G.Pullaiah College of Engineering and Technology

(Autonomous)

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

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

BACHELOR OF TECHNOLOGY

ACADEMIC REGULATIONS
GPCET - R19

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

Preliminary Definitions and Nomenclature

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

G. Pullaiah College of Engineering and Technology
(Autonomous)
Academic Regulations
Regulations for Four Year Bachelor of Technology (B.Tech) Degree programme for the batches admitted from the academic year 2019-20
&
For B.Tech Lateral Entry batches admitted from the academic year 2020 -2021

1. Award of B.Tech. Degree

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

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

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

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

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

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

3. Courses of study

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

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

4. Credits:

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

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

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

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

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

5. Course Structure

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

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

6. Weightage for course evaluation

6.1 Course Pattern

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

6.2 Evaluation Process

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition, Project Work Phase-1, Socially Relevant projects and Internships are evaluated for 100 marks each and Project Work Phase- 2 shall be evaluated for 200 marks.

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

6.3 Internal Examinations:

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

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

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

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

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

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

6.4 **End Examinations**:

End examination of theory subjects shall have the following pattern:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

6.11 **Honors degree in a discipline:**

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

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

Procedure for Conduct and Evaluation of Honors degree Mini project:

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

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

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

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

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

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

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

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

6.15 Procedure for Conduct and Evaluation of Project II:

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

7. Attendance Requirements:

- A student shall be eligible to appear for University examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
- A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester when offered next.

8. Minimum Academic Requirements:

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

8.1 A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. In case of audit courses and technical seminar & comprehensive viva – voce he/she should secure 40% of the total marks.

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

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

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

One regular and four supplementary examinations of I Semester.

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

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

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

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

9. Course Pattern:

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

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

(ii) **With–holding of Results**:

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

(iii) **Grading**

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

Table – Conversion into Grades and Grade Points assigned

Range in which the marks in the subject fall	Grade	Grade points Assigned
≥ 90	S (Superior)	10
80-89	A (Excellent)	9
70-79	B (Very Good)	8
60-69	C (Good)	7
50-59	D (Average)	6
40-49	E (Below Average)	4
< 40	F (Fail)	0
Absent	Ab (Absent)	0

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

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

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

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

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

where, C_i is the number of credits of the i^{th} subject and GP_i is the grade point scored by the student in the i^{th} course.

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

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

where "$SGPA_j$" is the SGPA of the j^{th} semester and TC_j is the total number of credits in that semester.

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

(iv) While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

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

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

11. Award of Class:

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

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 4.0 < 5.5

12. Gap Year:

Gap year concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after II year to pursue entrepreneurship full time. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. An evaluation committee shall be constituted by the College to evaluate the proposal submitted by the student and the committee shall decide whether or not to permit the student(s) to avail the Gap Year.

13. Transitory Regulations:

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

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

14. Minimum Instruction Days:

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

15. Medium of Instruction

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

16. Rules of Discipline

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

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

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

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

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

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

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

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

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

(x) Dress Code

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

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

17. ***Punishments for Malpractice cases – Guidelines***

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

S.No.	**Nature of Malpractice/Improper conduct**	**Punishment**
1	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cellphones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the course of the examination).	Expulsion from the examination hall and cancellation of the performance in that course only.
2	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
3	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
4	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any other student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the students involved. In case of an outsider, he will be handed over to the police and a case shall be registered against him.
5	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that

		semester/year.
6	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
7	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeit of seat.
8	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case shall be registered against them.
9	Leaves the exam hall taking away answer script or intentionally tears up the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from classwork and all end examinations. The continuation of the course by the

		candidate is subject to the academic regulations in connection with forfeiture of seat.
10	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The student is also debarred and forfeits the seat.
11	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in S.No7 to S.No 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case shall be registered against them.
12	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college for one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed over to the police and a case shall be registered against him. The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination including practicals and project work of that semester/year. The student is rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
13	If any malpractice is detected which is not covered in the above S.No 1 to S.No 12 items, it shall be reported to the college academic council for further action and award suitable punishment.	
14	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable punishment.	

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

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

1. Award of B.Tech. Degree

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

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

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

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

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

2. Minimum Academic Requirements:

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

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. For the Seminar & Comprehensive viva-voce he should secure 40% in the internal evaluation.

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

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

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

3. Course Pattern

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

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

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

5. Award of Class:

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

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

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

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

MECHANICAL ENGINEERING

Under R19 Regulations

B. Tech. - Regular Four-Year Degree Program

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

&

B. Tech. - Lateral Entry Scheme

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

PROGRAMMECURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – MECHANICAL ENGINEERING

0 SEMESTER (I YEAR)									
S.No	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
19SIP01	Physical Activities - Sports, Yoga and Meditation, Plantation	MC	0	0	6	0	-	-	-
19SIP02	Career Counselling	MC	2	0	2	0	-	-	-
19SIP03	Orientation to all branches - career options, tools, etc.	MC	3	0	0	0	-	-	-
19SIP04	Orientation on admitted Branch - corresponding labs, tools and platforms	EC	1	0	4	0	-	-	-
19SIP05	Proficiency Modules & Productivity Tools	ES	2	1	2	0	-	- http://www.gpcet.ac.in/	-
19SIP06	Assessment on basic aptitude and mathematical skills	MC	1	0	4	0	-	-	-
19SIP07	Remedial Training in Foundation Courses	MC	2	1	2	0	-	-	-
19SIP08	Human Values & Professional Ethics	MC	3	0	0	0	-	-	-
19SIP09	Communication Skills - focus on Listening, Speaking, Reading, Writing skills	BS	2	1	2	0	-	-	-
	TOTAL		16	3	22	0			-

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PROGRAMMECURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – MECHANICAL ENGINEERING

I SEMESTER (I YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2002	Mathematics-I	BS	3	1	0	4	30	70	100
A2004	Engineering Physics	BS	3	0	0	3	30	70	100
A2501	Computer Programming	ES	3	1	0	4	30	70	100
A2001	Communicative English	HS	2	0	0	2	30	70	100
A2006	Communicative English Laboratory	HS	0	0	3	1.5	30	70	100
A2008	Engineering Physics Laboratory	BS	0	0	3	1.5	30	70	100
A2502	Computer Programming Laboratory	ES	0	0	3	1.5	30	70	100
	TOTAL		11	02	09	17.5	210	490	700

II SEMESTER (I YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2011	Mathematics-II	BS	3	1	0	4	30	70	100
A2005	Engineering Chemistry	BS	3	0	0	3	30	70	100
A2503	Data Structures	ES	3	0	0	3	30	70	100
A2303	Engineering Mechanics	ES	3	0	0	3	30	70	100
A2301	Engineering Graphics and Computer Aided Drafting	ES	1	0	4	3	30	70	100
A2009	Engineering Chemistry Laboratory	BS	0	0	3	1.5	30	70	100
A2504	Data Structures Laboratory	ES	0	0	3	1.5	30	70	100
A2304	Applied Mechanics Laboratory	ES	0	0	3	1.5	30	70	100
A2302	Co-Engineering Laboratory	ES	0	0	3	1.5	30	70	100
	TOTAL		13	01	16	22	270	630	900

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B. TECH – MECHANICAL 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
A2014	Transform Techniques and Numerical Methods	BS	3	0	0	3	30	70	100
A2305	Thermodynamics	PC	3	1	0	4	30	70	100
A2306	Mechanics of Solids	PC	3	0	0	3	30	70	100
A2307	Material Science and Engineering	PC	3	0	0	3	30	70	100
A2308	Engineering Drawing for Mechanical Engineers	PC	2	0	2	3	30	70	100
A2309	Mechanics of Solids Laboratory	PC	0	0	4	2	30	70	100
A2310	Material Science and Engineering Laboratory	PC	0	0	3	1.5	30	70	100
A2311	Computer Aided Drafting Laboratory	PC	0	0	3	1.5	30	70	100
A2015	Quantitative Aptitude and Reasoning - I	BS	1	0	0	1	30	70	100
A2031	Environmental Science	MC	2	0	0	0	100*	0	100*
	TOTAL		17	01	12	22	270	630	900

IV SEMESTER (II YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2312	Fluid Mechanics and Hydraulic Machines	PC	3	0	0	3	30	70	100
A2313	Kinematics of Machinery	PC	3	0	0	3	30	70	100
A2314	I.C. Engines	PC	3	0	0	3	30	70	100
A2315	Manufacturing Technology	PC	3	0	0	3	30	70	100
A2316	Computer Aided Machine Drawing	PC	2	0	2	3	30	70	100
A2317	Fluid Mechanics and Hydraulic Machines Laboratory	PC	0	0	3	1.5	30	70	100
A2318	I.C Engines Laboratory	PC	0	0	3	1.5	30	70	100
A2319	Manufacturing Technology Laboratory	PC	0	0	3	1.5	30	70	100
A2016	Quantitative Aptitude and Reasoning - II	BS	1	0	0	1	30	70	100
A2320	Socially Relevant Project-I	PW	0	0	2	1	100	0	100
A2321	Comprehensive Assessment-I	PC	0	0	0	1	100	0	100
A2047	Human Values and Professional Ethics	MC	2	0	0	0	100*	0	100*
	TOTAL		17	00	13	22.5	470	630	1100

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

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PROGRAMMECURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – MECHANICAL 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
A2322	Thermal Engineering	PC	3	0	0	3	30	70	100
A2323	Dynamics of Machinery	PC	3	1	0	4	30	70	100
A2324	Design of Machine Elements	PC	3	0	0	3	30	70	100
	Professional Elective-I	PE	3	0	0	3	30	70	100
	Open Elective-I	OE	3	0	0	3	30	70	100
A2325	Machine Tools Laboratory	PC	0	0	3	1.5	30	70	100
A2326	CAD/CAM Laboratory	PC	0	0	3	1.5	30	70	100
A2327	Production Drawing Practice	PC	0	0	2	1	30	70	100
A2328	Socially Relevant Project-II	PW	0	0	2	1	100	0	100
A2049	Gender Sensitization	MC	2	0	0	0	100*	0	100*
	TOTAL		17	01	10	21	340	560	900

VI SEMESTER (III YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A2701	Managerial Economics & Financial Analysis	HS	3	0	0	3	30	70	100
A2329	Design of Transmission Systems	PC	3	1	0	4	30	70	100
A2330	Heat Transfer	PC	3	0	0	3	30	70	100
	Professional Elective-II	PE	3	0	0	3	30	70	100
	Open Elective-II	OE	3	0	0	3	30	70	100
A2331	Heat Transfer Laboratory	PC	0	0	3	1.5	30	70	100
A2238	MATLAB Programming Laboratory	ES	0	0	3	1.5	30	70	100
A2017	Professional English Communication Skills	HS	0	0	2	1	30	70	100
A2333	Comprehensive Assessment-II	PC	0	0	0	1	100	0	100
A2048	Indian Constitution and Multiculturalism	MC	2	0	0	0	100*	0	100*
	TOTAL		17	01	08	21	340	560	900

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

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PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – MECHANICAL 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
A2334	Operations Research	PC	3	0	0	3	30	70	100
A2335	Metrology and Measurements	PC	3	0	0	3	30	70	100
	Professional Elective-III	PE	3	0	0	3	30	70	100
	Open Elective-III	OE	3	0	0	3	30	70	100
A2336	Computer Aided Engineering Laboratory	PC	0	0	4	2	30	70	100
A2337	Metrology and Measurements Laboratory	PC	0	0	4	2	30	70	100
A2338	Mini-Project/Internship	PW	0	0	4	2	100	0	100
A2339	Project Work Phase - I	PW	0	0	4	2	100	0	100
	TOTAL		**15**	**00**	**10**	**20**	**380**	**420**	**800**

VIII SEMESTER (IV YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
	Professional Elective-IV	PE	3	0	0	3	30	70	100
	Open Elective-IV	OE	3	0	0	3	30	70	100
A2340	Project Work Phase - II	PW	0	0	16	8	60	140	200
	TOTAL		**06**	**00**	**16**	**14**	**120**	**280**	**400**

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PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – MECHANICAL ENGINEERING

Professional Electives

Professional Elective – 1	
Course Code	**Title of the Course**
A2351	Machining Processes
A2352	Non-Conventional Sources of Energy
A2353	Principles of Management
A2354	Flexible Manufacturing System
Professional Elective – 2	
Course Code	**Title of the Course**
A2355	Production and Operations Management
A2356	Refrigeration and Air Conditioning
A2357	Mechanical Vibrations
A2358	Metal Forming Processes
Professional Elective – 3	
Course Code	**Title of the Course**
A2359	Modern Manufacturing Methods
A2360	Automobile Engineering
A2361	Finite Element Method
A2362	Artificial Intelligence for Mechanical Engineers
Professional Elective – 4	
Course Code	**Title of the Course**
A2363	Industrial Engineering
A2364	Power Plant Engineering
A2365	Composite Materials
A2366	Automation and Robotics

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B. TECH – MECHANICAL ENGINEERING

Open Electives

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

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

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

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

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

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

Course Content:		
Unit-I	**Matrix Opreations And Solving Systems Of Linear Equations**	**Lecturer Hours:10Hrs**
Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix,		
Unit-II	**Quadratic forms and Mean Value Theorems**	**Lecturer Hours:8Hrs**
Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof).		
Unit-III	**Multivariable Calculus**	**Lecturer Hours:8Hrs**
Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers with three variables only.		
Unit-IV	**Double Integrals**	**Lecturer Hours:8Hrs**
Double integrals, change of variables ,change of order of integration, double integration in polar coordinates, areas enclosed by plane curves		
UNIT-V	**Multiple Integrals and Special Functions**	**Lecturer Hours:8Hrs**
Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates, Beta and Gamma functions and their properties, relation between beta and gamma functions.		

Text Books:

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

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

References:

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

ENGINEERING PHYSICS

Title of the Course	Engineering Physics				
Branches for which this course is offered	I B.Tech I Sem (CE & ME)	L	T	P	C
		3	0	0	3

Course Overview

There has been an exponential growth of knowledge in the recent past opening up new areas and challenges in the understanding of basic laws of nature. The laws of physics play a key role in the development of science, engineering and technology. Sound knowledge of physical principles is of paramount importance in understanding new discoveries, recent trends and latest developments in the field of engineering. To keep in pace with the recent scientific advancements in the areas of emerging technologies, the syllabi of engineering physics has been thoroughly revised keeping in view of the basic needs of all engineering branches by including the topics in basic concepts of mechanics, acoustics, material properties,lasers and fiber optics are introduced, types of sensors for various engineering applications are to be familiarized.

Course Objectives

- To disseminate knowledge in basic concepts of mechanics
- To enlighten the concepts of acoustics and ultrasonics with their engineering applications.
- To impart knowledge in the basic concepts of elasticity
- To impart knowledge in basic concepts of optical fiber and laser along with its engineering applications
- Familiarize types of sensors for various engineering applications.

Course Outcomes	
After Successful completion of the course, the student will able to	
CO1	**apply**mechanics for solving engineering problems
CO2	**apply** the principles of acoustics for noise cancellation and in designing buildings
CO3	**analyze** the applications of ultrasonics in various engineering fields
CO4	**explain**the relationship between elastic constants
CO5	**interpret** the concepts of lasers and optical fibers in various applications
CO6	**identify** the sensors for various engineering applications

Course Content			
Unit-I	**MECHANICS**	**Lecture Hours**	**10**
Basic laws of vectors and scalars, conservative forces F = - grad V and angular momentum, Newton's laws in inertial and linear accelerating non-inertial frames of reference, rotating frame of reference with constant angular velocity, Centrifugal and Coriolis forces, Effect of Coriolis force due to Earth's rotation, qualitative explanation of Foucault's pendulum-rigid body, angular momentum, moment of inertia, Moment of Inertia of a fly wheel and circular Disc.			
Unit-II	**ACOUSTICS AND ULTRASONICS**	**Lecture Hours**	**10**
ACOUSTICS : Classification of Sound, decibel, Weber–Fechner law – Sabine's formula, derivation using growth and decay method – Absorption coefficient and its determination – factors affecting acoustics of buildings and their remedies. **ULTRASONICS**: Introduction-magnetostriction effect and piezo electric effect-Production of ultrasonics by magnetostriction and piezoelectric methods, acoustic grating-Determination of velocity of ultrasonics by using acoustic diffraction- Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Medical applications, Sonogram.			
Unit-III	**ELASTICITY**	**Lecture Hours**	**8**
Concepts of elasticity, plasticity, Idealization of one dimensional stress-strain curve; Generalized Hooke's law with and without thermal strains for isotropic materials; elastic constants and their relationships; Strain energy, expression for strain energy stored in a body when the load is applied gradually and suddenly.			
Unit-IV	**LASERS ANDFIBEROPTICS**	**Lecture Hours**	**14**
LASERS : Introduction - Characteristics of Laser - Spontaneous and Stimulated emission of radiation - Einstein's coefficients - Population inversion - Pumping Mechanisms - He-Ne laser, Nd-YAG laser - Semiconductor laser - Applications of laser. **FIBEROPTICS**: Introduction-Total Internal Reflection-Construction of optical fibers, Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile& modes –Propagation of electromagnetic wave through optical fiber- importance of V number- Block Diagram of Fiber optic Communication system -Medical Applications.			
Unit-V	**SENSORS**	**Lecture Hours**	**8**
Sensors :(qualitative description only): Different types of sensors and applications; Strain and Pressure sensors- Piezoelectric, magneto strictive sensors, Fiber optic methods of pressure sensing; Temperature sensor -Hall-effect sensor, smoke and fire detectors.			
Text Books			
1	D.Kleppner and Robert Kolenkow"An introduction to Mechanics"-II -Cambridge University Press,2015		
2	Gaur R.K. and Gupta S.L., "Engineering Physics"-Dhanpat Rai publishers, 2012		
3	M.N.Avadhanulu&P.G.Kshirsagar"A Text book of Engineering Physics"-S.Chand Publications,2017		
4	Ian R Sinclair, Sensor and Transducers 3rd eds, 2001, Elsevier (Newnes)		
References			
1	M K Varma "Introduction to Mechanics"-Universities Press-2015		
2	D.K. Bhattacharya and A. Bhaskaran, "Engineering Physics"- Oxford Publications-2015		

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

COMPUTER PROGRAMMING

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

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

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

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

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

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

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

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

COMMUNICATIVE ENGLISH

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

Course Overview

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

Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.

Course Outcomes:

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

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

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

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

Reference Books

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

Sample Web Resources

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

https://www.englishpractice.com/

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

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

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

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

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

Online Dictionaries

Cambridge dictionary online

MacMillan dictionary

Oxford learner's dictionaries

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
COMMUNICATIVE ENGLISH LAB

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

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

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

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

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

Suggested Software:

1. Kvan Advanced Communication Skills.

References:

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

Sample Web Resources

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

ENGINEERING PHYSICS LAB

Title of the Course	Engineering Physics Lab				
Branches for which this course is offered	I B.Tech I Sem (CE&ME)	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

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

Course Objectives
The main objective of this lab is the student • Will recognize the important of rigidity modulus of material of a wire. • Will understand the role of moment of inertia a physical object • Will understand the ultrasonic velocity in liquid • Will understand the role of optical fiber parameters and significance of laser in engineering applications • Will recognize the application of the elastic constants of the material • Will identify the various sensor applications

Course Outcomes	
After Successful completion of the course, the student will able to	
CO1	**estimate** the mechanical properties of materials
CO2	**determine** moment of inertia of a flywheel
CO3	**measure** the velocity of ultrasonics in liquid by applying the basic concepts of ultrasonics
CO4	**determine**the wavelength of laser, particle size, numerical aperture and acceptance angle by applying the principles of lasers and optical fibres
CO5	**measure** the elastic constants, Poisson's ratio of the material and verifiesHooke'slaw
CO6	**compare** pressure and temperature variation in strain gauge sensor and optical fibre sensor

Course Content	
Experiment No	**Name of the Experiment**
1	Polygon law of coplanar forces
2	Rigidity modulus of material of a wire-dynamic method (torsional pendulum)
3	Moment of inertia by Flywheel
4	Determination of ultrasonic velocity in liquid (Acoustic grating)
5	Hooke's Law experiment
6	Poisson's Ratio of aluminium and rubber
7	Determination of the elastic constants of the material of a flat spiral spring
8	Determination of Numerical Aperture and acceptance angle of an optical fibre
9	LASER: Determination of wavelength of laser source by using diffraction grating
10	LASER: Determination of Particle size (hair) by using laser source
11	Study of Strain Measurement by using Strain Gauge.
12	Determination of Pressure variation using Strain Gauge sensor
13	Determination of Temperature variation using Strain Gauge sensor
14	Determination of Pressure variation using optical fiber sensor
15	Determination of Temperature variation using optical fiber sensor

References
S.Balasubramanian , M.N.Srinivasan " A Text book of Practical Physics"- S. Chand Publishers, 2017
http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

G.PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

(COMPUTER PROGRAMMING LAB)

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

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

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

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

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

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

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

TASK-8		**PRACTICAL HOURS: 2**

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

TASK-9		**PRACTICAL HOURS: 2**

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

TASK-10		**PRACTICAL HOURS: 2**

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

TASK-11		**PRACTICAL HOURS: 2**

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

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

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

TASK-12		**PRACTICAL HOURS: 2**

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

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

TASK-13		**PRACTICAL HOURS: 2**

Starting with the number 1 and moving to the right in a clockwise direction a 5 by 5 spiral is formed as follows:

21 22 23 24 **25**
20 **7** 8 **9** 10
19 6 **1** 2 11
18 **5** 4 **3** 12
17 16 15 14 **13**

TASK-14		**PRACTICAL HOURS: 2**

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

TASK-15		**PRACTICAL HOURS: 2**

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

TASK-16		**PRACTICAL HOURS: 2**

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

TASK-17		**PRACTICAL HOURS: 2**

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

TASK-18		**PRACTICAL HOURS: 2**

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

Output : go, me, goal.

TASK-19		**PRACTICAL HOURS: 2**

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

TASK-20		**PRACTICAL HOURS: 2**

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

TASK-21		**PRACTICAL HOURS: 2**

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

TASK-22		**PRACTICAL HOURS: 3**

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

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

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

TASK-23		**PRACTICAL HOURS: 3**

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

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

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

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

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

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

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

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

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

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

Course Content:		
Unit-I	**Linear Differential Equations of Higher Order**	**Lecturer Hours:8Hrs**
Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.		
Unit-II	**Equations Reducible to Linear Differential Equations and Applications**	**Lecturer Hours:10Hrs**
Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, Applications: Mass spring system and L-C-R Circuit problems.		
Unit-III	**Partial Differential Equations – First order**	**Lecturer Hours:8Hrs**
First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential equations.		
Unit-IV	**Multivariable Calculus (Vector differentiation)**	**Lecturer Hours:8Hrs**
Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.		
UNIT-V	**Multivariable Calculus (Vector integration)**	**Lecturer Hours:8Hrs**
Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).		

Textbooks:

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

References:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
ENGINEERING CHEMISTRY

Title of the Course:	Engineering Chemistry				
Branches for which this course is offered:	I B.Tech I Sem (CE,ME)	L	T	P	C
		3	`0	0	3

Course Overview
This course acquaint the students with different softening methods and develops the study of electrochemical cells, types of batteries and their applications , Interactions between them, emphasizing their properties and indicating some applications. It deals with more advanced topics, familiarises engineering material, their properties and applications which provides the student to impart knowledge on corrosion and its significance, to explain nano and Smart materials and their uses.
Course Objectives
• To acquaint the students with soft and hard water types and softening methods. • To introduce the basic concepts of electrochemical cells and Fuel cells . • To familiarize the students with Polymers,engineering materials, their properties and applications. • To impart knowledge on corrosion and its significance. • To explain nano and smart materials and their uses.To e
Course Outcomes:
After successful completion of the course, the student will be able to

CO 1	Compare the quality of drinking water with BIS and WHO standards. Illustrate problems associated with hard water and demonstrate industrial water treatment process.
CO 2	Demonstrate the corrosion prevention method and apply Nernst equation for calculating electrode and cell potentials.
CO 3	Analyze the classification of fuels along with their characteristics and calorific value involving solid fuels, liquid and gaseous fuels.
CO 4	Explain different types of polymers and their applications, demonstrate the mechanism of conduction and conducting polymers.
CO 5	Summarize the underlying chemistry of engineering materials involving Cement, lubricants.
CO 6	Summarize the applications of SEM, TEM and X-Ray diffraction in surface characterization.

Course Content		
UNIT – I	**Water Technology**	**Lecture Hours: 8**
Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge, Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis		
UNIT – II	**Electrochemistry and Applications:**	**Lecture Hours: 10**
Electrodes – concepts, electrochemical cell, Nernst equation, cell potential calculations. Primary cells Zinc Air Battery, Lechlanche battery. Secondary cells – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions. Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells. Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bed worth ratios and uses, environmental factors (pH, temperature, DO) affecting corrosion rate, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).		
UNIT-III	**Polymers and Fuel Chemistry**	**Lecture Hours: 12**
Introduction to polymers, functionality of monomers, Classification of polymerization with specific examples and mechanisms of polymer formation. Plastomers: Thermoplastics and Thermo-sets preparation properties and applications of Bakelite urea formaldehyde, nylons. Elastomers: preparation, properties and applications Buna-S, Buna-N. Conducting polymers – polyacetylene, polyaniline– mechanism of conduction and applications. Fuels **–** Types of fuels, calorific value, numerical problems based on calorific value; Analysis of coal. Petroleum- Refining of petroleum, Synthetic petrol- Fischer Tropsch's and Bergius process, fuels for IC engines, knocking and anti-knock agents, Octane and Cetane value. Gaseous fuels- Flue gas analysis by Orsat's method.		
UNIT-IV	**Advanced Engineering Materials**	**Lecture Hours: 8**
Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications Refractories- Classification, Properties, Factors affecting the refractory materials and Applications Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils and Applications Building materials- Portland Cement, constituents, phases and reactivity of clinker, Setting and Hardening of cement.		
UNIT – V	**Surface Chemistry and Applications**	**Lecture Hours: 10**
Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (any two methods with examples), chemical and electrochemical methods (not more than two methods) of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, characterization of surface by physicochemical methods (SEM, TEM, X-ray diffraction), functionalization of surface of nanomaterials– applications of colloids and nanomaterials – catalysis, medicine, sensors, etc		

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
Reference Books
1.H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997. 2.D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992. 3.Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007. 4.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

G.PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

DATA STRUCTURES

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

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

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

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

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

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

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

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

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

ENGINEERING MECHANICS

Title of the Course:	ENGINEERING MECHANICS				
Branches for which this course is offered:	**I B.Tech II Semester –CE & ME**	L	T	P	C
		3	0	0	3

Course Objectives:
Engineering Mechanics is the branch of science for analyzing force systems that acts upon the bodies at either at rest or in motion. The knowledge of mechanics helps us in designing the various parts of machine elements. The course content is designed in such a way that the balancing of various mechanical systems could be achieved by the calculations of center of gravity and moment of inertia. The effects of friction and the consequences of frictional forces on the mating parts will be analyzed to design various systems with negligible effort loss.

Course Outcomes:	
After successful completion of the course, the student will be able to	
CO1	To analyze the basic concepts of rigid bodies subjected to different types of loads and supports.
CO2	To analyze the motion of the bodies considering friction and external loads.
CO3	To determine Centroids and area moment of inertia and centre of gravity and mass moment of inertia of simple and composite figures.
CO4	To analyse the motion of particle without considering forces and considering forces
CO5	To analyze the perfect frames using method of joints, method of sections & tension coefficient method for vertical , horizontal and inclined loads and concepts of Mechanical vibrations. (Simple, compound and torsional pendulums)
CO6	To analyse the motion of particle with and without considering forces

Course Content:

Unit – I	**Introduction of Engineering Mechanics**	Lecture Hours: 12

INTRODUCTION TO ENGINEERING MECHANICS:
Introduction to Engineering Mechanics – Basic Concepts. Resultants of Force System: Parallelogram law –Forces and components- Resultant of coplanar Concurrent Forces – Components of forces in Space – Moment of Force – principle of moments – Coplanar Applications – Couples – Resultant of any Force System. Equilibrium of Force Systems: Free

Body Diagrams, Equations of Equilibrium.		
Unit – II	**Coplanar Force Systems &Friction**	Lecture Hours: 12
Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, Ladder friction, wedge friction.		
Unit – III	**Centroid, Center of gravity & Moment of Inertia**	Lecture Hours: 12
Centroid and Centre of Gravity, Centroid of simple figures from first principle, Centroid of composite sections, Pappus theorems. Centre of Gravity and its implications, centre of gravity of composite sections. Moment of Inertia– Area & Mass M.I – Radius of Gyration, Parallel axis– Perpendicular axis theorem – Simple Problems.		
Unit – IV	**Dynamics of Particles**	Lecture Hours: 12
Dynamics of Particles - