National Service Scheme: A Report, Published by Ministry of Education, Govt. of India, 1961.
2. N. F. Kaikobad, Krishan K. Kapil, Training and consultancy needs in national service scheme, by. Published by the Tata Institute of Social Sciences (TISS), 1971.
3. National Service Scheme: guide-lines to project-masters, by Andhra University, Dept. of Sociology & Social Work. Published by Dept. of Sociology & Social Work, Andhra University, 1971.

COURSE STRUCTURE
A2085 – YOGA

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

Yoga is an invaluable gift of ancient Indian tradition. It embodies unity of mind and body; thought and action; restraint and fulfilment; harmony between man and nature and a holistic approach to health and well-being. Yoga is not about exercise but to discover the sense of oneness with ourselves, the world and Nature. By changing our lifestyle and creating consciousness, it can help us to deal with climate change. Stress and Depression have become silent killers. Yoga offers a solution to these ailments. Practicing Yoga helps fight stress and find peace. All you need is willingness to practice it.

Course Pre/corequisites

There is no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2085.1 Improve physical conditioning related to flexibility through participation in yoga.

A2085.2 Develop and maintain a personal yoga practice.

A2085.3 Recognize and apply the value and benefits of an on-going yoga practice

A2085.4 Select asanas appropriate for personal needs

A2085.5 Identify and apply relaxation techniques for stress reduction

3.Course Syllabus

UNIT I

Introduction of human body and its systems, definition of anatomy and physiology and importance in Yogic practices, respiratory system, digestive system, endocrine system. Origin of Yoga & its brief development, Meaning of Yoga & its importance, Yoga as a Science of Art (Yoga Philosophy), Meaning of meditation and its types and principles

UNIT II

Classification of Yoga/Types of Yoga - Hatha Yoga, Raja Yoga, Laya Yoga, Bhakti Yoga, Gyan Yoga, Karma Yoga, Asthang Yoga

UNIT III

Classification of Asanas and its Mechanism, Cultural Asana (standing, sitting, supinline, praline position & topsy-turvy), Meditative Asana and Relaxative Asana, Nervous System, Circulatory System

UNIT IV

Introduction of Kriya, Bandha and Mudra, importance of KRIYA and its scientific approach, importance of BANDHA and its scientific approach, importance of MUDRA and its scientific approach

UNIT V

Effect of Asanas on various Systems, Difference between Asana and Exercise, Difference between Pranayama and deep breathing and Yogic Diet.

4.Books and Materials

References:

1. Georg Feuerstein, *The Yoga Tradition: Its History, Literature, Philosophy and Practice*, New Delhi, Bhavana Books & Prints, 2002.
2. Joshi, K.S. *Yoga in daily life*, Delhi, Orient paper backs, 1985
3. Taimni I.K, *The Science of Yoga (The Yoga Sutras of Patanjali)*, The Theosophical Publishing House, Adyar, 1961/1999.

COURSE STRUCTURE
A2086 – DESIGN THINKING

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 introduces design thinking and its application to developing new products, services, and the organization of businesses. Design thinking is a human-centric, interdisciplinary approach towards innovation. Design thinking as practiced in this course blends creative thinking and logical or rational thinking, and involves a process consisting of empathizing, ideating, and prototyping. Students will learn design principles, methodologies, and frameworks, and apply them through exercises and projects. The course is divided into four main aspects, all interconnected but which we also separately emphasize. They are: (1) design methodologies, (2) the "thing" to be designed (i.e., products, services, or the business itself, e.g. the business model), (3) human attitudes and behaviors (towards the designs), and (4) design contexts.

Course Pre/corequisites

This course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2086.1 Appreciate various design processes for creativity and innovation

A2086.2 Develop design ideas through different techniques

A2086.3 Identify the significance of reverse engineering about products

A2086.4 Make use of design drawings to communicate ideas effectively

A2086.5 Build organizations that support creative and innovative thinking

3. Course Syllabus

UNIT I

Introduction to Design Thinking, Definition, why is Design Thinking important, How is Design Thinking different, Process of design - Introduction – Product Life Cycle - Design Ethics, creativity, innovation and design, Design Process - Creativity and Innovation in Design Process - Design limitation, Preparing mind for Innovation-The physics of innovation.

UNIT II

Idea generation- The Idea, generation process, mind mapping tool. Experimentation-What works, learning launch tool, Strategic Opportunities, Creative people, creative organizations, Ideas, and tools to help both people and organizations work more creatively

UNIT III

Creative Thinking - Generating Design Ideas - Lateral Thinking –Analogies – Brainstorming - Mind mapping - National group Technique – Synectic's - Development of work - Analytical Thinking - Group Activities Recommended

UNIT IV

Reverse engineering - Introduction - Reverse Engineering Leads to New Understanding about Products -Reasons for Reverse Engineering - Reverse Engineering Process - Step by Step – Case Study

UNIT V

Basics of drawing to develop design Ideas- Introduction - Many Uses of Drawing - Communication through Drawing – Drawing Basis – Line - Shape/ Form – Value – Colour – Texture –Overview of drawing -Practice using Auto CAD recommended.

