G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

(An Autonomous Institute affiliated to JNTUA, Ananthapuramu)

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

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

www.gpcet.ac.in

CURRICULUM FRAMEWORK

UG - BACHELOR OF TECHNOLOGY

ELECTRONICS AND COMMUNICATION ENGINEERING

Under R19 Regulations

B. Tech. - Regular Four-Year Degree Program

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

&

B. Tech. - Lateral Entry Scheme

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

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 works to be taken up by a student during his/her final year to 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

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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:

First Class 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).

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PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

0 SEMESTER (I YEAR)									
S.No	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
20SIP01	Physical Activities - Sports, Yoga and Meditation, Plantation	MC	0	0	6	0	-	-	-
20SIP02	Career Counselling/Lectures by eminent people	MC	2	0	2	0	-	-	-
20SIP03	Orientation to all branches - career options, tools, etc.	MC	3	0	0	0	-	-	-
20SIP04	Orientation on admitted Branch - corresponding labs, tools and platforms	EC	1	0	4	0	-	-	-
20SIP05	Proficiency Modules & Productivity Tools	ES	2	1	2	0	-	- http://www.gpcet.ac.in/	-
20SIP06	Assessment on basic aptitude and mathematical skills	MC	1	0	4	0	-	-	-
20SIP07	Remedial Training in Foundation Courses	MC	2	1	2	0	-	-	-
20SIP08	Universal Human Values, painting, sculpture, pottery, music, dance	MC	1	0	2	0	-	-	-
20SIP09	Communication Skills - focus on Listening, Speaking, Reading, Writing skills, debates, enacting a play.	BS	2	1	2	0	-	-	-
	TOTAL		14	3	24	0			-

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(An Autonomous Institute affiliated to JNTUA, Ananthapuramu)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

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 Lab	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	02	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	Principles of Electrical Engineering	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	3	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
A2203	Principles of Electrical Engineering Laboratory	ES	0	0	3	1.5	30	70	100
	TOTAL		14	01	13	21	270	630	900

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PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION 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
A2401	Electronic Devices and Circuits	PC	3	0	0	3	30	70	100
A2402	Digital Logic Design	PC	3	0	0	3	30	70	100
A2403	Signals and Systems	PC	3	1	0	4	30	70	100
A2404	Probability Theory and Stochastic Processes	PC	3	0	0	3	30	70	100
A2405	Electronic Devices and Circuits Laboratory	PC	0	0	4	2	30	70	100
A2406	Digital Logic Design Laboratory	PC	0	0	3	1.5	30	70	100
A2407	Basic Simulation Laboratory	PC	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	01	10	22	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
A2213	Control Systems	PC	3	0	0	3	30	70	100
A2410	Electromagnetics and Transmission Lines	PC	3	0	0	3	30	70	100
A2411	Electronic Circuit Analysis	PC	3	0	0	3	30	70	100
A2412	Analog Communication Systems	PC	3	0	0	3	30	70	100
A2413	Internet of Things	PC	3	0	0	3	30	70	100
A2414	Electronic Circuit Analysis Laboratory	PC	0	0	3	1.5	30	70	100
A2415	Analog Communication Systems Laboratory	PC	0	0	3	1.5	30	70	100
A2416	Internet of Things Laboratory	PC	0	0	3	1.5	30	70	100
A2018	Quantitative Aptitude and Reasoning – II	BS	1	0	0	1	30	70	100
A2417	Socially Relevant Project – I	PW	0	0	2	1	100	0	100
A2418	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	11	22.5	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 – ELECTRONICS AND COMMUNICATION ENGINEERING

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
A2421	Antennas and Wave Propagation	PC	3	0	0	3	30	70	100
A2422	Linear Integrated Circuit Applications	PC	3	0	0	3	30	70	100
A2423	Digital Communication Systems	PC	3	0	0	3	30	70	100
	Professional Elective – 1	PE	3	0	0	3	30	70	100
A2582	Fundamentals of DBMS	OE	3	0	0	3	30	70	100
A2424	Linear Integrated Circuit Applications Laboratory	PC	0	0	3	1.5	30	70	100
A2425	Digital Communication Systems Laboratory	PC	0	0	3	1.5	30	70	100
A2426	Digital Design through Verilog HDL Laboratory	PC	0	0	4	2	30	70	100
A2016	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
A2427	Digital Signal Processing	PC	3	0	0	3	30	70	100
A2428	CMOS VLSI Design	PC	3	0	0	3	30	70	100
A2429	Microprocessors and Microcontrollers	PC	3	0	0	3	30	70	100
	Professional Elective – 2	PE	3	0	0	3	30	70	100
A2584	Python for Everyone	OE	3	0	0	3	30	70	100
A2430	Digital Signal Processing Laboratory	PC	0	0	2	1	30	70	100
A2539	JAVA Programming Laboratory	PC	0	0	3	1.5	30	70	100
A2431	Microprocessors & Microcontrollers Laboratory	PC	0	0	3	1.5	30	70	100
A2432	Socially Relevant Project – II	PW	0	0	2	1	100	0	100
A2433	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 – ELECTRONICS AND COMMUNICATION ENGINEERING

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
A2019	Managerial Economics and Financial Analysis	HS	3	0	0	3	30	70	100
A2434	Digital Image Processing	PC	3	0	0	3	30	70	100
A2435	Embedded Systems	PC	3	0	0	3	30	70	100
A2436	Embedded Systems Lab	PC	0	0	2	1	30	70	100
	Professional Elective – 3	PE	3	0	0	3	30	70	100
A2583	Basics of Software Engineering	OE	3	0	0	3	30	70	100
A2437	Mini-Project/Internship	PW	0	0	4	2	100	0	100
A2438	Project Work Phase – I	PW	0	0	4	2	100	0	100
		TOTAL	15	00	10	20	380	420	800

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 – 4	PE	3	0	0	3	30	70	100
A2485	CISCO Networking	OE	3	0	0	3	30	70	100
A2439	Project Work Phase – II	PW	0	0	16	8	60	140	200
		TOTAL	06	00	16	14	120	280	400

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B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

Professional Electives

Professional Elective – 1	
Course Code	**Title of the Course**
A2451	Optical Communications
A2452	Nanotechnology
A2453	Digital Design through Verilog HDL
A2454	Real Time Operating Systems
Professional Elective – 2	
Course Code	**Title of the Course**
A2455	Microwave Engineering
A2456	Biomedical Signal Processing
A2457	FPGA Design
A2458	Embedded Hardware and Software Co-Design
Professional Elective – 3	
Course Code	**Title of the Course**
A2459	Cellular and Mobile Communications
A2460	Artificial Neural Networks
A2461	Low Power VLSI Design
A2462	Development of Secure Embedded Systems
Professional Elective – 4	
Course Code	**Title of the Course**
A2463	Satellite Communications
A2464	Speech Processing
A2465	Digital VLSI Testing
A2466	Embedded System Design

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PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

Open Electives

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

COURSE STRUCTURE

I - SEMESTER

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.

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(AUTONOMOUS)

CHEMISTRY

Title of the Course:	Chemistry				
Branches for which this course is offered:	(CSE,ECE & EEE)	L	T	P	C
		3	0	0	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:	(CE,EEE,CSE)	L	T	P	C
		0	0	3	1.5

Course Objectives:
• 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

COURSE STRUCTURE

II - SEMESTER

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 (EEE&ECE)	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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLO
(AUTONOMOUS)

PRINCIPLES OF ELECTRICAL ENGINEERING

Title of the Course :	**PRINCIPLES OF ELECTRICAL ENGINEERING**				
Branches for which this course is offered:	**II Semester (ECE)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Overview:
The primary objective of this course is to introduce basics of electric circuits and basics of DC and AC electrical circuit analysis with working principles of transformers and electrical machines and impart knowledge on low voltage electrical installations.

Course Objectives:	
To make the Student to learn about	
1	Basic Concepts simple electric circuits with dc excitation using Kirchhoff's laws, and to Apply network theorems to simple circuits with independent sources and to Analyze first order RL & RC circuits in time domain.
2	Basic concepts of AC circuits and Resonance conditions and analysis of three phase circuits for balanced loads.
3	Constructional details of Transformers, calculation of efficiency and regulation
4	Constructional details of Induction motor, Separately exited DC motor and Synchronous generator and working principle and determination of loss and efficiency.
5	Working principles of LT Switchgear components and elementary calculations for energy consumption, power factor improvement and battery backup.

Course Outcomes:	
After successful completion of the course, the student will be able to	
CO1	Apply concepts of KVL/KCL and network theorems in solving DC circuits
CO2	Analyze steady state behavior of single phase and three phase AC electrical circuits
CO3	Choose correct rating and characteristics of a transformer for a specific application
CO4	Illustrate working principles of induction motor,dc motor and synchronous generator.
CO5	Identify type of electrical machine based on their construction.
CO6	Describe working principles of protection devices used in electrical circuits.

Course Content:			
Unit – I	**DC CIRCUITS**	**Lecture Hours:**	**12**
Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems, Maximum power transfer theorem & Reciprocity theorem - Time-domain analysis of first-order RL and RC circuits.			
Unit – II	**AC CIRCUITS**	**Lecture Hours:**	**12**
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Concept of Resonance in series & parallel circuits, bandwidth and quality factor, Three-phase balanced circuits, voltage and current relations in star and delta connections.			
Unit – III	**TRANSFORMERS**	**Lecture Hours:**	**11**
Magnetic materials, BH characteristics, Mutual coupled circuits, Dot Convention in coupled circuits, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency, Auto-transformer and three –phase transformers connections.			
Unit – IV	**ELECTRICAL MACHINES**	**Lecture Hours:**	**11**
Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor, Single-phase induction motor, construction, working, torque- speed			

	characteristic and speed control of separately excited dc motor, construction and working of synchronous generators.		
Unit – V	**ELECTRICAL INSTALLATIONS**	**Lecture Hours:**	**12**
	Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing, Types of Batteries, Important Characteristics for Batteries, Elementary calculations for energy consumption, power factor improvement and battery backup.		

Text Books:	
1	D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2	D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
References Books:	
1	L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011. .
2	E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3	V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

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)	T 2	Tu 0	C 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
(AUTONOMOUS)
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
(AUTONOMOUS)

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

G.PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

PRINCIPLES OF ELECTRICAL ENGINEERING LAB

Title of the Course :	**PRINCIPLES OF ELECTRICAL ENGINEERING LAB**				
Branches for which this course is offered:	**II Semester(ECE)**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

Course Overview:
The objective of the Electrical Engineering Labis to expose the students to the basic elements of the electrical circuitsand to learn performance characteristics of DC Machines and determine the efficiency and regulation of a transformer and also Demonstration of components of LT switchgear.

Course Objectives:	
To make the Students to learn about	
1	Practical verification of Network theorems
2	Verification of transient response using pulse excitation.
3	Measurement of active and reactive power in three phase circuits
4	To experiment in detail on Transformers, Synchronous generator and evaluate their performance.
5	To experiment in detail on DC shunt and compound motors and evaluate their performance.

Course Outcomes:	
After successful completion of the course, the student will be able to	
CO1	Get exposure to common electrical components and their ratings.
CO2	Make electrical connections by wires of appropriate ratings.
CO3	Understand usage of common electrical measuring instruments.
CO4	Determine performance characteristics of transformers and electrical machines.

List of Experiments:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors andinductors.
2. Verification of Thevenin's and NortonTheorems.
3. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-Ccircuits.
4. Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, andpower.
5. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line- line voltage, phase to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phasecircuits.
6. Verification of Superposition theorem for DC and ACNetworks.
7. Verification of Maximum power transfer theorem for DC and ACNetworks.
8. Verification of Reciprocitytheorem.
9. To determine the performance characteristics of a ShuntMotor.
10. To determine the performance characteristics of a CompoundMotor.
11. To determine speed control of DC ShuntMotor.
12. To determine the load characteristics of a ShuntGenerator.
13. Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through fieldexcitation.
14. Demonstration of components of LT switchgear.
15. 3 – Phase Power Measurements for balancedloads

COURSE STRUCTURE

III - SEMESTER

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION 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
A2401	Electronic Devices and Circuits	PC	3	0	0	3	30	70	100
A2402	Digital Logic Design	PC	3	0	0	3	30	70	100
A2403	Signals and Systems	PC	3	1	0	4	30	70	100
A2404	Probability Theory and Stochastic Processes	PC	3	0	0	3	30	70	100
A2405	Electronic Devices and Circuits Laboratory	PC	0	0	4	2	30	70	100
A2406	Digital Logic Design Laboratory	PC	0	0	3	1.5	30	70	100
A2407	Basic Simulation Laboratory	PC	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	01	10	22	270	630	900

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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/co requisites

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: 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 Books

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,* Vol-II, and Vol-IV, 6th revised Edition, S.Chand and Company Pvt.Ltd, 2014.

Reference Books

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2401 – ELECTRONIC DEVICES AND CIRCUITS

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 explores the fundamentals of electronics and knowledge on discrete range of semiconductor devices, its construction, characteristics, analysis and design of various electronic devices. This course makes the students expertise in analysing the principle of operation of diodes, transistors and their applications.

Course Pre/corequisites

1. A2004 – Engineering Physics

2. Course Outcomes (COs)

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

A2401.1	Explain the construction, working principles and applications of various electronic devices.
A2401.2	Analyze the characteristics of diodes and transistors.
A2401.3	Design the DC bias circuitry of BJT and FET for various applications.
A2401.4	Construct the simple amplifier circuits using BJT and FET.

3. Course Syllabus

UNIT-I

Diode: Operation, biasing, characteristics, equation, static and dynamic resistance. Effect of temperature on VI characteristics of a diode, ideal vs practical diode, diode equivalent circuits.

Special Diodes: Zener diode, tunnel diode, LED, photo diode– construction, operation and characteristics.

UNIT-II

Rectifiers: Block diagram of regulated power supply, half wave, full wave and bridge rectifier.

Filters: Derivation of ripple factor for inductor, capacitor, L-section and Π-section filters, Zener diode as a voltage regulator.

UNIT-III

Transistors: BJT – Transistor as an amplifier, configurations (CE, CB, CC), input and output characteristics. **FET –** Construction, operation and characteristics of JFET and MOSFET.

UNIT-IV

Biasing: load line, criteria for fixing operating point, factors affecting operating point, Methods of biasing– fixed bias, self-bias, collector to base bias, stability factors (S, S^{I}, S^{II}), Thermal runaway, condition for thermal stability.

UNIT-V

Amplifiers: BJT – Analysis of CE, CB and CC amplifiers using exact and approximate h-parameter model. **FET –** Analysis of CS and CD amplifiers.

4. Books and Materials

Text Book(s)

1. J. Millman, C. Halkias, *Electronic Devices and Circuits*, TMH, 4th Edition, 2010.

Reference Book(s)

1. R.L. Boylestad and Louis Nashelsky, *Electronic Devices and Circuits*, Pearson Publications, 9th Edition, 2011.
2. J.B.Gupta, *Electronic Devices and Circuits*, 3rd Edition, S.K.Kataria & Sons, 2008.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2402 – DIGITAL LOGIC DESIGN

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 logic design and the basic building blocks used in digital systems, in particular digital computers. This course provides comprehensive understanding of number systems, Boolean algebra, logic gates, minimization techniques, combinational and sequential logic. 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 basis for microprocessors and microcontrollers and embedded systems.

Course Pre/Corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

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

A2402.1 Apply arithmetic operations and principles of Boolean algebra to minimize logic expressions.

A2402.2 Make use of K-map and tabulation methods to minimize Boolean functions.

A2402.3 Analyze the performance of different combinational and sequential circuits.

A2402.4 Design various programmable logic devices using combinational circuits.

3. Course Syllabus

UNIT-I

DIGITAL SYSTEMS AND BINARY NUMBERS: Number systems and their conversions, Representation of negative numbers, binary codes, and hamming code.

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

UNIT-II

GATE LEVEL MINIMIZATION: The k-map method, four-variable map, five-Variable map, Sum of Products and Product of Sums simplification, don't-care conditions, realization using universal gates, AND-OR-INVERT, OR-AND-INVERT models realization, and exclusive-OR properties. The tabulation (Quine Mccluskey) method, determination of Prime implicants and essential prime implicants.

UNIT-III

COMBINATIONAL LOGIC: Introduction, analysis and design with basic logic gates (code converters), comparators, data selectors, priority encoders, decoders, full adder, serial binary adder, parallel binary adders-ripple-carry adder, carry-look ahead adder, BCD adder, subtractor and binary multiplier.

UNIT-IV

SEQUENTIAL LOGIC: Memory elements and their excitation functions SR, JK, T, and D latches and flip-flops, master slave JK flip-flop, analysis and design of clocked sequential circuits, state minimization and assignment.

REGISTERS AND COUNTERS: Registers, classification of registers, design of ripple counters, synchronous counters, ring counter, twisted ring counter.

UNIT-V

MEMORY AND PROGRAMMABLE LOGIC: Types of memories, SRAM, DRAM, ROM, memory decoding, programmable logic array, programmable array logic, and Concept of Programmable logic devices like FPGA, Logic implementation using Programmable Devices.

