


**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 R20 Regulations

**B. Tech. - Regular Four-Year Degree Program**

**(For batches admitted from the Academic Year 2020-21)**

**(For batches admitted from the Academic Year 2021-22)**

**(For batches admitted from the Academic Year 2022-23)**

**&**

**B. Tech. - Lateral Entry Scheme**

**(For batches admitted from the Academic Year 2021-22)**

**(For batches admitted from the Academic Year 2022-23)**

**(For batches admitted from the Academic Year 2023-24)**

## 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 Semester:** Student who does not obtain minimum prescribed attendance in a Semester shall be detained in that particular Semester. Also a Student can also be detained for lack of required number of credits till II-I/III-I at the end of Second year or Third Year respectively

**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):** MOOCs inculcate the habit of self-learning. MOOCs would be additional choices in all the elective group courses.

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

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

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

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

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

**Project work:** It is a design or research-based work to be taken up by a student during his/her final 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 – R20" 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.

**Program 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 2020-21
### &
### For B.Tech Lateral Entry batches admitted from the academic year 2021 -2022

## 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 fulfil 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 |
| 6. | Computer Science and Engineering -Artificial Intelligence | 31 |
| 7. | Computer Science and Engineering -Internet of Things | 35 |

## 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 |
| Internship (IV/VI evaluated in V/VII resp.) | - | 1.5/3.0 |
| Project work | - | 12 |

## 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 | Humanities and social science | Humanities and social science including Management courses | HS | 10.5 |
| 2 | Basic Sciences | Basic Science courses | BS | 21 |
| 3 | Engineering Science courses | Engineering Science Courses including workshop, drawing, basics of electrical/mechanical/compute r etc. | ES | 24 |
| 4 | Professional core | Professional core Courses | PC | 51 |
| 5 | Open Electives | Open Elective Courses- from other technical/ emerging and job oriented | OE | 12 |
| 6 | Professional Courses | Professional Elective Courses relevant to chosen specialization/ branch | PE | 18 |
| 7 | Project Work | Project Work, Seminar, Internship in industry elsewhere | PW | 16.5 |
| 8 | Mandatory courses | Environmental Studies, Induction training, Universal human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge (Non-Credit) | MC | 0 |
| 9 | Skill Oriented Courses | Skill Oriented Courses relevant to domain, interdisciplinary, communication skill, industry | SC | 10 |
| | | **Total Credits** | | 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 fulfilment 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, Internships carried out after IV Semester & VI Semester shall be evaluated for 100 marks each and the Internship along with Project Work carried out in VIII Semester shall be evaluated for 200 marks.

- For theory subjects, the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examination.
- For practical subjects, the distribution shall be 40 marks for Internal Evaluation and 60 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 30 marks with duration of 1 hour 50 minutes (20 minutes for Objective paper and 90 minutes for subjective paper). The marks obtained in subjective paper will be condensed to 20 marks. The remaining 10 marks shall be awarded based on the submission of assignments by the student. A student has to submit two assignments in every subject each for 10 marks.

ii. The objective paper shall consist of 20 objective questions each carrying 0.5 Mark.

iii. Subjective paper shall be set for 30 marks containing 3 either or descriptive questions of equal weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 20 marks.

***Note 1: T**he marks obtained in the subjective paper shall be condensed to 20 marks, any fraction (0.5 & above) shall be rounded off to the next higher mark.

iv. If the student is absent for the internal examination other than the mandatory courses, no re-exam shall be conducted and internal marks for that examination shall be considered zero.

v. 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.

vi. 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 1 shall contain 5 compulsory short answer questions for a total of 10 marks such that each question carries 2 marks. There shall be 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 each for 10 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 40 sessional marks and end examination shall be for 60 marks. Day-to-day work in the laboratory shall be evaluated for 40 marks by the concerned laboratory teacher based on the regularity/record/ viva. The end examination shall be conducted by the concerned laboratory faculty 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 30 marks in each part. Internal examination shall be evaluated as above for 40 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 mandatory 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 40 marks for internal evaluation and 60 marks for end examination.

Day-to-day work shall be evaluated for 10 marks by the concerned subject faculty 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 40 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 30 marks, any fraction (0.5 & above) shall be rounded off to the next higher mark. 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 five Professional Elective Courses from V Semester to VII and for each elective there shall be choices such that the student shall choose a course from the list of choice courses offered by the department for that particular elective.

6.9 There shall be four Open Electives/ Job Oriented Courses common to all disciplines from V Semester to VII, where in the students shall choose the electives offered by various departments including his/her own department in such a manner that he/she has not studied the same course in any form during the Programme.

The students shall be permitted to pursue up to a maximum of two elective courses under MOOCs (Massive Open Online Courses) offered by NPTEL notified by the Department during the semester. Each of the Courses must be of minimum 12 weeks in duration. The student has to acquire a certificate for the concerned course from the NPTEL during the semester only in order to earn 3 Credits.

6.10 There shall be a mandatory **induction program** for three weeks before the commencement of first semester.

6.11 **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.

a. Students who have a CGPA of 8.0 or above (up to II semester) and without any backlog subjects will be permitted to register for Minor discipline programme. A 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 at the beginning of IV Semester and must opt for a Minor in a discipline other than the discipline he/she has registered in.
c. In order to earn a Minor in a discipline a student has to earn 20 extra credits by studying four theory subjects each for 4 credits and two MOOCs offered by NPTEL (notified by the Department corresponding to the Minor Programme) each for 2 credits and with a minimum duration of 8 weeks.
d. The student has to acquire a certificate for the concerned course from the NPTEL in order to earn 2 Credits.
e. Students are not allowed to register and pursue more than two courses in any semester. Students may complete the Minor before VIII semester.
f. Each department shall enlist a set of subjects from its curriculum which are core for the discipline without any prerequisites. The Evaluation pattern of theory subjects will be similar to the regular programme evaluation.
g. Students are not allowed to pursue minor discipline programme subjects under Self-study. Classes for the courses of the minor shall be conducted beyond the regular hours.
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.

h. Minimum strength for offering Minor in a discipline is considered One-Fifth (i.e., 20% of the class) of the class size and Maximum size is Four-Fifth of Class size (i.e., 80% of the class).

i. 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.

j. 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.

k. A Student registered for Minor in a discipline shall pass in all subjects that constitute the requirement for the Minor discipline programme. No class/division (i.e., second class, first class and distinction etc.) shall be awarded for Minor discipline programme.

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

m. 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 for Minor programme with CGPA mentioned separately.

**6.12 Honors degree in a discipline:**

a. 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.

b. A student shall be permitted to register for Honors program at the beginning of IV Semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of second semester without any backlogs. SGPA and CGPA of 8.0 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Honors discipline registration active else Honors discipline registration will stand cancelled.

c. In order to earn the Honors degree in his/her discipline, a student has to earn 20 extra credits by studying four advanced specified courses for 16 credits and acquiring the remaining 4 credits through two MOOCs offered by NPTEL which are domain specific in the branch of Engineering concerned, each for 2 credits and with a minimum duration of 8 weeks.

d. The student has to acquire a certificate for the concerned course from the NPTEL in order to earn 3 Credits.

e. The Evaluation pattern of theory subjects shall be similar to the regular programme evaluation.

f. If a student drops or is terminated from the Honors program, the additional credits earned till that time cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following:

   i. All the courses done under the dropped Honors will be shown in the transcript. (or)

   ii. None of the courses done under the dropped Honors will be shown in the transcript.

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

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

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

6.13 National Service Scheme (NSS)/Yoga is compulsory for all the Undergraduate students. The student participation shall be for a minimum period of 45 hours during the first year. Grades will be awarded as Very good, Good, Satisfactory in the mark sheet on the basis of participation, attendance, performance and behaviour. If a student gets Unsatisfactory grade, he/she has to repeat the above activity in the subsequent years along with the next year students.

6.14 Students shall undergo two summer internships each for a minimum of six weeks duration at the end of second and third years of the programme for 1.5 credits & 3 credits respectively. The organization in which the student wishes to carry out Internship need to be approved by Internal Department Committee comprising Head of Department and two senior faculty. The student shall submit a detailed technical report along with internship certificate from the Internship organization in order to obtain the prescribed credits. The student shall submit the Internship Project Report along with Certificate of Internship. The evaluation of the first and second summer internships shall be conducted at the end of the V Semester & VII semester respectively.

There shall be internal evaluation for 100 marks and there shall not be external evaluation. The Internal Evaluation shall be made by the departmental committee (Head of the Department and two senior faculty of the department) on the basis of the project report submitted by the student.

Completion of the internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such a case, the student shall repeat the internship in the subsequent summer provided that the student doesn't pursue two summer internships in the same summer.

Community Service Project focussing on specific local issues, shall be an alternative to the six weeks of summer Internship, whenever there is any emergency and when students cannot pursue their summer internships. The Community Service Project shall be for 6 weeks in duration which includes preliminary survey for 1 week, community awareness programs for one week, community immersion program in consonance with Government agencies for 3 weeks and a community exit report (a detailed report) for one week. The community service project shall be evaluated for 100 marks by the internal departmental committee comprising Head of the Department and two senior faculty of the department. **However, the first priority shall be given to the internship.**

6.15 There shall also be a mandatory full internship in the final semester (VIII Semester) of the Programme along with the project work. The organization in which the student wishes to carry out the Internship need to be approved by Internal Department Committee comprising Head of the Department and two senior faculty. The faculty of the respective department monitors the student internship program along with project work. At the end of the semester, the candidate shall submit a certificate of internship and a project report. The project report and presentation shall be internally evaluated for 60 marks by the departmental committee consisting of Head of the Department, Project supervisor and a senior faculty member. The Viva-Voce shall be conducted for 140 marks by a committee consisting of HOD, Project Supervisor and an External Examiner.

Completion of internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such a case, the student shall repeat the internship along with project work for next six months.

6.16 There shall be five skill-oriented courses offered during III semester to VII semester. Out of the five skill courses, two shall be skill-oriented programs related to the domain and these two shall be completed in second year. Of the remaining three skill courses, one shall necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

The student can choose between a skill advanced course being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies which are duly approved by the Internal Department Committee. The credits assigned to the skill advanced course shall be awarded to the student upon producing the Course Completion Certificate from the agencies/professional bodies.

The Internal Department Committee comprising Head of Department and two senior faculty shall evaluate the grades/ marks awarded for a course by external agencies and convert to the equivalent marks/grades.

**7. Attendance Requirements:**

- A student shall be eligible to appear for external examination and promoted to next semester, if he/she acquires a minimum attendance of 40% in every subject (Theory/Laboratory) being offered in that semester along with an aggregate attendance of 75% of all the subjects (Theory/Laboratory) offered in that 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. However, a student who has been condoned for shortage of attendance need to acquire a minimum of 40% in each subject (Theory/ Laboratory) being offered in that semester.
- 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 examination 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 re-admission for that semester when offered next.
- A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

**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/she 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 mandatory courses, internships, project work 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 if a 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.

8.4 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.

8.5 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 fulfilment 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 **mandatory** 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/she 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 fulfilment 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 re-joining.

**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 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 material to be uploaded to social media sites need to be approved by Head of the Department concerned/Dean/Principal.

(x) 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

(xi) 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 | Cancellation of the performance in that course. |

| | | |
|---|---|---|
| | writes to the examiner requesting him to award pass marks. | |
| 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 | 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. |

| | | |
|---|---|---|
| | 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. | |
| 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.<br>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.<br>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.(R20)
## (LATERAL ENTRY SCHEME)

**(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2021-2022 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 fulfils 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 121 credits and secures all *121* credits from III semester to VIII semester of Regular B. Tech. program.
(c) Students, who fail to fulfil the requirement for the award of the degree in six consecutive academic years from the year of admission, shall forfeit their seat.
(d) 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/she 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/she fulfils 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 a 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 fulfilment 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/she shall be placed in one of the following four classes:

| **Class Awarded** | **CGPA Secured** | From the Aggregate Marks secured for 121 Credits (i.e II Year to IV Year) |
|---|---|---|
| First Class with Distinction | ≥ 7.5 | |
| First Class | ≥ 6.5 < 7.5 | |
| Second Class | ≥ 5.5 < 6.5 | |
| Pass Class | ≥ 4.0 < 5.5 | |

**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).

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## 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 | | | - |

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

### B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

**I SEMESTER (I YEAR)**

| S.NO | Title of the Course | Category | Periods per Week | | | Credits | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | C | Internal | External | Total |
| A30002 | Mathematics-I | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30005 | Chemistry | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30501 | Computer Programming | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30401 | Fundamentals of Electronics Engineering | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30302 | Engineering Workshop | ES | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| A30502 | Phython Programming Lab | ES | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30009 | Chemistry Lab | BS | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30402 | Fundamentals of Electronics Engineering Lab | ES | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| | TOTAL | | 13 | 00 | 13 | 19.5 | 320 | 480 | 800 |

**II SEMESTER (I YEAR)**

| S.NO | Title of the Course | Category | Periods per Week | | | Credits | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | C | Internal | External | Total |
| A30010 | Mathematics-II | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30004 | Applied Physics | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30503 | Data Structures using C | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30001 | Communicative English | HS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30301 | Engineering Graphics & Computer Aided Drafting | ES | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| A30008 | Applied Physics Lab | BS | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30504 | Data Structures Lab | ES | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30006 | Communicative English Lab | ES | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30031 | Environmental Science | MC | 2 | 0 | 0 | 0 | 100* | - | 100* |
| | TOTAL | | 15 | 00 | 13 | 19.5 | 320 | 480 | 800 |

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

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 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 |
| A30015 | Transform Techniques and Complex Variables | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30403 | Electronic Devices and Circuits | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30404 | Digital Logic Design | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30405 | Signals and Systems | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30211 | Network Analysis | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30406 | Electronic Devices and Circuits Laboratory | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30407 | Digital Logic Design Laboratory | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30408 | Basic Simulation Laboratory | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30409 | PCB Designing | SC | 1 | 0 | 2 | 2 | 40 | 60 | 100 |
| A30032 | Universal Human Values | MC | 2 | 0 | 0 | 0 | 100* | 0 | 100* |
| | TOTAL | | 18 | 0 | 11 | 21.5 | 360 | 540 | 900 |

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

**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 |
| A30412 | Analog Communication Systems | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30017 | Probability Theory and Stochastic Processes | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30413 | Electronic Circuit Analysis | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30414 | Electromagnetics and Transmission Lines | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30019 | Managerial Economics and Financial Analysis | HS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30415 | Analog Communication Systems Laboratory | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30416 | Electronic Circuit Analysis Laboratory | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30417 | Internet of Things Laboratory | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30418 | Web Development | SC | 1 | 0 | 2 | 2 | 40 | 60 | 100 |
| | TOTAL | | 16 | 00 | 11 | 21.5 | 360 | 540 | 900 |
| **Internship 2 Months (Mandatory) during summer vacation** | | | | | | | | | |

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 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 |
| A30425 | Antennas & Wave Propagation | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30426 | Digital Communication Systems | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30427 | Linear Integrated Circuit Applications | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **Professional Elective-1** | | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30475 | Fiber Optic Communication Technology | | | | | | | | |
| A30476 | Fundamentals of Micro & Nano Fabrication | | | | | | | | |
| A30474 | Introduction to Internet of Things | | | | | | | | |
| A30451 | Optical Communications | | | | | | | | |
| A30452 | Nano Technology | | | | | | | | |
| A30453 | System Design Through Verilog | | | | | | | | |
| A30458 | Computer Architecture & Organization | | | | | | | | |
| **Open Elective-1** | | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30589 | Social Network Analysis | | | | | | | | |
| A30284 | Control Systems Engineering | | | | | | | | |
| A30428 | Digital Communication Systems Lab | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30429 | Linear Integrated Circuit Applications Lab | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30430 | Python Full Stack | SC | 1 | 0 | 2 | 2 | 40 | 60 | 100 |
| A30033 | Indian Constitution | MC | 2 | 0 | 0 | 0 | 100* | 0 | 100* |
| A30431 | **Internship 2 Months (Mandatory) during summer vacation (to be evaluated during V Semester)** | PW | 0 | 0 | 0 | 1.5 | 100 | 0 | 100 |
| A30437 | **Community Service Project** | PW | | | | | | | |
| TOTAL | | | 18 | 00 | 08 | 21.5 | 420 | 480 | 900 |

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

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

| 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 |
| A30432 | Digital Signal Processing | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30433 | Microprocessors & Microcontrollers | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30434 | CMOS VLSI Design | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | **Professional Elective-2** | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30454 | Microwave Engineering | | | | | | | | |
| A30455 | Biomedical Signal Processing | | | | | | | | |
| A30456 | FPGA Design | | | | | | | | |
| | **Open Elective-2** | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30588 | Introduction to Java Programming | | | | | | | | |
| A30435 | Digital Signal Processing Lab | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30436 | Microprocessors & Microcontrollers Lab | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30510 | Object Oriented Programming Through Java Lab | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30524 | R Programming | SC | 1 | 0 | 2 | 2 | 40 | 60 | 100 |
| A30034 | Gender Sensitization | MC | 2 | 0 | 0 | 0 | 100* | 0 | 100* |
| TOTAL | | | 18 | 00 | 11 | 21.5 | 360 | 540 | 900 |
| **Industrial/Research Internship (Mandatory) 2 Months during summer vacation** | | | | | | | | | |

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

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 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 |
| **Professional Elective-3** | | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30459 | Cellular & Mobile Communications | | | | | | | | |
| A30460 | Advanced Signal Processing | | | | | | | | |
| A30461 | Low Power VLSI Design | | | | | | | | |
| A30462 | Embedded System Design | | | | | | | | |
| A30468 | Digital Image Processing | | | | | | | | |
| A33148 | Introduction To Industry 4.0 & Industrial Internet Of Things | | | | | | | | |
| A30477 | Principles & Techniques Of Modern Radar Systems | | | | | | | | |
| **Professional Elective-4** | | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30463 | Global Navigation Satellite System | | | | | | | | |
| A30464 | Speech Processing | | | | | | | | |
| A30465 | System Verilog & Verification | | | | | | | | |
| A30466 | Real Time Operating Systems | | | | | | | | |
| A30491 | Digital VLSI Testing | | | | | | | | |
| A30479 | Real Time Digital Signal Processing | | | | | | | | |
| A30480 | Simulation Of Communication System Using MATLAB | | | | | | | | |
| **Professional Elective-5** | | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30470 | Photonics Engineering | | | | | | | | |
| A30469 | Analog VLSI Design | | | | | | | | |
| A30457 | Electrical Measurement And Electronics Instruments | | | | | | | | |
| A30467 | Modern Digital Communication Techniques | | | | | | | | |
| **Open Elective-3** | | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30579 | The Joy Of Computing Using Python | | | | | | | | |
| A30588 | Introduction to Java Programming | | | | | | | | |
| **Open Elective-4** | | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30094 | Entrepreneurship | | | | | | | | |
| A30583 | Basics of Software Engineering | | | | | | | | |
| A30022 | Professional Ethics | HS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30438 | VLSI & Embedded Systems Programming | SC | 1 | 0 | 2 | 2 | 40 | 60 | 100 |
| A30439 | **Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester** | PW | 0 | 0 | 0 | 3 | 100 | 0 | 100 |
| TOTAL | | | 19 | 00 | 2 | 23 | 380 | 420 | 800 |
| **Industrial/Research Internship (Mandatory) 2 Months during summer vacation** | | | | | | | | | |

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

| 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 |
| A30440 | Project (Major Project) Project work, seminar and internship in industry (Internship along with Project Work) | PW | 0 | 0 | 0 | 12 | 60 | 140 | 200 |
| Internship (6 Months) | | | | | | | | | |
| | TOTAL | | 0 | 0 | 0 | 12 | 60 | 140 | 200 |

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

**B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING**

### Professional Electives

| Professional Elective – 1 | |
|---|---|
| **Course Code** | **Title of the Course** |
| A30451 | Optical Communications |
| A30452 | Nano Technology |
| A30453 | System Design Through Verilog |
| A30458 | Computer Architecture & Organization |
| A30475 | Fiber Optic Communication Technology |
| A30476 | Fundamentals Of Micro & Nano Fabrication |
| A30474 | Introduction To Internet Of Things |
| **Professional Elective – 2** | |
| **Course Code** | **Title of the Course** |
| A30454 | Microwave Engineering |
| A30455 | Biomedical Signal Processing |
| A30456 | FPGA Design |
| A30457 | Electronic Measurements & Instrumentation |
| **Professional Elective – 3** | |
| **Course Code** | **Title of the Course** |
| A30459 | Cellular & Mobile Communications |
| A30460 | Advanced Signal Processing |
| A30461 | Low Power VLSI Design |
| A30462 | Embedded System Design |
| A30468 | Digital Image Processing |
| A33148 | Introduction To Industry 4.0 & Industrial Internet Of Things |
| A30477 | Principles & Techniques Of Modern Radar Systems |
| **Professional Elective – 4** | |
| **Course Code** | **Title of the Course** |
| A30463 | Global Navigation Satellite System |
| A30464 | Speech Processing |
| A30465 | System Verilog & Verification |
| A30466 | Real Time Operating Systems |
| A30491 | Digital VLSI Testing |
| A30479 | Real Time Digital Signal Processing |
| A30480 | Simulation Of Communication System Using MATLAB |
| **Professional Elective – 5** | |
| **Course Code** | **Title of the Course** |
| A30467 | Modern Digital Communication Techniques |
| A30469 | Analog VLSI Design |
| A30470 | Photonics Engineering |
| A30471 | Electrical Measurement And Electronics Instruments |

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

### B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

## Open Electives

| Course Code | Title of the Course | Offered by |
|---|---|---|
| A30181 | Basic Civil Engineering | CE |
| A30182 | Building Planning and Construction | CE |
| A30183 | Disaster Management | CE |
| A30184 | Water Resources Conservation | CE |
| A30281 | Fundamentals of Electrical Engineering | EEE |
| A30282 | Renewable Energy Sources | EEE |
| A30283 | Electrical Measuring Instruments | EEE |
| A30284 | Control Systems Engineering | EEE |
| A30381 | Optimization Techniques | ME |
| A30382 | Mechanical Technology | ME |
| A30383 | Automobile Systems and Applications | ME |
| A30384 | Manufacturing Processes | ME |
| A30481 | Principles of Communication Systems | ECE |
| A30482 | Signal Processing & Applications | ECE |
| A30483 | Fundamentals of IoT | ECE |
| A30484 | Introduction to Embedded Systems | ECE |
| A30579 | The Joy of Computing Using Python | CSE |
| A30581 | Basic Data Structures | CSE |
| A30582 | Fundamentals of DBMS | CSE |
| A30583 | Basics of Software Engineering | CSE |
| A30584 | Python for Every One | CSE |
| A30585 | Computer Organization and Operating Systems | CSE |
| A30586 | Ethical Hacking | CSE |
| A30587 | Fundamentals of Web Technologies | CSE |
| A30588 | Introduction to Java Programming | CSE |
| A30589 | Social Network Analysis | CSE |
| A33147 | Agile Methodologies | CAI |
| A33148 | Human Computer Interaction | CAI |
| A33149 | AI Foundations for Everyone | CAI |
| A33150 | Introduction to Data Science | CAI |
| A33545 | Adhoc and Wireless Sensor Networks | CSO |
| A33546 | Ethics in Information Technology | CSO |
| A33547 | Drone Technologies | CSO |
| A33548 | Computer Communication Networks | CSO |
| A30081 | Research Methodology | H&S |
| A30082 | Intellectual Property Rights | H&S |
| A30083 | National Service Scheme | H&S |
| A30084 | Yoga | H&S |
| A30085 | Design Thinking | H&S |
| A30086 | Management Science | H&S |
| A30087 | Entrepreneurship Development | H&S |
| A30094 | Entrepreneurship | H&S |

# COURSE STRUCTURE

## I - SEMESTER

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

### B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

| I SEMESTER (I YEAR) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S.NO | Title of the Course | Category | Periods per Week | | | Credits | Scheme of Examination Maximum Marks | | |
| | | | L | T | P | C | Internal | External | Total |
| A30002 | Mathematics-I | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30005 | Chemistry | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30501 | Computer Programming | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30401 | Fundamentals of Electronics Engineering | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30302 | Engineering Workshop | ES | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| A30502 | Computer Programming Lab | ES | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30009 | Chemistry Lab | BS | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30402 | Fundamentals of Electronics Engineering Lab | ES | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| | TOTAL | | 13 | 00 | 13 | 19.5 | 320 | 480 | 800 |

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30002 – MATHEMATICS – I

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 3 | 0 | 0 | 42 | 0 | 0 | 3 | 40 | 60 | 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:Solution of system of linear equations, Eigen values and Eigen vectors, Quadratic forms, Functions of single variable,Roll'stheorem,legranges mean value theorem, Cauchy mean value theorem,multivariable calculus, jacobian, maxima&minima. Evaluate the double and Triple integrals and its applications, Specialfunctions.The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program

**Course Pre/co requisites**

- Linear Algebra
- Differentiation
- Integration

## 2. Course Outcomes (COs)

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

A30002.1 Develop the use of matrix algebra techniques that is needed by engineers for practical Applications.

A30002.2 Interpret the Eigen values and Eigen vectors of matrix in terms of the transformation it represents in to a matrix Eigen value problem.

A30002.3 Utilize mean value theorems to real life problems.

A30002.4 Familiarize with functions of several variables which is useful in optimization.

A30002.5 Apply important tools of calculus in higher dimensions and will become familiar with 2-dimensional coordinate systems.

A30002.6 Analyze 3- dimensional coordinate systems and utilization of special functions.

## 3. Course Syllabus

**UNIT-I: Matrix Operations and Solving Systems Of Linear Equations**

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, Clayey-Hamilton theorem (without proof), finding inverse and power of a matrix by Clayey-Hamilton theorem, Diagonalisation of a matrix.

**UNIT-II: Quadratic forms**

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

**Mean Value Theorems:** 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**

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**

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

**UNIT-V:Triple Integrals and Special Functions**

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.

## 4. Books and Materials

**Text Books:**

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

**Reference Books:**

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, 2011.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30005 – CHEMISTRY

| 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 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

This course acquaints 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 Pre/Co requisites

Bridge Course

### Course Outcomes (COs)

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

| | |
|---|---|
| A30005.1 | To illustrate the molecular orbital energy levels for different molecular species and Apply Schrodinger wave equation and particle in a box. |
| A30005.2 | To differentiate between pH metry, Potentiometric and conductometric titrations. |
| A30005.3 | Explain the preparation properties and applications of polymers and describe the mechanism of conduction in conducting polymers. |
| A30005.4 | Understand the principles of different analytical instruments and explain their applications. |
| A30005.5 | Explain the concept of nano clusters nano wires and characterize the applications of SEM & TEM. |
| A30005.6 | Explain of different types of colloids, their preparations, properties and applications |

## 2. Course Syllabus

**Unit – 1 : Structure and Bonding Models:** Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of $\Psi$ and $\Psi^2$ , applications to hydrogen, Particle in a box model , molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of $O_2$ and CO, etc. calculation of bond order, crystal field theory – salient features – energy level diagrams for transition metal ions – splitting in octahedral and tetrahedral environments-Applications of CFT (magnetic properties and colour).