4. Books and Materials

Text Book(s)

1. John.R.Karsnitz, Stephen O 'Brien and John P. Hutchinson, "*Engineering Design*", Cengage learning (International edition) Second Edition,2013.
2. YousefHaikand Tamer M. Shahin, "*Engineering Design Process*", Cengage Learning, Second Edition, 2011.

Reference Online Resources

1. https://courses.edx.org/register?course_id=coursev1%3AUQx%2BCORPINN1x%2B2T2020&enrollment_action=enroll&email_opt_in=false
2. https://www.coursera.org/programs/coursera-response-program-for-pcek-brht?collectionId=&productId=bfnQqUbbEeeMtBKozo_2UA&productType=course&showMiniModal=true
3. www.tutor2u.net/business/presentations/../productlifecycle/default.html orhttps://www.mindtools.com/brainstm.html
4. https://www.quicksprout.com/.../how-to-reverse-engineer-your-competit www.vertabelo.com/blog/documentation/reverse-engineeringhttps://support.microsoft.com/en-us/kb/273814
5. https://support.google.com/docs/answer/179740?hl=en https://www.youtube.com/watch?v=2mjSDIBaUlMthevirtualinstructor.com/foreshortening.html
6. https://docs.oracle.com/cd/E11108_02/otn/pdf/.../E11087_01.pdfwww.bizfilings.com›Home › Marketing› Product Development
7. https://canvas.uw.edu/courses/1023376/assignments/syllabus

COURSE STRUCTURE

A2087 – ENTREPRENEURSHIP DEVELOPMENT

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 primary objective of this course is to provide common knowledge on the basics of entrepreneurship, risk and reward. Further, the course addresses on promotion and institutional support by various institutions, ways and means of project planning, feasibility studies, project proposal and report preparation and, also the role of angel investors in promotion and expansion of start-ups in India. It also encourages the student to take up local challenges and establish start-ups. Hence, students will be able to transform himself/herself from a job seeker to provider.

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2087.1	Analyze the nature of entrepreneurship, risk and reward in modern business scenario
A2087.2	Identify the business challenges and opportunities by various case studies
A2087.3	Assess the promotion and institutional support by various agencies in India
A2087.4	Evaluate the role of angel investors in promotion and expansion of start-ups in India
A2087.5	Prepare effective and feasible project proposals and project reports

3. Course Syllabus

UNIT I

Introduction to Entrepreneurship: Introduction to entrepreneurship definition types of entrepreneur, entrepreneurial traits, Entrepreneur vs. Manager, Entrepreneur VsIntrapreneur, Entrepreneurial decision process, Ethics and social responsibility of entrepreneurs, Opportunities for entrepreneurs in India and abroad. Creating and starting the venture, sources of new ideas, methods of generating ideas, creative problem solving, and product planning and development process.

UNIT II

Business Plan: The business plan nature and scope of business plan, writing business plan, evaluating business plans, using and implementing business plans, Marketing plan, financial plan, the organizational plan and Launching formalities.

UNIT III

The Financing & managing New Venture: Financing and managing the new venture, sources of capital, venture capital, angel investment, record keeping, recruitment, motivating and leading teams, financial controls, Marketing and sales controls, E-commerce, entrepreneurship and internet advertising.

UNIT IV

The New Venture Expansion Strategies: New venture expansion strategies and issues, features and evaluation of joint ventures, acquisitions, mergers, franchising. Public issues, rights issues, bonus issues and stock splits. Choosing location and layout, Issues related to selection of layout.

UNIT V

Production & Marketing Management: Production and Marketing Management: thrust of production management, selection of production techniques, plant utilization and maintenance, designing the work place, inventory control, material handling and quality control, Marketing functions, market segmentation, market research and channels of distribution, sales promotion and product pricing, global aspects of entrepreneurship.

4. Books and Materials

Text Books:

1. Vasanth Desai, *The Dynamics of Entrepreneurial Development and Management,* Sixth edition, Himalaya Publishing House, New Delhi, 2011.

Reference Books:

1. Poornima M Charantimath, *Entrepreneurship Development and Small Business Enterprises,* 2nd Edition, Pearson Education India: Bengaluru, August 2013.
2. S.S. Khanka, *Entrepreneurial Development*, 2nd Edition, S Chand Publishing: New Delhi, ISBN: 9788121918015, 2014.
3. Robert D Hisrich, Michael P Peters and Dean A Shepherd, *Entrepreneurship*, 6th Edition, TATA McGraw-Hill: New Delhi, 2007.