4. Books and Materials

Text Book(s)

1. M. Morris Mano, Michael D. Ciletti, *Digital Design*, 4th edition, Pearson Education/PHI, India, 2008.

Reference Book(s)

1. Zvi. Kohavi, *Switching and Finite Automata Theory*, Tata McGraw Hill, India, 2004.
2. C.V.S. Rao, Switching and Logic Design, 3rd edition, Pearson Education, India, 2009.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2403 – SIGNALS AND SYSTEMS

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

This is an introductory course to all communication engineering subjects. This course deals with classification of signals and systems in continuous and discrete time domains. The convolution and correlation of signals in both continuous and discrete time domains are discussed in detail. This course also presents the Fourier, Laplace and Z-transform representation of signals and systems. This course serves as an elementary subject for signal and image processing.

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:

A2403.1	Distinguish between different signals and systems.
A2403.2	Make use of Fourier series for the representation of signals.
A2403.3	Analyze different signals by using an appropriate transform.
A2403.4	Examine the transmission characteristics of linear systems.
A2403.5	Select an appropriate transform to find the transfer function of linear systems.

3. Course Syllabus

UNIT-I

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,

Singularity functions: Unit impulse, step, ramp and parabolic signals.

Operations on signals: Time shifting, time scaling, time reversal and combined operations.

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.

UNIT-II

Continuous Time Fourier Series: Analogy between vectors and signals, orthogonality in complex functions, trigonometric and exponential Fourier series.

Continuous Time Fourier Transform: Fourier transform of different signals, properties of Fourier transform.

UNIT-III

Signal Transmission through Linear Systems: Convolution and correlation of continuous time signals, causality and physical realizability, distotionless transmission, signal bandwidth and system bandwidth, Filter characteristics of linear systems, transfer function of an LTI system, relationship between bandwidth and rise time.

UNIT-IV

Discrete Time Fourier Transform: Discrete Time Fourier series, discrete time Fourier transform of different signals, Properties of discrete time Fourier transform, convolution and correlation of discrete time signals.

UNIT-V

The Laplace Transform: Relation between Laplace and Fourier transform, forward and inverse transform, region of convergence, Properties of Laplace transform, solution of differential equations using Laplace transform with initial conditions.

The Z-Transform: Relation between DTFT and Z-transform, z-transform of different sequences, inverse z-transform, properties of z-transform, solution of difference equations using z-transform with initial conditions.

4. Books and Materials

Text Book(s)

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, *Signals and Systems*, Pearson Education, 2nd edition, 1997.
2. B. P. Lathi, *Principles of Linear Systems and Signals*, Oxford University Press, 2nd edition, 2009.

Reference Book(s)

1. A.Anand Kumar, *Signals and Systems*, Prentice Hall of India, 2012.
2. Simon Haykin and Van Veen, *Signals and Systems*, Wiley, 2nd edition, 1998.
3. B.P. Lathi, *Signals, Systems and Communications*, BS Publications, 2009.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2404 – PROBABILITY THEORY AND STOCHASTIC PROCESSES

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 knowledge for the study of analog and digital communication systems. This course covers the concepts of probability distribution function, probability density function and operations on random variables and random processes. This course provides the students an opportunity to analyze random variables and random process and estimation of power spectral density in communication systems.

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:

A2404.1	Apply different probability techniques to observe the different events.
A2404.2	Determine the characteristics of random variables and random processes.
A2404.3	Classify the random processes by using different techniques.
A2404.4	Analyze the temporal and spectral characteristics of stochastic processes.
A2404.5	Develop the relationship between the input and output statistical characteristic of a linear system.

3. Course Syllabus

UNIT-I

Probability: Definition of probability, joint Probability, conditional Probability, total Probability, bayes Theorem.

Random variable: Classification, distribution and density functions-Gaussian, Binomial, Poisson, Uniform, Exponential, Rayleigh, conditional distribution and density functions. Operations on single random variable- Expectation, moments, characteristic function.

UNIT-II

Multiple random variables: Joint distribution and density functions, statistical independence, central limit theorem. Operations on multiple random variables- Expectation, joint moments, joint characteristic functions.

UNIT-III

Stochastic processes -temporal characteristics: The random process, classification of processes, distribution and density functions, stationary processes, correlation functions, covariance functions.

UNIT-IV

Stochastic processes–spectral characteristics: Properties of power density spectrum, relationship between power spectrum and autocorrelation function, properties of cross-power density spectrum, relationship between cross-power spectrum and cross-correlation function.

UNIT-V

Random signal response of linear systems: System response – convolution, mean and mean-squared value of system response, autocorrelation and cross-correlation functions of system response, spectral characteristics of system response.

4. Books and Materials

Text Book(s)

1. Peyton Z. Peebles, *Probability, Random Variables and Random Signal Principles,* Tata McGraw-Hill, 4th edition, 2009.

Reference Book(s)

1. Athanasius Papoulis, S. Unnikrishna Pillai, *Probability, Random Variables and Stochastic Processes,* PHI, 4th edition, 2002.
2. Y.Mallikarjuna Reddy, *Probability theory and stochastic processes,* Tata McGraw-Hill, 4th edition, 2013.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2405 – ELECTRONIC DEVICES AND CIRCUITS 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 course makes the students learn and implement the concept of the feedback and frequency response of small signal amplifier.

Course Pre/corequisites

1. A2004 – Applied Physics
2. A2008 – Applied Physics Laboratory
3. A2401 – Electronic Devices and Circuits

2. Course Outcomes (COs)

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

A2405.1 Identify various electronic components and measuring equipment.

A2405.2 Analyze the V-I characteristics of electronic devices.

A2405.3 Measure the ripple content present in rectifiers with and without filters.

A2405.4 Construct single stage amplifier circuits and plot transient and frequency response.

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. Zener Diode as a Voltage Regulator
7. Half-wave Rectifier without and with C-filter
8. Full-wave Rectifier without and with C-filter
9. V-I Characteristics of CE Configuration
10. V-I Characteristics of CB Configuration
11. FET Characteristics (CS Configuration)
12. Frequency Response of CE Amplifier
13. Frequency Response of CC Amplifier

4. Laboratory Equipment/Software/Tools Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Decade Resistance Boxes, Decade Capacitance Boxes
5. Ammeters (Analog or Digital) , Voltmeters (Analog or Digital), Digital Multimeters
6. Active and passive devices, bread boards

5. Books and Materials

Text Book(s)

1. J. Millman, C. Halkias, *Electronic Devices and Circuits*, TMH, 4th Edition, 2010.

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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2406 – DIGITAL LOGIC DESIGN 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 introduces LabVIEW graphical programming. This course deals with graphical programming of logic gates, universal logic gates, code converters, multiplexers, adders, flip-flops, magnitude comparators, synchronous and ripple counters using NI LabVIEW software. It also provides the knowledge of virtual lab utilization and helps the students to do LabVIEW based projects.

Course Pre/Corequisites

A2402 – Digital Logic Design

2. Course Outcomes (COs)

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

A2406.1 Make use of LabVIEW software to construct combinational and sequential circuits.

A2406.2 Test and Debug the combinational and sequential circuits using LabVIEW Software.

A2406.3 Analyze virtual lab demo for Boolean relations using digital comparators.

A2406.4 Develop LabVIEW based projects using LabVIEW Software.

3. Course Syllabus

List of Experiments using NI LabVIEW

1. Introduction to NI Lab VIEW.
2. Realization of logic gates.
3. Realization of Boolean function using basic gates and using Universal gates.
4. Implementation and verification of Code Converters.
5. Implementation and verification of Decoder.
6. Implementation and verification of Priority Encoder.
7. Implementation and verification of Multiplexer.
8. Implementation and verification of half adder, full adder and parallel adder.
9. Implementation and verification of magnitude comparators
10. Design and verification of Flip-flops.
11. Design and implementation of synchronous and ripple counters
12. Analysis and Synthesis of Boolean Relations using Digital Comparators (Virtual Lab Demo)

4. Laboratory Equipment/Software/Tools Required

1. Computers installed with operating systems
2. NI LabVIEW Software

5. Books and Materials

Reference Books

1. M. Morris Mano, Michael D. Ciletti, *Digital Design*, 4th edition, Pearson Education/PHI, India, 2008.

Other References

1. https://www.ni.com/getting-started/labview-basics/
2. https://www.pearson.ch/download/media/9780130153623.pdf

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2407 – BASIC 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

This laboratory course introduces MATLAB programming in communication engineering. This course deals with generation of different signals, computation of convolution, correlation, Fourier and Laplace transform of signals. In addition, this course covers the verification of linearity and time invariance of a system and checking the random process for wide sense stationary. This laboratory course will provide an opportunity to enhance programming skills by using MATLAB.

Course Pre/corequisites

1. A2403 – Signals and Systems
2. A2404 – Probability Theory and Stochastic Processes

2. Course Outcomes (COs)

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

A2407.1 Develop programs to generate different signals.

A2407.2 Compile programs to perform different operations on signals and sequences.

A2407.3 Analyze different responses of the systems and spectrums of the signals.

A2407.4 Test the different properties of given signals and systems.

A2407.5 Estimate the mean skew, kurtosis, and probability distribution function of Gaussian noise.

3. Course Syllabus

1. Generate different signals in continuous time domain.
2. Generate different signals in discrete time domain.
3. Perform different operations on signals and sequences.
4. Find even and odd components & real and imaginary parts of signals and sequences.
5. Examine the linearity property of the given system.
6. Examine the time invariance property of the given system.
7. Plot the impulse and unit step responses of the given system.
8. Plot the frequency response of the given system.
9. Evaluate convolution of signals and sequences.
10. Perform autocorrelation and cross correlation of signals and sequences.
11. Find the Fourier transform of a given signal and plot its magnitude and phase spectrums.
12. Find the Laplace transform of the given function.
13. Compute mean, skew, kurtosis, and probability distribution function of Gaussian noise.
14. Check the given random process for wide sense stationary.

4. Laboratory Equipment/Software/Tools required

1. Computers installed with operating systems.
2. MATLAB/other equivalent software.

5. Books and Materials

Text Book(s)

1. Luis F. Chaparro and Aydin Akan, *Signals and Systems Using MATLAB*, 3rd edition, Academic Press, 2019.

Reference Book(s)

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, *Signals and Systems*, Pearson Education, 2nd edition, 1997.
2. Bhanu Bhaskara and Siddhartha Bhaskara, *Basic Simulation Lab with MATLAB*, McGraw-Hill Education (India) Pvt Limited, 2009.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 learner 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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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.

UNIT-II

Nehru yuva Kendra (NYK), activities – socio cultural and sports.

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 bharat abhiyan.

UNIT-IV

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION 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
A2213	Control Systems	PC	3	0	0	3	30	70	100
A2410	Electromagnetics and Transmission Lines	PC	3	0	0	3	30	70	100
A2411	Electronic Circuit Analysis	PC	3	0	0	3	30	70	100
A2412	Analog Communication Systems	PC	3	0	0	3	30	70	100
A2413	Internet of Things	PC	3	0	0	3	30	70	100
A2414	Electronic Circuit Analysis Laboratory	PC	0	0	3	1.5	30	70	100
A2415	Analog Communication Systems Laboratory	PC	0	0	3	1.5	30	70	100
A2416	Internet of Things Laboratory	PC	0	0	3	1.5	30	70	100
A2018	Quantitative Aptitude and Reasoning – II	BS	1	0	0	1	30	70	100
A2417	Socially Relevant Project – I	PW	0	0	2	1	100	0	100
A2418	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	11	22.5	470	630	1100

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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

A2002- Mathematics-I

2. Course Outcomes (COs)

After 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.

UNIT-V

Compensators: Lag, lead, lead - lag networks.

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 FaridGolnaraghi, *Automatic Control Systems*, John Wiley, 8th edition, 2003.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2410-ELECTROMAGNETICS AND TRANSMISSION LINES

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 basic knowledge required to understand any communication course. This course covers electrostatics and magnetostatics, electromagnetic waves and transmission lines. This course also deals with variations of electric and magnetic fields that are used to produce a wave and to understand its behaviour in various media. The course continues with derivation of parameters relating to transmission lines and its importance.

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:

A2410.1	Apply various laws of electrostatics and magnetostatics to deduce Maxwell's equations in static and time variants fields.
A2410.2	Develop boundary conditions for different combinations of media.
A2410.3	Make use of Maxwell's equations to deduce EM wave equations.
A2410.4	Develop expressions for primary and secondary parameters of transmission line using conventional and graphical methods.
A2410.5	Derive continuity equation, Poisson's, Laplace's equation and Poynting theorem to characterize field.

3. Course Syllabus

UNIT-I

Electrostatics: coulomb's law, electric field intensity – fields due to different charge distributions, electric flux density, gauss law and applications, electric potential, relations between e and v, maxwell's two equations for electrostatic fields, electric dipole, energy density, convection and conduction currents, dielectric constant, isotropic and homogeneous dielectrics, continuity equation, relaxation time, poisson's and laplace's equations,.

UNIT-II

Magnetostatics: Biot-savart law, ampere's circuital law and applications, magnetic flux density, maxwell's two equations for magnetostatic fields, magnetic scalar and vector potentials, forces due to magnetic fields, magnetic torque and moment, magnetic dipole, inductances and magnetic energy.

UNIT-III

Maxwell's Equations (For Time Varying Fields): faraday's law and transformer e.m.f, inconsistency of ampere's law and displacement current density, maxwell's equations in different final forms and word statements. boundary conditions of electromagnetic fields: dielectric-dielectric and dielectric-conductor interfaces.

UNIT-IV

Wave Characteristics: Wave equations for conducting and perfect dielectric media, uniform plane waves – definition, all relations between E and H, sinusoidal variations, wave propagation in lossless and conducting media, conductors and dielectrics – characterization, wave propagation in good conductors and good dielectrics, polarization, reflection and refraction of plane waves – normal and oblique incidences, for both perfect conductor and perfect dielectrics, brewster angle, critical angle and total internal reflection, surface impedance, poynting vector, and poynting theorem – applications, power loss in a plane conductor.

UNIT-V

Transmission Lines: types, transmission line parameters (primary and secondary), transmission line equations, input impedance, standing wave ratio and power, smith chart and its applications, applications of transmission lines of various lengths, micro-strip transmission lines – input impedance.

4. Books and Materials

Text Book(s)

1. Matthew N.O. Sadiku, *Elements of Electromagnetics*, Oxford Univ. Press, 4th ed., 2008.

Reference Book(s)

1. E.C. Jordan and K.G. Balmain , *Electromagnetic Waves and Radiating Systems*, PHI, 2nd Ed., 2000.
2. John D. Krauss, *Electromagnetics*, McGraw- Hill publications, 3rd ed., 1988.
3. William H. Hayt Jr. and John A. Buck, *Engineering Electromagnetics*, TMH, 7th ed., 2006.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2411 – ELECTRONIC CIRCUIT 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

The aim of this course is to familiarize the students with the analysis and design of multistage amplifiers and oscillators. This course covers the mathematical modelling of active solid state devices, power amplifiers and tuned amplifiers. This course will provide the students to analyze the frequency response of amplifier circuits.

Course Pre/corequisites

A2401 – Electronic Devices and Circuits

2. Course Outcomes (COs)

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

A2411.1 Analyze the small signal models of BJT amplifiers at high frequencies.

A2411.2 Analyze the frequency response of single and multi-stage amplifiers with compound connections.

A2411.3 Classify amplifiers based on feedback mechanism.

A2411.4 Evaluate the efficiency of large signal amplifiers.

A2411.5 Explain the concept of resonant frequency in tuned amplifiers.

3. Course Syllabus

UNIT-I

Amplifiers at high frequency: BJT – Hybrid-π common emitter transistor model, determination of high-frequency parameters in terms of low-frequency (hybrid) parameters.

UNIT-II

Multistage Amplifiers: Methods of coupling**,** cascade amplifier, cascode amplifier, darlington pair amplifier, effect of cascading on gain and bandwidth.

UNIT-III

Feedback Amplifiers: Characteristics of negative feedback amplifiers, feedback topologies- voltage series feedback, voltage shunt feedback, current series feedback, current shunt feedback.

UNIT-IV

Oscillators: Barkhausen criteria, LC oscillators - Hartley and Colpitt's oscillators, RC oscillators – phase shift oscillator, Wien bridge oscillator, crystal oscillator.

UNIT-V

Power Amplifiers: Series fed and transformer coupled class A power amplifier, distortion in amplifiers, class B amplifier, push-pull and complementary symmetry power amplifiers, class AB amplifier, class C amplifier, introduction to tuned amplifiers.

4. Books and Materials

Text Book(s)

1. J. Millman, C. Halkias, *Electronic Devices and Circuits*, TMH, 4th Edition, 2010.

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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2412 – ANALOG 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 knowledge of analog communication systems and their applications. This course covers different continuous modulation techniques and analog pulse modulation schemes. This course also covers the operation of AM and FM receivers and effect of noise on AM, FM and PM receiver performance. This course helps the students in understanding and design of communication systems that are being used today.