**Unit- 2: Electrochemistry and Applications:** Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems. Photovoltaic cell &photo galvanic cells – working and applications. Primary cells – Zinc-air battery, alkali metal sulphide batteries, Secondary cells – lead acid and lithium batteries. Fuel cells - Hydrogen-oxygen & Methanol fuel cells – working and applications.

**Unit - 3: Polymer Chemistry:** Introduction to polymers, Basic Concepts, Chain growth and Step growth polymerization, copolymerization (stereo specific polymerization) with specific examples. Mechanisms of polymer formation. Plastomers: Thermoplastics and Thermosetting, Preparation, properties and applications of – Bakelite, Nylons. Elastomers: Buna-S, Buna-N–preparation, properties and applications. Conducting polymers – polyacetylene, polyaniline – mechanism of conduction and applications.

**Unit – 4: Instrumental Methods and Applications:** Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. Principle and applications of pH metry, potentiometer, Conductometry, UV-spectroscopy, IR Spectroscopy. Chromatography- Basic principle- TLC- Separation of organic mixtures.

**Unit – 5: Nano materials and Colloidal chemistry**:
**Nano materials :** 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).
**Colloidal chemistry**: Introduction to colloidal chemistry - colloidal, Micelle formation, synthesis of colloids (any two methods with examples), properties and applications.

## 3. Books and Materials

**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, KURNOOL

## A30501 – PYTHON PROGRAMMING

| 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 | 40 | 60 | 100 |

## 1. Course Description

### 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 Pre/Co-requisites

The course has no specific prerequisite and co- requisites.

## 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30501.1 | Comprehend the fundamental concepts of computer hardware and problem solving Abilities. |
| A30501.2 | Knowledge on the basic concepts of algorithms, flow charts and python programming. |
| A30501.3 | Ability to analyze the procedure for providing input and acquire output from the program along with implementation of control statements. |
| A30501.4 | Interpret the importance of functions in programming |
| A30501.5 | Analyze and modularize the problem and its solution by using functions. |
| A30501.6 | Ability to relate the concepts of strings, files and pre-processors to the real world Applications. |

## 3. Course Syllabus

**Introduction to Computers and Problem Solving Strategies -**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.

**Basics of Python Programming** – 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.

**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.

**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.

**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.

## 4. Books and Materials

### Text Book(s)

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 ReemaThareja, Oxford.

### Reference Book(s)

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

4.http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30401-FUNDAMENTALS OF ELECTRONICS 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 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

This course provides an introduction to basic electronic devices, logic design and the basic building blocks of communication systems. This course provides comprehensive understanding of electronic components, number systems, microprocessors and microcontrollers. 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 core subjects of electronics and communication engineering.

### Course Pre/Co-requisites

- Physics

## 2. Course Outcomes (COs)

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

A30401.1 Analyze brief history of electronic components and devices.

A30401.2 Analyze the function of CRO used to measure frequency, amplitude and phase.

A30401.3 Comprehend the operation and characteristics of various electronic devices.

A30401.4 Analyze various applications of semiconductor diodes.

A30401.5 Make use of boolean algebra postulates to minimize boolean functions.

A30401.6 Understand the basic principles of electronic communication.

## 3. Course Syllabus

**UNIT-I**

**Introduction:** Brief history of electronics, review of semiconductor physics.

**CRO:** charged particles, force in electric and magnetic fields, electrostatic deflection, motion in a magnetic field.

**UNIT-II**

**Electronic Devices:** operation and applications of Diodes, Special diodes – Zener diode, Tunnel diode, LED and Photo diode.

**UNIT-III**

**Feedback in Electronic Systems:** open loop and closed loop systems, Negative and positive Feedback, merits and demerits, Principles of LC and RC oscillators.

**UNIT-IV**

**Integrated Circuits:** Operational amplifiers – characteristics and linear applications

**Digital Circuits:** Number systems and logic gates, Combinational Logic circuits, Analog to Digital and Digital to Analog converters (ADC/DAC's), Introduction to microprocessors and microcontrollers.

**UNIT-V**

**Principles of Communication:** Need for Modulation, Definitions of various Modulation and Demodulation techniques, AM radio transmitter and receiver, brief understanding of FM and mobile communications.

## 4. Books and Materials

### Text Book(s)

1. J.B. Gupta, *Electronic Devices and Circuits*, 3rd Edition, S.K. Kataria& Sons, 2008.
2. Bhargava N. N., D C Kulshreshtha and S C Gupta, *Basic Electronics & Linear Circuits*, 2nd Edition, Tata McGraw Hill, 2013.
3. Malvino and Brown, *Digital Computer electronics*,Mcgraw Hill, 3rd Edition.

### Reference Book(s)

1. G. Kennedy, B. Davis, *Electronic Communication Systems*, TMH, 4th edition, 2003.
2. V.K. Mehta, *Principles of Electronics*, S.Chand& Company, 8th edition, 2003.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30302 – ENGINEERING WORKSHOP

| 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 | 3 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

This course introduces students to the basic concepts related to Engineering workshop and also imparts the knowledge about usage of the tools. This course familiarizes students with woodworking, welding, sheet metal operations, fitting and electrical house wiring skills. This knowledge enables the students to fabricate, manufacture or work with materials.

### Course Pre/corequisites

This course has no Pre/corequistites

## 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30302.1 | Apply wood working skills to make products. |
| A30302.2 | Perform metal cutting operations in the fitting section to make models. |
| A30302.3 | Perform simple welding operations to join to metal pieces. |
| A30302.4 | Apply sheet metal working skills to make required models. |
| A30302.5 | Evaluate the performance analysis of various pumps and turbines. |
| A30302.6 | Perform general maintenance works on own at house/ work place. |

## 3. Course Syllabus

1. **FittingTrade–**Making of aL-fitfromthegivenM.SFlatmaterialpiece.
2. **FittingTrade–**Making of aSquare joint fromthegivenM.SFlatmaterialpiece.
3. **CarpentryTrade–**Making of acrosslapjointasperspecification.
4. **CarpentryTrade-**Tomakea dovetail jointasperspecification.
5. **TinSmithy–**Making of an openscoopwiththegivensheetmetal
6. **TinSmithy–**Making of asquare tin withthegivensheetmetal
7. **Foundry:**Preparation of asandmouldusingasinglepiecepattern
8. **Welding**: Preparation of a single V butt joint
9. **Welding**: Preparation of single lap joint
10. **House Wiring:** One bulb connected by oneone-way switch
11. **House Wiring:** One bulb connected by two Two- way switches

12. **House Wiring:** Staircase-wiring
13. **House Wiring:**Tubelightwiring
15. **House Wiring:** Go-DownWiring

## 4. Laboratory Equipment/Software/Tools Required

1. Fitting bench wise
2. Hack saw frame
3. Carpentry bench-wise
4. Jack plane
5. Snip tool
6. Nose player
7. Cope & Drag
8. Sprue
9. Welding machine
10. House wiring set up

## 5. Books and Materials

**Text Book(s)**

P.N. Rao, *Manufacturing Technology*, Volume-I, Tata McGraw Hill, 4th edition, 2013.

**Reference Book(s)**

1. Schmid and Kalpakjin, *Manufacturing Technology*, Pearson education, 7thedition, 2014.

2. P. N. Rao, *Manufacturing Technology*, *Foundry forming and welding*, Volume-I, McGraw Hill education, 5th edition, 2018.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30502 – PYTHON PROGRAMMING 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 | 40 | 60 | 100 |

## 1. Course Description

**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 Pre/Co-requisites**

A30501-Python Programming

## 2. Course Outcomes (COs)

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

A30502.1 Design solutions to mathematical problems & Organize the data for solving the Problem.

A30502.2 Understand and implement modular approach using python

A30502.3 Learn and implement various data structures provided by python library including string, list, dictionary and its operations etc.

A30502.4 Understands about files and its applications.

A30502.5 Develop real-world applications, files and exception handling provided by python

A30502.6 Select appropriate programming construct for solving the problem

## 3. Course Syllabus

Experiment-1 a) Running instructions in Interactive interpreter and a Python Script.
b) Write a program to compute distance between two points taking input from the user

Experiment-2 a) Write a Program for checking whether the given number is a even number or not.
b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . ,1/10

Experiment-3 a) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Experiment-4 a) Write a Python program to check if a number is a perfect number.
b) Write a Python program to check if a number is a strong number.

Experiment-5 a) Write a program to count the number of characters in the string and store them in a dictionary data structure.

b) Python program to split a string based on a delimiter and join the string using another delimiter.

Experiment-6 a) Python Program to Convert Decimal to Binary, Octal and Hexadecimal without using built in methods.
b) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

Experiment-7 a) Write a function dups to find all duplicates in the list.
b) Write a function cumulative product to compute cumulative product of a list of numbers.

Experiment-8 a) Write a function reverse to reverse a list. Without using the reverse function.
b) Write function to compute gcd, lcm of two numbers using recursion.

Experiment-9 a) Write a program to perform addition of two square matrices.
b) Write a program to perform multiplication of two square matrices.

Experiment-10 a) Write a program to print each line of a file in reverse order.
b) Write a program to compute the number of characters, words and lines in a file.

## 4. Laboratory Equipment/Software/Tools Required

Open source scripting language (Spyder, pyscripter and etc), Python IDLE, Anaconda

## 5. Books and Materials

**Text Book(s)**

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

## A30009 – CHEMISTRY 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

- This course introduces the basic concepts of practical understanding of the redox reactions which is the foundation for the Engineering discipline.
- The emphasis of this course is laid on the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineers these to suit diverse applications.
- Learn practical understanding of Potentiometric titrations

**Course Pre/co requisites:**

A30005-Chemistry

### 2. Course Outcomes (COs)

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

A30009.1 Understand the determine the cell constant and conductance of solutions
A30009.2 Prepare advanced polymer materials.
A30009.3 Measure the strength of an acid present in secondary batteries
A30009.4 Understand and apply the pH metric titrations.
A30009.5 Verify Lambert-Beer'slaw
A30009.6 Potentiometry - determination of redox potentials and EMFs

### 3. Course Syllabus

1. Determination of cell constant and conductance of solutions
2. Conduct metric 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 Dichometry
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a polymer (Bakelite)
8. Verify Lambert-Beer's law
9. Determination of copper by colorimetry
10. Thin layer chromatography
11. Identification of simple organic compounds by UV-Visible Spectral analysis
12. Preparation of nonmaterial's by Precipitation method.

## 4. Laboratory Requirements

1. Conductivity meter
2. $p^H$ meter
3. Potentiometer
4. Colorimeter
5. TLC chamber
6. UV- Spectrometer

## 5. Books and Materials

**Reference Book(s):**

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 AND TECHNOLOGY, KURNOOL

## A30402-FUNDAMENTALS OF ELECTRONICS ENGINEERING 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

This Lab provides the students to get an understanding about various electronic component specifications, identifying and testing using various electronic instruments. Students also get an idea about soldering of electronic components on a PCB and EDA tools.

**Course Pre/Corequisites**

A30401-Fundamentals of Electronics Engineering

### 2. Course Outcomes (COs)

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

A30402.1 Analyze brief history of electronic components and devices.

A30402.2 Analyze the function of CRO used to measure frequency, amplitude and phase.

A30402.3 Identify various electronic components and measuring equipment.

A30402.4 Assemble and test simple electronic circuits over a PCB.

A30402.5 Interpret specifications (ratings) of the components.

A30402.6 Understand the working of various communication systems.

### 3. Course Syllabus

1. Familiarization of commonly used Electronic Workshop Tools : Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
2. Familiarization of Electronic Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
3. Electronic Components:
   Familiarization/Identification of electronic components (Resistors,Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, color coding, package, symbol, cost etc.
4. Testing of electronic components like Resistor, Capacitor, Diode, Transistor, ICs etc.
5. Study of Cathode Ray Oscilloscope (CRO)
6. Interpret data sheets of discrete components and IC's.
7. Introduction to EDA Tools: MULTISIM/PSPICE/TINA schematic capture tool, learning of basic functions of creating a new project, getting and placing parts, connecting placed parts, simulating the schematic, plotting and analyzing the results.
8. Assembling and Testing of simple electronic circuits on breadboards; identifying the components and its location on the PCB, soldering of the components, testing the assembled circuit for correct functionality.
9. Familiarization of PA system with different microphones, loud speakers, mixer etc. Represent the same in the form of diagrams, write specifications and submit it in the form of a report.

10. Understand working of various Communication Systems like Television, Satellite Transmitter & Receiver, Radio Receiver, Mobile Phone. Prepare demo boards/charts of various communication systems.

## 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 Active and passive devices, bread boards.

## 5. Books and Materials

**Text Books**

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

**Reference Books**

1. J.B.Gupta, “Electronic Devices and Circuits”, 3rd Edition, S.K.Kataria& Sons, 2008.

# COURSE STRUCTURE

## II - SEMESTER

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

### B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

| II SEMESTER (I YEAR) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S.NO | Title of the Course | Category | Periods per Week | | | Credits | Scheme of Examination Maximum Marks | | |
| | | | L | T | P | C | Internal | External | Total |
| A30010 | Mathematics-II | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30004 | Applied Physics | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30503 | Data Structures | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30001 | Communicative English | HS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30301 | Engineering Graphics & Computer Aided Drafting | ES | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| A30008 | Applied Physics Lab | BS | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30504 | Data Structures Lab | ES | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30006 | Communicative English Lab | HS | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30031 | Environmental Science | MC | 2 | 0 | 0 | 0 | 100* | - | 100* |
| | TOTAL | | 15 | 00 | 13 | 19.5 | 320 | 480 | 800 |

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

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30010 – MATHEMATICS – II

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 3 | 0 | 0 | 42 | 0 | 0 | 3 | 40 | 60 | 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: Linear Differential Equations of Higher Order, Equations Reducible to Linear Differential Equations and Applications, Partial Differential Equations – First order, Multi variable Calculus (Vector differentiation&Integration). Mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

**Course Pre/co requisites**

- Calculus
- Vectors

## 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30010.1 | Apply the mathematical principles to solve second and higher order differential equations. |
| A30010.2 | Analyze the non- homogeneous linear differential equations along with method of variation of parameters. |
| A30010.3 | Apply the concept of higher order differential equations to the various streams like Mass spring system and L-C-R Circuit problems. |
| A30010.4 | Apply a range of techniques to find solutions of standard PDEs and basic properties of standard PDEs. |
| A30010.5 | Analyze the vector calculus involving divergence, curl and their properties along with vector identities. |
| A30010.6 | Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals. |

## 3. Course Syllabus

**UNIT-I: Differential Equations of First and Higher Order**

Formation of differential equations, Solutions to First order differential equations (Exact &Reducible to Exact ),Higher order linear differential equations , complete solution, operator D, Solution of homogeneous &Non-Homogeneous linear differential equations, method of variation of parameters.

**UNIT-II: Equations Reducible to Linear Differential Equations and Applications**

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

**UNIT-III: Partial Differential Equations – First order**

Formation of PDE by the elimination of arbitrary constants and arbitrary functions. solutions of first order linear and non-linear Partial differential equations (f(p,q) = 0,f(z,p,q) = 0,f(x,p) = F(y,q) ,Z = px +qy+f(x,y) ,f(x,y,z,p,q) = 0(Charpit's method ) ). Solutions of homogeneous higher order linear partial differential equations with constant coefficients.

**UNIT-IV: Vector differentiation**

Scalar and vector point functions, vector differential operator(DEL) Gradient,Directional derivatives, normal to surface, Divergence,Solenoidal vector and Curl, Irrational vector,vector identities.

**UNIT-V: Vector integration**

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

## 4. Books and Materials

**Textbooks:**

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

**References:**

1. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, *Thomas Calculus,* 13/e, Pearson Publishers, 2013.
3. Glyn James, *Advanced Modern Engineering Mathematics*, 4/e, Pearson publishers, 2011.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30004-APPLIED PHYSICS

| 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

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 Applied 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 nano materials relevant to engineering branches are to be familiarized.

**Course Pre/co-requisites**

Bridge Course

### 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30004.1 | Interpret the properties of light waves and its interaction of energy with the matter |
| A30004.2 | Explain the principles of physics in dielectrics and magnetic materials |
| A30004.3 | Apply electromagnetic wave propagation in different guided media |
| A30004.4 | Calculate conductivity of semiconductors |
| A30004.5 | Interpret the difference between normal conductor and super conductor |
| A30004.6 | Elucidate the applications of nano materials |

### 3. Course Syllabus

**UNIT I**

**Physical Optics**

**Interference:** Superposition Principle-Interference of light -Interference in thin films by reflection -Newton's Rings-Determination of Wavelength-Engineering applications of Interference.

**Diffraction**-Fraunhofer Diffraction-Single slit, double slit, multiple slit diffraction-Diffraction Grating – Grating Spectrum -Determination of Wavelength-Engineering applications of Diffraction

**Polarization**-Polarization by double refraction-Nicol's Prism--Half wave and Quarter wave plate- Engineering applications of Polarization.

**UNIT II**

**Dielectric and Magnetic Materials**

**Dielectric Materials**: Introduction to Dielectrics - 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.

**Magnetic Materials**: Introduction to Magnetics--Classification of Magnetic materials-Weiss theory of ferromagnetism (qualitative)-Hysteresis-soft and hard magnetic materials-Ferrites and garnets and its applications.

**UNIT III**

**Electromagnetic Waves and Fiber Optics**

**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 in non-conducting media-Poynting's Theorem.

**Fiber Optics**: Introduction-Total Internal Reflection-Construction of optical fibers, Critical angle of propagation-Acceptance Angle-Numerical Aperture-Classification of optical fibers-Fiber optic Communication system – Applications of optical fibers.

**UNIT IV**

**Semiconductors**

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 .

**UNIT V**

**Superconductors and Nano materials**

**Superconductors**: Superconductors-Properties- Meissner effect-BCS Theory- AC & DC Josephson Effect -Types of Superconductors-High $T_c$ superconductors-Applications.

**Nanomaterials:** Introduction-significance of nanoscale-Basic Principles of Nano materials –Properties of nanomaterials: Optical, Electrical, Thermal, Mechanical and Magnetic properties -Synthesis of nanomaterials: Top-down and bottom-up approach methods-Ball milling-chemical vapour deposition method-Applications of Nano materials.

## 4. Books and Materials

### Text Book(s):

**1.**P.K.Palaniswamy, "Engineering Physics" ScitechPublications,2011.

**2.**B.K.Pandey and S.Chaturvedi, "Engineering Physics",Cengage Learning, 2012.

**3.**K.Thyagarajan, "Applied Physics", Mc Graw Hill Education(India) Private Limited,2020.

### Reference Book(s):

**1.** Shatendra Sharma,Jyotsna Sharma, "Engineering Physics" Pearson Education,2018.

2. M.N. Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy "A Text book of Engineering Physics"-

S.Chand Publications,11th Edition 2019.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30503 – DATA STRUCTURES USING C

| 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 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

This course covers data structures and algorithms. Topics include space and time complexity, analysis, static data and dynamic data structures. The learner will enrich their logical abilities by handling data in organised way. The students can choose their career path as software engineers.

### Course Pre/Co-requisites

- C
- Mathematics

## 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30503.1 | Learn to choose appropriate data structure as applied to specified problem definition. |
| A30503.2 | Design and analyse linear and non-linear data structures. |
| A30503.3 | Design algorithms for manipulating linked lists, stacks, queues, trees and graphs. |
| A30503.4 | Demonstrate advantages and disadvantages of specific algorithms and data Structures. |
| A30503.5 | Develop programs for efficient data organisation with reduce time complexity. |
| A30503.6 | Evaluate algorithms and data structures in terms of time and memory complexity of basic operations. |

## 3. Course Syllabus

**Unit-1**
**Introduction to Problem Solving Using C**
**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-Operations
**Unit-2**
Solving Problems using arrays, Functions, Strings, Pointers.
**Linear Data Structures**
**Stacks**: Introduction-Definition-Representation of Stack-Operations on Stacks- Applications of Stacks.
**Unit-3**
**Queues**: Introduction, Definition- Representations of Queues- Various Queue Structures- Applications of Queues.

**Unit-4**
**Linked lists:**
Definition- Single linked list- Circular linked list- Double linked list- Circular Double linked list.
**Sorting**: Bubble Sort, Selection Sort, Insertion Sort, Shell Sort, Merge Sort, Quick Sort

**Unit**-5
**Search**: Sequential Search, Binary Search, Hashing, time complexity.
**Trees and Graphs:**
**Trees:** examples, Binary Trees, Tree Traversals, Binary Search Trees.
**Graph:** BFS and DFS.

## 4. Books and Materials

### Text Book(s)

1. C & Data Structures, by farouzan
2. Fundamentals of Data Structures in C – Horowitz, Sahni, Anderson- Freed, Universities Press, Second Edition.

### Reference Book(s)

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 Data Structures With Applications, TMH

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30001 – COMMUNICATIVE ENGLISH

| 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 | 40 | 60 | 100 |

## 1. Course Description

**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 Pre/Co-requisites:**

The course has no specific pre/co-requisites

## Course Out comes (COs)

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

A30001.1 Remember the concepts which the student has learnt previously and identifying their connection

A30001.2 Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English

A30001.3 Apply grammatical structures to formulate sentences and correct word forms

A30001.4 Analyze discourse markers to speak clearly on a specific topic in informal discussions

A30001.5 Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.

A30001.6 Create a coherent paragraph interpreting a figure/graph/chart/table.

## Course Syllabus

**UNIT – I**

**Listening:** Listening for comprehension.
**Speaking:** Introducing oneself and describing people, places and objects.
**Reading:** Skimming and scanning pieces of information.
**Writing:** Summary writing.
**Grammar and Vocabulary:** Sentences and Clauses. Preposition, Parts of speech. One word substitutes.
**Text**: On the Conduct of Life: William Hazlitt.
If: Rudyard Kipling

**UNIT –II**

**Listening:** Listening for purpose.
**Speaking:** Short structured talks on specific topics.
**Reading:** Identifyingand recognizing verbal techniques to link the ideas in a paragraph.
**Writing:** Mechanics of writing. (Punctuation)
**Grammar and Vocabulary:** Articles. Parts of speech. Synonyms.
**Text**: The Brook: Alfred Tennyson
Self-Improvement- How I Became a Public Speaker: George Bernard shaw

**UNIT –III**

**Listening:** Listening for global comprehension.
**Speaking:** Discussing and reporting on specific topics.
**Reading:** Reading for comprehension
**Writing:** Paragraph writing.
**Grammar and Vocabulary:** Noun-Pronoun Agreement. Subject-Verb Agreement. Antonyms.
**Text**: The Death Trap: Saki
Time Management: On Saving Time: Seneca

**UNIT –IV**

**Listening:** Predicting conversation/transactional dialogues
**Speaking:** Role Plays
**Reading:** Interpreting the graphic elements in the text.
**Writing:** Information Transfer. Letter writing (formal and Informal). Essay Writing
**Grammar and Vocabulary:** Misplaced Modifiers. Degrees of Comparisions.
**Text**: ChinduYellamma
Innovation: Muhammad Yunus

**UNIT – V**

**Listening:** Listening comprehension.
**Speaking:** Formal Oral Presentations.
**Reading:** Reading for comprehension
**Writing:** Summary writing. Technical Report writing.
**Grammar and Vocabulary:** Spotting the errors. Idioms and Phrases.
**Text**: Politics and the English Language: George Orwell
The Dancer with a White Parasol: Ranjana Dave

## 4. Books and Materials

**Text Book**:

*Language and Life:A Skills Approach,* Orient BlackSwan, Hyderabad. 2018.

**Reference Books:**

1.Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.

2.Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.

3.Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.

Hewings, Martin. *Cambridge Academic English (B2).* CUP, 2012.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30301-ENGINEERING GRAPHICS AND COMPUTER AIDED DRAFTING

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 1 | 0 | 4 | 14 | 0 | 56 | 3 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

This course teaches the practices for accuracy and clarity in presenting the technical information in the form of drawings and the utility of drafting &modelling packages in orthographic and isometric drawings. It enables the student to understand and develop engineering imagination essential for successful design and familiarize how industry communicates technical information.

### Course Pre/Co-requisites

The course has no specific prerequisite and co-requisites

## 2. Course Outcomes (COs)

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

A30301.1 Construct various curves like ellipse, parabola, hyperbola etc which are used in Engineering drawing.

A30301.2 Apply orthographic projection concepts to draw projections of points, lines, planes and solids.

A30301.3 Apply development concepts to draw development of surfaces of simple solids.

A30301.4 Apply isometric projection concepts to draw isometric projections of right regular solids

A30301.5 Apply orthographic projection concepts to convert isometric view to orthographic views.

A30301.6 Make use of AutoCAD Software to draw 2D diagrams of various objects

## 3. Course Syllabus

**PART -A**

**UNIT I**

**Introduction to Engineering Drawing:** Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions.

Curves used in Engineering Practice:

a) Conic Sections- Ellipse, Parabola & Hyperbola – General method only.

b) Rectangular Hyperbola – General method only.

c) Cycloid, Epicycloids and Hypocycloid

**UNIT II**

**Projections of Points**: Principles of Orthographic Projection, Conventions, First and Third Angle Projections, Projections of Points.

**UNIT III**

**Projections of Lines**: Projections of Lines in simple positions, inclined to one or both planes, Finding True lengths.

**Projections of Planes**: Projections of regular Plane surfaces in simple position, inclined to one plane.

**UNIT IV**

**Projections of Solids**: Projections of Regular Solids in simple position, axis inclined to one of the planes.

**Developments of Solids**: Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid and Cone.

**UNIT V**

**Isometric and Orthographic Projections**: Principles of Isometric Projection –Isometric Scale – Isometric Views– Isometric Views of Lines, Plane Figures, Simple Solids(Cube, Prism, Cone & Cylinder).Conversion of Isometric views to Orthographic Views.

**PART –B (PRACTICE ONLY)**

**Introduction to Computer Aided Drafting**:

Introduction to AutoCAD Software, setting of units and drawing limits, producing drawings by using Absolute, Relative and Polar coordinate input entry methods, drawing simple figures, applying dimensions to objects and Editing options

## 4. Books and Materials

**Text Book(s):**

K.L. Narayana and P. Kannaih, Engineering *Drawing*, Scitech Publications, 2nd edition, 2011.

**Reference Book(s)**

1. N.D. Bhatt*, Engineering Drawing,* Charotar Publishing House, 53rd Edition2016.
2. K. Venugopal, *Engineering Drawing and Graphics,* New age International Publishers, 5th edition, 2004.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30008 – APPLIED PHYSICS 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 | 40 | 60 | 100 |

## 1. Course Description

**Course Overview**

This course imparts practical and conceptual knowledge of Physics applicable to the domain of civil and mechanical engineering. The laboratory work of the course is aimed to ensure that the student comprehends the concepts of Physics through demonstrable and executable experiments. This course will enable the student to determine the thickness of paper, radius of curvature of plano-convex lens, wavelength of different colors of white light, dispersive power of grating, self -Inductance of the coil, numerical aperture and acceptance angle of an optical fiber, resistivity and energy gap of a semiconductor, study of magnetic field along the axis of a current carrying coil, diffraction of light through single slit and measurement of resistance by varying temperature.

**Course Pre/co-requisites:**

A30004- Applied Physics

## 2. Course Outcomes (COs)

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

A30008.1 Operate optical instruments like Travelling microscope and spectrometer

A30008.2 Understand the concepts of interference by finding thickness of paper, radius of curvature of Newton's rings

A30008.3 Interpret the concept of diffraction by the determination of wavelength of different colors of white light and dispersive power of grating

A30008.4 Plot the intensity of the magnetic field of circular coil carrying current with varying distance and B-H curve

A30008.5 Evaluate the acceptance angle of an optical fiber and numerical aperture

A30008.6 Determine the resistivity of the given semiconductor using four probe method, the band gap of a semiconductor

## 3. Course Syllabus

### (Any 12 of the following)

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. Magnetic field along the axis of a circular coil carrying current
7. Determine the self-inductance of the coil (L) using Anderson's bridge
8. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)

9. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
10. To determine the resistivity of semiconductor by Four probe method
11. To determine the energy gap of a semiconductor
12. Measurement of resistance with varying temperature
13. Determination of dielectric constant by charging and discharging method.
14. LASER: Determination of wavelength of laser source by using diffraction grating
15. LASER: Determination of Particle size (hair) by using laser source

## 4. Laboratory Equipment/Software/Tools Required

1. Spectrometer
2. Travelling Microscope
3. Stewart-Gee's Apparatus
4. Single slit
5. Anderson's Bridge
6. B-H Curve
7. Optical Fiber Kit
8. Four Probe kit
9. Energy gap kit
10. Thermistor

## 5. Books and Materials

**Text Book(s):**

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

**Reference Book(s)**

https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=802&cnt=1.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30504 – DATA STRUCTURES 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 | 40 | 60 | 100 |

## 1. Course Description

**Course Overview**

This Laboratory covers data structures and algorithms. Programs include static data and dynamic data structures along with analysis of time and space complexity. The learner will enrich their logical abilities by handling data in an organised way. The students can choose their career path as software engineers.

**Course Pre/Co-requisites**

A30503-Data Structures Using C

## 2. Course Outcomes (COs)

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

Learn to choose appropriate data structure as applied to specified problem definition.

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

| | |
|---|---|
| A30504.1 | Learn to choose appropriate data structure as applied to specified problem definition. |
| A30504.2 | Design and analyse linear and non-linear data structures. |
| A30504.3 | Design algorithms for manipulating linked lists, stacks, queues, trees and graphs. |
| A30504.4 | Demonstrate advantages and disadvantages of specific algorithms and data Structures. |
| A30504.5 | Develop programs for efficient data organisation with reduce time complexity. |
| A30504.6 | Evaluate algorithms and data structures in terms of time and memory complexity of basic operations. |

## 3. Course Syllabus

**PART A: Introduction**

| | |
|---|---|
| **Task – 1** | Write a program to sort the number of elements using sorting by exchange.<br>Write a program to sort the characters in a string using sorting by exchange. |
| **Task – 2** | Write a program to sort numbers using insertion sort.<br>Write a program to sort the elements of an array using Selection Sort. |
| **Task – 3** | Write a program to convert infix expression to postfix expression and evaluate postfix expression. |

**Linked List, Stack, Queue**

| | |
|---|---|
| **Task – 4** | Write a program to implement stack, queue, circular queue using arrays and linked lists on employee details. |
| **Task– 5** | Write a program to perform the operations creation, insertion, deletion, and traversing a singly linked list |
| **Task– 6** | Write a program to perform the operations creation, insertion, deletion, and traversing a Doubly linked list. |

| | |
|---|---|
| **Task– 7** | Write a program to remove duplicates from ordered and unordered arrays. |
| **Task– 8** | Write a program to implement quick sort using non-recursive and recursive approaches. |
| **Task– 9** | Write a program to perform operations creation, insertion, deletion and traversing on a binary search tree. |
| **Task– 10** | Write a program to implement depth first search and breadth first search on graphs. |

## 4. Laboratory Equipment/Software/Tools Required

C Compiler, GCC, Dev C++, Turbo C Editor

## 5. Books and Materials

**Text Book(s)**

1. Herbert Schildt. *The Complete Reference C*. Fourth Edition, Mc-GrawHillEduction, 2008.
2. DebasisSamanta. *Classic Data Structures*. Second Edition, PHI,2009.

**Reference Book(s)**

1. Horowitz, Sahni, Anderson Freed. Fundamentals of Data Structures in C.2nd Edition, Universities Press.
2. Ron S.Gottfried, Programming with C, 3rd Edition, TMH, 2011.
3. G A VijayalakshmiPai. *Data Structures and Algorithms*. TMH, 2008.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30006 – COMMUNICATIVE ENGLISH 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 | 40 | 60 | 100 |

### 1. Course Description

A well equipped and well maintained language lab is maintained in the college to hone the communication skills ofstudents. The students are trained in developing their communication skills through this system. The language lab lessions engaged in this college facilities classroom engagement and interaction via computer based exercises and activities to maximize language immersion. It focuses on acquiring and developing the four main language skills of a student, namely; listening, speaking, reading and writing along with adequate grammar and vocabulary building exercises as well.

**Course Objectives:**

1. Students will be exposed to a variety of self-instructional, learner friendly modes of language learning
2. Students will cultivate the habit of reading passages from the computer monitor.Thus Providing them with there quired facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc.
3. Students will learn better pronunciation through stress, intonation and rhythm
4. Students will be trained to use language effectively to face interviews, group discussions, Public speaking
5. Students will be initiated into greater use of the computer in resume preparation, Report writing, format making etc

**Course Pre/co requisites**

A30001-Communicative English

### 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30006.1 | Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills |
| A30006.2 | Apply communication skills through various language learning activities |
| A30006.3 | Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. |
| A30006.4 | Evaluate and exhibit acceptable etiquette essential in social and professional settings |
| A30006.5 | Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English. |
| A30006.6 | Improve upon speaking skills over telephone, role plays and public speaking |

## 3. Course Syllabus

**List of topics to be covered:**

1. Phonetics for listening comprehension of various accents
2. Reading comprehension
3. JAM
4. Small talks on general topics (Hypothetical situations)
5. Debates
6. Situational dialogues –Greeting and Introduction
7. Reading passages (TOEFL, IELTS)- Summarizing and Note making.
8. Vocabulary Building
9. Asking for Information and Giving Directions
10. Information Transfer
11. Non-verbal Communication –Dumb Charades
12. Oral Presentations
13. Précis Writing and Paraphrasing
14. Spotting errors
15. Describing objects/places/persons

## 4. Books and Materials

**Text Books:**


1. *Language and Life:A Skills Approach.* Orient BlackSwan: Hyderabad. 2018.
2. Rizvi, M. Ashraf. Effective Technical Communication. Noida: McGraw-Hill Education. 2009.


**Reference Books:**


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

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## A30031-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 the completion of the course, the student will be able to**

A30031.1- Solve environmental problems through higher level of personal involvement and interest.

A30031.2- Apply ecological morals to keep up amicable connection among nature and human beings.

A30031.3- Recognize the interconnectedness of human dependence on the earth's ecosystems.

A30031.4- Apply environmental laws for the protection of environment and wildlife.

A30031.5- Influence society in proper utilization of goods and services.

## 3. Course Syllabus

**Unit -1: 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 – 2: Ecosystems:** Ecosystem Definition. Structure of an ecosystem: Producers, Consumers and Decomposers. Function of ecosystems: Food chains, food webs and energy flow in an ecosystem. Ecological pyramids: Pyramid of number, Pyramid of biomass and Pyramid of energy.Introduction , types ,characteristic features ,structure and function of the following ecosystem.A)Forest ecosystem B) Dessert system C)Aquatic ecosystems(ponds,rivers,ocean,estuaries).

**Biodiversity and Its Conservation:** Introduction and definition. Levels of biodiversity,Bio geographical classification of India ,Values of biodiversity(Consumptive value, productive value ,Social ,ethical and

aesthetic value)Hot spots and Threats to biodiversity. In-situ and Ex-situ conservation of biodiversity.

**Unit -3: Environmental Pollution:** Definition, causes, effects and control measures of Air Pollution, Water pollution, Soil pollution,Nuclear hazards, Global warming, Acid rains and Ozone layer depletion. Role of an individual in prevention of pollution. Solid waste management and Disaster management:floods,earthquakes,cyclone and landslides.

**Unit -4: Social Issues and the Environment:** Concept of sustainable development: Sustainable development goals. Threats to sustainability: Population explosion, crazy consumerism. Water conservation, Rainwater harvesting and environmental ethics. Environment Protection Act(Air, water, soil and wild life protection act)-Public awareness.

**Unit -5: Human population and the Environment**: population growth,variation,value education-HIV/AIDS-women and child welfare-Role of IT in environment and human health.Fieldwork-visit to a local area to document environmental assets.

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

## 4. Books and Materials

**Text Books:**

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

**Reference Books:**

1. ErachBharucha, *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

## III - SEMESTER

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 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 |
| A30015 | Transform Techniques and Complex Variables | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30403 | Electronic Devices and Circuits | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30404 | Digital Logic Design | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30405 | Signals and Systems | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30211 | Network Analysis | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30406 | Electronic Devices and Circuits Laboratory | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30407 | Digital Logic Design Laboratory | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30408 | Basic Simulation Laboratory | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30409 | PCB Designing | SC | 1 | 0 | 2 | 2 | 40 | 60 | 100 |
| A30032 | Universal Human Values | MC | 2 | 0 | 0 | 0 | 100* | 0 | 100* |
| | TOTAL | | 18 | 0 | 11 | 21.5 | 360 | 540 | 900 |

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

### A30015 – 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 | 40 | 60 | 100 |

## 1. Course Description

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 and Fourier 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 derived from this course from a necessary base to analytical and design concepts encountered in the program.

**Course Pre/co requisites**

1. A30002- Mathematics-I
2. A30010- Mathematics-II

## 2. Course Outcomes (COs)

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

| | |
|---|---|
| 30015.1 | Apply Laplace transforms to solve ordinary differential equations. |
| 30015.2 | Build Fourier series and Fourier transforms of a given function. |
| 30015.3 | Test for analyticity of complex functions in the given domain |
| 30015.4 | Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper Integrals along contours |
| 30015.5 | Evaluate improper integrals of complex functions using Residue theorem |

## 3. Course Syllabus

**UNIT - I**

**Laplace transforms and Inverse 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**

**Functions of a Complex variable:** Functions of a complex variable,-Continuity-Differentiability Analyticity-Properties 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. E.Rukmanghadachari, E.Keshava Reddy, *Engineering Mathematics*, Pearson publications.
3. Dr.T.K.V.Iyengar, *Engineering Mathematics*, VOL-II, S.Chand & company Ltd.

### Reference Books:

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

## COURSE STRUCTURE
## A30403 – 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 | 40 | 60 | 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. A30401 – Fundamentals of Electronics Engineering
2. A30004 – Applied Physics

### 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30403.1 | Explain the construction, working principles and applications of various electronic devices. |
| A30403.2 | Analyze the characteristics of diodes and transistors. |
| A30403.3 | Design the DC bias circuitry of BJT and FET for various applications. |
| A30403.4 | 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.

**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 $\Pi$-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 at Low frequency: BJT –** Small Signal Analysis of BJT (CE, CB & CC) amplifiers using exact and approximate h-parameter model.

**FET –** Small Signal Analysis of FET (CS, CD) amplifiers.

## 4. Books and Materials

### Text Book(s)

1. T.Tirupal, B.Chandra Mohan, S.Srinivas Kumar, P.Bindu Swetha, *Electronic Devices and Circuits*, Mantech Publications, 1st Edition, 2021.
2. 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.

## COURSE STRUCTURE
## A30404 – 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 | 40 | 60 | 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. It starts with a discussion of number systems, Boolean algebra, logic gates, and minimization techniques. The second part of the course deals with combinational and sequential logic, wherein the procedures to analyze and design the same will be discussed. 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:**

A30404.1 Perform arithmetic operations on different number systems and to apply the principles of Boolean algebra to minimize logic expressions.

A30404.2 Make use of k-map and tabulation methods to minimize Boolean functions and to implement with logic gates.

A30404.3 Analyze basic components used in digital systems such as adder, subtractor, decoder, encoder, multiplexer, flip-flops, registers and counters.

A30404.4 Distinguish combinational and sequential logic in terms of their functions.

A30404.5 Design various PLDs such as ROMs, PALs, PLAs and PROMs.

## 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
2. Thomas L. Floyd 2006, *Digital fundamentals*, 9th edition, Pearson Education International, 2006

### 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.

## COURSE STRUCTURE
## A30405 – SIGNALS AND 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 | 40 | 60 | 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. A30002 – Mathematics – I
2. A30010 – Mathematics – II

### 2. Course Outcomes (COs)

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

| | |
|---|---|
| A3405.1 | Distinguish between different signals and systems. |
| A3405.2 | Make use of Fourier series for the representation of signals. |
| A3405.3 | Analyze different signals by using an appropriate transform. |
| A3405.4 | Examine the transmission characteristics of linear systems. |
| A3405.5 | 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, distortion less 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.

## COURSE STRUCTURE

## A30211 – NETWORK 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 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

The purpose of this course is to enable the student to acquire knowledge on D.C and A.C circuits. The objective of this course is to introduce the basic fundamentals of A.C and D.C circuits, network theorems, two-port networks and transient and steady state responses. This course also gives the knowledge to solve the complex circuits in A.C and D.C circuits. In addition, this course also focuses on the concepts of resonance magnetically coupled coils.

### Course Pre/corequisites

Nil

## 2. Course Outcomes (COs)

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

A30211.1 Understand the basic Fundamentals of A.C and D.C circuits and solve the basic various circuits by using mesh and node analysis.

A30211.2 Apply the theorems to solve A.C and D.C complex circuits to calculate the voltage, current and power.

A30211.3 Apply the fundamental knowledge of circuits to calculate the various parameters for A.C and D.C circuits.

A30211.4 Apply the basic fundamentals of Laplace transform to calculate the transient and steady state response of D.C and A.C circuits.

A30211.5 Apply the basic fundamentals of circuits to calculate resonance frequency, quality factor and also analyze the magnetic coupled circuits.

## 3. Course Syllabus

**UNIT - I**

**Elementary Concepts:** Concept of Potential difference, Current and resistance, Ohm's law, Kirchhoff's law, ideal and practical voltage and current sources. Source transformation, Star delta transformation**.** Mesh and Nodal analysis with independent and dependent sources. **Magnetically Coupled Circuits**: Mutual Inductance, Energy Considerations, The Linear Transformer, The Ideal Transformer.

**UNIT - II**

**Sinusoidal steady state analysis:** Characteristics of Sinusoids, Forced response of Sinusoidal Functions, The Complex forcing Function, The Phasor, Phasor relationships for R,L, and C, Impedance, Admittance. Instantaneous Power, Average Power, Effective Values of Current and Voltage, Apparent Power, Power Factor, Complex Power. Resonance: Series, Parallel Circuits, Concept of Bandwidth and Q Factor.

**UNIT - III**

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

**UNIT - IV**

**Two Port Networks:** Two Port Network Parameters: Impedance, Admittance, Transmission and Hybrid Parameters and their Relations. Concept of Transformed Network, Two Port Network Parameters Using Transformed Variables.

**UNIT - V**

**Transient Response Analysis D.C Transient Analysis:** Transient Response of R-L, R-C, R-L-C Series Circuits for D.C Excitation-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms, Response of R-L & R-C Networks to Pulse Excitation.

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

## 4. Books and Materials

**TEXT BOOKS:**

1. John Bird, Rovtledge, *Electrical Circuit Theory and Technology*, 4th Edition, T&F, 2011.
2. M.E Van Valkenberg, *Network Analysis*, 3rd Edition, PHI.

**REFERENCES:**

1. A. Chakrabarti, *Circuit Theory (Analysis & Synthesis)*, 6th Edition, Dhanpat Rai & Sons, 2008.
2. William Hayt and Jack E. Kemmerly, *Engineering Circuit Analysis*, Mc Graw Hill Company, 6th edition.
3. A. Sudhakar and Shyammohan S Palli, *Circuits & Networks*, Tata McGraw- Hill.

## COURSE STRUCTURE

## A30406 – 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 | 3 | 0 | 0 | 42 | 1.5 | 40 | 60 | 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. A30401 – Fundamentals of Electronics Engineering
2. A30004 – Applied Physics
3. A30402 – Fundamentals of Electronics Engineering Lab
4. A30008 – Applied Physics Lab

### 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30406.1 | Identify various electronic components and measuring equipment. |
| A30406.2 | Analyze the V-I characteristics of electronic devices. |
| A30406.3 | Measure the ripple content present in rectifiers with and without filters. |
| A30406.4 | Construct single stage amplifier circuits and plot transient and frequency response. |

### 3. Course Syllabus

1. P-N Junction Diode Characteristics
2. Zener Diode Characteristics
3. Zener Diode as a Voltage Regulator
4. Half-wave Rectifier without and with C-filter
5. Full-wave Rectifier without and with C-filter
6. V-I Characteristics of CE Configuration
7. V-I Characteristics of CB Configuration
8. FET Characteristics (CS Configuration)
9. Frequency Response of CE Amplifier
10. 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. T.Tirupal, B.Chandra Mohan, S.Srinivas Kumar, P.Bindu Swetha, *Electronic Devices and Circuits*, Mantech Publications, 1st Edition, 2021.
2. 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.

## COURSE STRUCTURE

## A30407 – 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 | 40 | 60 | 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**

A3404 – Digital Logic Design

### 2. Course Outcomes (COs)

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

A30407.1 Construct combinational and sequential circuits using LabVIEW Software.

A30407.2 Execute LabVIEW graphical programs for combinational and sequential circuits.

A30407.3 Analyze combinational and sequential circuits functioning using LabVIEW Software.

A30407.4 Test and Debug the combinational and sequential circuits using LabVIEW Software.

A30407.5 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 multiplexers.
6. Implementation and verification of half adder, full adder and parallel adder.
7. Design and verification of Flip-flops.
8. Implementation and verification of magnitude comparators.
9. Design and implementation of synchronous and ripple counters.
10. 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.
2. Thomas L. Floyd 2006, *Digital fundamentals*, 9th edition, Pearson Education International, 2006.

### Other References

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

## COURSE STRUCTURE

## A30408 – 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 | 40 | 60 | 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. A30405 – Signals and Systems

### 2. Course Outcomes (COs)

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

A30408.1 Develop programs to generate different signals.

A30408.2 Compile programs to perform different operations on signals and sequences.

A30408.3 Analyze different responses of the systems and spectrums of the signals.

A30408.4 Test the different properties of given signals and systems.

### 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. Find the z-transform of the given function.

### 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
## A30409 – PCB DESIGNING

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 1 | 0 | 2 | 14 | 0 | 28 | 2 | 40 | 60 | 100 |

## 1. Course Description

**Course Overview:**

This is a basic course for designing of PCB using software. PCB (Printed Circuit Board) designing is an integral part of each electronics products and this program is designed to make students capable to design their own projects PCB up to industrial grade.

**Course Pre/Co-requisites:**

The course has no specific pre/co-requisites

## 2. Course Outcomes (COs)

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

A30409.1 Understand the significance of printed circuit board design
A30409.2 Analyze various PCB components and their categories
A30409.3 Understand the concept of development tools like OrCAD and PROTEUS
A30409.4 Develop academic and industrial based projects using OrCAD and PROTEUS.

## 3. Course Syllabus

**UNIT - I**
**Introduction to PCB designing concepts:** Introduction & Brief History, Electronic design Automation (EDA), SPICE and PSPICE Environment, Working of PROTEUS.

**UNIT - II**
**Component introduction and their Packages:** Types of Components, Active Components, Passive Components, Component Package Types, Through Hole Packages.

**UNIT - III**
**Introduction to Development Tools:** Introduction to PCB Design using OrCAD tool, Introduction to PCB Design using PROTEUS tool.

**UNIT - IV**
**Detailed description and practical of PCB designing:** PCB Designing Flow Chart, Prototype Designing, PCB Making, PCB Layers. Keywords & Their Description, PCB Materials, Rules for Track, Study of IPC Standards.

**UNIT - V**
**Lab practice and designing concepts:** Starting the PCB designing, Auto routing, PCB Designing Practice, Post Designing & PCB Fabrication Process.
**Project work:** Soldering and De-soldering of components as per Design, Testing and Troubleshooting Methods.

## 4. Books and Materials

**Text Book**:

1. Michael Dsouza and Dsouza Michael, *PCB Design: Printed Circuit Board*, Kindle edition.
2. Kraig Mitzner, *Complete PCB Design Using OrCAD Capture and PCB Editor,* 1st edition, kindle.
3. Dr. R. S Khandpur, Printed Circuit Boards.

**Reference Books:**

1. Simon Monk, Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards (Electronics).
2. James Drewniak and Bruce R Archambeault, PCB Design for Real-World EMI Control.

## COURSE STRUCTURE
## A30032 – UNIVERSAL HUMAN VALUES

| 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* | --- | 100* |

### 1. Course Description

**Course Overview:**

This course is aimed at giving inputs that will help to ensure the right understanding and right feelings in the students in their life and profession, enabling them to lead an ethical life. In this course, the students learn the process of self-exploration, the difference between the Self and the Body, the naturally acceptable feelings in relationships in a family, the comprehensive human goal in the society, the mutual fulfillment in the nature and the co-existence in existence. As a natural outcome of such inputs, they are able to evaluate an ethical life and profession ahead.

**Course Pre/Co-requisites:**

The course has no specific pre/co-requisites

### 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30032.1 | Understand the significance of value inputs in a classroom and start applying them in their life and profession |
| A30032.2 | Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc. |
| A30032.3 | Understand the value of harmonious relationship based on trust and respect in their life and profession |
| A30032.4 | Understand the role of a human being in ensuring harmony in society and nature. |
| A30032.5 | Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work. |
| A30032.6 | Analyze the value of maintaining ethical values in critical situations |

### 3. Course Syllabus

**UNIT - I**

**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

1. Understanding the need, basic guidelines, content and process for Value Education.
2. Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration.
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations.
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario.
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

**UNIT - II**

**Understanding Harmony in the Human Being - Harmony in Myself**

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I'.
Understanding the harmony of I with the Body: Sanyam and Swasthya; correctappraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

**UNIT - III**
**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**
Understanding harmony in the Family- the basic unit of human interaction, Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship, Understanding the meaning of *Vishwas*; Difference between intention and competence, Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha* )- from family to world family!

**UNIT - IV**
**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**
Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

**UNIT - V**
**Implications of the above Holistic Understanding of Harmony on Professional Ethics**
Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics:
a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models
Case studies of typical holistic technologies, management models and production, systems, Strategy for transition from the present state to Universal Human Order:
a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers.
b) At the level of society: as mutually enriching institutions and organizations.

## 4. Books and Materials

**Text Book**:

1. R R Gaur, R Sangal, G P Bagaria, 2009, *A Foundation Course in Human Values and Professional Ethics*.

**Reference Books:**

1. A Nagraj, *Jeevan Vidya Ek Parichay*, Divya Path Sansthan, Amarkantak, 1998.
2. P L Dhar, RR Gaur, *Science and Humanism*, Commonwealth Publishers, 1990.
3. A N Tripathy, *Human Values*, New Age International Publishers, 2003.
4. SubhasPalekar, *How to practice Natural Farming*, Pracheen (Vaidik) KrishiTantraShodh, Amravati, 2000.
5. B P Banerjee, *Foundations of Ethics and Management*, Excel Books, 2005.

# COURSE STRUCTURE

## IV - SEMESTER

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 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 |
| A30412 | Analog Communication Systems | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30017 | Probability Theory and Stochastic Processes | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30413 | Electronic Circuit Analysis | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30414 | Electromagnetics and Transmission Lines | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30019 | Managerial Economics and Financial Analysis | HS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30415 | Analog Communication Systems Laboratory | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30416 | Electronic Circuit Analysis Laboratory | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30417 | Internet of Things Laboratory | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30418 | Web Development | SC | 1 | 0 | 2 | 2 | 40 | 60 | 100 |
| TOTAL | | | 16 | 00 | 11 | 21.5 | 360 | 540 | 900 |
| Internship 2 Months (Mandatory) during summer vacation | | | | | | | | | |

## COURSE STRUCTURE
## A30412 – 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 | 40 | 60 | 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**

A30405 - Signals and Systems

### 2. Course Outcomes (COs)

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

A30412.1 Explain the operation of different analog communication systems.

A30412.2 Analyze the performance of different modulation schemes used in analog communication systems.

A30412.3 Make use of sampling theorem to generate pulse modulation signals.

A30412.4 Analyze the performance of AM, FM and PM receivers in the presence of noise.

A30412.5 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, power calculations, generation and demodulation of AM signals. Generation and demodulation of DSBSC, SSBSC and VSBSC signals.

**UNIT - II**

**Angle Modulation:** Generation and demodulation of Frequency Modulation (FM) and Phase modulation (PM) signals. 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, 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.

## COURSE STRUCTURE
## A30017 – 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 | 40 | 60 | 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. A30002 Mathematics -I
2. A30010 Mathematics –II
3. A30015 Transform Techniques and Complex Variables

### 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30017.1 | Apply different probability techniques to observe the different events. |
| A30017.2 | Determine the characteristics of random variables and random processes. |
| A30017.3 | Classify the random processes by using different techniques. |
| A30017.4 | Analyze the temporal and spectral characteristics of stochastic processes. |
| A30017.5 | 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.

## COURSE STRUCTURE

## A30413 – 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 | 40 | 60 | 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**

A3403 – Electronic Devices and Circuits

### 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30413.1 | Analyze the small signal models of BJT amplifiers at high frequencies. |
| A30413.2 | Analyze the frequency response of single and multi-stage amplifiers with compound connections. |
| A30413.3 | Classify amplifiers based on feedback mechanism. |
| A30413.4 | Evaluate the efficiency of large signal amplifiers. |
| A30413.5 | 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 hybrid-π parameters.

**FET –** Analysis of FET (CS, CD) amplifiers at high frequency.

**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.

## COURSE STRUCTURE
## A30414 – 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 | 40 | 60 | 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**

A30002 - Mathematics-I
A30010 - Mathematics-II

### 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30414.1 | Apply various laws of electrostatics and magnetostatics to deduce Maxwell's equations in static and time variants fields. |
| A30414.2 | Develop boundary conditions for different combinations of media. |
| A30414.3 | Make use of Maxwell's equations to deduce EM wave equations. |
| A30414.4 | Develop expressions for primary and secondary parameters of transmission line using conventional and graphical methods. |
| A30414.5 | 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.

## COURSE STRUCTURE

## A30019 – 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 | 40 | 60 | 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:**

A30019.1 Analyze the concepts of managerial economics and financial accounting to make better decisions in the organization

A30019.2 Analyze the demand, production, cost and break even to know interrelationship among variables and their impact

A30019.3 Classify the market structure to decide the fixation of suitable price

A30019.4 Apply capital budgeting techniques to select best investment opportunity

A30019.5 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.

## COURSE STRUCTURE

## A30415 – 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 | 40 | 60 | 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**

A30412 - Analog Communication Systems

### 2. Course Outcomes (COs)

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

A30415.1 Analyze the performance of different continuous modulation and demodulation schemes.

A30415.2 Sketch the characteristics of mixer, pre-emphasis and de-emphasis.

A30415.3 Compute the specifications of a phase locked loop.

A30415.4 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.

## COURSE STRUCTURE

## A30416 – 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 | 40 | 60 | 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. A30406 – Electronic Devices and Circuits Laboratory
2. A30413 – Electronic Circuit Analysis

### 2. Course Outcomes (COs)

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

A30416.1 Design single and multistage amplifiers at low, mid and high frequencies.
A30416.2 Determine the gain of feedback amplifiers and efficiency of power amplifiers.
A30416.3 Design oscillator circuits for given frequency of oscillation.
A30416.4 Compare the frequency response of tuned amplifiers.
A30416.5 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.
3. T.Tirupal, B.Chandra Mohan, S.Srinivas Kumar, P.Bindu Swetha, *Electronic Devices and Circuits*, Mantech Publications, 1st Edition, 2021.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30417 – 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 | 40 | 60 | 100 |

## 1. Course Description

**Course Overview**

This laboratory course provides the students with the knowledge of embedded C and arduino uno programming – blink led, push button, potentiometer, fade led, ldr, serial interface, lcd, dht sensor using arduino ide. It also provides the knowledge of nodemcu programming –blink led, push button, dht sensor, ir sensor, mqtt. This laboratory course helps to the students to use these experiments in IoT based projects.

**There are no Prerequisites for this course**

## 2. Course Outcomes (COs)

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

A30417.1 Develop embedded C Programs using arduino uno and ide.

A30417.2 Execute arduino C programs for blink led, push button, potentiometer, fade led, ldr, serial interface, lcd, dht sensor.

A30417.3 Build Programs of nodemcu using embedded C.

A30417.4 Interface LEDs, Push Buttons, dht sensor, ir sensor, mqtt broker to nodemcu.

A30417.5 Test and Debug arduino uno and nodemcu embedded C Programs.

## 3. Course Syllabus

**PART A: List of Embedded C Programs using Arduino UNO**

1. Introduction to Arduino UNO, IDE and different types of Arduino.
2. Program to blink an inbuilt and external LED.
3. Program to turn on and off an LED using push button.
4. Program to control LED blinks frequency using potentiometer.
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 Embedded C Programs using Node MCU**

1. Introduction to Node MCU.
2. Program to turn on and off an LED using push button.
3. Program to control an inbuilt and external LED using MQTT
4. Program to get the status of push button into system/smart phone using MQTT
5. Program to get the DHT sensor data into system/smart phone using MQTT
6. Program to get the IR sensor data into system/smart phone using MQTT

## 4. Laboratory Equipment/Software/Tools Required

1. Computers installed with operating systems
2. Arduino UNO Board
3. Arduino IDE Software
4. Node MCU
5. Breadboard
6. LED, Push Button, Potentiometer, Resistors
7. DHT Sensor, IR Sensor, LDR, LCD Board with LCD
8. Jumper wires

## 5. Books and Materials

### Reference Books

1. Jeeva Jose. *Internet of Things,* 1st edition, Khanna Book Publishing, 2019.
2. Manoj R. Thakur. *NodeMCU ESP8266 Communication Methods and Protocols: Programming with Arduino IDE,* Kindle Edition, Amazon, 2019

### Other References

1. https://www.tutorialspoint.com/arduino/arduino_tutorial.pdf
2. https://www.raspberrypi.org/documentation/usage/gpio/
3. https://en.wikipedia.org/wiki/NodeMCU

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30418 – WEB DEVELOPMENT

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 1 | 0 | 2 | 14 | 0 | 28 | 2 | 40 | 60 | 100 |

## 1. Course Description

**Course Overview**

This course introduces various intermediate and advanced web development practices for the student to become an expert in all the aspects of web development. In this course the student will be able to learn Frontend technologies like HTML, CSS and JavaScript whereas Backend – technology Node.js and finally Database – MongoDB.

**No Pre/corequisites for this course**

## 2. Course Outcomes (COs)

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

A30418.1 Develop front end of an application using HTML, CSS and JavaScript along with ReactJs.

A30418.2 Develop back end of an application using NodeJs.

A30418.3 Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone.

A30418.4 Develop a website and deploy on a web server.

A30418.5 Authenticate, store, and structure user data.

## 3. Course Syllabus

**UNIT - I**

**HTML:** Introduction to HTML, Browsers and HTML, Editor's Offline and Online, Tags, Attribute and Elements, Doctype ElementS, Comments, Headings, Paragraphs and Formatting Text, Lists and Links, Images and Tables.

**UNIT - II**

**CSS:** Introduction CSS, Applying CSS to HTML, Selectors, Properties and Values, CSS Colors and Backgrounds, CSS Box Model, CSS Margins, Padding, and Borders, CSS Text and Font Properties, CSS General Topics.

**UNIT - III**

**JavaScript :** Introduction to JavaScript, Applying JavaScript (internal and external), Understanding JS Syntax, Introduction to Document and Window Object, Variables and Operators, Data Types and Num Type Conversion, Math and String Manipulation, Objects and Arrays, Date and Time, Conditional Statements, Switch Case , Looping in JS, Functions.

**UNIT - IV**

**NodeJs:** Node js Overview, Node js - Basics and Setup, Node js Console, Node js Command Utilities Node js Modules, Node js Concepts, Node js Events, Node js with Express js, Node js Database Access.

**UNIT - V**

**MongoDB:** SQL and NoSql Concepts, Create and Manage MongoDB, Migration of Data into MongoDB, MongoDB with PHP, MongoDB with NodeJS, Services Offered by MongoDB.

## 4. Books and Materials

**Text Book(s)**

1. Edwin Ross Torres , "Full Stack Web Development: Round One - Begin", Independently published, 2020.

**Reference Book(s)**

1. Frank Zammetti,"Modern Full-*Stack Development: Using TypeScript, React, Node.js, Webpack and Docker"*, Apress; 1st ed. Edition, 2020.
2. Chris Northwood , "The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer", Apress; 1st ed. Edition, 2018.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## V - SEMESTER

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 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 |
| A30425 | Antennas & Wave Propagation | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30426 | Digital Communication Systems | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30427 | Linear Integrated Circuit Applications | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **Professional Elective-1** | | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30475 | Fiber Optic Communication Technology | | | | | | | | |
| A30476 | Fundamentals of Micro & Nano Fabrication | | | | | | | | |
| A30474 | Introduction to Internet of Things | | | | | | | | |
| A30451 | Optical Communications | | | | | | | | |
| A30452 | Nano Technology | | | | | | | | |
| A30453 | System Design Through Verilog | | | | | | | | |
| A30458 | Computer Architecture & Organization | | | | | | | | |
| **Open Elective-1** | | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30589 | Social Network Analysis | | | | | | | | |
| A30284 | Control Systems Engineering | | | | | | | | |
| A30428 | Digital Communication Systems Lab | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30429 | Linear Integrated Circuit Applications Lab | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30430 | Python Full Stack | SC | 1 | 0 | 2 | 2 | 40 | 60 | 100 |
| A30033 | Indian Constitution | MC | 2 | 0 | 0 | 0 | 100* | 0 | 100* |
| A30431 | **Internship 2 Months (Mandatory) during summer vacation (to be evaluated during V Semester)** | PW | 0 | 0 | 0 | 1.5 | 100 | 0 | 100 |
| A30437 | **Community Service Project** | PW | | | | | | | |
| TOTAL | | | 18 | 00 | 08 | 21.5 | 420 | 480 | 900 |

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

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

**COURSE STRUCTURE**

**A30425 – 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 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

Antenna is a key element in establishment of an 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/corequisites

A30414-Electromagnetics and Transmission Lines

## 2. Course Outcomes (COs)

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

A30425.1: Compare the performance of different antennas using antenna parameters
A30425.2: Analyze dipole and array antennas by computing fields, radiated power and radiation resistance.
A30425.3: Select appropriate antenna for a specific application like TV, AM/FM radio, radar, satellite link.
A30425.4: Design horn, helical and reflector antennas for VHF, UHF and microwave communication applications
A30425.5: 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 monoflair 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, endfire arrays, bionomial 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.

### Reference Online Resources/Materials:

1. https://onlinecourses.nptel.ac.in/noc20_ee20/preview
2. https://www.virtulearn.in/course/antenna-and-wave-propagation-online-classes
3. https://ocw.mit.edu/courses/6-661-receivers-antennas-and-signals-spring-2003/pages/lecture-notes/

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30426-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 | 40 | 60 | 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

1. A30412 - Analog Communication Systems

## 2. Course Outcomes (COs)

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

A30426.1 Analyze different digital modulation techniques to convert analog signals to digital form.

A30426.2 Distinguish between baseband and passband transmission techniques in terms of SNR and BER.

A30426.3 Examine the concepts of geometric representation of signals and constellation diagrams.

A30426.4 Compare digital carrier modulation schemes in terms of bandwidth, complexity and spectral efficiency.

A30426.5 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.

### Reference Online Resources/Materials:

1. https://www.udemy.com/course/digital_communications/
2. https://onlinecourses.nptel.ac.in/noc20_ee17/preview
3. https://ocw.mit.edu/courses/6-450-principles-of-digital-communications-i-fall-2006/

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

**COURSE STRUCTURE**

**A30427 – 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 | 40 | 60 | 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. A30401 – Fundamentals of Electronics Engineering
2. A30403 – Electronic Devices and Circuits
3. A30413 – Electronic Circuit Analysis

## 2. Course Outcomes (COs)

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

A30427.1 Analyze the characteristics of operational amplifier.

A30427.2 Design different amplifier and oscillator circuits using op-amp.

A30427.3 Make use of IC 555 and PLL effectively in communication systems.

A30427.4 Construct different active filters using op-amp.

A30427.5 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, 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, 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.

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

## 4. Books and Materials

### Text Books:

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

### Reference Books:

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.

### Reference Online Resources/Materials:

1. https://www.allaboutcircuits.com/
2. https://www.electronics-tutorials.ws/
3. https://learnabout-electronics.org/

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30428 – 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 | 40 | 60 | 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

1. A30426 - Digital Communication Systems

## 2. Course Outcomes (COs)

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

A30428. 1 Demonstrate the working of various digital modulation and demodulation schemes.

A30428.2 Design various digital modulation schemes to obtain desired modulation index.

A30428.3 Analyze the performance of time division multiplexing and demultiplexing.

A30428.4 Study and verify sampling theorem.

A30428.5 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

## A30429 – 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 | 40 | 60 | 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. A30402 – Electronic Devices and Circuits Laboratory
2. A30416 – Electronic Circuit Analysis Laboratory
3. A30427 – Linear Integrated Circuit Applications

## 2. Course Outcomes (COs)

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

A30429.1 Implement different configurations of operational amplifiers.

A30429.2 Generate various shapes of signals using op-amps and timers.

A30429.3 Construct and analyze various active filters and data converters using op-amp.

A30429.4 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 Books:**

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

**Reference Books:**

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.

**Reference Online Resources/Materials:**

1. https://www.allaboutcircuits.com/
2. https://www.electronics-tutorials.ws/
3. https://learnabout-electronics.org/

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

**COURSE STRUCTURE**

**A30430 – PYTHON FULL STACK**

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 1 | 0 | 2 | 14 | 0 | 28 | 2 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

This course introduces various intermediate and advanced web development practices for the student to become an expert in all the aspects of web development. In this course the student will be able to learn Frontend technologies like HTML, CSS and JavaScript whereas Backend – technology Node.js and finally Database – MongoDB.

### Course Pre/corequisites

No Pre/corequisites for this course

## 2. Course Outcomes (COs)

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

A30430.1 Develop front end of an application using HTML, CSS and JavaScript along with ReactJs.

A30430.2 Develop back end of an application using NodeJs.

A30430.3 Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone.

A30430.4 Develop a website and deploy on a web server.

A30430.5 Authenticate, store, and structure user data.

## 3. Course Syllabus

UNIT - I

BOOTSTRAP: Introduction to Bootstrap, Bootstrap Setup, Bootstrap Containers, Bootstrap Grids, Bootstrap Tables, Bootstrap Buttons, Navbars, Alerts, Bootstrap Carousel, Bootstrap Forms.

UNIT – II

ANGULARJS: Introduction to Angular, Environment Setup, Installing Angular CLI, Directory Structure of Angular , Angular Fundamentals, Angular Building Blocks , Angular Data Binding String Interpolation, Directives and Pipes, Forms , Approaches (Driven & Reactive), Validators Routing.

UNIT – III

Numpy: Introduction to numpy, Creating arrays, Indexing Arrays , Array Transposition, Universal Array Function , Array Processing, Array Input and Output , Matplotlib: Data Visualization , Python for Data Visualization, Welcome to the Data Visualization Section Matplotlib, Pandas.

UNIT - IV

DJango web framework in python: Django overview, Creating a project , Apps life cycle , Admin interface, Creating views, URL Mapping , Template system, Models, Form details, Testing, Page redirection, Sending Emails, Deploying Django framework, Form processing, File uploading , Cookie handling , Sessions, caching and comments , RSS,AJAX ,Sending Emails , GitHub.

UNIT - V

Database: Database handling with mysql , python mysql database access , create database connection, dml and ddl operations with databases , performing transactions , handling database errors, disconnecting database, database handling with mongodb.

## 4. Books and Materials

**Text Book(s)**

1. Edwin Ross Torres, “Full Stack Web Development: Round One - Begin”, Independently published, 2020.

**Reference Book(s)**

1. Frank Zammetti, “Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack and Docker”, Apress; 1st ed. Edition, 2020.
2. Chris Northwood, “The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer”, Apress; 1st ed. Edition, 2018

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE
## A30033 – 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:**

A30033.1 Understand historical background of the constitution making and its importance for building a democratic India.

A30033.2 Explain the role of President and Prime Minister.

A30033.3 Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

A30033.4 Understand the value of the fundamental rights and duties for becoming good citizen of India

A30033.5 Analyze the decentralization of power between central, state and local self-government.

A30033.6 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*, 4$^{th}$ edition in 3 volumes (Universal Law Publication)

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## VI - SEMESTER

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

| VI SEMESTER (III YEAR) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | Title of the Course | Category | Periods per Week | | | Credits | Scheme of Examination Maximum Marks | | |
| | | | L | T | P | C | Internal | External | Total |
| A30432 | Digital Signal Processing | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30433 | Microprocessors & Microcontrollers | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30434 | CMOS VLSI Design | PC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | **Professional Elective-2** | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30454 | Microwave Engineering | | | | | | | | |
| A30455 | Biomedical Signal Processing | | | | | | | | |
| A30456 | FPGA Design | | | | | | | | |
| | **Open Elective-2** | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30588 | Introduction to Java Programming | | | | | | | | |
| A30435 | Digital Signal Processing Lab | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30436 | Microprocessors & Microcontrollers Lab | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30510 | Object Oriented Programming Through Java Lab | PC | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| A30524 | R Programming | SC | 1 | 0 | 2 | 2 | 40 | 60 | 100 |
| A30034 | Gender Sensitization | MC | 2 | 0 | 0 | 0 | 100* | 0 | 100* |
| TOTAL | | | 18 | 00 | 11 | 21.5 | 360 | 540 | 900 |
| **Industrial/Research Internship (Mandatory) 2 Months during summer vacation** | | | | | | | | | |

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

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE
## A30432 – 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 | 40 | 60 | 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

A30405 – Signals and Systems

## 2. Course Outcomes (COs)

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

A30432.1 Apply the Discrete Fourier Transform to represent the signals in frequency domain.

A30432.2 Analyze various DFT algorithms and their applications.

A30432.3 Analyze various realization forms of FIR and IIR Filters.

A30432.4 Design digital FIR and IIR filters and analyze their performances.

A30432.5 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.

### 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
## A30433 – MICROPROCESSORS & 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 | 40 | 60 | 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

A30402 - Digital Logic Design

## 2. Course Outcomes (COs)

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

A30433.1 Analyze 8086 microprocessor and MSP430 microcontroller architectures.

A30433.2 Develop programs using 8086 microprocessor and MSP430 microcontroller.

A30433.3 Make use of peripherals of MSP430 to interface I/O devices.

A30433.4 Apply serial communication protocols for interfacing serial devices.

A30433.5 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-bytearithmetic, 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*, 1stedition, 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**

**A30434 – 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 | 40 | 60 | 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/corequisites

1. A30404 – Digital Logic Design
2. A30403 – Electronic Device Circuits

## 2. Course Outcomes (COs)

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

1. A30434.1 Analyze the electrical properties of MOS transistors
2. A30434.2 Apply various CMOS processing techniques to fabricate NMOS, PMOS and CMOS devices
3. A30434.3 Analyze the DC and transient characteristics of CMOS logic gates
4. A30434.4 Build logic circuits using transmission gate logic
5. A30434.5 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.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30435 – 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 | 3 | 0 | 0 | 42 | 1.5 | 40 | 60 | 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

A30405 – Signals and Systems
A30432 – Digital Signal Processing

## 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30435.1 | Evaluate the DFT and IDFT of given signals using MATLAB. |
| A30435.2 | Analyze various DFT algorithms and their applications. |
| A30435.3 | Design IIR and FIR digital filters for the given specifications using MATLAB. |
| A30435.4 | Apply the concepts of multirate signal processing using MATLAB. |
| A30435.5 | 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

**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 Books:

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

### Reference Books:

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.

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.

### 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

### A30436 – 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 | 40 | 60 | 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 onMSP430 microcontroller.

**Course Pre/corequisites**

1. A30402 – Digital Logic Design
2. A30433 – Microprocessors and Microcontrollers

## 2. Course Outcomes (COs)

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

A30436.1 Develop assembly language programs using EMU8086 emulator.

A30436.2 Execute 8086 ALPs for arithmetic, logical, string, call operations.

A30436.3 Build programs of MSP430 using embedded C.

A30436.4 Interface LEDs, push buttons, potentiometer to MSP430.

A30436.5 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

### 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 Online Resources/Materials:

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

## A30510 – 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 | 40 | 60 | 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. A30507 - Object Oriented Programming Through Java

## 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30510.1 | Design solutions for the problems of general purpose applications using object oriented concepts. |
| A30510.2 | Generate reusable code using inheritance, user defined packages and interface |
| A30510.3 | Write robust and efficient code using exception handling and multithreading concepts |
| A30510.4 | Implement collection frameworks and file handling techniques to store and retrieve data |
| A30510.5 | 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.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE
## A30524 – R PROGRAMMING

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 1 | 0 | 2 | 14 | 0 | 28 | 2 | 40 | 60 | 100 |

## 1. Course Description

**Course Overview**

The aim of this course is to learn how to program in R and how to use R for effective data analysis. The course covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, profiling R code, and organizing and commenting R code. Topics in statistical data analysis will provide working examples.

**Course Pre/co requisites**

## 2. Course Outcomes (COs)

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

A30524.1 Understand and apply the basics in R programming in terms of constructs, control statements, string functions
A30524.2 Apply the functions on matrix rows and columns and list operators
A30524.3 Work on Data frames and tabular type of DATA
A30524.4 Understand and write reliable code using OOP concepts in R
A30524.5 Understand and apply R Interfaces for Other languages

## 3. Course Syllabus

**Unit 1 : Introduction :** Introducing to R – R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all and any – Vectorized operations – NA and NULL values – Filtering – Vectorised if-then else .

**Unit 2 : Matrices, Arrays And Lists :** Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction– Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – recursive lists

**Unit 3: Data Frames:** Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames – Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Control statements – Arithmetic and Boolean operators and values - Returning Boolean values – functions are objects –Recursion.

**Unit 4 : OOP :** S3 Classes – S4 Classes – Managing your objects – Input/Output – accessing keyboard and monitor – reading and writing files – accessing the internet – String Manipulation - Use of String Utilities in the edtdbg Debugging Tool.

**Unit 5 : Graphics & Interfacing :** Graphics – Creating Graphs – Customizing Graphs – Saving graphs to files – Creating three-dimensional plots - Interfacing R to other languages –Writing C/C++ Functions to Be Called from R - Using R from Python.

## 4. Books and Materials

### Text Book(s)

1. Norman Matloff “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, 2011

### Reference Book(s)

1. Mark Gardener, “Beginning R – The Statistical Programming Language”, Wiley, 2013

2. Robert Knell, “Introductory R: A Beginner's Guide to Data Visualization, Statistical Analysis and Programming in R”, Amazon Digital South Asia Services Inc, 2013.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE
## A30034 – 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:**

A30034.1 Develop a better understanding of important issues related to gender in contemporary India

A30034.2 Sensitize to basic dimensions of the biological, sociological, psychological and legal aspects of gender

A30034.3 Acquire insight into the gendered division of labour and its relation to politics and economics

A30034.4 Equip to work and live together as equals

A30034.5 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.

# COURSE STRUCTURE

## VII & VIII - SEMESTER

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 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 |
| **Professional Elective-3** | | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30459 | Cellular & Mobile Communications | | | | | | | | |
| A30460 | Advanced Signal Processing | | | | | | | | |
| A30461 | Low Power VLSI Design | | | | | | | | |
| A30462 | Embedded System Design | | | | | | | | |
| A30468 | Digital Image Processing | | | | | | | | |
| A33148 | Introduction To Industry 4.0 & Industrial Internet Of Things | | | | | | | | |
| A30477 | Principles & Techniques Of Modern Radar Systems | | | | | | | | |
| **Professional Elective-4** | | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30463 | Global Navigation Satellite System | | | | | | | | |
| A30464 | Speech Processing | | | | | | | | |
| A30465 | System Verilog & Verification | | | | | | | | |
| A30466 | Real Time Operating Systems | | | | | | | | |
| A30491 | Digital VLSI Testing | | | | | | | | |
| A30479 | Real Time Digital Signal Processing | | | | | | | | |
| A30480 | Simulation Of Communication System Using MATLAB | | | | | | | | |
| **Professional Elective-5** | | PE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30470 | Photonics Engineering | | | | | | | | |
| A30469 | Analog VLSI Design | | | | | | | | |
| A30457 | Electrical Measurement And Electronics Instruments | | | | | | | | |
| A30467 | Modern Digital Communication Techniques | | | | | | | | |
| **Open Elective-3** | | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30579 | The Joy Of Computing Using Python | | | | | | | | |
| A30588 | Introduction to Java Programming | | | | | | | | |
| **Open Elective-4** | | OE | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30094 | Entrepreneurship | | | | | | | | |
| A30583 | Basics of Software Engineering | | | | | | | | |
| A30022 | Professional Ethics | HS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| A30438 | VLSI & Embedded Systems Programming | SC | 1 | 0 | 2 | 2 | 40 | 60 | 100 |
| A30439 | **Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester** | PW | 0 | 0 | 0 | 3 | 100 | 0 | 100 |
| TOTAL | | | 19 | 00 | 2 | 23 | 380 | 420 | 800 |
| **Industrial/Research Internship (Mandatory) 2 Months during summer vacation** | | | | | | | | | |

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

| 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 |
| A30440 | Project (Major Project) Project work, seminar and internship in industry (Internship along with Project Work) | PW | 0 | 0 | 0 | 12 | 60 | 140 | 200 |
| Internship (6 Months) | | | | | | | | | |
| | TOTAL | | 0 | 0 | 0 | 12 | 60 | 140 | 200 |

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL `

## COURSE STRUCTURE

## A 30022 - PROFESSIONAL ETHICS

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 3 | 0 | 0 | 48 | 0 | 0 | 3 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

Ethical and professional values course provides a framework and a moral compass for students and help guide their professional behaviors. This course broadens ethical and professional values which underpin professional skills and behaviors. The students work efficiently by prioritizing, organizing and managing their time effectively. They make the best use of technology, including spreadsheets and data analytics, to find effective solutions to various issues by considering the importance of maintaining professional competence and pursuing life-long learning. This course also introduces them to communicate effectively in academics and in profession. The students become aware of the working structure of the society by identifying opportunities, problems and observe trends and make suitable recommendations based on them. The students explore different types of leadership approaches and qualities of effective leaders which can be adopted or adapted at any level. This course provides the students with those skills that encourage them to become open-minded and involve in innovative thinking.

### Course Pre/co requisites

A30035 – Universal Human Values- understanding harmony

## 2. Course Outcomes (COs)

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

A30022.1 to identify ethical dilemmas and take ethical decisions.

A30022.2 to consider the importance of maintaining professional competence and pursuing life-long learning

A30022.3 to understand patterns and channels of communication and their efficiency.

A30022.4 to analyze and evaluate available data andinformation from a variety of sources.

A30022.5 to demonstrate leadership qualities in teams effectively and efficiently.

A30022.6 theimportance of applying an enquiring mind when collecting and assessing data and information.

## 3. Course Syllabus

**UNIT I**

**ETHICS AND PROFESSIONALISM:** Introduction, perspectives of Ethics, branches of Ethics, justice vs care, Ethics and morality, Ethics and religion, Ethics and maturity, Ethics and the professions, Rules vs principles, Ethical dilemma.

**UNIT II**

**PERSONAL EFFECTIVENESS:** Prioritising, organising and managing time effectively, Using technology effectively- Using email effectively, How to manage email, Maintaining professional competence and lifelong learning- Continuing professional development, Personal development plan, How to craft your CV for the job of your dreams, Tips to prepare for an interview, The interview, Getting it wrong, Getting it right.

**UNIT III**

**COMMUNICATION AND INTERPERSONAL SKILLS:** Introduction, The communication process-What can go wrong?, Barriers and distortions to the communications process, How good are you at communicating? Formal and informal communication, six elements of effective communication, communicating in the work place- Errors and Solutions, Report Writing- the purpose of and the best practices in report writing. Interpersonal skills- Interpersonal skills, Personal qualities, Verbal communication Non-verbal communication

**UNIT IV**

**SOCIAL AWARENESS:** How to enhance your commercial awareness, SWOT analysis, deciding when to seek the help of experts Suitability, acceptability, feasibility (SAF) model

**UNIT V**

**LEADERSHIP AND TEAM WORKING:** Introduction, The nature of leadership, Situational leadership, Leadership in action, Action-cantered leadership (Adair), Factors influencing leadership style, Blake and Mouton grid, Examples of outstanding leaders, Team development, Motivation, Accountability, responsibility and authority.

## 4. Books and Materials

### Text Book(s)

1. Rizvi, M. Ashraf, *Effective Technical Communication,* Noida, McGraw-Hill Education. 2009.
2. Engineering Ethics (Includes Human Values)" by Govindarajan M

### Reference Book(s)

1. Professional Ethics in Engineering" by I A Dhotre V S Bagad
2. Professional Ethics In Engineering" by Dr V Jayakumar and Lakshmi Publications
3. Engineering Ethics: Challenges and Opportunities" by W Richard Bowen

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

### A30438 – VLSI & EMBEDDED SYSTEMS PROGRAMMING

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 1 | 0 | 2 | 14 | 0 | 28 | 2 | 40 | 60 | 100 |

## 1. Course Description

**Course Overview**

This course provides Verilog HDL for designing hardware and for creating test entities to verify the behavior of a piece of hardware. Verilog HDL is used as an entry format by a variety of EDA tools, including synthesis tools for Synthesis, simulation tools, and formal verification tools. For an 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**

A30432 - Microprocessors and Microcontrollers
A30453- System Design Through Verilog HDL

## 2. Course Outcomes (COs)

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

A30438.1 Design and draw the internal structure of the various digital integrated circuits.

A30438.2 Develop Verilog HDL source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.

A30438.3 Verify the logic with the necessary embedded hardware.

A30438.4 Build Embedded C Programs using TM4C123GH6PM microcontroller.

A30438.5 Develop embedded systems applications using TM4C123GH6PM.

## 3. Laboratory

**Verilog HDL PROGRAMMING**

1. Introduction to Verilog
2. Language Constructs
3. Gate Level Modeling
4. Switch level modeling
5. Data Flow Modeling
6. Behavioral Modeling
7. Functions and UDPs
8. Introduction to EDA tool (Cadence Incisive/Xilinx ISE design suite).

**PART-A: LIST OF EXPERIMENTS**

1. Develop Verilog HDL code of logic gates in dataflow & Gate level styles.
2. Write a Verilog HDL code to describe the function of Full adder and Full subtractor.
3. Write a Verilog HDL program for a) Multiplexers and b)Decoders.
4. Develop a Verilog HDL code for the flip-flops - D, T, SR and JK.
5. Develop a Verilog HDL code for the Shift registers and counters using behavioural modeling.

**Embedded systems Programming**

1. Introduction to TM4C123GH6PM MICROCONTROLLER

**PART-B: LIST OF EXPERIMENTS**

1. Configuration of GPIO Ports
2. Timer Based InterruptProgramming
3. Hibernation and Wakeup on RTC
4. Interfacing Potentiometer withTIVA GPIO
5. PWM Generation

## 4. Books and Materials

**TEXT BOOKS:**

1) M.Morris Mano Digital Design (Edition-3)
2) John Davies MSP430 Microcontroller Basics- (Edition-1)

**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, Createspace Publications.
3) http://processors.wiki.ti.com/index.php/HandsOn_Training_for_TI_Embedded_Processors.
4) http://processors.wiki.ti.com/index.php/MCU_Day_Internet_of_Things_2013_Workshop.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

# PROFESSIONAL ELECTIVES

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

**B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING**

### Professional Electives

| Professional Elective – 1 | |
|---|---|
| **Course Code** | **Title of the Course** |
| A30451 | Optical Communications |
| A30452 | Nano Technology |
| A30453 | System Design Through Verilog |
| A30458 | Computer Architecture & Organization |
| A30475 | Fiber Optic Communication Technology |
| A30476 | Fundamentals Of Micro & Nano Fabrication |
| A30474 | Introduction To Internet Of Things |
| **Professional Elective – 2** | |
| **Course Code** | **Title of the Course** |
| A30454 | Microwave Engineering |
| A30455 | Biomedical Signal Processing |
| A30456 | FPGA Design |
| A30457 | Electronic Measurements & Instrumentation |
| **Professional Elective – 3** | |
| **Course Code** | **Title of the Course** |
| A30459 | Cellular & Mobile Communications |
| A30460 | Advanced Signal Processing |
| A30461 | Low Power VLSI Design |
| A30462 | Embedded System Design |
| A30468 | Digital Image Processing |
| A33148 | Introduction To Industry 4.0 & Industrial Internet Of Things |
| A30477 | Principles & Techniques Of Modern Radar Systems |
| **Professional Elective – 4** | |
| **Course Code** | **Title of the Course** |
| A30463 | Global Navigation Satellite System |
| A30464 | Speech Processing |
| A30465 | System Verilog & Verification |
| A30466 | Real Time Operating Systems |
| A30491 | Digital VLSI Testing |
| A30479 | Real Time Digital Signal Processing |
| A30480 | Simulation Of Communication System Using MATLAB |
| **Professional Elective – 5** | |
| **Course Code** | **Title of the Course** |
| A30467 | Modern Digital Communication Techniques |
| A30469 | Analog VLSI Design |
| A30470 | Photonics Engineering |
| A30471 | Electrical Measurement And Electronics Instruments |

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE
## A30451 – 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 | 40 | 60 | 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:**

A30451.1 Analyze different optical propagation methods and understand cylindrical fibers and mode configurations

A30451.2 Differentiate various fabrication methods used in optical fibers and factors causing signal distortion

A30451.3 Evaluate the signal degradation at fiber joints and fiber splices

A30451.4 Describe the characteristics of optical sources and detectors, and power launching capability of optical fiber

A30451.5 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.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30452 – 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 | 40 | 60 | 100 |

## 1. 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

1. A30004 – Applied Physics
2. A30403 – Electronic Devices and Circuits

## 2. Course Outcomes (COs)

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

A30452.1 Distinguish between different types of materials and their properties.

A30452.2 Compare different types of nanomaterials.

A30452.3 Analyze different properties of nanomaterial.

A30452.4 Contrast between different types of carbon nanotubes.

## 3. 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)**

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

**Reference Book(s)**

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

**Reference Online Resources/Materials:**

1. https://www.understandingnano.com/resources.html
2. https://www.openculture.com/engineering_free_courses

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

### A30453 – SYSTEM 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 | 40 | 60 | 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**

A30404 – Digital Logic Design

## 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30453.1 | Understand the basics of Hardware Description Languages, Program structure and basic language elements of Verilog. |
| A30453.2 | Understand types of modelling, modules, functions of Verilog and simulate and synthesize related Programs. |
| A30453.3 | Design, Simulate and synthesize various Verilog descriptions for Combinational circuits. |
| A30453.4 | Design, Simulate and synthesize various Verilog descriptions for Sequential circuits. |
| A30453.5 | 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**

**Unit III**

**Computer Arithmetic:** Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-Point Arithmetic Operations

**UNIT-IV**

**Input-Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication.

**UNIT-V**

**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

**Pipelining:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

## 4. Books and Materials

**Text Book(s)**

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI.

**Reference Book(s)**

1. Computer organization and architecture-William Stallings sixth edition, pearson.
2. Structured computer organization-Andrew S. Tenenbaum, 4$^{th}$ edition, PHI.

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30458 – COMPUTER ARCHITECTURE AND ORGANIZATION

| 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

This course presents the fundamental concepts of computer organization and instruction set architectures. The computer organization is concerned with the structure and behavior of digital computers. The main goal of this subject is to understand the overall basic computer hardware structure, including the peripheral devices. This course provides a clear comprehensive presentation of the organization and architecture of modern day computers, emphasizing both fundamental principles and critical role of performance in driving computer design. The aim of the subject is to provide a thorough discussion of the fundamentals of computer organization and architecture and to relate these to contemporary design issues.

**Course Pre/corequisites**

1. A30404 – Digital Logic Design

### 2. Course Outcomes (COs)

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

A30458.1 Recognize basic digital computer components and various micro operations and their implementation in RTL.

A30458.2 Interpret the various parameters effect the computer performance and techniques to increase performance.

A30458.3 Experiment with the representation of data, addressing modes, instruction sets, stacks and register organization in a basic computer.

A30458.4 Understanding the various techniques to design functional units of the processor such as register file, arithmetic logic unit and control unit.

A30458.5 Understand memory hierarchy and analyze the functioning of a multi-processor system and interconnection structures.

### 3. Course Syllabus

**Unit I**

**Data Representation:** Data Types, Complements, Fixed-Point Representation, Floating-Point Representation.

**Register Transfer and Micro-operations:** Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit

**UNIT-II**

**Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation Instructions, Program Control Instructions, Reduced Instruction Set Computer (RISC).

**Unit III**

**Computer Arithmetic:** Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-Point Arithmetic Operations

**UNIT-IV**

**Input-Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication.

**UNIT-V**

**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

**Pipelining:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

## 4. Books and Materials

**Text Book(s)**

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI.

**Reference Book(s)**

1. Computer organization and architecture-William Stallings sixth edition, pearson.
2. Structured computer organization-Andrew S. Tenenbaum, 4$^{th}$ edition, PHI.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30454 - 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 | 40 | 60 | 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**

1. Electronic Devices and Circuits
2. Electromagnetics and Transmission Lines

### 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30454.1 | Analyze rectangular waveguide transmission line characteristics using concepts of Electromagnetic theory. |
| A30454.2 | Evaluate relation between input(s) and output(s) of microwave passive componentsusing scattering parameters. |
| A30454.3 | Compare performance of O-type and M-type microwave tubes. |
| A30454.4 | Sketch the characteristics of microwave solid state devices. |
| A30454.5 | 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.

### Reference Online Resources/Materials:

1. https://www.digimat.in/nptel/courses/video/108103141/L01.html
2. https://www.digimat.in/nptel/courses/video/108101112/L01.html
3. https://ece.umass.edu/graduate-students/certificates/microwave-engineering

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30455 – 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 | 40 | 60 | 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. A30405 – Signals and Systems
2. A30430 – Digital Signal Processing

## 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30455.1 | Analyze the nature of biomedical signals and related concepts. |
| A30455.2 | Apply averaging technique on biomedical signals and extract the features. |
| A30455.3 | Design various time domain filtering techniques for the removal of artefact from biomedical signal. |
| A30455.4 | Apply signal compression techniques on biomedical signals. |
| A30455.5 | 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.

**Reference Online Resources/Materials:**

1. https://www.courses.com/biomedical-engineering
2. https://www.openculture.com/engineering_free_courses

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

### A30456 – 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 | 40 | 60 | 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 requiredto design VSLI and DSP systems using FPGA.

### Course Pre/corequisites

1. A30404 – Digital Logic Design

## 2. Course Outcomes (COs)

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

A30456.1 Discuss different PLDs based on real time applications and compare its architectures.

A30456.2 Analyze the programmable technologies used in FPGAs.

A30456.3 Design combinational and sequential circuits using FPGA.

A30456.4 Distinguish between technology dependent and technology independent optimizations while implementing logic in FPGA.

A30456.5 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.

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30457 – ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 3 | 0 | 0 | 42 | 0 | 0 | 3 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

This course provides an overall understanding of the elements and processes, including sources of errors, and digitally acquiring these measurements. Along with an overview of instrumentation principles, the physical principles and electrical characteristics for several common instrument transducers are studied. The electronic signal conditioning circuits required for converting the electrical changes in the transducers to signal which can be interpreted accurately by a microprocessor or an embedded controller are analyzed and designed effectively. This course also gives an integration of hardware and software in designing computer controlled processes and/or systems with the aid of sensors, transducers data acquisition board, and instrument control.

**Course Pre/corequisites**

1. A30403 – Electronic Devices and Circuit
2. A30427- Linear Integrated Circuit Applications

### 2. Course Outcomes (COs)

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

A30457.1 Apply the acquired knowledge of measuring instruments to design various measuring devices.

A30457.2 Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

A30457.3 Identify different Oscilloscopes for the measurement of various signals.

A30457.4 Classify different Transducers based on their principles and apply them in Mini Projects.

A30457.5 Analyze various bridge circuits for the measurement of physical quantities to minimize errors in measurements.

### 3. Course Syllabus

**UNIT - I**

**Block Schematics of Measuring Systems:** Performance Characteristics-Static Characteristics: Accuracy, Precision, Resolution, Gaussian Error, Root Sum Squares formula, Repeatability, Reproducibility, Dynamic Characteristics: Fidelity, Lag, Types of Errors.

**Measuring Instruments:** DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multi meters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

**UNIT - II**

**Signal Analyzers**: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators.

**Signal Generators:** AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator.

**UNIT - III**

**Oscilloscopes:** CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines.

**Special Purpose Oscilloscopes**: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

**UNIT - IV**

**Transducers:** Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Special Resistance Thermometers, Piezoelectric Transducers, Variable Capacitance Transducers.

**UNIT - V**

**Bridges:** Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

**Measurement of Physical Parameters**: Flow Measurement, Liquid level Measurement, Measurement of Humidity and Moisture, Vacuum level, Data Acquisition Systems.

## 4. Books and Materials

**Text Book(s)**

1. Electronic Instrumentation and Measurements – David A. Bell, 3rd Edition Oxford Univ. Press, 2013.
2. Electronic Instrumentation: H. S. Kalsi – Mc Graw Hill Education, 2nd Edition 2004.

**Reference Book(s)**

1. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI 5th Edition 2003.

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

**COURSE STRUCTURE**

**A30459 – CELLULAR & 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 | 40 | 60 | 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. A30412 – Analog Communication Systems
2. A30425 – Antennas & Wave Propagation

## 2. Course Outcomes (COs)

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

A30459.1 Analyze the cellular mobile system design concepts to improve the signal to noise Ratio and cell coverage.

A30459.2 Interpret the Co-channel interferences and their parameters to improve the system capacity.

A30459.3 Illustrate the importance of cell coverage for signal and traffic, diversity techniques and mobile antennas to a caller.

A30459.4 Utilize the Omni directional and directional antennas to improve the channel capacity and interference reduction.

A30459.5 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

## A30460 – ADVANCED 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 | 40 | 60 | 100 |

## 1. Course Description

**Course Overview**

This course presents the fundamental concepts, algorithms and applications of advanced 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**

1. A30405 – Signals and Systems
2. A30432 – Digital Signal Processing

## 2. Course Outcomes (COs)

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

A30460.1 Apply the concepts of multirate signal processing to implement digital filters.

A30460.2 Analyze various study of linear prediction and power spectrum estimation of ignals.

A30460.3 Choose appropriate spectrum estimation techniques for a given random process

A30460.4 Implementation adaptive algorithms in filter design.

A30460.5 Apply appropriate adaptive algorithm for processing non-stationary signals

## 3. Course Syllabus

**UNIT-I**

**UNIT-I**

**Multirate Digital Signal Processing:** Introduction, Decimation by a Factor D, Interpolation by a Factor I, Sampling Rate Conversion by a Rational Factor I/D, Filter Design and Implementation for sampling rate Conversion Multirate Digital Signal Processing Multistage Implementation of Sampling Rate Conversion, Applications of Multirate Signal Processing, Sampling Rate Conversion of Bandpass Signals

**UNIT-II**

**Linear Prediction And Optimum Linear Filters:** Innovations Representation of a Stationary Random Process, Forward and Backward linear prediction, Solution of the Normal Equations, Properties of linear prediction-Error Filter, AR Lattice and ARMA Lattice-Ladder Filters.

**UNIT-III**

**Power Speciral Estimation:** Estimation of Spectra from Finite Duration Observations of a signal, the Periodogram, Use DFT in power Spectral Estimation, Bartlett, Welch and Blackman, Tukey methods,

**UNIT-IV**

**ADAPTIVE FILTERS:** Principles and properties of adaptive filters - FIR adaptive filters. Adaptive algorithms - steepest descent algorithm, the LMS algorithm - convergence. Applications of adaptive filtering.

**UNIT-V**

Adaptive Signal Processing: Least Mean Square Algorithm, Recursive Least Square Algorithm,

Variants of LMS Algorithm: SK-LMS, N-LMS, FX-LMS. Adaptive FIR & IIR Filters,

## 4. Books and Materials

### Text Book(s)

1. J.G. Proakis and D.G. Manolakis, Digital Signal Processing, Third Edition,

### Reference Book(s)

1. Sophoncles J. Orfanidis, "Optimum signal processing", McGraw Hill, 2000.
2. Monson H. Hayes, "Statistical digital signal processing and modeling", John Wiley and Sons Inc. New York, Indian reprint 2008.

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

**COURSE STRUCTURE**

**A30461 – 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 | 40 | 60 | 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

1. A30456 – FPGA Design

## 2. Course Outcomes (COs)

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

A30461.1 Comprehend different sources of power dissipation.

A30461.2 Realize switched capacitance and arrive at ways to minimize.

A30461.3 Analyze and minimize dynamic and static power consumption in VLSI circuits.

A30461.4 Outline the working principles of adiabatic logic.

A30461.5 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

## A30462 – 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 | 40 | 60 | 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

A30432 - Microprocessors and Microcontrollers

## 2. Course Outcomes (COs)

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

A30462.1 Analyze the embedded systems features and architecture considerations

A30462.2 Develop Programs using TM4C123GH6PM Microcontroller

A30462.3 Make use of Peripherals of TM4C123GH6PM to interface I/O Devices

A30462.4 Apply Serial Communication Protocols for interfacing serial Devices.

A30462.5 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

## A30463 – GLOBAL NAVIGATION SATELLITE SYSTEM

| 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

1. Understand the principle of operation of GPS and GPS ephemerides.
2. Analyze GPS signal structure and significance of various coordinate systems
3. Estimate the various errors and their effect on position estimation.
4. Compare other global and regional navigational systems
5. Apply DGPS principle and also analyze various augmentation systems. Use of GPS in

**Course Pre/corequisites**

### 2. Course Outcomes (COs)

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

A30463.1 Understand the principle of operation of GPS and GPS ephemerides.

A30463.2 Analyze GPS signal structure and significance of various coordinate systems

A30463.3 Estimate the various errors and their effect on position estimation.

A30463.4 Compare other global and regional navigational systems.

A30463.5 Apply DGPS principle and also analyze various augmentation systems. Use of GPS in Surveying, Mapping and Navigation

### 3. Course Syllabus

**UNIT-I**

**GPS Fundamentals:** GPS System Segments: space, control and user segments, Principle of operation, Current status of GPS satellite constellation. Orbital Mechanics: GPS ephemeris data, algorithm for computation of satellite's position from ephemeris data. Time References: solar and sidereal days, UTC time, GPS time.

**UNIT-II**

**GPS Signals:** Legacy GPS signals: Signal structure, Operating frequencies, C/A and P-Code, Navigation message, Modernized GPS signals: list of signals and their significance. Range measurements: code and carrier measurements, User position estimation with PRN codes. Coordinate systems:Earth Centered Earth Fixed (ECEF) coordinate system, Earth Centered Inertial (ECI) coordinate system, Geodetic coordinate system, Ellipsoid and Geoid, Regional and Global Datum, World Geodetic System (WGS-84).

**UNIT-III**

**GPS Error Sources:** Satellite clock error, ephemeris error, Receiver clock errors, satellite and receiver instrumental bias, Multipath error, receiver measurement noise, ionospheric error and tropospheric error, Klobuchar model, ionospheric delay estimation using dual frequency measurements and UERE. Dilution of precision: HDOP, VDOP, TDOP, PDOP & GDOP.

**UNIT-IV**

**Data Formats:** RINEX Observation and Navigation Data formats GNSS: architecture, operation and signals of other global satellite systems such as Galileo, Beidou, GLONASS and regional systems such as IRNSS, QZSS.

**UNIT-V**

**Differential GPS (DGPS):** Principle of DGPS, Types of DGPS: Local Area DGPS (LADPS), Wide Area DGPS (WADGPS). GPS Augmentation Systems: Principle of operation of Satellite Based Augmentation system (SBAS) and Ground Based Augmentation System (GBAS), GNSS Applications.

## 4. Books and Materials

**Text Book(s)**

1. Elliot D Kaplan and Christopher J Hegarty, “Understanding GPS principles and applications”, Artech House Publishers, 2/e Boston & London 2005.
2. PratapMisra and Per Enge, “Global Positioning System Signals, Measurement and Performance”, Ganga- Jamuna Press, 2/e, Massachusetts, 2010.

**References:**

1. B.Hofmann, Wellenhof, H.Lichtenegger, and J.Collins, “GPS Theory and Practice,” Springer Verlog, 5/e, 2008.
2. Ahmed El-Rabbany, “Introduction to GPS”, Artech House Publishers, 2/e, Boston 2006. 3. Bradford W.Parkinson and James J. Spilker, “Global Positioning system: Theory and Application”, Vol.II, American Institution of Aeronautics and Astronautics Inc., Washington, 1996.

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30464 – 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 | 40 | 60 | 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. A30405 – Signals and Systems
2. A30432 – Digital Signal Processing

### 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30464.1 | Summarize the concepts of speech signals and their applications. |
| A30464.2 | Analyze the speech signals by using different transform techniques. |
| A30464.3 | Distinguish between different cepstrums of speech signals. |
| A30464.4 | Compare different speech coding techniques. |
| A30464.5 | 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

# GPULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30465 – SYSTEM VERILOG & VERIFICATION

| 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 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

This course gives you an in-depth introduction to the main System Verilog enhancements to the Verilog hardware description language (HDL). It discusses the benefits of the new features, and demonstrates how design and verification can be more efficient and effective when using System Verilog constructs. The course also teaches how to code in System Verilog language – which is the most popular Hardware Description Language used for SOC design and verification in semiconductor industry. This course helps the students to learn everything about System Verilog Assertions (SVA) and Functional coverage coding which forms the basis for the Assertion based and Coverage Driven Verification methodologies.

### Course Pre/corequisites

1. A30461 – Low Power VLSI Design
2. A30462 – Digital VLSI Testing

## 2. Course Outcomes (COs)

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

A30465.1 Develop language constructs of System Verilog HDLs and implements a digital logic effectively.

A30465.2 Utilize assertions to quickly correct behavior in simulation.

A30465.3 Design an interface between the System Verilog test program and the Device Under Test.

A30465.4 Construct a device driver routines to drive DUT input with stimulus from generator.

A30465.5 Execute device drivers, monitors and self-checking routines concurrently.

## 3. Course Syllabus

**UNIT-I**

**Basics of Verilog and simulation schematic:** Processing of multi threads, simulation event queue, basic coding guidelines for design and test bench. System Verilog for design– data type system, enum, typedef, struct, union, packed/unpacked.

**Nets and variables:** Key changes in Verilog, 2005 and System Verilog, continuous assignment to variables, modules and processes, port connection shorthand, procedural programming statements.

**UNIT-II**

**Design applications of interfaces:** The interface constructs, interfaces to encapsulate communication, modports, synthesis of interfaces and modports, imported functions for design.

**System Verilog for Verification:** Data types, Logic, enum, string, typedef, struct, union-packed/unpacked, packages, Arrays– Fixed, dynamic, procedural statements and routines-conditional if, operators and expressions. Loops– while, for, repeat, foreach, functions and tasks.

**UNIT-III**

**System Verilog TB and design**: Interfaces, clocking blocks and skews, modports. OOP – 1, OOP – 2, randomization.

**UNIT-IV**

**Packages:** Usage of packages in design and verification, scope rules, static and dynamic life scope. Package declarations– Referencing data within packages, package search order rules, exporting imported names from packages.

**UNIT-V**

**Threads and Inter process Communication:** Creating threads, automatic variables in threads, fork join none, any, all, disable, disable fork, wait fork, wait(..), event, mailbox (FIFO), semaphore.

**Functional coverage**: Defining coverage groups, defining coverage points, defining cross coverage, coverage options, coverage system tasks and system functions, coverage computation.

## 4. Books and Materials

### Text Book(s)

1. S. Sutherland, S. Davidmann, P. Flake, *System Verilog for Design,* 2nd edition, Springer, 2006.

### Reference Book(s)

1. Z. Dr Mark, *Digital System Design with System Verilog,* Pearson, 2010.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30466 – 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 | 40 | 60 | 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:**

A2466.1 Analyze the Computer hardware organization and operating System components.

A2466.2 Understand real time concepts and hardware considerations.

A2466.3 Make use power management concepts for rtos.

A2466.4 Apply the Inter process communication algorithms to avoid deadlocks.

A2466.5 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

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

### A30467 - MODERN DIGITAL COMMUNICATION 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 | 40 | 60 | 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-Requisites:**

1. A30412 -Analog communications
2. A30426 -Digital communications
3. A30405 -Signals and systems

## 2. Course Outcomes (COs)

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

A30467.1 Analyze different digital modulation techniques to convert analog signals to digital form.

A30467.2 Distinguish between baseband and passband transmission techniques in terms of SNR and BER.

A30467.3 Examine the concepts of geometric representation of signals and constellation diagrams.

A30467.4 Compare digital carrier modulation schemes in terms of bandwidth, complexity and spectral efficiency.

A30467.5 Interpret the differences between linear block codes and convolutional codes for noisy and noiseless channels.

## 3. Course Syllabus

### Unit-1:

Introduction to digital communication systems, Source Coding, Channel coding

**Unit 2:**

Characterization of Communication Signals & Systems, Signal space Representation

**Unit 3:**

Representation of Memory less Modulation Methods I, Nonlinear modulation methods, Optimal receivers of AWGN

**Unit 4:**

Receiver for non-ideal channel, Probability of error of different modulation schemes

**Unit 5:**

Fundamentals of estimation and detection theory used in digital communication, Carrier phase and symbol timing synchronization techniques, Channel estimation and equalization techniques, Power Adaptation methods for colored noise channel

## 4. Books and Materials

1. Digital Communications by John G. Proakis

2. Digital Communications by Bernard Sklar

3. Digital Communications by Robert Gallager

4. Digital Communications by Simon Haykin

5. Modern Digital and Analog communications by B.P. Lathi.

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30468 – 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 | 40 | 60 | 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. A30405 – Signals and Systems
2. A30432 – Digital Signal Processing

## 2. Course Outcomes (COs)

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

A30468.1 Demonstrate different operations on image pixels.

A30468.2 Distinguish between different types of image transforms.

A30468.3 Compare different image enhancement techniques.

A30468.4 Apply different techniques to perform image segmentation.

A30468.5 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. Image restoration and its methods.

**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

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30469 – ANALOG 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 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

This course is aimed at introducing analog circuits from the perspective of designing amplifiers in an integrated circuit using MOS transistors. The students will be introduced to the techniques required for designing amplifiers using negative feedback as the guiding principle. Small signal characteristics of widely used amplifier topologies will be discussed and their limitations analyzed. The learning objective of the course is to make the students proficient in the synthesis basic amplifier topologies so that one can develop an intuition to design circuits based on specific requirements in their career.

### Course Pre/Co-requisites

1. **A30403** – Electronics Device and Circuits
2. **A30413** – Electronics Circuit Analysis

## 2. Course Outcomes (COs)

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

A30469. 1 Understand the basic Physics and Modeling of MOSFETs.

A30469. 2 Analyze the performance of MOSFETs circuits on the basis of their operation and working.

A30469.3 Identify, formulates, and solves engineering problems in the area of analog integrated circuits

A30469.4 Use the techniques, skills, and modern programming tools such as Mentor Graphics, necessary for engineering practice.

A30469.5 Design and analyze the MOSFET Multi stage amplifiers using controlled devices.

## 3. Course Syllabus

**UNIT-I**

**Introduction and Basic amplifier design:** Linearization of non-linear elements, Generation of small incremental linear equivalents from non-linear elements. Basic amplifier design using MOSFET, Common source amplifier with resistive load, biasing a common source amplifier, Gain limitations of the configuration, Introduction to swing limits, Relevance of the limitations in a integrated circuit.

**UNIT-II**

**Biasing techniques of CS Amplifiers:** Different biasing techniques of a common source amplifier Use of negative feedback to realize stable biasing, Distinction between constant voltage and constant

current biasing.

**UNIT-III**

**Controlled Sources**: Introduction to controlled sources, Realizing controlled sources using a voltage controlled current source, Using MOSFETs to realize the controlled sources and other amplifier configurations, Body effects in an MOSFET, The effect of output resistance of a MOSFET on an amplifier configuration.

**UNIT-IV**

**Single Stage Differential Amplifiers:** Introduction to active loads, and single stage differential amplifiers. Analysis of gain, swing limits, slew rate, common mode rejection ratio, power supply rejection ratio in a single stage differential amplifier.

**UNIT-V**

**Multi-stage amplifiers:** Multi-stage amplifiers using controlled sources, Introduction of stability parameters of multistage amplifier when configured in negative feedback, Design and analysis of multi-stage amplifier by replacing the controlled sources with MOSFETs.

## 4. Books and Materials

### Text Book(s)

1. Prof. Nagendra Krishnapura, *NPTEL lectures on analog circuit design*
2. Behzad Razavi *Design of Analog CMOS Integrated Circuits* , 2nd edition, Springer, 2008

### Reference Book(s)

1. Jacob Baker, *CMOS Circuit Design- Layout and Simulation,* Pearson, 2006.

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30470 – PHOTONICS 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

This course reviews working principle, system functionality and design and fabrication issues of semiconductor integrated photonic devices and circuits for optical telecommunication and interconnect applications. The course will begin with very briefly reviewing optoelectronic device principles as well as optical waveguide design. It will then quickly get into discussions on advanced integrated devices and circuits such as optical switches, optical transceivers, wavelength converters, arrayed waveguide gratings, etc. The course will end with more state-of-the-art topics such as silicon photonics.

**Course Pre/corequisites**

1. A30451 – Optical Communications
2. A30461- Low Power VLSI Design

### 2. Course Outcomes (COs)

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

A30470.1 Get familiarity with Photonic Integrated Circuits, multimode waveguides, various types of directional couplers, and CMOS Compatible Silicon Photonics Technology.

A30470.2 Understand the concepts of coupled mode theory, fiber to waveguide converters, and directional couplers.

A30470.3 Analyze the functionality of multimode waveguides, various types of directional couplers Reconfigurable Filters and Tunable Delay Lines, and FPPGAs.

A30470.4 Design single mode, multimode waveguides, bends, and photonic crystal waveguides and Integrated Optical High-Speed Modulators.

### 3. Course Syllabus

**Unit -I:**

Introduction to Photonic Integrated Circuits – Functional Building Blocks; Theory of Optical Waveguide – The Basic Building Block; Orthogonality Condition of Guided Modes, Introduction to Photonic Integrated Circuits – Functional Building Blocks; Theory of Optical Waveguide – The Basic Building Block; Orthogonality Condition of Guided Modes.

**Unit-II:**

Design Principle of Single-Mode and Multimode Waveguides: Channel and Ridge/Rib waveguides, Waveguide Bends; Slot and Photonic Crystal Waveguides, Design Principle of Single-Mode and Multimode Waveguides: Channel and Ridge/Rib waveguides, Waveguide Bends; Slot and Photonic Crystal Waveguides.

**Unit-III:**

Coupled Mode Theory; Waveguide Distributed Bragg Reflector (DBR) and SubWavelength Grating (SWG) waveguide; Adiabatic Mode-Size Converter (MSC), Fiber-toWaveguide, Vertical Grating Coupler (VGC), Coupled Mode Theory; Waveguide Distributed Bragg Reflector (DBR) and Sub-Wavelength Grating (SWG) waveguide; Adiabatic Mode-Size Converter (MSC), Fiber-to-Waveguide Vertical Grating Coupler (VGC).

**Unit-IV:**

Directional Coupler (DC), Multi-Mode Interferometric Coupler (MMIC). MachZehnder Interferometer (MZI) and Microring Resonator (MRR): Filters and Delay Lines, Directional Coupler (DC), Multi-Mode Interferometric Coupler (MMIC). Mach-Zehnder Interferometer (MZI) and Microring Resonator (MRR): Filters and Delay Lines. Practical Planar Lightwave Circuits and CMOS Compatible Silicon Photonics Technology Platforms; Thermo-Optic and Electro-Optic Switches; Reconfigurable Filters and Tunable Delay Lines, Concept of Field Programmable Photonic Gate Array (FPPGA).

**Unit-V:**

Practical Planar Light wave Circuits and CMOS Compatible Silicon Photonics Technology Platforms; Thermo-Optic and Electro-Optic Switches; Reconfigurable Filters and Tunable Delay Lines, Concept of Field Programmable Photonic Gate Array (FPPGA), 208 Page Integrated Optical High-Speed Modulators Design and Working Principle.

## 4. Books and Materials

**Text Book(s)**

1. Silicon Photonics – An Introduction, G.T. Reed (Wiley)

**Reference Book(s)**

1. Photonics: Optical Electronics for Modern Communication, Yariv and Yeh (Oxford) 3) Optoelectronic Integrated Circuit Design and Device Modeling, Jianjun Gao (Wiley)

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

### A30471- ELECTRICAL MEASUREMENTS AND ELECTRONIC INSTURUMENTS

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 3 | 0 | 0 | 51 | 0 | 0 | 3 | 40 | 60 | 100 |

## 1. Course Description Course Overview

This It is a core course for all UG Electrical and Electronics Engineering students. The content of this course is also aligned to the syllabus for the GATE Exam. The course has two halves: (1) Electrical Measurements: Working principle and Dynamics of different electro-mechanical instruments, ammeter, voltmeter, ohmmeter, wattmeter, energy meter, measurement of resistance and impedances, bridges and potentiometers, Instrument transformers. (2) Electronic Instruments: Differential amplifier, op-amp circuits, Analog DC and AC instruments, ADC and DAC, Digital instruments, function generator, oscilloscope Find details below

**Course Pre/corequisites**

ELECTRICAL MEASUREMENTS AND ELECTRONIC INSTURUMENTS

## 2. Course Outcomes (COs)

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

A30471.1 Recognize different electro-mechanical instruments, PMMC, BGM and ammeter

A30471.2 Recognize Dynamics of different electro-mechanical instruments, voltmeter, ohmmeter, wattmeter, energy meter, measurement of resistance and impedances, bridges and potentiometers.

A30471.3 Understand and remember the generic bridge balance equation both in product form as well as ratio form and be able to quickly recognize whether a given bridge can be balanced or not.

A30471.4 Use various types of signal generators, signal analyzers for generating and analyzing various signals.

A30471.5 Operate on Oscilloscope to measure various signals.

## 3. Course Syllabus

**Unit I**

Introduction to Electrical Measurement and Electronic Instruments. PMMC Instrument, Moving Iron Instrument, Electrostatic Instruments, Damping and Eddy current, Dynamics of MVI, Ballistic Galvanometer, Ammeter-I, Ammeter-I

**UNIT-II**

Voltmeter, ohmmeters, ohmmeters –II, Rectifier based voltmeter and ammeter–I, Rectifier based voltmeter and ammeter –II, Resistance measurements with voltmeter and an ammeter –I, Four Terminal Resistance, Error Calculation, Sensitivity, accuracy and Resolution of Wheat stone bridge, Kelvin Double Bridge, High resistance bridge, Wattmeter connection and compensated wattmeter, Single phase energy meter, DC, AC potentiometer, polar potentiometer and phase shifter.

**Unit III**

Kelvin Varley potential divider, Importance of bridges, AC Bridges-I, AC bridges-II, III, Current transformer and potential transformer, Review of transformer and magnetic circuit, flux density measurement with BGM, back ground of flip flop, Back ground: operational amp-I.II.III and IV, Inverting amplifier verses Schmitt trigger

**UNIT-IV**

Non Inverting amplifier verses Schmitt trigger, Differential Amplifier-I, II, Differential amplifier-III Digital frequency mete, Digital frequency meter and Schmitt trigger, linear ramp type DVM, Dual slope DVM-I, Dual slope DVM-I, Dual slope DVM and Integrator, Digital Ramp type voltmeter, Digital Ramp type voltmeter and Successive approximation, ADC and DAC-I

**UNIT-V**

ADC and DAC-II, why we need Instruments, Instruments with op - Amp-I, Instruments with op - amp-II and III, Instrumentational amplifier, Function generator,555 Timer, Astable and monostable multivibrator, Schmitt trigger, Pulse generator, Oscilloscope-I and II, Emitter follower voltmeter, Linear ohmmeter, ramp generator

## 4. Books and References

1. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W. D. Cooper: PHI 5th Edition 2003.
2. Electronic Instrumentation: H. S. Kalsi – TMH, 2nd Edition 2004.
3. Electronic Instrumentation and Measurements: David A. Bell
4. A course in Electrical and Electronic Measurements and Instrumentation: A. K. Sawhney
5. Basic Electrical Measurements: M B Stout
6. Electrical Measurements and Measuring Instruments, E.W Golding, F.C Widdis.

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30474 - INTRODUCTION TO 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 | 51 | 0 | 0 | 3 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT. IoT cuts across different application domain verticals ranging from civilian to defence sectors. These domains include agriculture, space, healthcare, manufacturing, construction, water, and mining, which are presently transitioning their legacy infrastructure to support IoT. Today it is possible to envision pervasive connectivity, storage, and computation, which, in turn, gives rise to building different IoT solutions. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to learn the fundamentals of this emerging technology.

**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:**

A30474.1 Analyze IoT applications using IoT design principles, protocols and levels.

A30474.2 Distinguish sensors and actuators in terms of their functions and applications.

A30474.3 Interface I/O devices, Sensors using Arduino uno.

A30474.4 Apply Python concepts for programming of Raspberry Pi.

A30474.5 Develop IoT applications using Raspberry Pi and Arduino uno.

### 3. Course Syllabus

**Unit I**

Introduction to IoT: Part I, Part II, Sensing, Actuation, Basics of Networking: Part-I, Communication Protocols: Part III, Part IV, Part V

**UNIT-II**

Sensor Networks: Part I, Part II, Part III, Part IV, Part V, Part VI, Machine-to-Machine Communications, Interoperability in IoT, Introduction to Arduino Programming: Part I, Part II, Integration of Sensors and Actuators with Arduino: Part I, Part II

**Unit III**

Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi, Implementation of IoT with Raspberry Pi (contd), Introduction to SDN, SDN for IoT.

**UNIT-IV**

Data Handling and Analytics, Cloud Computing, Sensor-Cloud, Fog Computing, Smart Cities and Smart Homes

**UNIT-V**

Connected Vehicles, Smart Grid, Industrial IOT, Industrial IOT (contd), Case Study: Agriculture, Healthcare, Activity Monitoring

## 4. Books and Materials

**Text Book(s)**

1. S. Misra, A. Mukherjee, and A. Roy, 2020. Introduction to IoT. Cambridge University Press.
2. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
3. Jeeva Jose, *Internet of Things,* 1st edition, Khanna Book Publishing, 2019.
4. 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

### A30475 – FIBER OPTIC COMMUNICATION TECHNOLOGY

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 3 | 0 | 0 | 51 | 0 | 0 | 3 | 40 | 60 | 100 |

## 1. Course DescriptionCourse 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:**

A30475.1 Analyse different optical propagation methods and understand cylindrical fibers and modeconfigurations

A30475.2 Differentiate various fabrication methods used in optical fibers and factors causing signaldistortion

A30475.3 Evaluate the signal degradation at fibre joints and fiber splices

A30475.4 Describe the characteristics of optical sources and detectors, and power launching capabilityof optical fiber

A30475.5 Evaluate the power penalties by system considerations in the link, error control correctionsand detections

## 3. Course Syllabus

**UNIT - I**

**INTRODUCTION TO OPTICAL FIBERS**: Motivation for fiber optic communication, Introduction to digital modulation, Overview of Optical Communication System.

**OPTICAL SOURCES**: LED - Working principle, Efficiency, Modulation bandwidth, Emission Pattern, Need for Laser Diodes, Resonator Concepts.

**OPTICAL SOURCES**: Laser Diodes - Resonator, FSR, Q, Single Longitudinal Mode Lasers, Photon Lifetime, Semiconductor Laser Rate equation, steady state solution, LI characteristics, Output power from laser, Modulation response of LD, Chirp.

**UNIT - II**

**OPTICAL SOURCES**: Noise in Lasers- Relative Intensity Noise, Phase noise, Effect of noise on different modulation schemes, External Modulation- generation of OOK, BPSK, QPSK and 16QAM.

**OPTICAL FIBERS** - Attenuation in fibers, Modes of a step index fiber, b-V curves, Modal profiles

**OPTICAL FIBERS**- Dispersion in fibers, intermodal dispersion, material dispersion, waveguide dispersion, polarisation mode dispersion.

**UNIT - III**

**PHOTO DETECTORS**- PIN and APD Detectors, Sources of Noise- shot noise, thermal noise, NEP, SNR, Heterodyne detectors, SNR in heterodyne detection.

**OPTICAL LINK DESIGN** - Performance Evaluation of an OOK link- BER, Q, Receiver Sensitivity, Optical Amplifiers- EDFA.

**UNIT - IV**

**OPTICAL LINK DESIGN** Link Budget, Case Studies, Dispersion Compensation, Nonlinear Effects- Self Phase Modulation.

**NONLINEAR EFFECTS** - Cross Phase Modulation, Four Wave Mixing, Stimulated Raman and Brillouin Scattering, commonly used components in Optical Networks.

**UNIT - V**

**COHERENT DETECTION AND DSP**: Balanced Detection, Phase and Polarisation Diverse Coherent Detection, Digital Signal Processing for compensation of phase noise, frequency offset, chromatic dispersion, polarisation mode dispersion.

**OPTICAL NETWORKS:** SDH/SONET Layering, Frame Structure, Physical network topologies, Access Networks- PON, Optical Interconnects, Data Centres, Optical communication for Wireless Front hauling.

## 4. Books and MaterialsText Book(s)

A.Fiber Optic Communication Systems by G P Agrawal
B.Introduction to Fiber Optics by Ghatak and Thyagarajan
C.Optical Fiber Communications –Principles and Practice by Senior
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.

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

**COURSE STRUCTURE**

**A30476 – FUNDAMENTALS OF MICRO AND NANOFABRICATION**

| 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 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

The course provides an in-depth understanding of top-down device fabrication. Focus is the unit processes typically used in micro & nanofabrication of devices. Both concepts and practical aspects are covered. Topics include crystal growth, doping, chemical vapor deposition, physical vapor deposition, photolithography, wet etching, dry etching, and packaging. The course is accessible to students from diverse backgrounds, such as materials, physics, chemistry, mechanical engineering, and electrical engineering. The course will be a derivative of NE203: Advanced Micro & Nano Fabrication Technology & Processes. Students from various departments, e.g. Physics, Chemistry, ECE, DESE, IAP, routinely take the course.

### Course Pre/corequisites

A30476-General background in physics, chemistry, materials, chemical engineering, mechanical engineering, or electronic engineering should be enough.

## 2. Course Outcomes (COs)

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

A30476.1: Understand the basics of micro and nanofabrication techniques.

A30476.2: Gain knowledge of lithography, etching, and deposition processes.

A30476.3: Apply fabrication techniques to design micro/nanostructures.

A30476.4: Develop problem-solving skills in the area of device fabrication and material integration.

## 3. Course Syllabus

### UNIT-I

**Introduction,** Substrate, Introduction to cleanroom, Contamination and surface cleaning, Advanced cleaning techniques, Defects & Diffusion, Diffusion -- Advanced Concepts, Ion Implantation, Native Films, Native Films: Advanced Concepts, Native Films: Defects at Si/SiO2 interface

### UNIT-II

**Methods and Some Definitions Chemical Vapor Deposition**: Basics, Chemical Vapor Depostion: Precursor Transport, Chemical Vapor **Depostion:** Types of CVD Equipment, Chemical Vapor Depostion: Nucleation and Growth, Chemical Vapor Depostion: Other Details, Atomic Layer Depostion, Physical Vapor Deposition: Basics, **Physical Vapor Deposition:** Evaporation, Sputtering, Metallization: Contact resistance, **Metallization**: Electro migration and Epilogue, Pattern Transfer Basics, Optical lithography basics: resist process-1 & 2,

**UNIT-III**

**Optical Lithography**: Stepper and Scanner, Projection **Lithography**: Image formation basics, Projection Lithography: Image formation in photoresist, **Optical lithography**: Surface Reflection, Optical Lithography: Mask Technology, Lithography process technology glossary, **Optical Lithography**: Resolution enhancement, Electron beam lithography: Basics, Electron beam lithography: Resist process, Emerging lithography techniques

**UNIT-IV**

**Etching Figures of Merit**, Wet etching Basics, Wet Ething Recipes, Dry etch: Plasma Basics, Dry etch: Plasma etching basics, Dry etch: Plasma tool configuration, Dry etch: Etch mechanism, Dry etch: Etch chemistry

**UNIT-V**

**Chemical Mechanical Polishing (CMP):** Basics, Chemical Mechanical Polishing (CMP): Tool and process, Design for Manufacturability-1 & 2, Design for Manufacturability: Case study, Process Integration, PV Integration - 1 & 2, Lab demo: Silicon Nitride cantilever fabrication-1 & 2, CMOS process for photonics application

## 4. Books and Materials

**Text Book(s)**

1.The Science and Engineering of Microelectronic Fabrication by Stephen A. Campbell

2.VLSI Fabrication Principles: Silicon and Gallium Arsenide by Sorab K. Gandhi

3.Introduction to Microelectronic Fabrication by Richard C. Jaeger

4.Materials Science of Thin Films by Milton Ohring

**Reference Book(s)**

1.Fundamentals of Microfabrication and Nanotechnology, by Marc J. Madou

2.Fundamental Principles of Optical Lithography by Chris Mack

3.Electronic Materials by Prof. Dr. Helmut Föll

**Reference Online Resources/Materials:**

1. https://onlinecourses.nptel.ac.in/noc24_bt51/course

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30477 – PRINCIPLES AND TECHNIQUES OF MODERN RADAR 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

This course covers a broad spectrum of the radar system design and analysis The main goal of this subject is to understand, the basic concepts of microwave radar principles and techniques. This course provides a clear comprehensive presentation of the modern radar systems. The aim of the subject is to provide a thorough discussion of the fundamentals of radar systems, techniques, radar tomography, Emerging and Modern Applications of Radar Principles. the topic of radar tomography is introduced to give the course students a thrill of various modern civil, industrial and mining applications of radar technology. This trend of radar technology evolution from defence applications to civilian applications is emphasized at the end of the course.

### 2. Course Outcomes (COs)

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

A30477.1 The basic concepts of microwave radar principles. Then the simple CW Radar and its limitations and how that can be overcome with the help of frequency modulation. Then the concept of pulsed radar to increase the range of the radar detection.

A30477.2 The concept of MTI filtering to discriminate clutter in the Doppler domain is and performance metric of MTI filtering. Thereafter tracking radar along with monopulse concept to measure angular position of a target with very high accuracy.

A30477.3 The detection theory with elaborate description of matches filtering, ambiguity function, range resolution and Doppler resolution concepts.

A30477.4 Pulse compression is increase the downrange resolution and synthetic aperture processing to increase cross range resolution. The concept of the imaging radar. The statistical nature of target and environment parameter fluctuations.

A30477.5 The concept of probability of false alarm and probability of detection. Swerling models with their help the radar equation model is modified to make it more realistic. The modern trend of close sensing of targets with ground penetrating radar.

A30477.6 Radar tomography gives the course students a thrill of various modern civil, industrial and mining applications of radar technology. This trend of radar technology evolution from defence applications to civilian applications is emphasized.

### 3. Course Syllabus

**Unit I**

**Basic Principles**: Radar equation, Radar Cross section.CW Radar, FMCW Radar, Pulsed Radar Principles.

**UNIT-II**

Clutter Analysis, MTI Improvement Factor, Pulsed Doppler Radar, Tracking Radar, Angular resolution, Mono pulse Technique.

**Detection Theory**: Match Filtering, Radar Ambiguity Function.

**Unit III**

**Imaging Radar**: Resolution Concept, Pulse Compression, Synthetic Aperture Processing, ISAR Imaging

**UNIT-IV**

Probability of false alarm and Detection, Modified Radar Range Equation with Swerling Models, Ground Penetrating Radar for close sensing.

**UNIT-V**

Radar Tomography and Radar based Microwave Imaging, Emerging and Modern Applications of Radar Principles.

## 4. Books and Materials

**Text Book(s)**

1. Introduction to Radar Systems, M.I. Skolnik, 3rdEdition, Tata Mcgraw hill edition, 2001.
2. Radar Systems Analysis and Design using MATLAB, B.R.Mahafza, 3rd Edition, CRC Press, 2013.
3. Monopulse Principles and Techniques, S.M.sherman and D.K.Barton, 2ndEdition,Artech house, 2011.

**Reference Book(s)**

1. Fundamentals of Radar Signal Processing, M.A.Richards, TMH, 2005.
2. Ground Penetrating Radar: Theory and Applications, Ed: H.M. Jolt, Elsevier, 2009.
3. Microwave Imaging, M.Pastorino, John Wiley, 2010.

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30479 - REAL TIME 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

This course provides a design and implementation of FIR, IIR filters, echo, reverberation, graphic equalizer, frequency analysis and DFT with practical applications of FFT, spectrum analysis and quantization effects. This course presents the fundamental concepts of Digital Image Processing. The aim of the subject helps in understanding of theory, design, applications, and implementations using hands-on experiments for the effective learning of real-time DSP technologies.

**Course Pre/corequisites**

A30432 Digital Signal Processing

### 2. Course Outcomes (COs)

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

A30479.1. Understand DSP elements including DSP functional blocks, DSP hardware options, fixed point and floating point DSP devices real-time constraints, algorithms and software development process.

A30479.2. To design and implementation of FIR, IIR filters and also to observe quantization effects.

A30479.3. To analyze frequency and DFT with practical applications of FFT.

A30479.4. Implementation of cross correlation, autocorrelation and LMS algorithm.

A30479.5. Understand implementation of echo, reverberation, graphic equalizer and basics of digital image processing.

### 3. Course Syllabus

**Unit I**

Introduction to Real-Time Signal Processing, Analog Interface, DSP hardware, DSP System Design, Experiments and program examples, signal concepts, Introduction to random variables, Fixed point and Quantization effects, overflow and solutions, experiments and program examples.

**UNIT-II**

Design and Implementation of FIR filters, Design and Implementation of IIR filters and structures, cascaded for implementation in hardware and quantization effects.

**Unit III**

Frequency analysis and DFT with practical applications of FFT, Spectrum Analysis, and implementation in filters, quantization effects

**UNIT-IV**

Cross correlation, autocorrelation and implementation, Introduction to Random Process, LMS algorithm and implementation consideration and practical applications, Digital Signal generation and program examples

**UNIT-V**

Implementation of Echo, Reverberation, Graphic equalizer, Introduction to Digital Image processing, fast DCT implementation in hardware.

## 4. Books and Materials

**Text Book(s)**

1. Real-Time Digital Signal Processing Fundamentals, Implementations and Applications 3rd edition – Sen M. Kuo Northern Illinois University, USA Bob H. Lee Ittiam Systems, Inc., USA Wenshun Tian Sonus Networks, Inc., USA
2. Rulph Chassaing, *Digital Signal Processing and Applications with the C6713 and C6416 DSK*, Wiley, NY, ISBN 0471690074, 2004

**Reference Book(s)**

1. Steven A. Tretter, Communication system design using DSP algorithms: with laboratory experiments for the TMS320C30, Plenum Press, Norwell, MA, ISBN 0306450321, 1995. Was the lab manual when course was introduced in fall 1997.
2. Thad B. Welch, Cameron H. G. Wright and Michael G. Morrow, Real-Time Digital Signal Processing from MATLAB to C with the TMS320C6x DSPs, CRC Press, 3rd ed., Jan. 2017, ISBN 978-1498781015, hardcover, 480 pages.

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30480– SIMULATION OF COMMUNICATION SYSTEM USING MATLAB

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 3 | 0 | 0 | 51 | 0 | 0 | 3 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

This course presents the fundamental concepts of communication Systems and MATLAB. This is course is meant to introduce students to the idea of modelling and simulation of communication systems exhibiting while highlighting the underlying stochastic behaviour of these systems. The key objectives of this course are twofold. To introduce the importance of Monte Carlo methods for analyzing the behavior of communication systems. To encourage students to model and analyze stochastic systems around them. By the end of this course, the students will be able to confidently program in MATLAB and develop programming models for simulating communication systems.

**Course Pre/corequisites**

1. A – Simulation of Communication System Using MATLAB

### 2. Course Outcomes (COs)

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

A30480 1. Basic of implementing digital communications systems using MATLAB.

A30480 2. Interpret the systems using Monte carlo methods by having knowledge of probability.

A30480 3. Understanding the concepts of Modeling and simulation of AWGN communication systems.

A30480 4. Understanding the fading channels and concepts of MIMO Systems

A30480 5. Understanding Markov Chains and the Viterbi Algorithm

### 3. Course Syllabus

**Unit I**

**Introduction:** Basics of MATLAB, Data types, Floating point numbers, Scripting of flow of control.

**MATLAB programming:** Arrays, Indexing, Matrix multiplication, Complex inversion, matrix inversion.

**UNIT-II**

**Monte Carlo methods:** Signals and Convolution, Probability, Random variables, Bayes theorem.

**Random Process:** Random numbers, Random distribution, Histogram, Functions and generating of random variables and distribution.

**Unit III**

**Information source and Quantization:** Properties of Random process, Power Spectra, Signal and Noise.

**Modeling and Simulation of AWGN Communication Systems:** Stochastic model, The AR-1 process, Yule Walker equations, Markov chains-1, fading channel. Markov chains-II, Markov chains-III, k mean and correlation.

**UNIT-IV**

**Fading channels and MIMO:** pre coding, image compression, Transform domine compression.

**Makov chain and vertibi algorithm:** Low pass and band pass signals, signal spaces, PAM and detection, Effect of AWGN.

**Queueing-I**: ML detection, ML detection II, The union Bond, Symbol error rate.

**UNIT-V**

**Queueing II:** Choosing constellations, Orthogonal Signaling, Non Coherent-I, Non coherent -II, DPSK.

**Optical Filtering and Stochastic Gradient Descent:** DPSK-II, Introduction to wireless communication, Conclusion

## 4. Books and Materials

**Text Book(s)**

1. Rudra Pratap. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers. Oxford University Press, Inc., USA, 2009.

2. Sheldon M. Ross, Introduction to Probability Models, (Twelfth Edition), Academic Press, 2019.

**Reference Book(s):**

1. Proakis, J.G., Salehi, M., Bauch, G., Contemporary Communication Systems Using MATLAB, Third edition, Cengage Learning, 2012.

2. Haykin, Simon S, Adaptive Filter Theory, Fifth Edition, Pearson, 2014.

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

**COURSE STRUCTURE**

**A30491 – 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 | 40 | 60 | 100 |

## 2. Course Description

### Course Overview

The Digital VLSI Testing course provides a comprehensive understanding of techniques and methodologies for ensuring the functionality and reliability of digital integrated circuits (ICs). It covers key topics such as fault modeling, automatic test pattern generation (ATPG), built-in self-test (BIST), scan-based testing, and design for testability (DFT). The course also delves into memory testing, advanced fault models, and challenges in testing circuits in deep submicron technologies. With hands-on experience in using industry-standard EDA tools for test simulation and implementation, students will gain practical skills in designing and implementing test solutions for VLSI circuits. By the end of the course, students will be able to apply test generation techniques, enhance circuit testability, and tackle testing challenges in advanced VLSI designs, preparing them for roles in the semiconductor industry or further research.

### Course Pre/corequisites

A30491- Digital VLSI Testing

## 2. Course Outcomes (COs)

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

A30491.1: Understand the importance of testing and apply various fault models to detect faults in VLSI circuits.

A30491.2: Generate efficient test patterns using ATPG algorithms and implement DFT techniques to enhance circuit testability.

A30491.3: Design and implement BIST systems and apply memory testing techniques for fault diagnosis in logic and memory circuits.

A30491.4: Apply low-power testing techniques and delay testing methods to address timing challenges in high-speed designs.

A30491.5: Utilize advanced EDA tools and industry standards for testing, and execute post-silicon validation and debugging effectively.

## 3. Course Syllabus

### UNIT-I

**Introduction to VLSI Testing and Fault Models**: Introduced to key concepts of VLSI testing, including the importance of testing, different testing processes, and fault models such as stuck-at faults, transition faults, bridging faults, and path delay faults.

### UNIT-II

**Automatic Test Pattern Generation (ATPG) :** Covers ATPG techniques like the D-Algorithm, PODEM, and FAN, alongside test pattern compression methods

**Design for Testability (DFT)** : Design for Testability (DFT) principles such as scan chain design, scan insertion techniques, and boundary scan (JTAG).

**UNIT-III**

**Built-In Self-Test (BIST) and Memory Testing**: BIST architecture, logic BIST (LBIST), memory testing with RAM fault models, March test algorithms, Memory BIST (MBIST), and fault diagnosis strategies for both logic and memory circuits.

**UNIT-IV**

**Low-Power Testing and Delay Testing**: Power-aware testing techniques, delay testing , path delay and transition delay faults, clock skew, timing hazards, at-speed testing, and advanced fault models including crosstalk and soft errors.

**UNIT-V**

**Advanced Topics, Tools, and Post-Silicon Validation:** Explores advanced EDA tools for ATPG and BIST implementation, industry standards such as IEEE 1149.x, IEEE 1500, and IEEE 1687, along with post-silicon validation, debugging techniques, and emerging technologies.

## 4. Books and Materials

### Text Book(s)

1. Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits" by M.L. Bushnell and V.D. Agrawal, Kluwer Academic Publishers, 2000

### Reference Book(s)

1. *"Digital Systems Testing and Testable Design"* by Abramovici, Breuer, and Friedman
2. "Introduction to VLSI Testing" by Vishwani D. Agrawal and Michael L. Bushnell
3. *"VLSI Test Principles and Architectures"* by Laung-Terng Wang, Cheng-Wen Wu, Xiaoqing Wen

### Reference Online Resources/Materials:

1. https://www.youtube.com/watch?v=MEaMm423t0w&list=PLZjlBaHNchvOFBWBAtAP9exwQgYpKqsO4
2. https://www.classcentral.com/course/youtube-digital-vlsi-testing-47862

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A33148 - INTRODUCTION TO INDUSTRY 4.0 AND IIOT

| 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 | 40 | 60 | 100 |

## 1. Course Description

This course provides sensors and actuators in IoT and connectivity technologies like Zigbee, Bluetooth, and RFID, emphasizing network QoS and data protocols such as MQTT and CoAP. It covers Industry 4.0's history, impact, and lean production systems, along with cyber-physical systems, AI, big data, and augmented reality. Students learn about IIoT business models and opportunities, IoT/IIoT reference architectures, and fog computing's role in industrial analytics. The course also includes R programming basics and data management technologies.

## 2. Course Outcomes (COs)

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

A33148.1. Understand various IoT connectivity technologies and their protocols.
A33148.2. Analyze the impact and implementation of Industry 4.0 and lean production systems.
A33148.3. Evaluate the role of augmented reality, virtual reality, AI, and big data in CPS.
A33148.4. Evaluate the feasibility and appropriateness of different business models for IIoT.
A33148.51. Apply fog computing architectures to industrial analytics use cases.

## 3. Course Syllabus

**UNIT-1**

Sensors – Definition, Characteristics, Classification, Actuators - Definition, Classification, IoT Connectivity Technologies – IEEE 802.15.4, Zigbee, 6LoWPAN, Wireless HART, Z-Wave, Bluetooth, NFC, RFID, IoT Network QoS, IoT Data Protocols – MQTT, CoAP, AMQP, XMPP.

**UNIT-2**

Introduction to Industry 4.0, Industry Revolution, the Fourth Revolution, Megatrends, LEAN Production Systems – 7 Types of wastes, overview of Impacts and Implementation of Lean, Smart and Connected Business Perspective.

**UNIT-3**

Cyber Physical Systems – Features, Applications, 5C Architecture, Challenges, difference with embedded systems, Collaborative Platform, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis.

**UNIT-4**

Industrial Internet Systems, Business Models of IoT, Business models of IIoT, Business opportunities in IIoT, Categorization of business models in IIoT, Reference architecture of IoT, Reference Architecture of IIoT.

**UNIT-5**

Fog Computing in IIoT – Fog Computing Architecture for IIoT, Industrial Analytics, Use Cases, IIoT Solutions using Fog, R Programing – Variables, Operators, Data Types, Data Management – Technologies, Process, Sources, Acquisition, Storage.

## 4. Books and Materials

**Text Book(s)**

1) S. Misra, A. Mukherjee, and A. Roy, *Introduction to IoT.* Cambridge University Press, 2021 edition.
2) S. Misra, C. Roy, and A. Mukherjee, *Introduction to Industrial Internet of Things and Industry 4.0,* CRC Press,1st edition 2021

**Online Learning Resources:**

1) https://archive.nptel.ac.in/courses/106/105/106105195/

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

# OPEN ELECTIVES

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

### B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

## Open Electives

| Course Code | Title of the Course | Offered by |
|---|---|---|
| A30181 | Basic Civil Engineering | CE |
| A30182 | Building Planning and Construction | CE |
| A30183 | Disaster Management | CE |
| A30184 | Water Resources Conservation | CE |
| A30281 | Fundamentals of Electrical Engineering | EEE |
| A30282 | Renewable Energy Sources | EEE |
| A30283 | Electrical Measuring Instruments | EEE |
| A30284 | Control Systems Engineering | EEE |
| A30381 | Optimization Techniques | ME |
| A30382 | Mechanical Technology | ME |
| A30383 | Automobile Systems and Applications | ME |
| A30384 | Manufacturing Processes | ME |
| A30481 | Principles of Communication Systems | ECE |
| A30482 | Signal Processing & Applications | ECE |
| A30483 | Fundamentals of IoT | ECE |
| A30484 | Introduction to Embedded Systems | ECE |
| A30579 | The Joy of Computing Using Python | CSE |
| A30581 | Basic Data Structures | CSE |
| A30582 | Fundamentals of DBMS | CSE |
| A30583 | Basics of Software Engineering | CSE |
| A30584 | Python for Every One | CSE |
| A30585 | Computer Organization and Operating Systems | CSE |
| A30586 | Ethical Hacking | CSE |
| A30587 | Fundamentals of Web Technologies | CSE |
| A30588 | Introduction to Java Programming | CSE |
| A30589 | Social Network Analysis | CSE |
| A33147 | Agile Methodologies | CAI |
| A33148 | Human Computer Interaction | CAI |
| A33149 | AI Foundations for Everyone | CAI |
| A33150 | Introduction to Data Science | CAI |
| A33545 | Adhoc and Wireless Sensor Networks | CSO |
| A33546 | Ethics in Information Technology | CSO |
| A33547 | Drone Technologies | CSO |
| A33548 | Computer Communication Networks | CSO |
| A30081 | Research Methodology | H&S |
| A30082 | Intellectual Property Rights | H&S |
| A30083 | National Service Scheme | H&S |
| A30084 | Yoga | H&S |
| A30085 | Design Thinking | H&S |
| A30086 | Management Science | H&S |
| A30087 | Entrepreneurship Development | H&S |
| A30094 | Entrepreneurship | H&S |

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE
## A30181 – 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 | 40 | 60 | 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:**

A30181.1 Classify various materials and components used in building construction.

A30181.2 List out different domains like Structural, Transportation and Geotechnical Engineering in Civil engineering stream.

A30181.3 Identify types of soils and foundations for various structures.

A30181.4 Measure the linear and angular parameters using concepts of surveying.

A30181.5 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
## A30182 – 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 | 40 | 60 | 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:**

A30182.1 Plan buildings by adhering to laws laid by regulatory bodies.

A30182.2 Classify different masonry types of brick and stones used in construction.

A30182.3 Select appropriate floors and roofs for a proposed building.

A30182.4 Identify building materials which can be employed in construction.

A30182.5 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
## A30183 – 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 | 40 | 60 | 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:**

A30183.1 Classify different kind of hazards/disasters and their effects on environment.

A30183.2 Analyze the causes of hazards/disasters which effects human life.

A30183.3 Apply disaster management through engineering applications.

A30183.4 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
## A30184 – 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 | 40 | 60 | 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:**

A30184.1 Interpret ground and surface water utilization for conservation of water resources.

A30184.2 Apply the concepts of artificial ground water recharge to increase ground water level.

A30184.3 Make use of the concepts of harvesting for preservation of water.

A30184.4 Utilizenew technologies like ion exchange and UV radiation techniques to recycle and reuse waste water.

A30184.5 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

## A30281 – 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 | 40 | 60 | 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:**

A30281.1 Apply network reduction techniques and knowledge of alternating quantities to calculate current, voltage and power for complex circuits.

A30281.2 Analyze the electrical circuits using nodal analysis, mesh analysis and network theorems.

A30281.3 Demonstrate the working principle and operation of DC machines, AC machines and single-phase transformers.

A30281.4 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

## A30282 – 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 | 40 | 60 | 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:**

A30282.1 Apply the principles of Renewable energy sources for the construction of Power generating station.

A30282.2 Analyze the various energy conversion systems and their limitations.

A30282.3 Analyze Renewable energy sources for various environmental conditions.

A30282.4 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

## A30283 – 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 | 40 | 60 | 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:**

A30283.1 Categorise various electrical instruments used for measuring electrical parameters.

A30283.2 Design appropriate arrangement for extension of range in measuring instruments.

A30283.3 Analyze the errors and compensations in various electrical measuring instruments.

A30283.4 Measure current, voltage, power and energy in 1-phase and 3-phase circuits.

A30283.5 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
## A30284 – CONTROL SYSTEMS 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 | 40 | 60 | 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

A30002- Mathematics-I

## 2. Course Outcomes (COs)

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

| | |
|---|---|
| A30284.1 | Determine the transfer function of a given system using different techniques. |
| A30284.2 | Analyze the response of a given system in time and frequency domains. |
| A30284.3 | Test the stability, observability and controllability of a given system. |
| A30284.4 | 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

## A30381 – 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 | 40 | 60 | 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:**

A30381.1 Apply various Operations Research models and methods to real world problems.

A30381.2 Solve Linear Programming, assignment, sequencing, game theory, queuing, transportation and project management problems for optimum solution.

A30381.3 Evaluate various alternatives available to find optimal solution for real world problems.

A30381.4 Choose the best strategies to maximize the profit or minimize loss in the presence of a competitor.

A30381.5 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

## A30382 – 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 | 40 | 60 | 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:**

A30382.1 Identify the types of engines and their cycles.

A30382.2 Classify the reciprocating air compressors and their working principles.

A30382.3 Discus the constructional features of domestic refrigeration and air conditioning systems.

A30382.4 Inspect the mechanism of power transmission elements of various engineering systems.

A30382.5 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

## A30383 – AUTOMOBILE SYSTEMS AND 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 | 40 | 60 | 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:**

A30383.1 Identify the different parts of the automobile systems used in daily life.

A30383.2 Analyze brakes, steering, axles, suspension and frames of an engine for better performance.

A30383.3 Inspect the mechanism of power transmission elements, and applications of various engineering systems.

A30383.4 Compare the significance of various engines in terms of their performance.

A30383.5 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

## A30384 – MANUFACTURING 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 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

This course provides details about converting raw material into finished products using various manufacturing processes. With the knowledge acquired through this course, the students will be able to manufacture the products by reducing the wastage of material.

### 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:**

A30384.1 Identify the properties of crystallization of ferrous and nonferrous materials.

A30384.2 Select suitable material for preparing the patterns.

A30384.3 Make use of moulding systems to prepare a product.

A30384.4 Identify the suitable special casting process used for the given application.

A30384.5 Identify the suitable welding process used for the given application.

## 3. Course Syllabus

**UNIT I**

**Engineering Materials-**Industrial Bonds in crystallization of metals, grain and grain boundaries, Determination of Grain size, solid solutions and types, structure and properties of various materials.

**UNIT II**

**Casting:** Introduction, steps involved in making a casting, advantages of casting, applications, pattern making, types of patterns, materials used for patterns, pattern allowances, principles of gating system, gating ratio, design of gating system, mould materials, types of moulds, molding methods and molding machines.

**UNIT III**

**Risers** - Types, function, casting design considerations, design of feeding systems like sprue, runner, gate, riser and molding flasks.

**UNIT IV**

**Special Casting Processes** - Centrifugal, die, investment casting, methods of melting, crucible melting, cupola operation, steel making processes, casting inspection and defects.

**UNIT V**

**Welding:** Classification of welding processes, types of welds, welded joints, gas welding, arc welding, forge welding, resistance welding, thermit welding, plasma (air and water) welding, TIG welding, MIG welding, welding defects, causes and remedies.

## 4. Books and Materials

### Text Book(s)

1. P.N. Rao, *Manufacturing Technology*, Volume-I, Tata McGraw Hill, 4th edition, 2013.

### Reference Book(s)

1. Schmid and Kalpakin, *Manufacturing Technology*, Pearson education, 7thedition, 2014.
2. P. N. Rao, *Manufacturing Technology*, *Foundry forming and welding*, Volume-I, McGraw Hill education, 5th edition, 2018.
3. R.K. Jain, *Production Technology*, Khanna Publishers, 18thedition, 2013.

## COURSE STRUCTURE
## A30481 – PRINCIPLES OF 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 | 40 | 60 | 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**

A30405 - Signals and Systems

### 2. Course Outcomes (COs)

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

A30481.1 Explain the operation of different analog communication systems.

A30481.2 Analyze the performance of different modulation schemes used in analog communication systems.

A30481.3 Make use of sampling theorem to generate pulse modulation signals.

A30481.4 Analyze the performance of AM, FM and PM receivers in the presence of noise.

A30481.5 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, power calculations, generation and demodulation of AM signals. Generation and demodulation of DSBSC, SSBSC and VSBSC signals.

**UNIT - II**

**Angle Modulation:** Generation and demodulation of Frequency Modulation (FM) and Phase modulation (PM) signals. 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, 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

## A30482 – SIGNAL PROCESSING AND 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 | 40 | 60 | 100 |

## 1. Course Description

**Course Overview**

This is an introductory course to all communication engineering subjects. This course deals withclassification of signals and systems in continuous and discrete time domains. The representation of signals in frequency domain is discussed in detail. This course also presents the sampling process of the signals and applications of the signals in various fields.

This course serves as an elementary subject for signal and image processing.

Course Pre/Co-requisites

1. A30002 – Mathematics – I
2. A30010 – Mathematics – II

## 2. Course Outcomes (COs)

After completion of the course, the learner will be able to:
A30482.1 Distinguish between different signals and systems.
A30482.2 Make use of Fourier series for the representation of signals.
A30482.3 Analyze different signals by using an appropriate transform.
A30482.4 Examine the transmission characteristics of linear systems.
A30482.5 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, standard test signals.

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

**UNIT - II**

**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, stableand unstable. LTI Systems - Continuous, discrete time systems and properties of LTI systems.

**UNIT – III**

**FOURIER SERIES**

Representation of the Fourier series, Properties of Fourier Series and Dirichlet's conditions.

**FOURIER TRANSFORMS**:

Deriving Fourier Transform from Fourier series, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform.

**UNIT – IV**

**SAMPLING:** Sampling of continuous time signals, sampling theorem, reconstruction of signal from its samples, the effect of under sampling- aliasing, practical aspects of sampling.

**UNIT –V Applications of Signal Processing**

Audio and video processing, Image processing, Speech processing, Biomedical engineering and Control systems.

**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

## A30483 – 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 | 40 | 60 | 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:**

A30483.1 Analyze IoT applications using IoT enablers and connectivity layers, components.

A30483.2 Distinguish sensors and actuators in terms of their functions and applications.

A30483.3 Interface I/O devices, Sensors using Arduino UNO.

A30483.4 Develop Raspberry Pi Interfacing programs using python concepts.

A30483.5 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

## A30484 – 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 | 40 | 60 | 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

A30432 - Microprocessors and Microcontrollers

## 2. Course Outcomes (COs)

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

A30484.1 Analyze the embedded systems features and architecture considerations

A30484.2 Develop Programs using TM4C123GH6PM Microcontroller

A30484.3 Make use of Peripherals of TM4C123GH6PM to interface I/O Devices

A30484.4 Apply Serial Communication Protocols for interfacing serial Devices.

A30484.5 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**

**A30579 – THE JOY OF COMPUTING USING PYTHON**

| Hours Per Week | | | Hours Per Semester | | | Credits | Assessment Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | L | T | P | C | CIE | SEE | Total |
| 3 | 0 | 0 | 51 | 0 | 0 | 3 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

"The Joy of Computing Using Python" is an engaging introduction to programming with Python, designed for beginners. The course covers fundamental concepts such as variables, control structures, functions, and data structures in a hands-on manner. Students will learn to write and debug code while exploring practical applications in problem-solving and data manipulation. Emphasis is placed on building computational thinking and fostering creativity through interactive projects. By the end, participants will have a solid foundation in Python and the confidence to tackle more advanced programming challenges. The course combines theoretical knowledge with practical exercises to ensure a well-rounded learning experience

### Course Pre/corequisites

**Basic Mathematics**, Computer Operation

## 2. Course Outcomes (COs)

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

A30579.1: Demonstrate proficiency in Python basics, including variables, loops, and conditionals for simple applications.
A30579.2: Apply abstraction and problem-solving techniques to develop applications and games using Python.
A30579.3: Implement and analyze algorithms such as recursion and sorting in practical scenarios.
A30579.4: Handle and analyze data using techniques like image processing, sentiment analysis, and natural language processing.
A30579.5: Develop interactive and automated solutions, including browser automation and calendar manipulation, using Python.

## 3. Course Syllabus

### UNIT-I

Motivation for Computing, Welcome to Programming!! Introduction to Anaconda, Spyder IDE, Variables and Expressions: Design your own calculator, Loops and Conditionals: Hopscotch once again, Lists Crowd computing, Permutations: Jumbled Words

### UNIT-II

Abstraction Everywhere: Apps in your phone, Magic Square hit, Dobble game, Counting Candies: Crowd to the rescue Birthday, Guess the movie, Dictionaries, Sorting and Searching,

### UNIT-III

Substitution Cipher: What's the secret!! Sentiment, Tic tac toe: Let's play, Recursions, Snakes and Ladders: Down the memory lane. Spiral Traversing, Track the route,

**UNIT-IV**

Tuples, Lottery Simulation, Image Processing, Anagrams, Sentiment Analysis: Analyse your Facebook data, Natural Language Processing, six degrees of separation: Meet your favourites Image, Calculation of the Area: Don't measure.

**UNIT-V**

Flames, Data Compression, Browser Automation, Fun with Calendar, Page Rank: How Google Works!!

## 4. Books and Materials

**Textbook(s)**

1. **Charles R. Severance.** *Python for Everybody: Exploring Data Using Python 3.* A beginner-friendly book that explains core Python concepts like variables, loops, conditionals, and functions. It also delves into topics such as web scraping, databases, and data visualization.
2. **Allen B. Downey.** *Think Python: How to Think Like a Computer Scientist.* An introductory textbook that emphasizes problem-solving and computational thinking, aligning well with beginner-level courses in Python.

**Reference Book(s)**

1. **Al Sweigart.** *Automate the Boring Stuff with Python.* A highly practical reference for automating everyday tasks like file management, web scraping, and working with Excel files using Python.
2. **John Zelle.** *Python Programming: An Introduction to Computer Science.* A more computer science-oriented introduction to Python that dives into computational theory and algorithms along with Python coding.
3. **Luciano Ramalho.** *Fluent Python: Clear, Concise, and Effective Programming.* A good reference for more advanced users, focusing on writing more Pythonic and efficient code.
4. **Mark Lutz.** *Learning Python.* A comprehensive book that covers the Python language in-depth. It's a good resource for beginners and intermediate programmers who want to dive deeper into the language.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30581 – 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 | 40 | 60 | 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:**

A30581.1 Analyze the time and space complexities of algorithms.

A30581.2 Apply various operations on linear data structures.

A30581.3 Design searching and sorting techniques for a given application.

A30581.4 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

## A30582 – 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 | 40 | 60 | 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)

A30582.1 Apply suitable data models for given application.

A30582.2 Design database using integrity constraints and ACID properties.

A30582.3 Construct optimized SQL queries to solve real time problems.

A30582.4 Apply suitable normal form to eliminate data redundancy.

A30582.5 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

## A30583 – 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 | 40 | 60 | 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:**

A30583.1 Apply the phases of software development life cycle in application development.

A30583.2 Identify software requirements for construction.

A30583.3 Design requirement engineering process for change management.

A30583.4 Apply the design concepts for design models.

A30583.5 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

## A30584 – 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 | 40 | 60 | 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:**

A30584.1 Apply the basic constructs of Python to solve problems.

A30584.2 Organize lists, tuples and dictionaries appropriately to solve complex problems.

A30584.3 Build functions to increase code reusability.

A30584.4 Implement modular programming for organized software development.

A30584.5 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

## A30585 – COMPUTER ORGANISATION 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 | 40 | 60 | 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:**

A30585. 1 Analyze the fundamentals of computer organization in designing a system.

A30585.2 Apply the concepts of programming language to solve system problems.

A30585.3 Make use of the Operating Systems design structure and its services for system programming.

A30585.4 Develop Process Scheduling algorithms and Inter-Process Communication systems for resource management.

A30585.5 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

## A30587 – 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

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

### 2. Course Outcomes (COs)

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

A30587.1 Apply the principles of creating an effective web page.

A30587.2 Apply the elements of design with regard to the web.

A30587.3 Create the language of the web: HTML and CSS.

A30587.4 Develop skills in analyzing the usability of a web site.

A30587.5 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

## A30588 – INTRODUCTION TO JAVA PROGRAMMING

| 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

This course makes the students to study the syntax, semantics and features of Java Programming Language. Learn the method of creating Multi-threaded programs and handle exceptions. Learn Java features to create GUI applications & perform event handling exceptions.

### 2. Course Outcomes (COs)

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

A30588.1 Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP like encapsulation, Inheritance and Polymorphism.

A30588.2 Demonstrate an ability to design and develop java programs, analyze, and interpretobject oriented data and report results.

A30588.3 Demonstrate an ability to design an object oriented system, swing components andmultithreaded processes as per needs and specifications.

A30588.4 Demonstrate an ability to visualize and work on laboratory and multidisciplinary tasks like console and windows applications both for standalone and Applets programs.

A30588.5 Demonstrate skills to use latest object oriented programming language and software toanalyze OOP problems.

A30588.6 Develop confidence for self-education and ability for life-long learning needed foradvanced java technologies.

### 3. Course Syllabus

**UNIT-I**

**The History and Evolution of Java:**

Java‟s Lineage, The Creation of java, how java changed the internet, **Java's magic:** The byte code, **Servlets:** java on the server side, java Buzzwords, Evolution of java.

**An Overview of Java:**

Object Oriented Programming, Two control statements, Using blocks of codes, Lexical issues,The java class Libraries.

**Data Types, Arrays and Variables:**

**UNIT-II**

**Operators:**

Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logic operators, The assignment operator, The ? Operator, Operator Precedence, Using Parentheses.

**Control Statements:**
Java‟s selection Statements, Iteration statements, Jump Statements.
**Introducing Classes:**
Class Fundamentals, Declaring Objects, Assuming Object reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The Finalize() method, A
Stack class. Overloading Methods, Using Object as Parameter, Argument Passing, Returning Objects, Recursion, Introducing Access control, Understanding static, Introducing Nested and Inner classes, Exploring the String class, Using Command line Arguments, Varargs: variable- Length Arguments.
**UNIT-III**
**Inheritance:**
Basics, Using super, creating a multi-level hierarchy, when constructors are executed, method overriding, dynamic method dispatch, using abstract class, using final with inheritance, the objectclass.
**Packages and Interfaces:** Packages, Access protection, Importing Packages, Interfaces, Default Interfaces, Default interface methods, Use static methods in an Interface, Final thoughts on Packages and interfaces.
**Exception Handling:** Exception handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try statements, throw, throws, finally, Java Built-in Exceptions, Creating your own exception subclasses, Chained Exceptions, Three Recently added Exceptions features, Using Exceptions.
**UNIT-IV**
**Multithreaded Programming:**
The java Thread Model, The main thread , Creating Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Interthread Communication, Suspending, resuming and stopping threads, Obtaining a thread state, Using Multithreading.
**Input and Output operations:**
I/O basics, Reading Console input, Writing console Output, The PrintWriter class, Reading andwriting files, Automatically closing a file.
**UNIT-V**
**Introducing Swing:** The Origins of Swing, Two Key Swing Features, Components and Containers, The Swing Packages, A Simple Swing Application, Event Handling, Create a SwingApplet.
**Exploring Swing:** JLabel and ImageIcon, JTextField, The Swing Buttons, JScrollPane, JList,JComboBox, JTree, JTable.

## 4. Books and Materials

**Text Book(s)**

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

**Reference Book(s)**

1. “Programming with Java” T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan PearsonEdition.

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE
## A30589 - SOCIAL NETWORK 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

This course mainly describes about social network and semantic web which are used to learn knowledge representation using ontology and also understand human behavior in social web and related communities. covering theoretical foundations, research design, data collection techniques, methods for the analysis and visualization of network data, and statistical modelling of networks.

### 2. Course Outcomes (COs)

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

A30589.1 To understand the concept of semantic web and related applications.

A30589.2 To learn knowledge representation using ontology.

A30589. 3 understand human behavior in social web and related communities.

A30589.4 To learn visualization of social networks.

A30589.5 To have access to a variety of descriptive measures for networks and software to calculate them, and have the ability to interpret the results.

### 3. Course Syllabus

**UNIT I**

Introduction to colab, NetworkX - Part I: Where is the similarity, Online SocialMedia, Network Measures Degree Distribution, Cumulative Degree Distribution, Power law Graph Preliminaries, Clusters in Social Network Analysis Types of Clusters, Connected Components Centrality PageRank, Hub & Authority Assortative Mixing, Transitivity, Reciprocity, Measuring Structural Equivalence, Degeneracy.

Introduction to NetworkX - Part II: Rise of Online Social Networks, Synthetic Networks, Properties of Real-World Networks, Small-world Property Synthetic Networks, Erdos-Renyi Networks Regular Ring Laticce Network model, Watts-Strogatz Network Model Barabasi-Albert Network Model Prices Network Model.

**UNIT II**

Preferencial Attachment Model, Vertex Copying Model, Other Models-Local-World Network Growth Model, Network Model with Accelarating Growth, Short-Term Memory Preferential Attachment

Mechanism ,What are links,Link Analysis,Balance Theory, Signed Networks,Interpersonel Ties, Strength of tie, Triadic Closure, Quantifying Strength, Clustering Co-efficient, Dunbar Number, Bridges,Page Rank,DivRank,SimRank, Heterogeneous Network, PathSim,Homophily in the Society,Communities in a network, Community Detection in Network, Community Structure,Types of Communities,Cut, Types of Cuts, Edge Betweenness,Community Detection.

**UNIT III**

Permaence and Communiuty Detection,Clique Percolation Method, Link Partition Method,BigClam,Evaluvation of Community Detection Methods,Label Propagation,Asynchronous Label Propagation, Synchronous Label Propagation, Local Community Detection,Detection Methods,Temporal changes in a network, Link Prediction-Application Areas,Link Prediction,Evaluating Link Prediction, Confusion Matrix,Link Prediction Methods:Local Heuristic,Global Heuristic,Probabilistic Models,Supervised Random Walk.

**UNIT IV**

Information Diffusion:Cascade Model: Decision Based Cascade Model,Cascade in Infinite Chain Model: Generic Model,Generic Model: Case Study,Probabilistic Cascade Model,Compartmental Model of Epidemiology,Analysing Romour Spread: SEIZ Model,Independent Cascade Model,Graph Based Anaomoly Detection: Introduction,Outline,Static Graphs,Static Attributed Graphs,Dynamic Graphs,Deep Learning: Introduction, McMculloch Pitts Neuron, Perceptron Learning Algorithm,Feed Forward Netwrok, Back Propogation,Convolution Nueural Network, Recurrent Neural Network,Mchine Learning Pipelines, Graph Representation Learning,GRL Metod Categories,Matrix Factorisation based GRL Method,Higher Order Proximity Preserved Embedding.

**UNIT V**

LINE: Large Scale Information Network Embedding,Random Walk Based Methods, Deep walk,Graph Convolution Network, Variations of GCN,SAN Tutorial,Model A Problem Using Networks, Malicious Activities on online Social Networks,Sockpuppets on online Social Networks,Shortcut to become popular on social media,Modelling the spread of COVID-19 Pandemic-SIR Model,Types of Recommender Systems.

TEXT BOOKS:

1. Peter Mika, —Social Networks and the Semantic Web, First Edition, Springer 2007.

2. Borko Furht, —Handbook of Social Network Technologies and Applications, 1st

Edition, Springer, 2010

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A33147-AGILE METHODOLOGIES

| 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview**

This course provide the students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software, good understanding of software design and a set of software technologies and APIs, to do a detailed examination and demonstration of Agile development and testing techniques, understand the benefits and pitfalls of working in an Agile team and Agile development and testing.

**Course Pre/Corequisites**

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### 2. Course Outcomes (COs)

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

1. Realize the importance of interacting with business stakeholders in determining the requirements for a software system
2. Perform iterative software development processes: how to plan them, how to execute them.
3. Point out the impact of social aspects on software development success.
4. Develop techniques and tools for improving team collaboration and software quality.
5. Perform Software process improvement as an ongoing task for development teams.
6. Show how agile approaches can be scaled up to the enterprise level.

### 3. Course Syllabus

**UNIT I AGILE METHODOLOGY**

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

**UNIT II AGILE PROCESSES**

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

**UNIT III AGILITY AND KNOWLEDGE MANAGEMENT**

Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

**UNIT IV AGILITY AND REQUIREMENTS ENGINEERING**

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

**UNIT V AGILITY AND QUALITY ASSURANCE**

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development

## 4. Books and Materials

**Text Book(s)**

1. David J. Anderson and Eli Schragenheim, —Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2. Hazza and Dubinsky, —Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

**Reference Book(s)**

1. Craig Larman, —Agile and Iterative Development: A Manager_s Guide‖, Addison-Wesley, 2004.
2. Kevin C. Desouza, —Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A33148-HUMAN COMPUTER INTERACTION

| 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview:**

This course provide the students with knowledge of foundations of Human Computer Interaction, can familiar with the design technologies for individuals and persons with disabilities, aware of mobile Human Computer interaction.

**Course Pre/Corequisites**

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### 2. Course Outcomes (COs)

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

1. Understand the structure of models and theories of human computer interaction and vision.
2. Understand the usability engineering models
3. Understand the cognitive models in user interface
4. Apply the user interface for mobile ecosystem
5. Design an interactive web interface on the basis of models studied.
6. Apply speech recognition and multimodal system

### 3. Course Syllabus

**UNIT I:**

Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices –Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

**UNIT II:**

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

**UNIT III:**

Cognitive models –Socio-Organizational issues and stake holder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

**UNIT IV:**

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

**UNIT V:**

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Recent Trends: Speech Recognition and Translation, Multimodal System

## 4. Books and Materials

**Text Book(s)**

1. David 1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004
2. Brian Fling, “Mobile Design and Development”, First Edition , O Reilly Media Inc., 2009

**Reference Book(s)**

1. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O’Reilly, 2009.

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A33149-AI FOUNDATIONS 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview:**

This course provide the students with knowledge of Artificial Intelligence, machine learning environment, searching Technique for Problem Solving, Natural Language Processing and Robotics

**Course Pre/Corequisites**

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### 2. Course Outcomes (COs)

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

1. Apply searching techniques for solving a problem
2. Design Intelligent Agents
3. Develop Natural Language Interface for Machines
4. Design mini robots
5. Summarize past, present and future of Artificial Intelligence

### 3. Course Syllabus

**UNIT-I Introduction**

Introduction: What is AI, Foundations of AI, History of AI, The State of Art.Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

**UNIT-II Solving Problems by searching**

Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

**UNIT-III Reinforcement Learning & Natural Language Processing**

Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

**UNIT-IV Natural Language for Communication**

Natural Language for Communication: Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, reconstructing the 3D World, Object Recognition from Structural information, Using Vision.

**UNIT-V Robotics**

Robotics: Introduction, Robot Hardware, Robotic Perception, Planning to move, Planning uncertain movements, Moving, Robotic software architectures, application domains Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right direction, What if AI does succeed.

## 4. Books and Materials

**Text Books**

1.Stuart J.Russell, Peter Norvig, “Artificial Intelligence A Modern Approach”, 3rdEdition, Pearson Education, 2019.

**Reference Books**

1.Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.

2.Johnson, Benny G., Fred Phillips, and Linda G. Chase. “An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence.” Journal of Accounting Education 27.1 (2009): 30-39.

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A33150- INTRODUCTION TO DATA 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview:**

This course provide the students with knowledge of concepts, techniques and tools they need to deal with various facets of data science, practice, including data collection and integration, basic types of data and basic statistics. Identify the importance of data reduction and data visualization techniques

**Course Pre/Corequisites**

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### 2. Course Outcomes (COs)

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

1. Understand basic terms what Statistical Inference means.
2. Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data
3. describe the data using various statistical measures
4. utilize R elements for data handling
5. perform data reduction and apply visualization techniques.

### 3. Course Syllabus

**UNIT - I**

Introduction: Definition of Data Science- Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting. Basics of R: Introduction, REnvironment Setup, Programming with R, Basic Data Types.

**UNIT - II**

Data Types & Statistical Description

Types of Data: Attributes and Measurement, What is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes,Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

**UNIT - III**

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting, Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays, Class. Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

**UNIT - IV**

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements. Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List. Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

**UNIT - V**

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation. Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

## 4. Books and Materials

**TEXT BOOKS:**

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

**REFERENCE BOOKS:**

1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
2. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
3. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
4. Paul Teetor, "R Cookbook", O'Reilly, 2011

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A33545- AD HOC AND WIRELESS SENSOR 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview:**

This course provide the students with knowledge of Ad-hoc & Sensor Networks, various fundamental and emerging protocols of all layers, issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks, nature and applications of Ad-hoc and sensor networks, various security practices and protocols of Ad-hoc and Sensor Networks.

**Course Pre/Corequisites**

Computer networking concepts

### 2. Course Outcomes (COs)

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

1. Identify different issues in wireless ad hoc and sensor networks.
2. To analyze protocols developed for ad hoc and sensor networks.
3. To identify and address the security threats in ad hoc and sensor networks.
4. Establish a Sensor network environment for different type of applications.

### 3. Course Syllabus

**UNIT I -MAC & TCP IN AD HOC NETWORKS**

Fundamentals of WLANs, IEEE 802.11 Architecture, Self-configuration and Auto configuration, Issues in Ad-Hoc Wireless Networks, MAC Protocols for Ad-Hoc Wireless Networks,Contention Based Protocols-TCP over Ad-Hoc networks, TCP protocol overview-TCP and MANETs, solutions for TCP over Ad-Hoc Networks.

**UNIT II-ROUTING IN AD HOC NETWORKS**

Routing in Ad-Hoc Networks, Introduction, Topology based versus Position based Approaches, Proactive, Reactive, Hybrid Routing Approach, Principles and issues ,Location services,DREAM ,Quorums based location service, Grid–Forwarding strategies, Greedy packetforwarding ,Restricted directional flooding, Hierarchical Routing, Issues and Challenges inproviding QoS.

**UNIT III-MAC, ROUTING & QOS IN WIRELESS SENSOR NETWORKS**

Introduction, Architecture, Single node architecture, Sensor network design considerations ,Energy Efficient Design principles for WSNs, Protocols for WSN, Physical Layer : Transceiver Design considerations, MAC Layer Protocols ,IEEE802.15.4 Zigbee, Link Layer and Error Control issues-Routing Protocols, Mobile Nodes and Mobile Robots, Data Centric & ContentionBased Networking ,Transport Protocols & QOS, Congestion Control issues ,Application Layersupport.

**UNIT IV -SENSOR MANAGEMENT**

Sensor Management, Topology Control Protocols and Sensing Mode Selection Protocols, Time synchronization, Localization and positioning, Operating systems and Sensor Networkprogramming, Sensor Network Simulators.

**UNIT V -SECURITY IN AD HOC AND SENSOR NETWORKS**

Security in Ad-Hoc and Sensor networks, Key Distribution and Management, Software based Anti-

tamper techniques, water marking techniques, Defence against routing attacks, Secure Adhoc routing protocols, Broadcast authentication WSN protocols, TESLA, Biba, Sensor NetworkSecurity Protocols, SPINS.

## 4. Books and Materials

**TEXT BOOKS:**

1) Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication: In Wired and Wireless Networks", Springer, 2006.
2) Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition), World Scientific Publishing, 2011.
3) C.Siva Ram,Murthy and B.S.Manoj, “Ad Hoc Wireless Networks–Architectures and Protocols”, Pearson Education, 2004.

**REFERENCE BOOKS:**

1) C.K.Toh, “Ad Hoc Mobile Wireless Networks”, Pearson Education, 2002.
2) Erdal Çayırcı , Chunming Rong, “Security in Wireless Ad Hoc and Sensor Networks”, John Wiley and Sons, 2009

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A33546- ETHICS IN INFORMATION 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview:**

This course provide the students with knowledge about professional ethics and understand Organizational culture and Climate, impact of IT Profession, software development Cyber laws and regulations in society. Familiarize with standards, policies, procedures and controls for Information Security Management.

**Course Pre/Corequisites**

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### 2. Course Outcomes (COs)

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

1. understand professional ethics and organizational culture conduct in information technology.
2. choose various leadership styles and the suitability for the specific organization
3. identify the possible Computer crimes and the rules and regulations for protection.
4. describe the various types of IPR and the procedures for obtaining IPR
5. explain the various types of Social Networking and issues
6. relate to the different national and international organizational models with intellectual ability.

### 3. Course Syllabus

**UNIT 1: Overview of Professional Ethics**

Professional Ethics - Big Picture View - Organizational Culture and Climate- Senses of 'EngineeringEthics-Leadership theories: Transactional, Transformational, charismatic leadership, situationalleadership-Participative style of management- Engineers as Managers - Concept of Continuousimprovement- PDCA Cycle- Suggestion Schemes and Quality circles

**UNIT 2: Cyber-Crimes and Cyber Laws**

Ethics for IT Workers and IT Users-IT Professionals-IT professional malpractice-IT , IT Act cyber laws - Information Technology Act, 2000 ("IT Act") - Digital Signature - Confidentiality, Integrity and Authenticity (CIA)

**UNIT 3: Intellectual Property Rights**

Key Issues-Intellectual Property - Software CopyRights- Patents- Patentable Software related Products- IPR Procedures- Patent Application, Publication, examination, awarding

**UNIT 4: Software Development and Information Technology**

Strategies to Engineer Quality Software-Key Issues in Software Development- The impact of IT onthe Standard of Living and Productivity -Industry 4.0 standards and applications in areas like Food,Water, Energy and Health care

**UNIT 5:** Social Networking, Ethics of Information Technology OrganizationsSocial Networking Web Site - Business Applications of Online Social Networking-Social NetworkingEthical IssuesOnline Virtual Worlds-Key ethical issues for Organizations- Outsourcing-WhistleBlowing-Green Computing-ICT

Industry Code for Conduct.

## 4. Books and Materials

**Text Book:**

1. George Reynolds, “Ethics in Information Technology”, CENGAGE Learning Fourth Edition, 2012. ISBN: 9788131518755, 8131518752

**Reference Books:**

1. Richard A. Spinello, “Case Studies in Information Technology Ethics”, Prentice Hall, Second Edition, 2003. ISBN:978-0130991508.

2. Sara Base, “A Gift of Fire:social, legal, and ethical issues for computing and the Internet”, Prentice Hall, Second Edition, 2008, ISBN: 978-0132492676

3. IT Act https://indiacode.nic.in/bitstream/123456789/1999/3/A2000-21.pdf

4. IPR in India Laws and Procedures: https://www.india-briefing.com/news/intellectualproperty-rights-india-laws-procedures-registration-14312.html/

5. Industry 4.0 the Fourth Industrial Revolution https://www.i-scoop.eu/industry-4-0/

6. ISMS Policy Oil India https://oilweb.oilindia.in/policy/Information_Security_Polciy_2013.pdf

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A33547 - DRONE 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview:**

This course provide the students with knowledge about the basics of drone concepts, fundaments of design, fabrication and programming of drone, flying and operation of drone, various applications of drone, safety risks and guidelines of fly safely.

**Course Pre/Corequisites**

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### 2. Course Outcomes (COs)

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

1. Analyze the impact of drone technology on various businesses.
2. Compare and contrast different methods of programming a drone.
3. Identify the various flight controls and management tools used in drone operation.
4. Utilize drones effectively in insurance inspections and claim assessments.
5. Design and implement safety protocols for operating drones in various scenarios.

### 3. Course Syllabus

**UNIT I-INTRODUCTION TO DRONE TECHNOLOGY**

Drone Concept - Vocabulary Terminology- History of drone - Types of current generation of drones based on their method of propulsion- Drone technology impact on the businesses- Drone business through entrepreneurship- Opportunities/applications for entrepreneurship and employability

**UNIT II-DRONE DESIGN, FABRICATION AND PROGRAMMING**

Classifications of the UAV -Overview of the main drone parts- Technical characteristics of the parts - Function of the component parts -Assembling a drone- The energy sources- Level of autonomy- Drones configurations -The methods of programming drone- Download program - Install program on computer- Running Programs- Multi rotor stabilization- Flight modes -Wi-Fi connection.

**UNIT III-DRONE FLYING AND OPERATION**

Concept of operation for drone -Flight modes- Operate a small drone in a controlled environment- Drone controls Flight operations –management tool –Sensors-Onboard storage capacity -Removable storage devices- Linked mobile devices and applications

**UNIT IV-DRONE COMMERCIAL APPLICATIONS**

Choosing a drone based on the application -Drones in the insurance sector- Drones in delivering mail, parcels and other cargo- Drones in agriculture- Drones in inspection of transmission lines and power distribution -Drones in filming and panoramic picturing

**UNIT V-FUTURE DRONES AND SAFETY**

The safety risks- Guidelines to fly safely -Specific aviation regulation and standardization- Drone license- Miniaturization of drones- Increasing autonomy of drones -The use of drones in swarms

## 4. Books and Materials

**Text Book:**

Editor(s):Sachi Nandan Mohanty, J.V.R. Ravindra, G. Surya Narayana, Chinmaya Ranjan Pattnaik, Y. Mohamed Sirajudeen

# G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A33548 -COMPUTER COMMUNICATION 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 | 40 | 60 | 100 |

### 1. Course Description

**Course Overview:**

This course provide the students with knowledge of data communication and networking, comprehend the layering architecture of OSI reference model and TCP/IP protocol suite, different protocols associated with each layers.

**Course Pre/Corequisites**

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### 2. Course Outcomes (COs)

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

1. Understand the components and layered architecture of communication networks
2. Identify the protocols and services of data link layer.
3. Analyze the different LAN technologies for building networks.
4. Describe the wireless WAN technologies for wireless transmission.
5. Design network model and determine the routing protocols for different applications.
6. Construct communication networks for supporting different applications

### 3. Course Syllabus

**Unit I :Physical Layer**

Uses of Computer Networks – Network Hardware – Network Software – Reference Models – Example Networks – Example Data Communication Services – Network Standardization –The Theoretical Basis for Data Communication – Transmission Media – WirelessTransmission – The Telephone System – Narrow band ISDN , Broadband ISDN and ATM –Cellular Radio – Communication Satellites

**Unit II :Data Link Layer**

Data Link Layer Design Issues – Error Detection and Correction – Elementary Data Link Protocols – Sliding Window Protocols – Protocol Specification and Verification – Example Data Link Protocols – The Channel Allocation Problem – Multiple Access Protocols – IEEE Standard 802 for LANS and MANS – Bridges – High Speed LANS – Satellite Networks

**Unit III :Network Layer**

Network Layer Design Issues – Routing Algorithms – Congestion Control Algorithms –Internetworking – The Network Layer in the Internet – The Network Layer in ATM Networks Transport LayerTransport Service – Elements of Transport Protocols – A simple transport protocol – TheInternet Transport Protocols (TCP and UDP) – The ATM AAL Layer Protocols – Performance Issues

**Unit IV : Application Layer**

Network Security – Domain Name System (DNS) – Simple Network Management Protocol (SNMP) – Electronic Mail – Usenet News – The World Wide Web – Multimedia

**Unit V :ATM Networks**

Introduction - ATM – Historical perspective – protocol architecture – logical connectives – cells – transmission of ATM cells – SDH – SONET – Switches. ATM Protocol – Connection setup – routing , switching

## 4. Books and Materials

**Text Book(s)**

1. Andrew S.Tanenbaum , Computer Networks, Prentice Hall of India ,1997
2. Rainer Handel, Manfred N.Huber, Stefan Schroder, "ATM Networks", Addison Wesley, 1999.

**Reference Book(s)**

1. W.Stallings ,Data and Computer Communication, Prentice Hall of India ,New Delhi,
Fourth Edition ,1996
2. F.Halsai ,Data Communications, Computer Networks and Open Systems, Addison Wesley Publications , Third Edition ,1994.
3. Peterson, Computer Networks, Second edition.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE
## A30081 – 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 | 40 | 60 | 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:**

A30081.1 Interpret the importance of literature survey to identify the research problem.

A30081.2 Develop suitable research methodologies to conduct engineering research.

A30081.3 Apply the principles of research to gather the required data from various sources.

A30081.4 Evaluate the gathered data by using appropriate statistical techniques.

A30081.5 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
## A30082 – 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 | 40 | 60 | 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:**

A30082.1 Analyze ethical and professional issues which arise in the intellectual property law context.

A30082.2 Apply intellectual property law principles (including copyright, patents, designs and trademarks) to real problems.

A30082.3 Analyze the social impact of intellectual property law and policy.

A30082.4 Make use of copyrighted material so that it does not obstruct the progress of human knowledge.

A30082.5 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
## A30083 – 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 | 40 | 60 | 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:**

A30083.1 Classify the organizational structure of NSS and its activities.

A30083.2 Identify the methods of mobilization and importance of youth Leadership.

A30083.3 Develop a sense of social and civic responsibility and provide solutions to individual and community problems.

A30083.4 Recognize the need for lifelong learning capabilities with the concepts of volunteerism and its functions.

A30083.5 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
## A30084 – 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 | 40 | 60 | 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

A30084.1 Improve physical conditioning related to flexibility through participation in yoga.

A30084.2 Develop and maintain a personal yoga practice.

A30084.3 Recognize and apply the value and benefits of an on-going yoga practice.

A30084.4 Select asanas appropriate for personal needs.

A30084.5 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.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30085 – 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 | 40 | 60 | 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:**

A30085.1 Appreciate various design processes for creativity and innovation.

A30085.2 Develop design ideas through different techniques.

A30085.3 Identify the significance of reverse engineering about products.

A30085.4 Make use of design drawings to communicate ideas effectively.

A30085.5 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

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

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

## COURSE STRUCTURE

## A30086 – 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 | 40 | 60 | 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:**

A30086.1 Apply the concepts, theories, and principles of management in professional life.

A30086.2 Design suitable organization structure for managing the operations in the organization.

A30086.3 Apply principles of management to the various functional areas of an organization such as Human Resource, Marketing and Production.

A30086.4 Evaluate cost and time of each business project by using PERT and CPM techniques.

A30086.5 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*, 1st edition, New Delhi: Cengaage, 2012.
2. Vijay Kumar & Apparo: *Introduction to Management Science*, New Delhi Cengage, 2011.

# G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

**COURSE STRUCTURE**

**A30087 – 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 | 40 | 60 | 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:**

A30087.1 Analyze the nature of entrepreneurship, risk and reward in modern business scenario.

A30087.2 Identify the business challenges and opportunities by various case studies.

A30087.3 Assess the promotion and institutional support by various agencies in India.

A30087.4 Evaluate the role of angel investors in promotion and expansion of start-ups in India.

A30087.5 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:

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

# G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

**COURSE STRUCTURE**

**A30094 – ENTREPRENEURSHIP**

| 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 | 40 | 60 | 100 |

## 1. Course Description

### Course Overview

This course provides a comprehensive exploration of entrepreneurship as a key driver of business growth and economic value. It offers essential frameworks for success and pathways to sustainable development, covering each theme with both conceptual and practical insights. By the end of the course, students will understand entrepreneurship's role in economic progress, gain clarity on success factors and risk mitigation, and develop skills to navigate the challenges of entrepreneurship effectively.

### Course Pre/corequisites

B3719- Entrepreneurship and Start -Up

## 2. Course Outcomes (COs)

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

A30094.1: Identify business opportunities through market research and competitive analysis.
A30094.2 Apply ideation techniques to create prototypes and MVPs for new ventures.
A30094.3 Evaluate the dynamics of business growth and the role of entrepreneurship in employment creation.
A30094.4: Analyze the impact of technological innovation on entrepreneurship
A30094.5: Explore funding sources and create financial strategies for startups.

## 3. Course Syllabus

### UNIT-I

**The Entrepreneurial Process Entrepreneurial Journey**
Introduction to the entrepreneurial process, key stages, milestones, and challenges. Success stories and case studies of prominent entrepreneurs
**Entrepreneurial Discovery-**Techniques for identifying business opportunities and unmet market needs. Tools such as market research, competitive analysis, and consumer behavior insights.
**Ideation and Innovation**: Ideation and Prototyping-Creative techniques for generating ideas. Steps for developing prototypes and minimum viable products (MVP) using iterative methods and design thinking.

### UNIT-II

**Testing, Validation, and Commercialization**-Strategies for product testing and customer validation. Refining business ideas based on feedback and scaling ideas into commercially viable products and services.
**Disruption as a Success Driver-**Understanding disruption in industries and its role in driving entrepreneurial success. Case studies of disruptive businesses and lessons on leveraging disruption for growth.
**Technological Innovation and Entrepreneurship– 1** -The impact of emerging technologies (AI, blockchain, IoT, etc.) on entrepreneurship. Leveraging technology for innovation and competitive advantage.

**UNIT-III**

**Technological Innovation and Entrepreneurship – 2**

Advanced strategies for integrating technological innovation into startups. Digital transformation, automation, and scaling through tech-enabled processes.

**Raising Financial Resources**

Overview of funding sources such as venture capital, angel investors, and crowdfunding. Strategies for securing funding and best practices for financial management.

**Education and Entrepreneurship**-The role of education in fostering entrepreneurship. Developing entrepreneurial skills in academic institutions and promoting entrepreneurship as a career path.

**UNIT-IV**

**Beyond Founders and Founder-Families Challenges** of scaling a business beyond the founder. Building strong leadership teams and succession planning for family-owned and founder-led businesses.

**India as a Start-up Nation-**Overview of India's startup ecosystem. Government policies, initiatives, and success stories that support and promote startups in India.

**National Entrepreneurial Culture-**Examining how different national cultures influence entrepreneurship. A comparative study of entrepreneurial ecosystems across the globe

**UNIT-V**

**Entrepreneurial Thermodynamics-**The dynamics of business growth and the concept of "entrepreneurial energy." Strategies for maintaining momentum and managing burnout in startups**.**

**Entrepreneurship and Employment-**How entrepreneurship contributes to job creation and economic growth. The relationship between startups, employment generation, and economic development**.**

**Start-up Case Studies-**In-depth analysis of real-world startups. Lessons learned from both successful ventures and failures across various industries.

## 4. Books and Materials

**Text Book(s)**

1. Arya Kumar, Entrepreneurship, Pearson, Delhi, 2012.
2. Poornima M, Entrepreneurship Development –Small Business Enterprises, Pearson, Delhi, 2009

**Reference Book(s)**

1. Michael H. Morris, et. al., Entrepreneurship and Innovation, Cengage Learning, New Delhi, 2011
2. KanishkaBedi, Management and Entrepreneurship, Oxford University Press, Delhi, 2009
3. Good Enough! To Launch Your Company, by Randal Wimmer, Joshua Ducharme, 2023
4. Start Your Business With Confidence, by Jeff Bezos, 2023

**Reference Online Resources/Materials:**

2. https://onlinecourses.nptel.ac.in/noc24_mg93/announcements?force=true