Course Pre/corequisites

1. A2403 – Signals and Systems
2. A2404 – Probability Theory and Stochastic Processes

2. Course Outcomes (COs)

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

A2412.1	Explain the operation of different analog communication systems.
A2412.2	Analyze the performance of different modulation schemes used in analog communication systems.
A2412.3	Make use of sampling theorem to generate pulse modulation signals.
A2412.4	Analyze the performance of AM, FM and PM receivers in the presence of noise.
A2412.5	Choose an appropriate modulation technique to design an analog communication system.

3. Course Syllabus

UNIT-I

Amplitude Modulation and Demodulation: Elements of communication systems, Modulation, Amplitude Modulation (AM)- Single tone modulation, generation of AM signals, demodulation, power calculations. DSBSC-Generation of DSBSC signals, demodulation. SSB-Generation of SSB signals, demodulation, VSB-modulation and demodulation.

UNIT-II

Angle Modulation: Phase modulation (PM), Frequency Modulation (FM)-Narrow band frequency modulation and wide band frequency modulation.

UNIT-III

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

UNIT-IV

Receivers and Multiplexing: Super-heterodyne AM receiver, pre-emphasis, and de-emphasis filters, FM capture Effect, FM receiver, frequency-division multiplexing (FDM), time-division multiplexing (TDM).

UNIT-V

Noise: Types of Noise, Narrowband noise - Time domain representation and quadrature representation, filtered white noise, signal to noise ratio, noise equivalent bandwidth, effective noise temperature, and noise figure, Performance analysis of AM, FM, PM receivers in the presence of noise.

4. Books and Materials

Text Book(s)

1. Simon Haykin, *Communication Systems*, Wiley-India edition, 3rd edition, 2010.

Reference Book(s)

1. B.P.Lathi and Zhi Ding, *Modern Digital and Analog Communication Systems*, Oxford University Press, 4th edition, 2010.
2. A. Bruce Carlson and Paul B. Crilly, *Communication Systems– An Introduction to Signals and Noise in Electrical Communication*, McGraw-Hill,5th edition, 2010.
3. Kennedy and Davis, *Electronic Communication Systems*, McGraw-Hill 4th edition, 1999.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2413 – INTERNET OF THINGS

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 IoT. In this course students study python concepts, how to interface I/O devices, sensors using arduino uno and raspberry pi. This course is accompanied by a laboratory course directly linked to the lecture topics for hands-on learning of the material. 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 learner will be able to:

A2413.1 Analyze IoT applications using IoT design principles, protocols and levels.

A2413.2 Distinguish sensors and actuators in terms of their functions and applications.

A2413.3 Interface I/O devices, Sensors using Arduino uno.

A2413.4 Apply Python concepts for programming of Raspberry Pi.

A2413.5 Develop IoT applications using Raspberry Pi and Arduino uno.

3. Course Syllabus

UNIT-I

Introduction to IoT: Characteristics of IoT, Design Principles of IoT, IoT Architecture and Protocols, Enabling Technologies for IoT, IoT Levels.

UNIT-II

Sensors and Actuators: Sensor-definition, features, characteristics of sensor, Different types of sensors, Actuator-definition, Different types of Actuators, purpose of Sensors and Actuators in IoT.

UNIT-III

Programming with Arduino: Introduction to Arduino UNO, Arduino IDE, Program Elements, Serial commands LCD commands. LED Interface, Switch Interface, Serial Interface, LCD Interface, Potentiometer Interface, DHT 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, modules, exceptions, reading files, writing files.

UNIT-V

IoT Implementation with Raspberry Pi: Introduction to Raspberry Pi, Installation of raspbian OS, connecting to laptop, terminal commands, LED Interface, Button Interface, DHT sensor interface. Case study-Remote Data Logging.

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, Mahendra Swain, *Internet of Things with Raspberry Pi and Arduino,* 1st edition, CRC Press, 2019.

Reference Book(s)

1. Vijay Madisetti, Arshdeep Bahga, *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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2414 – ELECTRONIC CIRCUIT ANALYSIS 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 to design the electronic circuits and perform the analysis through simulator using Multisim/Pspice/Equivalent Licensed simulation software tool. Further the students are required to verify the result using necessary hardware in the hardware laboratory. The laboratory experiments reinforce lecture theory and provide the student with the implementation using hardware and simulation software.

Course Pre/corequisites

1. A2405 – Electronic Devices and Circuits Laboratory
2. A2411 – Electronic Circuit Analysis

2. Course Outcomes (COs)

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

A2414.1	Design single and multistage amplifiers at low, mid and high frequencies.
A2414.2	Determine the gain of feedback amplifiers and efficiency of power amplifiers.
A2414.3	Design oscillator circuits for given frequency of oscillation.
A2414.4	Compare the frequency response of tuned amplifiers.
A2414.5	Analyze all the electronic circuits using simulation software and hardware.

3. Course Syllabus

1. Frequency Response of CE amplifier
2. Frequency Response of two stage RC coupled amplifier
3. Darlington pair amplifier
4. Voltage-series feedback amplifier
5. Current-shunt feedback amplifier
6. RC phase shift oscillator
7. Hartley oscillator
8. Colpitt's oscillator
9. Class A series-fed power amplifier
10. Complementary symmetry class B push-pull power amplifier
11. Single tuned amplifier
12. Double tuned amplifier

4. Laboratory Equipment/Software/Tools Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Active and passive devices, bread boards
5. Computers installed with operating system

6. Multisim/Equivalent simulation software tool

5. Books and Materials

Text Book(s)

1. R.L. Boylestad and Louis Nashelsky, *Electronic Devices and Circuits*, Pearson Publications, 9th Edition, 2006.

Reference Book(s)

1. J. Millman, C. Halkias, *Electronic Devices and Circuits*, TMH, 4th Edition, 2010.
2. J.B.Gupta, *Electronic Devices and Circuits*, 3rd Edition, S.K.Kataria & Sons, 2008.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2415 – ANALOG COMMUNICATION 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

This laboratory course provides the students to experience real time behavior of different analog modulation schemes. This course covers practically visualization of AM, DSBSC, SSB, FM, PAM, PWM and PPM signals and verification of phase locked loop, pre-emphasis and de-emphasis and mixer operation. This course helps the students to acquire the fundamental knowledge required to design any communication system.

Course Pre/corequisites

A2412 – Analog Communication Systems

2. Course Outcomes (COs)

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

A2415.1 Analyze the performance of different continuous modulation and demodulation schemes.

A2415.2 Sketch the characteristics of mixer, pre-emphasis and de-emphasis.

A2415.3 Compute the specifications of a phase locked loop.

A2415.4 Analyze the performance of different pulse modulation Schemes.

3. Course Syllabus

1. Amplitude modulation and demodulation
2. DSB-SC modulation and demodulation
3. SSB-SC modulation and demodulation
4. Frequency modulation and demodulation
5. Phase Locked Loop (PLL)
6. Characteristics of Mixer
7. Pre-emphasis and de-emphasis
8. Pulse amplitude modulation and demodulation
9. Pulse width modulation and demodulation
10. Pulse position modulation and demodulation

4. Laboratory Equipment/Software/Tools Required

1. Amplitude modulation and demodulation kit
2. DSB-SC modulation and demodulation kit
3. SSB-SC modulation and demodulation kit
4. Frequency modulation and demodulation kit
5. Phase Locked Loop (PLL) kit
6. Mixer kit
7. Pre-emphasis and de-emphasis kit
8. Pulse amplitude modulation and demodulation kit

9. Pulse width modulation and demodulation kit
10. Pulse position modulation and demodulation kit

5. Books and Materials

Text Book(s)

1. Simon Haykin, *Communication Systems*, Wiley-India edition, 3rd edition, 2010.

Reference Book(s)

1. B.P.Lathi and Zhi Ding, *Modern Digital and Analog Communication Systems*, Oxford University Press, 4th edition, 2010.
2. A. Bruce Carlson and Paul B. Crilly, *Communication Systems– An Introduction to Signals and Noise in Electrical Communication*, McGraw-Hill,5th edition, 2010.
3. Kennedy and Davis, *Electronic Communication Systems*, McGraw-Hill 4th edition, 1999.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2416 – INTERNET OF THINGS 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 embedded C and Arduino UNO programming. This course consists of experiments to blink LED, push button, potentiometer, fade LED, LDR, serial interface, LCD, DHT sensor using Arduino IDE. This course provides additional knowledge on python programming viz., installation, blink LED, push button, DHT sensor, IR sensor, thingspeak using Raspberry-Pi. This laboratory course helps the students to perform experiments in IoT based projects.

Course Pre/Corequisites

A2413 – Internet of Things

2. Course Outcomes (COs)

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

A2416.1	Develop embedded C Programs using Arduino UNO and IDE.
A2416.2	Execute Arduino C programs for blink LED, push button, potentiometer, fade LED, LDR, serial interface, LCD, DHT sensor.
A2416.3	Build Programs of Raspberry-Pi using python.
A2416.4	Interface LEDs, Push Buttons, Potentiometer to Raspberry-Pi.
A2416.5	Test and Debug Arduino UNO embedded C and Raspberry-Pi python Programs.

3. Course Syllabus

PART A: List of Embedded C Programs using Arduino UNO

1. Program to blink an LED.
2. Program to turn on and off an LED using push button.
3. Program to control LED blinks frequency using potentiometer.
4. Program to fade an LED using PWM pin on the Arduino.
5. Program to control brightness of the LED using LDR.
6. Program to display potentiometer values on serial monitor using serial port.
7. Program to display string on LCD.
8. Program to interface DHT sensor and display the value on LCD

PART – B: List of Python Programs using Raspberry-Pi

1. Installation of raspbian OS on SD card and configuring Raspberry pi to access SSH remotely through putty and vnc viewer.
2. Program to blink an LED
3. Program to turn on and off an LED using push button.
4. Program to interface DHT sensor
5. Program to interface IR sensor
6. DHT sensor remote data logger using thingspeak

4. Laboratory Equipment/Software/Tools Required

1. Computers installed with operating systems
2. Arduino UNO Board
3. Arduino IDE Software
4. Raspbian OS, Raspberry Pi Kit
5. Putty and VNC viewer Software
6. Breadboard, Jumper wires
7. LED, Push Button, Potentiometer, Resistors
8. DHT Sensor, IR Sensor, LDR, LCD Board with LCD

5. Books and Materials

Reference Books

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

Other References

1. https://www.tutorialspoint.com/arduino/arduino_tutorial.pdf
2. https://www.raspberrypi.org/documentation/usage/gpio/
3. https://www.raspberrypi.org/documentation/usage/gpio/python/README.md

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 learner will be able to:

A2016.1 Identify the problems by applying mathematical fundamentals.

A2016.2 Apply the suitable logical method to solve the problems.

A2016.3. Solve the various problems by using quantitative mathematical fundamentals.

A2016.4 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, *Quantitative Aptitude for competitive examinations,* latest edition, S.Chand publishers, 2007.
2. Dinesh Khattear, *Quantitative Aptitude, vol-I*, Pearson Education.
3. Arun Sharma, *How to prepare for quantitative aptitude,* McGraw Hill Publishers.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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/co requisites

This course has no pre/co-requisites.

2. Course Outcomes (COs)

After completion of the course, the learner 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. Aquatic ecosystems (ponds, rivers, lake, ocean, estuaries).

Biodiversity and Its Conservation: Introduction and definition, levels of biodiversity**,** values of biodiversity, 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, 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-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 assests.

- 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.

COURSE STRUCTURE

V - SEMESTER

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

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
A2421	Antennas and Wave Propagation	PC	3	0	0	3	30	70	100
A2422	Linear Integrated Circuit Applications	PC	3	0	0	3	30	70	100
A2423	Digital Communication Systems	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
A2424	Linear Integrated Circuit Applications Laboratory	PC	0	0	3	1.5	30	70	100
A2425	Digital Communication Systems Laboratory	PC	0	0	3	1.5	30	70	100
A2426	Digital Design through Verilog HDL Laboratory	PC	0	0	4	2	30	70	100
A2016	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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2421 – ANTENNAS AND WAVE PROPAGATION

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

Antenna is a key element in establishment of an efficient wireless communication between two points. So, the study of a course exclusively on antennas along with radio wave propagation is essential for Electronics and Communication Engineering graduates. This course covers antenna parameters, construction and design specifications of different antennas and antenna arrays used for VHF, UHF and microwave applications. This course also delivers knowledge on radio wave propagation in different atmosphere layers. The knowledge provided by this course will be useful in understanding and design of practical antennas.

Course Pre/corequisite

A2410 - Electromagnetics and Transmission Lines

2. Course Outcomes (COs)

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

A2421.1 Compare the performance of different antennas using antenna parameters.

A2421.2 Analyze dipole and array antennas by computing fields, radiated power and radiation resistance.

A2421.3 Select appropriate antenna for a specific application like TV, AM/FM radio, radar, satellite link.

A2421.4 Design horn, helical and reflector antennas for VHF, UHF and microwave communication applications.

A2421.5 Formulate the design equations of microstrip antennas for a given application.

3. Course Syllabus

UNIT - I

Antenna Basics: Introduction, radiation mechanism, basic antenna parameters.

Dipole antennas: Radiation from small electric dipole, quarter wave monopole and half-wave dipole–Current distributions, field components, radiated power, radiation resistance.

UNIT - II

Helical antennas: Helical geometry, helix modes, practical design considerations for mono flair helical antenna in axial and normal modes.

Horn antennas: Types, Fermat's principle, optimum horns, design considerations of pyramidal horns.

UNIT - III

Reflector antennas: Introduction, flat sheet and corner reflectors, parabola reflectors- geometry, pattern characteristics, feed methods.

Microstrip antennas: Rectangular patch antenna- Geometry and parameters, characteristics of microstrip antennas, Impact of different parameters on characteristics

UNIT - IV

Antenna arrays: Array of 2 isotropic sources- Different cases, principle of pattern multiplication, uniform linear arrays – Broadside arrays, end fire arrays, bio nomial array.

UNIT - V

Ground wave propagation: Introduction, plane earth reflections, space and surface waves, wave tilt, curved earth reflections

Space wave propagation: Introduction, field strength variation with distance and height, effect of earth's curvature, M-curves and duct propagation.

Sky wave propagation: Introduction, structure of ionosphere, refraction and reflection of sky waves by ionosphere, critical frequency, MUF, virtual height and skip distance, relation between MUF and skip distance.

4. Books and Materials

Text Book(s)

1. John D. Kraus, Ronald J. Marhefka and Ahmad S.Khan, *Antennas and wave propagation*, TMH, New Delhi, 4th edition (special Indian edition), 2010.

Reference Book(s)

1. E.C. Jordan and K.G. Balmain, *Electromagnetic Waves and Radiating Systems,* PHI, 2nd edition, 2000.
2. C.A. Balanis, *Antenna Theory- Analysis and Design,* John Wiley & Sons, 2nd edn., 2001.
3. K.D. Prasad, Satya Prakashan, *Antennas and Wave Propagation,* Tech. India Publications, New Delhi, 2001.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2422 – LINEAR INTEGRATED CIRCUIT APPLICATIONS

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

1. Course Description

Course Overview

This course 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, PLL and their use in communication applications. This course deals with analog to digital and digital to analog conversion techniques and provides the complete knowledge of linear and non-linear applications of integrated circuits.

Course Pre/corequisites

1. A2202 – Principles of Electrical Engineering
2. A2401 – Electronic Devices and Circuits
3. A2411 – Electronic Circuit Analysis

2. Course Outcomes (COs)

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

A2422.1 Analyze the characteristics of operational amplifier.

A2422.2 Design different amplifier and oscillator circuits using op-amp.

A2422.3 Make use of IC 555 and PLL effectively in communication systems.

A2422.4 Construct different active filters using op-amp.

A2422.5 Design different analog to digital and digital to analog converters effectively.

3. Course Syllabus

UNIT - I

Operational amplifiers: Differential amplifier configurations, balanced and unbalanced output differential amplifiers, current mirror, level translator, introduction to operational amplifier, block diagram, ideal op-amp, equivalent circuit, voltage transfer curve, open loop op-amp configurations.

UNIT - II

Feedback configurations: voltage series feedback, voltage shunt feedback and differential amplifiers, open loop and closed loop frequency responses, circuit stability, slew rate.

Linear applications of op-amps: Summing, scaling and averaging amplifiers, instrumentation amplifier, integrator, differentiator.

UNIT - III

Active filters and Oscillators: First, second and third order Butterworth filter and its frequency response, phase shift and Wien bridge oscillators, square, triangular and saw-tooth wave generators, comparators, zero crossing detector, schmitt trigger.

UNIT - IV

Timers and PLL: Introduction to IC 555 timer, functional diagram, monostable, astable operations and applications, introduction to PLL, block schematic, principles and description of individual blocks, applications of PLL.

UNIT - V

Data converters: Specifications of analog to digital converters, weighted resistor and R-2R ladder converter type D/A converters, specifications of digital to analog converters, flash, successive approximation, single slope and dual Slope type A/D converters.

4. Books and Materials

Text Book(s)

1. D. Roy Chowdhury, *Linear Integrated Circuits*, New Age International (p) Ltd, 2nd edition, 2003. Education, 2007.

Reference Book(s)

1. Ramakanth A. Gayakwad, *Op-Amps and Linear ICs*, PHI, 4th edition, 1987.
2. David A. Bell, *Operational Amplifiers & Linear ICs*, Oxford University Press, 2nd edition, 2010.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2423 – DIGITAL 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

The aim of this course is to provide students with an in-depth knowledge on sampling, quantizing and coding to convert analog signals in to digital form. This course covers various analog to digital conversion techniques like PCM, DM along with the refined forms like DPCM and ADM. In addition to baseband transmission of digital data over the channel, carrier modulation schemes like ASK, FSK, PSK, DPSK and QPSK are also covered. Students will also be able to analyze different channel coding methods.

Course Pre/corequisites

A2412 - Analog Communication Systems

2. Course Outcomes (COs)

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

A2423.1 Analyze different digital modulation techniques to convert analog signals to digital form.

A2423.2 Distinguish between baseband and passband transmission techniques in terms of SNR and BER.

A2423.3 Examine the concepts of geometric representation of signals and constellation diagrams.

A2423.4 Compare digital carrier modulation schemes in terms of bandwidth, complexity and spectral efficiency.

A2423.5 Interpret the differences between linear block codes and convolutional codes for noisy and noiseless channels.

3. Course Syllabus

UNIT - I

Source Coding Systems: Introduction, encoding and decoding of pulse code modulation, delta modulation, differential PCM, adaptive DPCM, noise in PCM systems, time division multiplexing.

UNIT - II

Baseband Pulse Transmission: Introduction, inter-symbol interference, raised cosine filter, matched filter, correlative coding – duo binary & modified duo binary signaling schemes, baseband M-array PAM transmission, Eye diagrams.

UNIT - III

Signal Space Analysis: Introduction, Geometric representation of signals, gram schmidt orthogonalization, coherent detection, correlation receiver, matched filter receiver, probability of error, signal constellation diagram.

UNIT - IV

Pass band Data Transmission: Introduction, generation ,detection and power spectra of coherent – BPSK, QPSK, BFSK, M-array PSK, M-array QAM, generation and detection of non-coherent BFSK and DPSK.

UNIT - V

Channel Coding: Error detection & correction, hamming distance, linear block codes, convolutional codes.

4. Books and Materials

Text Book(s)

1. Simon Haykin, *Communication Systems,* wiley India, 4th edition, 2011.
2. Sam shanmugam, *Digital and Analog Communication Systems,* John Wiley, 2005.

Reference Book(s)

1. B.P.Lathi and Zhi Ding, *Modern Digital & Analog Communication Systems*, Oxford University Press, International 4th edition, 2010.
2. Bruce Carlson and Paul B Crilly, Communication Systems – *An introduction to Signals & Noise in Electrical Communication*, Mc Graw-Hill International, 5th edition, 2010.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2424 – LINEAR INTEGRATED CIRCUIT APPLICATIONS 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 implementation of oscillators, waveform generators, data converters and the concepts of specialized ICs like 555 timer and 565 PLL.

Course Pre/corequisites

1. A2405 – Electronic Devices and Circuits Laboratory
2. A2414 – Electronic Circuit Analysis Laboratory
3. A2422 – Linear Integrated Circuit Applications

2. Course Outcomes (COs)

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

A2424.1 Implement different configurations of operational amplifiers.

A2424.2 Generate various shapes of signals using op-amps and timers.

A2424.3 Construct and analyse various active filters and data converters using op-amp.

A2424.4 Analyze the characteristics and applications of PLL.

3. Course Syllabus

1. Construct and test the performance of

a) Unity gain amplifier

b) Non – Inverting amplifier

c) Inverting amplifier

2. Analyze how op-amp can be used as Adder and Subtractor.

3. Study the characteristics of Comparator using op-amp.

4. Design of Astable multivibrator as a square wave generator.

5. Design and analyze the practical differentiator.

6. Design and analyze the practical integrator.

7. Construct a function generator to generate triangular and square wave signals.

8. Verify the characteristics of voltage controlled oscillator using IC 565.

9. Design and analyze the 1st and 2nd order low pass and high pass filters and plot the frequency responses.

10. Design and analyze the notch filter and plot the frequency response.
11. Design and verify the operation of instrumentation amplifier using op-amp.
12. Design and analyze R-2R ladder type Digital to Analog Converter using IC 741
13. Design adjustable duty cycle rectangular wave generator and frequency shift keying generator IC555 in astable mode of operation.

4. Laboratory Equipment/Software/Tools Required

1. Analog Discovery2 Kit with PC, USB Cable.
2. Analog IC's: TL082, 741C, 555 and 565.

5. Books and Materials

Text Book(s)

1. D. Roy Chowdhury, *Linear Integrated Circuits*, New Age International (p) Ltd, 2nd edition, 2003. Education,2007

Reference Book(s)

1. Ramakanth A. Gayakwad, *Op-Amps and Linear ICs*, PHI, 4th edition, 1987.
2. David A. Bell, *Operational Amplifiers & Linear ICs*, Oxford University Press, 2nd edition, 2010

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2425 – DIGITAL COMMUNICATION 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

This laboratory course provides the students to experience real time behavior of different digital modulation schemes and technically visualize spectra of different digital modulation schemes. In this course students will be able to analyze practical behavior of different elements available in digital communication system such as filters and amplifiers.

Course Pre/corequisites

A2423 - Digital Communication Systems

2. Course Outcomes (COs)

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

A2425.1 Demonstrate the working of various digital modulation and demodulation schemes.

A2425.2 Design various digital modulation schemes to obtain desired modulation index.

A2425.3 Analyze the performance of time division multiplexing and demultiplexing.

A2425.4 Study and verify sampling theorem.

A2425.5 Verify digital modulation techniques using MATLAB.

3. Course Syllabus

Hardware & Software (MATLAB)

1. Sampling theorem
2. Time division multiplexing and demultiplexing
3. Pulse code modulation and demodulation
4. Differential pulse code modulation and demodulation
5. Delta modulation and demodulation
6. Frequency shift keying
7. Phase shift keying
8. Quadrature phase shift keying

4. Laboratory Equipment/Software/Tools Required

1. Trainer Kits
2. Computers with latest MATLAB software
3. Digital storage oscilloscopes

5. Books and Materials

Reference Book(s)

1. Simon Haykin, Communication Systems, Wiley India edition, 4th edition, 2011.

Links

1. https://www.gphisar.ac.in/downloads/files/n5d60af42a3532.pdf

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2426 – DIGITAL DESIGN THROUGH VERILOG HDL 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 introduces Verilog HDL, a hardware description language for the design, synthesis, simulation and verification of VLSI circuits. Verilog HDL is an IEEE standard that is used by the engineers to efficiently design and analyse complex digital designs. This course covers the various modelling styles like data flow, structural, behavioural and switch level modelling. This course also provides knowledge on developing test benches to verify the functionality of combinational and sequential logic designs. The knowledge acquired in this course is used to develop complex digital applications using suitable EDA tools.

Course Pre/corequisites

A2402 **–** Digital Logic Design

2. Course Outcomes (COs)

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

A2426.1 Develop hardware digital designs using Verilog HDL

A2426.2 Use various modeling styles appropriately for digital design

A2426.3 Design, simulate and synthesize combinational circuits using Verilog descriptions

A2426.4 Design, simulate and synthesize sequential circuits using Verilog descriptions

A2426.5 Use finite state machines to design complex circuits

3. Course Syllabus: list of experiments (minimum 10 experiments to be done)

PART – A:

Introduction to Verilog: Evolution of HDLs, typical HDL-based design flow.

Language constructs: Lexical conventions, data types, system tasks and compiler directives, module definition, port declaration, connecting ports, hierarchical name referencing, test bench.

Gate-Level Modeling: Gate primitives and delays.

Data-flow Modeling: Continuous assignments, delay specification, expressions, operators and operands.

Behavioral Modeling: Structured procedures, initial and always, blocking and non-blocking statements, delay control, event control, conditional statements, multiway branching, loops, sequential and parallel blocks.

Switch-Level Modeling: Switch modeling elements, delay specification on switches, examples. **Tasks, Functions and UDPs:** Differences between tasks and functions, declaration, combinational and sequential UDPs.

PART-B:

1. Introduction to EDA tool (Cadence Incisive/Xilinx ISE design suite).
2. Develop Verilog HDL code of logic gates in data flow & Gate level styles.
3. Write a Verilog HDL code to describe the function of Full adder and Full subtractor.
4. Develop a Verilog HDL code for Ripple carry adder.
5. Write a Verilog HDL program for a) Multiplexers b) Decoders c) Priority encoder.
6. Write a Verilog HDL code for code converters (binary to gray, gray to binary, bcd to seven segment and etc.).
7. Write a Verilog HDL code to describe Magnitude comparators.
8. Write a Verilog HDL program for ALU by mentioning operations.
9. Write a Verilog HDL code for all logic gates using switch level modelling.
10. Develop a Verilog HDL code for the flip-flops - D, T, SR, JK.
11. Develop a Verilog HDL code for the Shift registers and counters using behavioural modelling.
12. Design and simulate the Verilog HDL code for sequence detector using FSM Moore & Mealy machine.

4. Laboratory Equipment/Software/Tools Required

1. Computers installed with operating system.
2. Cadence Incisive/Xilinx ISE design suite

5. Books and Materials

Text Book(s)

1. Samir Palnitkar, *Verilog HDL: A Guide to Digital Design and Synthesis*, 2nd Edition, 2003.
2. T.R Padmanabhan & B Bala Tripura Sundari, *Design through Verilog HDL*, WSE, IECE Press, 2004.

Reference Book(s)

1. J Bhasker, *A Verilog HDL Primer*, BSP, 2003.
2. Stephen Brown & Zvonko Vranesic, *Fundamentals of Logic Design with Verilog design*, TMH, 2nd edition, 2010.
3. Michael D Ciletti, *Advanced Digital Design with Verilog HDL*, PHI, 2005.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2016 – PROFESSIONAL ENGLISH COMMUNICATION SKILLS LABORATORY

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:

A2016.1	Able to use language effectively in everyday conversations
A2016.2	Able to get exposed various environments
A2016.3	Able to pronounce correctly
A2016.4	Able to acquire fluency in spoken English
A2016.5	Able to translate from mother tongue to English effectively
A2016.6	Able to face interviews/ GD to acquire proficiency towards employability

3. Course Syllabus

COMMUNICATION SKILLS:

1. Reading Comprehension 2. Listening comprehension 3. Vocabulary Development 4. Common Errors.

WRITING SKILLS:

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

PRESENTATION SKILLS:

1. Oral presentation 2. Power point presentation 3. Poster presentation

GETTING READY FOR JOB:

1. Debates 2. Group discussions 3. Job Interviews

INTERPERSONAL SKILLS:

1. Time Management 2. Problem Solving & Decision Making 3. Etiquettes

4. Books and Materials

Text Books:

1. SunithaMisra and C.Murali Krishna, *Communication Skills for Engineers.*
2. M. Ashraf Rizvi, *Effective Technical Communication*.
3. Dr. M. Hari Prasad, *Strengthen your Steps*.

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, Lok Sabha, Rajya Sabha, 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: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy

- (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT - V

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

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. Subash Kashyap, *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*, 4th edition in 3 volumes (Universal Law Publication)

COURSE STRUCTURE

VI - SEMESTER

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

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
A2427	Digital Signal Processing	PC	3	0	0	3	30	70	100
A2428	CMOS VLSI Design	PC	3	0	0	3	30	70	100
A2429	Microprocessors and Microcontrollers	PC	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
A2430	Digital Signal Processing Laboratory	PC	0	0	2	1	30	70	100
A2539	JAVA Programming Laboratory	PC	0	0	3	1.5	30	70	100
A2431	Microprocessors & Microcontrollers Laboratory	PC	0	0	3	1.5	30	70	100
A2432	Socially Relevant Project – II	PW	0	0	2	1	100	0	100
A2433	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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2427 – DIGITAL SIGNAL PROCESSING

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 presents the fundamental concepts, algorithms and applications of digital signal processing. This course investigates the processing and analysis of signals using the most common approaches and algorithms. This course also presents the designing of digital filters, realization of filters, multi rate signal processing and applications of multirate signal processing. This course provides the students an opportunity to design and realize different filters.

Course Pre/corequisites

A2403 – Signals and Systems

2. Course Outcomes (COs)

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

A2427.1 Apply the Discrete Fourier Transform to represent the signals in frequency domain.

A2427.2 Analyze various DFT algorithms and their applications.

A2427.3 Analyze various realization forms of FIR and IIR Filters.

A2427.4 Design digital FIR and IIR filters and analyze their performances.

A2427.5 Apply the concepts of multirate signal processing to implement digital filters.

3. Course Syllabus

UNIT - I

Discrete Fourier Transform: Review of discrete time signals and systems, Introduction to DFT, relationship of the DFT to other transforms, properties of the DFT, use of the DFT in linear filtering-Linear convolution and circular convolution; Filtering of long data sequences using DFT: Over-Lap Add Method, Over-Lap Save Method.

UNIT - II

Fast Fourier Transform Algorithms: Direct computation of DFT, Introduction to Fast Fourier Transform, Evaluating N- point DFT using FFT Algorithms: Radix-2 Decimation-in-Time FFT and Decimation-in-Frequency FFT, Split Radix-2 FFT algorithms, Compute IDFT using Inverse FFT algorithms.

UNIT - III

Realization of digital filters: Introduction to FIR systems, Structures for FIR systems - direct form, cascade form, frequency sampling structures, design of finite impulse response (FIR) filters-Frequency Response, Design of FIR filters using Fourier-Series Method, design of linear phase FIR filters using windows and frequency sampling method.

UNIT - IV

Design of digital filters: Introduction, structures for IIR systems – direct form, signal flow graphs & transposed, cascade form, parallel form and lattice structures. Design of analog Butterworth and

Chebyshev filters. Design of infinite impulse response filters from analog filters – IIR filter design by approximation of derivatives, by impulse invariance and by bilinear transformation methods.

UNIT - V

Multirate Signal Processing: Introduction, decimation, interpolation, sampling rate conversion by a rational factor, multistage implementation of sampling rate conversion, applications of multirate signal processing.

4. Books and Materials

Text Book(s)

1. John G. Proakis, Dimitris G. Manolakis, *Digital Signal Processing Principles, Algorithms and applications*, Pearson Education/ PHI, 4th edition.
2. Loney Ludeman, *Fundamentals of Digital Signal Processing*, John Wiley,2009.

Reference Book(s)

1. Monson H. Hayes, *Digital Signal Processing*, Schaum's Outlines, 2nd edition.
2. A.V.Oppenheim and R.W. Schaffer, & J R Buck, *Discrete Time Signal Processing*, 2nd ed., Pearson Education, 2012.
3. B.P. Lathi, *Principles of Signal Processing and Linear Systems*, Oxford Univ. Press, 2011.
4. Sanjit K Mitra, *Digital Signal Processing - A Computer based approach*, 3nd Edition, McGraw-Hill, 2008.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2428 – CMOS VLSI DESIGN

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 is an introductory course which covers basic theories and techniques of digital VLSI design in CMOS technology. This course covers physics of MOS transistor, CMOS fabrication processes, DC and transient characteristics of CMOS inverter, static and dynamic CMOS logic circuits. The knowledge acquired in this course will enable the students to design CMOS VLSI circuits and systems utilizing modern IC design methodologies.

Course Pre/co-requisites

A2402 – Digital Logic Design

2. Course Outcomes (COs)

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

A2428.1 Analyze the electrical properties of MOS transistors

A2428.2 Apply various CMOS processing techniques to fabricate NMOS, PMOS and CMOS devices

A2428.3 Analyze the DC and transient characteristics of CMOS logic gates

A2428.4 Build logic circuits using transmission gate logic

A2428.5 Make use of charge leakage and charge sharing concepts to design dynamic logic circuits

3. Course Syllabus

UNIT - I

MOS Transistor: Introduction, MOS device design equations, threshold voltage, body effect, channel length modulation.

CMOS Processing Technology: Overview, wafer processing, oxidation, epitaxy, deposition, ion implantation, diffusion, etching, and photolithography, the silicon gate process, NMOS, PMOS and CMOS fabrication technologies.

UNIT - II

CMOS Inverter: Basic circuit, CMOS inverter– DC characteristics, transient characteristics, noise margins, layout considerations, inverter switching characteristics, switching intervals, high-to-low time, low-to-high time, maximum switching frequency, transient effects on the VTC, RC modelling, propagation delay, inverter design– DC design, transient design, power dissipation.

UNIT - III

Static Logic Gates: Complex logic functions, CMOS NAND & NOR gates– DC characteristics, transient characteristics, complex logic gates, Pass transistor logic, EX-OR and equivalence gates, adder

circuits, SR and D-type Latch, CMOS SRAM cell, Schmitt trigger circuits, tri-state output circuits and pseudo-nMOS logic gates.

UNIT - IV

Transmission Gate Logic Circuits: Basic structure, TG as tri-state controller, electrical analysis– logic 1 transfer, logic 0 transfer, RC Modelling– TG resistance, TG capacitance, TG based switch logic gates– multiplexers, OR, XOR, TG adders, TG registers, the D-type Flip-Flop.

UNIT - V

Dynamic Logic Circuit Concepts: Charge leakage, charge sharing, the dynamic RAM cell, clocks and synchronization, clocked-CMOS and clock generation circuits.

4. Books and Materials

Text Book(s)

1. John P. Uyemura, *CMOS Logic Circuit Design*, Kluwer Academic Publishers, 2002.

Reference Book(s)

1. Douglas A Pucknell, Kamran Eshraghian, *Basic VLSI Design*, PHI, 3rd edition, 1995.
2. Neil H. E. Weste, Kamran Eshraghian, *Principles of CMOS VLSI Design.*

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 introduces 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

A2402 - Digital Logic Design

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 RISC 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, active vs standby current consumption. Timer & real time clock, 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*, 3rd edition, TMH Publications
2. John H. Davies, *MSP430 microcontroller basics*, 1st edition, 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

A2430 – DIGITAL SIGNAL PROCESSING LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

This laboratory course introduces MATLAB programming and Integrated Development Environment for Code composer with DSP Processor kit in signal processing environment. This course deals with the generation of discrete-time signals, evaluation of DFT, IDFT, frequency analysis of discrete-time sequences using linear convolution and circular convolution. In addition, in this course perform the Low-pass, High-pass using FIR and IIR digital filters, and implement the decimation and interpolation process. This laboratory course will provide an opportunity to enhance programming skills and real-time performance using DSP processor kit.

Course Pre/corequisites

A2403 – Signals and Systems
A2427 – Digital Signal Processing

2. Course Outcomes (COs)

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

A2430.1	Evaluate the DFT and IDFT of given signals using MATLAB.
A2430.2	Analyze various DFT algorithms and their applications.
A2430.3	Design IIR and FIR digital filters for the given specifications using MATLAB.
A2430.4	Apply the concepts of multirate signal processing using MATLAB.
A2430.5	Demonstrate real-time signal Processing applications with DSK kit (TMS320C6713) and Code Composer Studio.

3. Course Syllabus

PART A-LIST OF EXPERIMENTS USING MATLAB

1. Generate different discrete-time signals.
2. Compute DFT and IDFT of given discrete-time signal.
3. Perform linear and circular convolution of sequences.
4. Generate FFT of a given sequence.
5. Design different FIR filters for a given sequence.
6. Design different IIR filters for a given sequence.
7. Implement decimation and interpolation process.

PART B - LIST OF EXPERIMENTS USING DSP PROCESSOR

1. Implementation of Linear convolution & Circular Convolution.
2. Generation of Sine wave and square wave with TMS320C6713 DSP Kit.
3. Implementation of audio loopback.
4. Computation of N- Point DFT of a Given Sequence.
5. IIR and FIR Filter Implementation using DSP Kits.

4. Laboratory Equipment/Software/Tools required

1. Computers are installed with operating systems.
2. MATLAB-Software
3. Code Composer Studio
4. DSP Hardware Kit (TMS320C6713)

5. Books and Materials

Text Book(s)

1. John G. Proakis, Dimitris G. Manolakis, *Digital Signal Processing Principles, Algorithms and applications*, Pearson Education/ PHI, 4th edition.
2. Vinay K. Ingle, *Digital Signal Processing Using MATLAB,* S.Chand Company Ltd, 2001.

Reference Book(s)

1. Texas instruments, *Code Composer Studio User's Guide*, Texas Instruments, 2000.
2. Sanjit.K. Mitra, *Digital Signal Processing - A Computer based approach*, 3nd Edition, McGraw-Hill, 2008.

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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	3	0	0	42	1.5	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 interfaces
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() 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.

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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.pdf
https://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 than one Million Women are Missing*, New York Review of Books, 1990.
2. Tripi Lahiri, *By the Numbers: Where Indian Women Work, Women's St Journal*, 2012.

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COURSE STRUCTURE

VII - SEMESTER

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

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
A2019	Managerial Economics and Financial Analysis	HS	3	0	0	3	30	70	100
A2434	Digital Image Processing	PC	3	0	0	3	30	70	100
A2435	Embedded Systems	PC	3	0	0	3	30	70	100
A2436	Embedded Systems Lab	PC	0	0	2	1	30	70	100
	Professional Elective – 3	PE	3	0	0	3	30	70	100
A2583	Basics of Software Engineering	OE	3	0	0	3	30	70	100
A2437	Mini-Project/Internship	PW	0	0	4	2	100	0	100
A2438	Project Work Phase – I	PW	0	0	4	2	100	0	100
		TOTAL	15	00	10	20	380	420	800

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 and 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, law of demand and its exceptions, GST-implications.

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

UNIT - II

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

Cost & Break Even Analysis: Cost concepts, Break-Even Analysis (BEA)-determination of Break-Even Point(BEP) (simple problems), Significance and limitations of BEA.

UNIT - III

Market structures: Types of competition, features of perfect competition, monopoly and monopolistic competition, oligopoly. Price-Output Determination in case of Perfect Competition, Monopoly. Forms of business organisations.

Pricing: Objectives, policies, methods.

UNIT - IV

Capital: Significance, types, methods and sources of raising finance. Working Capital: components, factors determining the need for working capital.

Capital Budgeting: Nature and scope, 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 (Simple problems).

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.

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COURSE STRUCTURE

A2434-DIGITAL IMAGE PROCESSING

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 objective of this course is to know the fundamentals and applications of image processing. The course deals with different image transforms, image enhancement in spatial and frequency domains including histogram processing, equalization, specification, edge linking and boundary detection. Different color models and image compression techniques are also covered .This course will provide an opportunity to the student to do the minor and major projects in the field of image processing applications.

Course Pre/corequisites

1. A2403 – Signals and Systems
2. A2427 – Digital Signal Processing

2. Course Outcomes (COs)

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

A2434.1	Demonstrate different operations on image pixels.
A2434.2	Distinguish between different types of image transforms.
A2434.3	Compare different image enhancement techniques.
A2434.4	Apply different techniques to perform image segmentation.
A2434.5	Contrast between different color models and compression techniques.

3. Course Syllabus

UNIT-I

Digital Image Fundamentals: Definition of image, types of images, image file formats, fundamental steps in digital image processing, elements of image processing, applications of image processing, sampling and quantization of images, basic operations on image pixels.

UNIT-II

Image Transforms: Unitary transform, 2-D Discrete Fourier transform and its properties, Separable image transforms: Walsh transform, Discrete Cosine Transform, Hadamard transform and Hotelling transform.

UNIT-III

Image Enhancement: Enhancement by point processing, Histogram processing, Histogram equalization, Histogram specification, Image smoothing and sharpening in spatial and frequency domains.

UNIT-IV

Image Segmentation: Detection of discontinuities: point, line and edge detection, Edge linking by boundary detection, Thresholding, Region-oriented segmentation: region growing, splitting and merging.

UNIT-V

Color Image Processing: RGB, CMY, HSI, HSV and YIQ color models; basics of color image enhancement.

Image Compression: Redundancy and types, Image compression model, Source encoder and decoder, Huffman coding, Arithmetic coding, Improved Gray scale code.

4. Books and Materials

Text Book(s)

1. R.C. Gonzalez, R.E. Woods, *Digital Image Processing*, Addison Wesley/Pearson education, 3rd Edition, 2010.

Reference Book(s)

1. Rafael C. Gonzalez, Richard E Woods and Steven L.Eddins, *Digital Image processing using MATLAB*, Tata McGraw Hill, 2010.
2. S.Jayaraman, S .Esakkirajan, T.Veerakumar, *Digital Image processing,* Tata McGraw Hill, 2009.

Reference Online Resources/Materials:

1. https://www.dsprelated.com
2. https://www.openculture.com/engineering_free_courses

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COURSE STRUCTURE

A2435 – EMBEDDED 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 an introduction to embedded systems and their architecture considerations. Focus is on TM4C123GH6PM microcontroller which includes internal architecture, instruction set, register organization, addressing modes, 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

A2429 - Microprocessors and Microcontrollers

2. Course Outcomes (COs)

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

A2435.1 Analyze the embedded systems features and architecture considerations

A2435.2 Develop Programs using TM4C123GH6PM Microcontroller

A2435.3 Make use of Peripherals of TM4C123GH6PM to interface I/O Devices

A2435.4 Apply Serial Communication Protocols for interfacing serial Devices.

A2435.5 Design Embedded Applications using TM4C123GH6PM Controller

3. Course Syllabus

UNIT - I

INTRODUCTION TO EMBEDDED SYSTEMS: Embedded System Introduction, Host and Target Concept, Embedded Applications, Features and Architecture Considerations for Embedded Systems- ROM, RAM, Timers, Data and Address Bus Concept, CISC vs RISC Design Philosophy, Von-Neumann Vs Harvard Architecture.

UNIT - II

EMBEDDED CONTROLLER ARCHITECTURE: TM4C123GH6PM Block Diagram, Address Space, On-Chip Peripherals (Analog and Digital), Register Sets, Addressing Modes and Instruction Set Basics.

UNIT - III

OVERVIEW OF TM4C123GH6PM: I/O Pin Multiplexing, Pull Up/Down Registers, GPIO Control, Programming System Registers, Watchdog Timer, Need of Low Power for Embedded Systems, System Clocks and Control, Hibernation Module on TM4C, Active Vs Standby Current Consumption. Introduction to Interrupts and Interrupt Vector Table.

UNIT - IV

TOOLS OF EMBEDDED SYSTEMS: Embedded Hardware and Various Building Blocks, Processor Selection for an Embedded System, I/O Devices and I/O Interfacing Concepts, Timer and Counting Devices, Design Cycle in the Development Phase for an Embedded System.

UNIT - V

EMBEDDED COMMUNICATIONS PROTOCOLS: Serial Communication Basics, Synchronous/Asynchronous Interfaces (Like UART, SPI, and I2C), Baud Rate Concepts, Implementing of UART, SPI and I2C.

4. Books and Materials

Text Book(s)

1. Raj Kamal. *Embedded Systems,* 2nd Edition, Tata McGraw-Hill Education, 2011.
2. Jonathan W Valvano. *Introduction to ARM Cortex - M Microcontrollers*, 5th Edition, Create space Publications.

References

1. http://processors.wiki.ti.com/index.php/HandsOn_Training_for_TI_Embedded_Processors.
2. http://processors.wiki.ti.com/index.php/MCU_Day_Internet_of_Things_2013_Workshop.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2436 – EMBEDDED SYSTEMS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

This laboratory course provides the students with the knowledge of embedded C programming – GPIO ports, low power modes, interrupts, PWM and interfacing potentiometer using Code Composer Studio on TM4C123GH6PM microcontroller.

Course Pre/Corequisites

1. A2429 – Microprocessors and Microcontrollers
2. A2435 – Embedded Systems

2. Course Outcomes (COs)

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

A2436.1 Build Embedded C Programs using TM4C123GH6PM microcontroller.

A2436.2 Execute TM4C123GH6PM Programs using Code Composer Studio.

A2436.3 Interface LEDs, Push Buttons, Potentiometer to TM4C123GH6PM.

A2436.4 Test and Debug TM4C123GH6PM Programs using Code Composer Studio.

A2436.5 Develop embedded systems applications using TM4C123GH6PM.

3. Course Syllabus

1. Write a C program for configuration of GPIO ports for Input and output operation (blinking LEDs, push buttons interface).
2. Write a C program for EK-TM4C123GXL Launchpad and associated Timer ISR to toggle on board LED using interrupt programming technique.
3. Write a C program to configure hibernation mode and wake up the EK TM4C123GXL Launchpad when on-board switch SW2is pressed.
4. Write a C program to configure in-built ADC of TM4C123GH6PM microcontroller and interface potentiometer with EK-TM4C123GXL Launchpad to observe corresponding 12- bit digital value.
5. Write a C program to configuring and programming the in-built PWM module of TM4C123GH6PM microcontroller.
6. Write a C program to configure the PWM and ADC modules of TM4C123GH6PM microcontroller to control the brightness of LED with a PWM signal based on the potentiometer output.
7. Write a C program to send an echo of the data input back to the PC terminal using UART.
8. Write a C program to find the angle and hypotenuse of a right angle triangle using IQmath library of TivaWare.

4. Laboratory Equipment/Software/Tools Required

1. Computers installed with operating systems
2. Code Composer Studio Software
3. EK-TM4C123GXL Launchpad with USB Cable

5. Books and Materials

Reference Books

1. Dhananjay V. Gadre, Sarthak Gupta. Getting Started with Tiva ARM Cortex M4 Microcontrollers, 1st Edition, Springer Publications, 2018.
2. Jonathan W Valvano. Introduction to ARM Cortex - M Microcontrollers, 5th Edition, Create space Publications.

Other References

1. http://processors.wiki.ti.com/index.php/HandsOn_Training_for_TI_Embedded_Processors.
2. http://processors.wiki.ti.com/index.php/MCU_Day_Internet_of_Things_2013_Workshop.

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COURSE STRUCTURE

VIII - SEMESTER

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PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

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 – 4	PE	3	0	0	3	30	70	100
A2485	CISCO Networking	OE	3	0	0	3	30	70	100
A2439	Project Work Phase – II	PW	0	0	16	8	60	140	200
	TOTAL		06	00	16	14	120	280	400

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PROFESSIONAL ELECTIVES

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COURSE STRUCTURE
A2451 – OPTICAL COMMUNICATIONS

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 overview of this course is to provide the students with a solid understanding on: Optical Fibers and their fabrication, signal degradation in optical fibers, optical sources, power launching and coupling, photo detectors, digital and analog transmission systems.

Course Pre/corequisites

A2004 - Applied Physics

2. Course Outcomes (COs)

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

A2451.1 Analyze different optical propagation methods and understand cylindrical fibers and mode configurations

A2451.2 Differentiate various fabrication methods used in optical fibers and factors causing signal distortion

A2451.3 Evaluate the signal degradation at fiber joints and fiber splices

A2451.4 Describe the characteristics of optical sources and detectors, and power launching capability of optical fiber

A2451.5 Evaluate the power penalties by system considerations in the link, error control corrections and detections

3. Course Syllabus

UNIT - I

INTRODUCTION TO OPTICAL FIBERS: Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides, Single Mode fibers, Graded Index fiber structure.

UNIT - II

SIGNAL DEGRADATION OPTICAL FIBERS: Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides - Information Capacity determination – Group Delay- Material Dispersion, Wave guide Dispersion, Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in step index fibers-Mode Coupling .

UNIT - III

FIBER OPTICAL SOURCES AND COUPLING: Direct and indirect Band gap materials-LED structures – Light source materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition , source-to-fiber Power Launching, Lensing schemes, Fiber –to- Fiber joints, Fiber splicing.

UNIT - IV

FIBER OPTICAL RECEIVERS: PIN and APD diodes –Photo detector noise, SNR, Detector Response time, Comparison of Photo detectors –Fundamental Receiver Operation –preamplifiers, Error Sources –Receiver Configuration –Quantum Limit.

UNIT - V

SYSTEM DESIGN AND APPLICATIONS: Design of Analog Systems: system specification, power budget, bandwidth budget.

DESIGN OF DIGITAL SYSTEMS: system specification, rise time budget, power budget, Receiver sensitivity.

4. Books and Materials

Text Book(s)

1. Gerd Keiser, *Optical Fiber Communication,* McGraw –Hill International, Singapore, 3rd ed., 2000.
2. J.Senior, *Optical Communication, Principles and Practice*, Prentice Hall of India, 1994.

Reference Book(s)

1. S.C.Gupta, *Text book on optical fiber communication and its applications*, PHI, 2005.
2. Satish Kumar, *Fundamentals of Optical Fiber communications*, PHI, 2009.

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COURSE STRUCTURE

A2452 – NANOTECHNOLOGY

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

2. Course Description

Course Overview

Nanotechnology is the study of manipulating matter on an atomic, molecular and super molecular scale. This course deals with the classification of materials and their properties. The classification, fundamentals and properties of nanomaterial's are also covered in detail. This course will provide an opportunity to the student to study about nanotechnology which is one of the emerging fields of technology.

Course Pre/corequisites

3. A2004 – Applied Physics
4. A2401 – Electronic Devices and Circuits

4. Course Outcomes (COs)

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

A2452.1 Distinguish between different types of materials and their properties.

A2452.2 Compare different types of nanomaterials.

A2452.3 Analyze different properties of nanomaterial.

A2452.4 Contrast between different types of carbon nanotubes.

5. Course Syllabus

UNIT - I

Introduction: Scale, structure, and behaviour and brief history of materials, nanomaterials and nanostructures in nature.

UNIT - II

Material Classes, Structure, and Properties: Classes of materials, the internal structure of materials, mechanical, thermal, electrical, magnetic, optical, and acoustic behaviours.

UNIT - III

Classification of Nanomaterials: Classification of nanomaterials, size effects, surface-to-volume ratio versus shape, magic numbers, surface curvature, strain confinement, quantum effects.

UNIT - IV

Properties of Nanomaterials: Mechanical, thermal, electrical, Magnetic, optical and acoustic properties.

UNIT - V

Special Cases of Nanomaterials: Single-walled and multiwalled carbon nanotubes, typical field-effect transistor, super capacitors, Nano composites, intercalated and exfoliated polymers.

4. Books and Materials

Text Book(s)

2. Michael F. Ashby, Paulo Ferreira, and Daniel L. Schoedek, *Nanomaterials, Nanotechnologies and design*, Elsevier Ltd, 2009.

Reference Book(s)

3. Charles P. Poole, Jr., and Frank J. Owens, *Introduction to Nanotechnology*, John Wiley & Sons, 2003.
4. Michael Reith, *Nano-Engineering in Science and Technology, World Scientific Publishing Co. Pt. Ltd., 2003.*

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COURSE STRUCTURE

A2453 – DIGITAL DESIGN THROUGH VERILOG HDL

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 teaches designing digital circuits, behaviour and RTL modelling of digital circuits using Verilog HDL, verifying these Models and synthesizing RTL models to standard cell libraries and FPGAs. Student aims to practical experience by designing, modelling, implementing and verifying several digital circuits. This course aims to provide students with the understanding of the different technologies related to HDLs, construct, compile and execute Verilog HDL programs using provided.

Course Pre/corequisites

2402 – Digital Logic Design

2. Course Outcomes (COs)

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

A2453.1	Understand the basics of Hardware Description Languages, Program structure and basic language elements of Verilog.
A2453.2	Understand types of modelling, modules, functions of Verilog and simulate and synthesize related Programs.
A2453.3	Design, Simulate and synthesize various Verilog descriptions for Combinational circuits.
A2453.4	Design, Simulate and synthesize various Verilog descriptions for Sequential circuits.
A2453.5	Use tasks and functions to design complex circuits like combinational and sequential UDPs.

3. Course Syllabus

UNIT - 1

Introduction to Verilog: Evolution of HDLs, typical HDL-based design flow.

Language constructs: Lexical conventions, data types, system tasks and compiler directives, module definition, port declaration, connecting ports, hierarchical name referencing, test bench.

UNIT - 2

Gate-Level Modelling: Gate primitives and delays.

Data-flow Modelling: Continuous assignments, delay specification, expressions, operators and operands.

UNIT - 3

Behavioural Modelling: Structured procedures, initial and always, blocking and non-blocking statements, delay control, event control, conditional statements, multiway branching, loops, sequential and parallel blocks.

UNIT - 4

Switch-Level Modelling: Switch modelling elements, delay specification on switches, examples.

UNIT - 5

Tasks, Functions and UDPs: Differences between tasks and functions, declaration, combinational and sequential UDPs.

4. Books and Materials

Text Book(s)

1. Samir Palnitkar, *Verilog HDL: A Guide to Digital Design and Synthesis*, 2nd Edition, 2003.
2. T.R Padmanabhan & B Bala Tripura Sundari, *Design through Verilog HDL*, WSE, IECE Press, 2004.

Reference Book(s)

1. J Bhasker, *A Verilog HDL Primer*, BSP, 2003.
2. Stephen Brown & Zvonko Vranesic, *Fundamentals of Logic Design with Verilog design*, TMH, 2nd edition, 2010.
3. Michael D Ciletti, *Advanced Digital Design with Verilog HDL*, PHI, 2005.

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COURSE STRUCTURE

A2454 – REAL TIME 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

Real Time Software Designers must be familiar with Computer Architecture and Organization, Operating Systems, Software related to embedded systems, Programming Languages(C, Assembly Language) and Compilation Techniques. This Course provides an overview of these techniques from the perspective of the real-time system designer. It covers techniques for Scheduling, Resource Access Control and Validation that are likely to be used in real-time computing and communication systems. Practical experience is gained during student work exercises

Course Pre/corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

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

A2454.1 Analyze the Computer hardware organization and operating System components.

A2454.2 Understand real time concepts and hardware considerations.

A2454.3 Make use power management concepts for rtos.

A2454.4 Apply the Inter process communication algorithms to avoid deadlocks.

A2454.5 Utilize the memory algorithms for memory management.

3. Course Syllabus

UNIT - I

INTRODUCTION: Introduction to Operating System: Computer Hardware Organization, BIOS and Boot Process, Multi-threading concepts, Processes, Threads, Scheduling.

UNIT - II

BASICS OF REAL-TIME CONCEPTS: Terminology: RTOS concepts and definitions, real-time design issues, examples, Hardware Considerations: logic states, CPU, memory, I/O, Architectures, RTOS building blocks, Real-Time Kernel.

UNIT - III

PROCESS MANAGEMENT: Concepts, scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms Threads: Multi-threading models, threading issues, thread libraries, synchronization Mutex: creating, deleting, prioritizing mutex.

UNIT - IV

INTER-PROCESS COMMUNICATION: Messages, Buffers, mailboxes, queues, semaphores, deadlock, priority inversion, PIPES.

UNIT - V

MEMORY MANAGEMENT: Process stack management, run-time buffer size, swapping, overlays, block/page management, replacement algorithms, real-time garbage collection.

4. Books and Materials

Text Book(s)

1. Liu, Jane W. S., *Real-Time Systems*, 8th edition, Pearson Education, 2009.
2. J. J Labrosse, *MicroC/OS-II: The Real –Time Kernel*, Newnes, 2002.

Reference Book(s)

1. Qing Li, *Real Time Concepts for Embedded Systems*, Elsevier, 2011
2. Silberschatz, Galvin and Gagne *Operating System Concepts* , 8th Edition, 2009

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COURSE STRUCTURE

A2455 – MICROWAVE 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 provides an overview of application of microwave in communication and other areas. This course covers fundamentals of microwaves along with description of microwave transmission lines, various microwave components, tubes, solid state devices and knowledge on microwave measurements. This course is useful for design and analysis of different microwave systems.

Course Pre/corequisites

A2401 - Electronic Devices and Circuits

A2410 - Electromagnetics and Transmission Lines

2. Course Outcomes (COs)

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

A2455.1	Analyze rectangular waveguide transmission line characteristics using concepts of Electromagnetic theory.
A2455.2	Evaluate relation between input(s) and output(s) of microwave passive components using scattering parameters.
A2455.3	Compare performance of O-type and M-type microwave tubes.
A2455.4	Sketch the characteristics of microwave solid state devices
A2455.5	Measure microwave parameters using microwave bench setup.

3. Course Syllabus

UNIT - I

Rectangular Waveguides: Wave equations, TE/TM mode, fields, characteristic equation, cutoff frequencies, filter characteristics, dominant and degenerate modes. Mode characteristics – phase and group velocity, wavelengths, impedance relations, impossibility of TEM mode.

UNIT-II

Wave guide multiport junctions: E plane and H plane Tees, magic Tee, and directional coupler.

Ferrite components: Gyrator, isolator, circulator.

Scattering Parameters: S-Matrix calculation for waveguide multiport junctions and ferrite components.

UNIT-III

O-Type tubes: Operation and performance of two-cavity klystron, reflex klystron oscillator and travelling wave tube (TWT) amplifier.

M-Type tubes: Magnetron-mode separation, frequency pushing and frequency pulling and applications.

UNIT-IV

Transferred electron devices- GUNN diode.

Avalanche transit time devices- IMPATT, TRAPATT and BARITT diodes.

UNIT-V

Microwave Measurements: Description of microwave bench-different blocks and their features, microwave power measurement-Bolometers, measurement of attenuation, frequency and VSWR, impedance measurement, scattering parameter measurement for 3 and 4 port devices.

4. Books and Materials

Text Book(s)

1. Samuel Y.Liao, *Microwave devices and circuits*, 3rd edition, PHI 2003.
2. M. Kulkarni, *Microwave & Radar Engineering*, 3rd edition, Umesh Publications, 2003.

Reference Book(s)

1. R.E.Collin, *Foundations for microwave engineering*, IEEE press, John Wiley, 2nd edition, 2002.
2. M.L.Sisodia and G.S.Raghuvanshi, *Microwave circuits and passive devices,* Wiley Eastern Ltd., Newage International publishers Ltd., 1995.

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COURSE STRUCTURE

A2456 – BIOMEDICAL SIGNAL PROCESSING

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 presents an overview of different methods used in biomedical signal processing. Signals with bioelectric origin are given special attention and their properties and clinical significance are reviewed. In many cases, the methods used for processing and analyzing biomedical signals are derived from a modelling perspective based on statistical signal descriptions. The purpose of the signal processing methods ranges from reduction of noise and artifacts to extraction of clinically significant features.

Course Pre/corequisites

1. A2403 – Signals and Systems
2. A2427 – Digital Signal Processing

2. Course Outcomes (COs)

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

A2456.1	Analyze the nature of biomedical signals and related concepts.
A2456.2	Apply averaging technique on biomedical signals and extract the features.
A2456.3	Design various time domain filtering techniques for the removal of artefact from biomedical signal.
A2456.4	Apply signal compression techniques on biomedical signals.
A2456.5	Analyze event detection techniques for EEG and ECG signals.

3. Course Syllabus

UNIT - I

Introduction to Biomedical Signals: The nature of biomedical signals, examples, objectives and difficulties in biomedical analysis.

Biomedical signal origin and its dynamics: Basic electrocardiography, ECG leads systems, ECG signal characteristics.

UNIT - II

Signal Averaging: Basics of signal averaging, signal averaging as a digital filter, typical averager, software for signal averaging, limitations of signal averaging.

Adaptive Noise Cancelling: Principal noise canceller model, 60-Hz adaptive cancelling using a sine wave model, other applications of adaptive filtering

UNIT - III

Data Compression Techniques: Turning point algorithm, AZTEC algorithm, Fan algorithm, Huffman coding, data reduction algorithms– Fourier transform, correlation, convolution, power spectrum estimation.

UNIT - IV

Cardiological signal processing: Basic Electrocardiography, ECG data acquisition, ECG lead system, ECG signal characteristics (parameters and their estimation), analog filters, ECG amplifier, and QRS detector, power spectrum of the ECG, QRS detection algorithm.

UNIT - V

Neurological Signal processing: Brain and its potentials, Electrophysiological origin of Brain waves, EEG signal and its characteristics, EEG analysis, Autoregressive (AR) method, Recursive Estimation of AR parameters.

4. Books and Materials

Text Book(s)

1. D.C.Reddy, *Biomedical Signal Processing- Principles and Techniques*, Tata McGraw-Hill, 2005.

Reference Book(s)

1. Willis J.Tompkins, *Biomedical Digital Signal Processing*, PHI, 2000.
2. Rangayyan Rangaraj, *Biomedical signal analysis- A case study approach*, Wiley (IEEE Press), 2005.

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COURSE STRUCTURE

A2457 – FPGA Design

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

Programmable Logic is emerging as a prominent core technology to build electronic systems. In particular, high performance systems are now almost always implemented with FPGAs. This course covers FPGA architectures, design processes, logic implementation and features, SRAM based FPGA, finite state machines and case studies. This course will provide the learner the foundations required to design VSLI and DSP systems using FPGA.

Course Pre/corequisites

1. A2402 – Digital Logic Design
2. A2426 – Digital Design through Verilog HDL Laboratory

2. Course Outcomes (COs)

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

A2457.1	Discuss different PLDs based on real time applications and compare its architectures.
A2457.2	Analyze the programmable technologies used in FPGAs.
A2457.3	Design combinational and sequential circuits using FPGA.
A2457.4	Distinguish between technology dependent and technology independent optimizations while implementing logic in FPGA.
A2457.5	Make use of finite state machines to design applications on FPGA.

3. Course Syllabus

UNIT - I

Introduction to Programmable Logic Architectures: Programmable sum-of-products Arrays, PAL fuse matrix, combinational outputs, PAL outputs with programmable polarity, PAL devices with programmable polarity, universal PAL and generic array logic.

UNIT - II

FPGA Based Systems: Introduction, Digital Design, FPGA based system design.

FPGA Fabrics: FPGA architectures, SRAM based FPGAs, permanently programmed FPGAs. Chip input/output, circuit design of FPGA fabrics, architecture of FPGA fabrics.

UNIT - III

Combinational Logic: The logic design process, combinational network delay, power and energy optimization, arithmetic logic.

Sequential Machines: Introduction, the sequential machine design process, sequential design styles, rules for clocking, performance analysis.

UNIT - IV

Logic Implementation Using FPGA: Syntax directed translation, logic implementation by macro, logic synthesis, technology independent and dependent logic optimizations, physical design for FPGAs, logic design process revisited.

UNIT - V

Finite State Machine: State transition table, state assignment for FPGAs, hazard and one hot encoding. **Case Studies:** Case studies Xilinx XC4000 and ALTERA's FLEX 8000.

4. Books and Materials

Text Book(s)

1. Wayne Wolf, *FPGA Based System Design*, Pearson Education, New Delhi, 2004.

Reference Book(s)

1. S. Trimberger, Edr., *Field Programmable Gate Array Technology*, Kluwer Academic Publications, New Dehi, 1994.
2. P. K. Chan, S. Moura, *Digital Design Using Field Programmable Gate Array*, PHI, 1994.
3. John V. Old Field, Richrad C. Dorf, *Field Programmable Gate Arrays*, Wiley, 2008.

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COURSE STRUCTURE

A2458 – EMBEDDED HARDWARE AND SOFTWARE CO-DESIGN

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 Hardware-Software Co-Design which focuses on the fundamental issues related to design of integrated hardware and software products. This course covers the models, architectures, synthesis algorithms, prototyping-emulation techniques, target architectures, design specifications and verification tools. This course provides the knowledge to students in the domain of embedded systems specialization.

Course Pre/Corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

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

A2458.1 Apply techniques for the concurrent design or co-design of embedded systems that are dedicated to specific applications.

A2458.2 Apply hardware and software design techniques for construction of embedded systems.

A2458.3 Distinguish various target architectures based on architecture specialization techniques.

A2458.4 Discuss modern design methodologies with an emphasis on early design phases, including modeling, verification and system-level synthesis.

3. Course Syllabus

UNIT - I

Co-Design Issues: Co-design models, architectures, languages, a generic co-design methodology.

UNIT - II

Co-Synthesis Algorithms: Hardware software synthesis algorithms: hardware – software partitioning distributed system co-synthesis.

UNIT - III

Prototyping and Emulation: Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure.

UNIT - IV

Target Architectures: Architecture specialization techniques, system communication infrastructure, target architecture and application system classes, architecture for control dominated systems (8051-architectures for high performance control), architecture for data dominated systems (adsp21060, tms320c60), and mixed systems.

UNIT - V

Design Specification and Verification: Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, and interface verification.

4. Books and Materials

Text Book(s)

1. Jorgen Staunstrup, Wayne Wolf, *Hardware/software Co-design Principles and Practice*, Springer, 2009.
2. Giovanni De Micheli, Mariagiovanna Sami, *Hardware / Software Co- Design*, Kluwer Academic Publishers, 2002.

Reference Book(s)

1. Patrick R. Schaumont, *A Practical Introduction to Hardware/Software Co-design*, Springer, 2010.

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COURSE STRUCTURE

A2459 – CELLULAR AND MOBILE COMMUNICATIONS

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 knowledge of wireless and mobile cellular communication systems over a stochastic fading channel. This course covers the understanding of advanced multiple access techniques. This course helps the students in understanding of digital cellular systems (GSM, CDMA One, GPRS, CDMA 2000, and W-CDMA)

Course Pre/corequisites

1. A2412 - Analog Communication Systems
2. A2421 - Antenna and wave propagation

2. Course Outcomes (COs)

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

A2459.1 Analyze the cellular mobile system design concepts to improve the signal to noise Ratio and cell coverage.

A2459.2 Interpret the Co-channel interferences and their parameters to improve the system capacity.

A2459.3 Illustrate the importance of cell coverage for signal and traffic, diversity techniques and mobile antennas to a caller.

A2459.4 Utilize the Omni directional and directional antennas to improve the channel capacity and interference reduction.

A2459.5 Demonstrate the Interim Standard, Digital Enhanced Cordless System, multiple access schemes of the wireless networks and standards and types of handoff.

3. Course Syllabus

UNIT-I

CELLULAR MOBILE RADIO SYSTEMS: Introduction to Cellular Mobile system, performance criteria, operation of cellular systems, Hexagonal shaped cells.

ELEMENTS OF CELLULAR RADIO SYSTEM DESIGN: concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting.

UNIT-II

INTERFERENCE: Introduction to Co-channel interference, real time Co-channel interference, Cochannel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.

UNIT-III

CELL COVERAGE FOR SIGNAL AND TRAFFIC: Signal reflections in flat and hilly terrain, effect of human made structures, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain.

UNIT-IV

CELL SITE AND MOBILE ANTENNAS: Sum and difference patterns and their synthesis, Omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas.

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units.

UNIT-V

HANDOFF: Handoff, dropped calls and cell splitting, types of handoff, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff.

DIGITAL CELLULAR NETWORKS: GSM architecture, GSM channels, multiplex access scheme, TDMA, CDMA.

4. Books and Materials

Text Books:

1. W .C. Y. Lee, Mobile cellular telecommunications, Wiley-India edition, 3rd edition, 2010.
2. Theodore. S. Rapport, Wireless communications, Pearson Education, 2 nd edition,2002.

Reference Books:

1. Gordon L. Stuber, Principles of Mobile communications, Springer International, 2 nd Edition, 2007.
2. Lee, Wireless and Mobile Communications, McGraw Hills, 3rd Edition, 2006.
3. Jon W.Mark and Weihua Zhqung , Wireless communications and Networking, PHI, 2005.
4. R.Blake, Wireless communication Technology, Thompson Asia Pvt.Ltd., 200

Reference Online Resources/Materials:

1. https://onlinecourses.nptel.ac.in/noc21_ee66/preview
2. https://nptel.ac.in/courses/117102062
3. https://www.youtube.com/watch?v=f2wlHL1Sok8&list=PLuv3GM6gsE3ypUYh43pPuZsXxJVG1e7F

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2460 – ARTIFICIAL NEURAL NETWORKS

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 objective of this course is to know the fundamentals and applications artificial neural networks. This course deals with biological and artificial neurons, different feedforward and feedback neural networks for pattern recognition and classification. Different activation and synaptic dynamic models with different learning rules are also covered in detail. This course will provide an opportunity to the student to do the minor and major projects in the field of image processing using neural networks and machine learning.

Course Pre/corequisites

There are no Pre/corequisites for this course.

2. Course Outcomes (COs)

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

A2460.1	Distinguish between biological and artificial neurons.
A2460.2	Compare different learning laws of neural networks.
A2460.3	Differentiate between activation and synaptic dynamic models.
A2460.4	Apply different neural networks to solve pattern recognition problems.
A2460.5	Contrast between different feedforward and feedback neural networks.

3. Course Syllabus

UNIT-I

Basics of Artificial Neural Networks: Features of Biological Neural Networks, Performance Comparison of Computer and Biological Neural Networks, Historical Development of Neural Network Principles, Artificial Neural Networks Terminology, Models of Neuron: McCulloch-Pitts Model, Perceptron, Adaline, Topology, Basic Learning Laws: Hebb's Law, Perceptron Learning Law, Delta Learning Law, Widrow and Hoff LMS Learning Law, Correlation Learning Law, Instar (Winner-take-all) Learning Law and Outstar Learning Law.

UNIT-II

Activation and Synaptic Dynamics: Introduction, Activation Dynamics Models: Issues in the Development of Activation Dynamics Models, Additive Activation Models, Shunting Activation Models, Stochastic Models, Equilibrium, Synaptic Dynamics Models: Learning, Requirements of learning laws, Categories of learning, Distinction between Activation and Synaptic Dynamics Models, Learning Methods, Hebbian Learning, Differential Hebbian Learning, Competitive Learning, Differential Competitive Learning, Error Correction Learning, Reinforcement Learning and Stochastic Learning.

UNIT-III

Functional Units of ANN for Pattern Recognition Tasks: Pattern Recognition Problem, Pattern Association Problem, Basic functional units, Pattern Recognition Tasks by the functional units, Pattern recognition tasks by feed forward Neural Networks: Pattern association problem, Pattern

classification problem and Pattern mapping, Pattern Recognition Tasks by Feedback Neural Networks: Auto association problem, Pattern storage problem, Pattern environment storage problem, Pattern Recognition Tasks by Competitive Learning Neural Networks: Temporary pattern storage, Pattern clustering problem, Feature mapping problem.

UNIT-IV

Feed forward Neural Networks: Introduction, Analysis of Pattern Association Networks: Linear Associative Network, Determination of Weights by Computation, Determination of Weights by Learning: Hebb's law and Widrow's law, Analysis of Pattern Mapping Networks, Pattern Mapping Problem, Pattern Mapping Network, Generalized Delta Rule: Back propagation learning, description and features of backpropagation, Performance of the back propagation learning law, Refinements of the back propagation learning and extensions of back propagation.

UNIT-V

Feedback Neural Networks: Introduction, Analysis of Linear Auto associative feed forward Networks, Analysis of Pattern Storage Networks, The Hopfield Model, Capacity of Hopfield Model, Energy Analysis of Hopfield Network, State Transition Diagram, Computation of weights for pattern storage, Boltzmann Machine: Problem of Pattern Environment Storage, Architecture of a Boltzmann Machine and Boltzmann Learning Law.

4. Books and Materials

Text Book(s)

1. B. Yegnanarayana, *Artificial Neural Networks*, Prentice-Hall of India Private Limited, 2009.

Reference Book(s)

1. Laurene Fuasette, *Fundamentals of Neural Networks: Architectures, Algorithms and Applications*, Pearson Education, 1993.

Reference Online Resources/Materials:

1. https://playground.tensorflow.org
2. https://www.openculture.com/engineering_free_courses

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2461 – LOW POWER VLSI DESIGN

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

Low power design is a collection of techniques aimed at reducing overall dynamic and static power consumption of an Integrated Circuit. So, the study of a course on low power VLSI Design is essential for Electronics and Communication Engineering graduates. This course covers Sources of power dissipation, scaling the supply voltages, minimizing the capacitances for low power. This course also delivers knowledge on various software approaches to reduce power consumption. The knowledge provided by this course will be useful in understanding the need of low power for high-speed VLSI circuits.

Course Pre/corequisites

A2428 – CMOS VLSI Design

2. Course Outcomes (COs)

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

A2461.1 Comprehend different sources of power dissipation.

A2461.2 Realize switched capacitance and arrive at ways to minimize.

A2461.3 Analyze and minimize dynamic and static power consumption in VLSI circuits.

A2461.4 Outline the working principles of adiabatic logic.

A2461.5 Establish ways to minimize power in software design.

3. Course Syllabus

UNIT-I

Sources of Power Dissipation: Short Circuit Power Dissipation, Switching Power Dissipation, Glitching Power Dissipation, Leakage Power.

Supply Voltage Scaling for Low Power: Device Feature Size Scaling, Architectural-Level Approaches, Voltage Scaling Using High-Level Transformations, Multilevel Voltage Scaling, Challenges in MVS, Dynamic Voltage and Frequency Scaling, Adaptive Voltage Scaling, Subthreshold Logic Circuits.

UNIT-II

Switched Capacitance Minimization: System-Level Approach: Hardware–Software Codesign, Transmeta's Crusoe Processor, Bus Encoding, Clock Gating, Gated-Clock FSMs, FSM State Encoding, FSM Partitioning, Operand Isolation, Precomputation, Glitching Power Minimization. **UNIT-III**

Logic Styles for Low Power: Static CMOS Logic, Dynamic CMOS Logic, Pass Transistor Logic.

Leakage Power Minimization: Fabrication of multiple threshold voltages, VTCMOS Approach, Transistor Stacking, MTCMOS Approach, Power Gating, Isolation Strategy, State Retention Strategy, Dynamic Vth Scaling.

UNIT-IV

Adiabatic logic circuits: Adiabatic Charging, Adiabatic Amplification, Adiabatic Logic Gates, Pulsed Power Supply, Stepwise Charging Circuits.

UNIT-V

Low-Power Software Approaches: Introduction, Machine-Independent Software Optimizations, Combining Loop Optimizations with DVFS- Loop Unrolling, Loop Tiling, Loop Permutation, Strength Reduction, Loop Fusion, Loop Peeling, Loop Un-switching.

4. Books and Materials

Text Books:

1. Ajit Pal, Low-Power VLSI Circuits and Systems, Springer, 2015.

2. J. Rabaey, Low Power Design Essentials, 1st Edition, Springer, 2010.

Reference Books:

1. Kaushik Roy and Sharat Prasad, Low-Power CMOS VLSI Circuit Design, Wiley Inter-science Publications, 2000.
2. Michael Keating, David Flynn, Robert Aitken, Alan Gibbons, Kaijian Shi, Low Power Methodology Manual for System-On-Chip Design, Springer, 2007

Reference Online Resources

1. https://nptel.ac.in/courses/106105034/
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/
3. www.ece.ucdavis.edu/~vojin/CLASSES/EEC280

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2462 – DEVELOPMENT OF SECURE EMBEDDED 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 primary objective of this course is to provide common knowledge on the basics of securities, terminologies, faults, errors, embedded system security, attacks on embedded systems and further, the course addresses on classification of security techniques, cryptography and aits algorithms, understanding the computing platform and vulnerability markets.

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:

A2462.1 Understand the basics of security and definitions

A2462.2 Understand the attacks of embedded system security

A2462.3 To understand process of common security techniques

A2462.4 To understand the cryptography and its algorithms

A2462.5 To understand the information of security economics

3. Course Syllabus

UNIT-I

INTRODUCTION TO EMBEDDED SYSTEMS SECURITY: Introduction, Security Trends, Security Policies, Security Threats

UNIT-II

LEVELS AND CHALLENGES FOR SECURITY: Definition of security, Types of security, security applications in embedded systems, Attacks on embedded systems, design challenges for embedded systems, Levels of security.

UNIT-III

EMBEDDED OPERATING SECURITY TECHNIQUES: CEOS, Security Flames and Security Attacks, Micro Kernel Versus Monolithic, Firewalls, Virtual private networks (VPN).

UNIT-IV

CRYPTOGRAPHY: cryptanalysis and security of ciphers, symmetric and asymmetric cryptography: RSA Algorithm, Elliptical curve cryptography

UNIT-V

TRUSTED COMPUTING PLATFORM AND DATA PROTECTION PROTOCOLS: Goals of the TCG, TPM specification overview, Ethernet Security protocols, IP Verses SSL.

4. Books and Materials

Text Books:

1. Embedded Security at a Glance: Security concepts for embedded systems- Armin Wasicek
2. Security in Embedded Hardware- Daniel Ziener (Computer architecture for Embedded systems)

Reference Books:

1. Secure embedded systems. Vai, Michael, Roger I. Khazan, Daniil M. Utin, Sean R. O'Melia, David J. Whelihan, and Benjamin R. Nahill. MASSACHUSETTS INST OF TECH LEXINGTON LEXINGTON United States, 2016.
2. Embedded System Design -frank vahid, tony grivargis, john Wiley.
3. Embedded Systems- An integrated approach - Lylab das, Pearson education 2012.
4. Embedded Systems – Raj Kamal, TMH

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2463 – SATELLITE COMMUNICATIONS

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 extensive usage of satellite communication system in navigation applications has necessitated the students to have thorough knowledge of this system. The basic knowledge of various subsystems and access techniques provides the better understanding in the development of systems. This course deals with calculation of carrier to noise ratio and further means to improve the accuracy of the system

Course Pre/corequisites

1. A2423 - Digital Communication Systems

2. Course Outcomes (COs)

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

A2463.1 Analyze the functionality of various elements of satellite communication system.

A2463.2 Apply launching procedures and Ephemeris data to place and locate satellite in the orbit.

A2463.3 Create link budgets to meet specific objectives for C/N.

A2463.4 Analyze the various GNSS constellations used for navigation.

A2463.5 Differentiate various access techniques used for communication.

3. Course Syllabus

UNIT-I

Orbital Mechanics and Launchers: Basic concepts of satellite communications, frequency allocations for satellite services .Orbital Mechanics look angle determination, orbital perturbations, orbit determination, launches and launch vehicles, orbital effects in communication systems performance.

UNIT-II

Satellite Subsystems: Attitude and orbital control system, Telemetry, Tracking, command and monitoring, power systems, communication subsystems, satellite antenna equipment reliability and space qualification.

UNIT-III

Satellite Link Design, Multiple Access: Basic transmission theory, system noise temperature and G/T ratio, design of down links, uplink design, design of satellite links for specified C/N, system design example. Frequency division multiple access (FDMA) Inter modulation, calculation of C/N, Time Division multiple access (TDMA) frame structure, examples. Satellite switched TDMA onboard processing, DAMA, code division multiple access (CDMA), spread spectrum transmission and reception.

UNIT-IV

Earth Station Technology: Transmitters, receivers, Antennas, tracking systems, terrestrial interface, primary power test methods

UNIT-V

Satellite Navigation & GNSS: Radio and satellite navigation, GPS position location principles, GPS receivers and codes, satellite signal acquisition, GPS navigation message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, differential GPS, NavIC.

4. Books and Materials

Text Books:

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt, Satellite communications, WSE, Wiley publications, 2nd Edition, 2003.
2. Wilbur L.Prichard, Robert A. Nelson & Henry G.Suyderhoud, Satellite communications Engineering, 2nd Edition, Pearson Publications, 2003.

Reference Books:

1. Satellite communications, 2nd edition, by T.Pratt, C. W.Bostian, J.E. Allnut,Publisher: John Willey and sons
2. Satellite Communications Systems: systems, techniques and technology, 5th edition, by G. Maral, M.Bousquet, Z.Sun,Publisher: John Willy and sons

Reference Online Resources/Materials:

1. https://archive.nptel.ac.in/courses/117/105/117105131/
2. https://www.youtube.com/watch?v=dt4Ce8gQPns&list=PLAnjLC20C-XQnoowCtt-67WmyxoQPu2Fi

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2464 – SPEECH PROCESSING

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 speech signals, their properties, parameters and applications. This course covers phonetic representation of speech, models for speech production, auditory masking, complex cepstrum, short-time cepstrum, computation of the cepstrum, recursive computation of the complex cepstrumand complete model of auditory processing. Spectral analysis, coding techniques and autocorrelation functions of speech signals are also covered in detail. This course will provide an opportunity to the student to do the minor and major projects in digital speech processing applications.

Course Pre/corequisites

1. A2403 – Signals and systems
2. A2427 – Digital Signal Processing

2. Course Outcomes (COs)

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

A2464.1	Summarize the concepts of speech signals and their applications.
A2464.2	Analyze the speech signals by using different transform techniques.
A2464.3	Distinguish between different cepstrums of speech signals.
A2464.4	Compare different speech coding techniques.
A2464.5	Contrast different speech prediction techniques.

3. Course Syllabus

UNIT-I

Fundamentals of Speech: The speech chain, applications of digital speech processing, phonetic representation of speech, models for speech production, hearing and auditory perception, the human ear, perception of loudness, critical bands, pitch perception, auditory masking, complete model of auditory processing.

UNIT-II

Short-Time Analysis of Speech: Short-Time Energy and zero-crossing rate, short-time autocorrelation function (STACF),Short-Time Fourier Transform (STFT),sampling the STFT in time and frequency, speech spectrogram, relation of STFT to STACF, short-time Fourier synthesis.

UNIT-III

Homomorphic Speech Analysis: Cepstrum and complex cepstrum, short-time cepstrum, computation of the cepstrum, recursive computation of the complex cepstrum, short-time homomorphic filtering of speech, application to pitch detection, applications to pattern recognition, compensation for linear filtering, liftered cepstrum distance measures, Mel-frequency cepstrum coefficients.

UNIT-IV

Linear Predictive Analysis: Linear prediction and the speech model, computing the prediction coefficients, the Levinson–Durbin recursion, LPC spectrum, equivalent representations, LSP coefficients, cepstrum of vocal tract impulse response, PARCOR coefficients, log area coefficients.

UNIT-V

Digital Speech Coding: Sampling and quantization of speech, uniform quantization noise analysis, μ-law quantization, non-uniform and adaptive quantization, digital speech coding, the two-State excitation model , pitch, gain, and V/UV detection, vocal tract system estimation, residual-excited linear predictive coding, mixed excitation systems, frequency-domain coders.

4. Books and Materials

Text Book(s)

1. Lawrence R. Rabiner and Ronald W. Schafer, *Introduction to Digital Speech Processing*, now Publishers Inc., 2007.

Reference Book(s)

1.Quatieri, Thomas F., *Discrete-Time Speech Signal Processing: Principles and Practice*, PHI, 2003.

Reference Online Resources/Materials:

1. https://www.dsprelated.com
2. https://www.openculture.com/engineering_free_courses

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2465 – DIGITAL VLSI TESTING

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

Testing is an integral part of the VLSI design cycle. With the advancement in IC technology, designs are becoming more and more complex, making their testing challenging. Testing occupies 60-80% time of the design process. A well-structured method for testing needs to be followed to ensure high yield and proper detection of faulty chips after manufacturing. Design for testability (DFT) is a matured domain now, and thus needs to be followed by all the VLSI designers. In this context, the course attempts to expose the students and practitioners to the most recent, yet fundamental, VLSI test principles and DFT architectures in an effort to help them design better quality products that can be reliably manufactured in large quantity.

Course Pre/corequisites

A2402 **–** Digital Logic Design

2. Course Outcomes (COs)

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

A2465.1	Detect faults occurring in digital systems and modelling of the faults to simplifying the detection.
A2465.2	Generate test vectors to detect and diagnose the faults using various algorithms.
A2465.3	Design testable Combinational and Sequential circuits using Logic BIST architectures
A2465.4	Develop testable circuits and find the output response of the stimulus compression.
A2465.5	Design testable memory units.

3. Course Syllabus

UNIT-1: Introduction: Importance, Challenges, Levels of abstraction, Fault Models, Advanced issues.

Design for Testability: Introduction, Testability Analysis, DFT Basics, Scan cell design, Scan Architecture, Scan design rules, Scan design flow Fault Simulation: Introduction, Simulation models.

UNIT-2: Fault Simulation: Logic simulation, Fault simulation.

Test Generation: Introduction, Exhaustive testing, Boolean difference, Basic ATPG algorithms, ATPG for non-stuck-at faults, other issues in test generation.

UNIT-3: Built-In-Self-Test: Introduction, BIST design rules, Test pattern generation, Output response analysis, Logic BIST architectures.

UNIT-4: Test Compression: Introduction, Stimulus compression, Response compression.

UNIT-5: Memory Testing: Introduction, RAM fault models, RAM test, Memory BIST Power and Thermal Aware Test: Importance, Power models, Low power ATPG, Power and Thermal Aware Test: Low power BIST, Thermal aware techniques.

4. Books and Materials

Text Book(s)

1. M.Abramovici, M.A.Breuer and A.D. Friedman, —Digital systems and Testable Design, Jaico Publishing House,2002
2. P.K. Lala, —Digital Circuit Testing and Testability‖, Academic Press, 2002.

Reference Book(s)

1. M.L.Bushnell and V.D.Agrawal, —Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits Kluwer Academic Publishers, 2002.
2. A.L.Crouch, —Design Test for Digital IC„s and Embedded Core Systems Prentice Hall International, 2002.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2466 – EMBEDDED SYSTEM DESIGN

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 embedded system, Communication Interface, Embedded firmware design and RTOS based embedded system design. Further, the course addresses on classification of embedded systems based on generations, types of memories, protocols and non-pre-emptive and pre-emptive scheduling

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:

A2466.1 Understand the basics of an embedded system

A2466.2 Understand the typical components of an embedded system.

A2466.3 To understand different communication interfaces.

A2466.4 To learn the design process of embedded system applications.

A2466.5 To understand the RTOS and inter-process communication.

3. Course Syllabus

UNIT-I

INTRODUCTION TO EMBEDDED SYSTEMS: History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, The embedded system design process-requirements, specification, architecture design, designing hardware and software, components, system integration, Applications of embedded systems, and characteristics of embedded systems.

UNIT-II

TYPICAL EMBEDDED SYSTEM: Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, Sensors, actuators, I/O components: seven segment LED, relay, piezo buzzer, push button switch, other sub-systems: reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer.

UNIT-III

COMMUNICATION INTERFACE: On-board communication interfaces: I2C, SPI, CAN, parallel interface; External communication interfaces: RS232 and RS485, USB, infrared, Bluetooth, Wi-Fi, ZigBee, GPRS, GSM.

UNIT-IV

EMBEDDED FIRMWARE DESIGN AND DEVELOPMENT: Embedded firmware design approaches-super loop based approach, operating system based approach; embedded firmware development languages-assembly language based development, high level language based development.

UNIT-V

RTOS BASED EMBEDDED SYSTEM DESIGN: Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-pre-emptive and pre-emptive scheduling; task communication-shared memory, message passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Task Synchronization Techniques

4. Books and Materials

Text Books:

1. Introduction to Embedded Systems - shibu k v, Mc Graw Hill Education.
2. Computers as Components –Wayne Wolf, Morgan Kaufmann (second edition).

Reference Books:

1. Embedded System Design -frank vahid, tony grivargis, john Wiley.
2. Embedded Systems- An integrated approach - Lyla b das, Pearson education 2012.
3. Embedded Systems – Raj Kamal, TMH

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

OPEN ELECTIVES

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 angular parameters 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,* Dhanpat Rai 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 Punmia Lal, *Irrigation and Water Power Engineering*, Laxmi Publications Pvt. Ltd., New Delhi, 16th edition, 2005.
3. Abe Kruger, *Green Building*, 5th edition, 2012.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 a building & 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 &Kameswara Rao 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 and Disasters: meaning of environmental hazards, environmental, disasters and environmental stress, concept of environmental hazards, environmental, stress and environmental disasters, different approaches and relation with human ecology, landscape approach - ecosystem approach - perception approach - human ecology and its application in geographical researches.

UNIT-II

Types of Environmental Hazards and Disasters: Natural hazards and disasters, man induced hazards and 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 and 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 and local storms, destruction by tropical cyclones and local storms (causes, distribution human adjustment, perception and mitigation) cumulative atmospheric hazards/disasters: floods-droughts, cold waves, heat waves. Floods: causes of floods, flood hazards India, flood control measures (human adjustment, perception and 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 and forms of soil erosion, factors and 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 and environmental problems, corrective measures of erosion and 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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 Utilizenew 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 and 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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 and 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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 and Applications: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors. **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-III

Wind Energy and 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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 torques errors 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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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. Hamdy Abdelaziz Taha, *Operations Research*: *an Introduction*, 9th edition, Pearson, Boston, 2015.
2. Prem Kumar Gupta & D S Hira, *Operations Research*, Revised edition, New Delhi: S. Chand Publishing, 2015.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2383 – INTRODUCTION TO 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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 Signals and 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 Arduino uno 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, Arshdeep Bahga, *Internet of Things – A hands on Approach*, 1st edition, University Press, 2014.
2. Adrian McEwen, Hakim Cassimally, *Designing the Internet of Things*, 1stedition, John Wiley and Sons, 2014.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2484 – INTRODUCTION TO EMBEDDED 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 an introduction to embedded systems and their architecture considerations. Focus is on TM4C123GH6PM microcontroller which includes internal architecture, instruction set, register organization, addressing modes, 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

A2429 - Microprocessors and Microcontrollers

2. Course Outcomes (COs)

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

A2484.1 Analyze the embedded systems features and architecture considerations

A2484.2 Develop Programs using TM4C123GH6PM Microcontroller

A2484.3 Make use of Peripherals of TM4C123GH6PM to interface I/O Devices

A2484.4 Apply Serial Communication Protocols for interfacing serial Devices.

A2484.5 Design Embedded Applications using TM4C123GH6PM Controller

3. Course Syllabus

UNIT - I

INTRODUCTION TO EMBEDDED SYSTEMS: Embedded System Introduction, Host and Target Concept, Embedded Applications, Features and Architecture Considerations for Embedded Systems- ROM, RAM, Timers, Data and Address Bus Concept, CISC vs RISC Design Philosophy, Von-Neumann Vs Harvard Architecture, Memory Types, Overview of Design Process of Embedded Systems, Programming Languages and Tools for Embedded Design.

UNIT - II

EMBEDDED CONTROLLER ARCHITECTURE: TM4C123GH6PM Block Diagram, Address Space, On-Chip Peripherals (Analog and Digital), Register Sets, Addressing Modes and Instruction Set Basics.

UNIT - III

OVERVIEW OF TM4C123GH6PM: I/O Pin Multiplexing, Pull Up/Down Registers, GPIO Control, Programming System Registers, Watchdog Timer, Need of Low Power for Embedded Systems, System Clocks and Control, Hibernation Module on TM4C, Active Vs Standby Current Consumption.

Introduction to Interrupts, Interrupt Vector Table, Interrupt Programming. Basic Timer, Real Time Clock (RTC), Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

UNIT - IV

TOOLS OF EMBEDDED SYSTEMS: Embedded Hardware and Various Building Blocks, Processor Selection for an Embedded System, I/O Devices and I/O Interfacing Concepts, Timer and Counting Devices, Design Cycle in the Development Phase for an Embedded System, Uses of In-Circuit Emulator (ICE), Use of Software Tools for Development of an Embedded System, Design Metrics of Embedded Systems – Low Power, High Performance, Engineering Cost, Time-To-Market.

UNIT - V

EMBEDDED COMMUNICATIONS PROTOCOLS: Serial Communication Basics, Synchronous/Asynchronous Interfaces (Like UART, SPI, and I2C), Baud Rate Concepts, Implementing and Programming UART, SPI and I2C, SPI Interface Using TM4C.Case Study: Tiva Based Embedded System Application using the Interface Protocols for Communication with External Devices “Sensor Hub Booster Pack”.

4. Books and Materials

Text Book(s)

1. Raj Kamal. *Embedded Systems,* 2nd Edition, Tata McGraw-Hill Education, 2011.
2. Jonathan W Valvano. *Introduction to ARM Cortex - M Microcontrollers*, 5th Edition, Create space Publications.

References

1. http://processors.wiki.ti.com/index.php/HandsOn_Training_for_TI_Embedded_Processors.
2. http://processors.wiki.ti.com/index.php/MCU_Day_Internet_of_Things_2013_Workshop.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2485 – CISCO NETWORKING

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 study of CISCO Networking is essential for Electronics and Communication Engineering graduates. Networking is a key element in establishing communication between two end points. This course provides an overview of the fundamentals of computer networks and the layered architectures. The course covers various transmission media, error detection and correction techniques, IEEE standards, algorithms and protocols of all layers. The knowledge provided by this course will be used to develop networks for sharing data.

Course Pre/corequisites

1. A2423 – Digital Communication Systems

3. Course Outcomes (COs)

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

A2583.1 Analyze the layers of reference models used for communication in various networks.

A2583.2 Apply the principles of error detection and correction to transfer data without errors.

A2583.3 Interpret various IEEE standards and channelization protocols.

A2583.4 Analyze the issues with host naming, addressing, and routing packets in internet.

A2583.5 Inspect the process to delivery data using TCP and UDP in transport layer.

4. Course Syllabus

UNIT-I

Introduction to Networks and data communication: The internet, protocols and standards, layered tasks, OSI model, TCP/IP, addressing, guided and unguided transmission media.

UNIT-II

Data Link Layer: Introduction, framing, error detection and correction, LRC, CRC, hamming code, flow and error control protocols, noiseless and noisy channel protocols.

UNIT-III

Multiple Access: Aloha, controlled access, channelization, IEEE standards: standard ethernet, changes in the standard, fast ethernet, gigabit ethernet, wireless LANs.

UNIT-IV

Network Layer: Virtual circuit and datagram approach in subnets, shortest path routing, flooding, hierarchical routing, broadcast routing, multicast routing and distant vector routing algorithms, congestion control algorithms, IPV4 and IPV6 addresses.

UNIT-V

Transport Layer: TCP and UDP, session layer-encryption, ciphers, types of ciphers, DES algorithm, public key cryptography-RSA Algorithm.

5. Books and Materials

Text Book(s)

1. Behrouz.A. Forouzan, *Data communications and Networking*, 2nd edition, TMH, 2003.
2. Andrew S. Tanenbaum, *Computer Networks*, 3rd edition, PHI, 2001.

Reference Book(s)

1. Wayne Tomasi (2005), *Introduction to Data Communications and Networking*, Pearson Education, India.
2. William Stallings, *Data and Computer Communications*, 3rd edition, Pearson, 2007.

Reference Online Resources/Materials:

1. https://www.classcentral.com/course/data-communication-network-services-9160
2. https://ocw.mit.edu/courses/6-263j-data-communication-networks-fall-2002/
3. https://nptel.ac.in/courses/106105082

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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*, 2nd edition, PHI, 2014.

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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. Ramez Elmasri, Shamkat B. Navathe, *Database Systems,* Pearson Education, 6th edition 2009.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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, 8th edition, 2015.

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 Namdev Kamthane, 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. Reema Thareja, *Python programming using problem solving approach*, Oxford, 2019.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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 Tensor Flow.

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, path finding 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, tensor flow for python, introduction to neural networks, deep learning.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

1. Dr. Dheeraj Mehrotra, *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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2587 – FUNDAMENTALS OF WEB TECHNOLOGIES

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 makes the students to practice the principles of creating an effective web page and learn the language of the web with HTML and CSS. It Develop skills in analysing the usability of a web site and how to plan and conduct user research related to web usability.

2. Course Outcomes (COs)

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

A2587.1 Apply the principles of creating an effective web page.
A2587.2 Apply the elements of design with regard to the web.
A2587.3 Create the language of the web: HTML and CSS.
A2587.4 Develop skills in analyzing the usability of a web site.
A2587.5 Understand how to plan and conduct user related to web usability.

3. Course Syllabus

UNIT-I

BASICS IN WEB DESIGN: Brief History of Internet, What is World Wide Web, Why create a web site and Standards, Public demand requirement.

UNIT-II

WEB DESIGN PRINCIPLES: Basic principles involved in developing a web site, Planning Process, rules of web designing, Page design, Home Page Layout and Design Concept.

UNIT-III

INTRODUCTION TO HTML: Introduction to HTML, HTML Documents, Basic structure of an HTML document, Creating an HTML document, Mark up Tags and Heading-Paragraphs

UNIT-IV

INTRODUCTION TO ELEMENTS OF HTML: Working with Text, Working with Lists, Tables and Frames Working with Hyperlinks, Images and Multimedia, Forms and controls.

UNIT-V

INTRODUCTION TO CASCADING STYLE SHEETS: Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts) and block elements and objects, Lists and Tables CSS Id and Class, Box Model.

4. Books and Materials

Text Book(s)

1. Deitel and Deitel and Nieto, *Internet and World Wide Web - How to Program*, Prentice Hall, 5th Edition, 2015.

Reference Book(s)

1. Chris Bates, *Web Programming – Building Intranet Applications*, 3r Edition, Wiley Publications, 2014.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2081 – 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:

A2081.1 Interpret the importance of literature survey to identify the research problem.

A2081.2 Develop suitable research methodologies to conduct engineering research.

A2081.3 Apply the principles of research to gather the required data from various sources.

A2081.4 Evaluate the gathered data by using appropriate statistical techniques.

A2081.5 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.

UNIT-II

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.

UNIT-III

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.

UNIT-IV

Data Collection: Collection of primary data, secondary data, data organization, methods of data grouping, diagrammatic representation of data, graphic representation of data. Sample designed for

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. Ratan Khananabis 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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2082 – 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:

A2082.1 Analyze ethical and professional issues which arise in the intellectual property law context.

A2082.2 Apply intellectual property law principles (including copyright, patents, designs and trademarks) to real problems.

A2082.3 Analyze the social impact of intellectual property law and policy.

A2082.4 Make use of copyrighted material so that it does not obstruct the progress of human knowledge.

A2082.5 Analyze IPR policies before filing patentable inventions and discoveries.

3. Course Syllabus

UNIT-I

Introduction to Intellectual Property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT-II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT-III

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.

UNIT-IV

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.

UNIT-V

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. Prabuddha Ganguli, *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).

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2083 – NATIONAL SERVICE 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:

A2083.1 Classify the organizational structure of NSS and its activities.

A2083.2 Identify the methods of mobilization and importance of youth Leadership.

A2083.3 Develop a sense of social and civic responsibility and provide solutions to individual and community problems.

A2083.4 Recognize the need for lifelong learning capabilities with the concepts of volunteerism and its functions.

A2083.5 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, shramdan as a part of volunteerism.

4. Books and Materials

Reference Book(s)

1. Khwajala Ghulama Saiyidain, *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*, 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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2084 – 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

A2084.1 Improve physical conditioning related to flexibility through participation in yoga.

A2084.2 Develop and maintain a personal yoga practice.

A2084.3 Recognize and apply the value and benefits of an on-going yoga practice.

A2084.4 Select asanas appropriate for personal needs.

A2084.5 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.

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COURSE STRUCTURE

A2085 – 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:

A2085.1 Appreciate various design processes for creativity and innovation.

A2085.2 Develop design ideas through different techniques.

A2085.3 Identify the significance of reverse engineering about products.

A2085.4 Make use of design drawings to communicate ideas effectively.

A2085.5 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. Yousef Haikand Tamer M. Shahin, *Engineering Design Process*, Cengage Learning, Second Edition, 2011.

Reference Online Resources

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

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COURSE STRUCTURE

A2086 – 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:

A2086.1 Apply the concepts, theories, and principles of management in professional life.

A2086.2 Design suitable organization structure for managing the operations in the organization.

A2086.3 Apply principles of management to the various functional areas of an organization such as Human Resource, Marketing and Production.

A2086.4 Evaluate cost and time of each business project by using PERT and CPM techniques.

A2086.5 Formulate the new strategies that enhance competitive edge.

3. Course Syllabus

UNIT-I

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.

UNIT-II

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.

UNIT-III

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.

UNIT-IV

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.

UNIT-V

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)

4. 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 Delhi Cengage, 2011.

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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:

A2086.1 Analyze the nature of entrepreneurship, risk and reward in modern business scenario.

A2086.2 Identify the business challenges and opportunities by various case studies.

A2086.3 Assess the promotion and institutional support by various agencies in India.

A2086.4 Evaluate the role of angel investors in promotion and expansion of start-ups in India.

A2086.5 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 Vs Intrapreneur, 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:

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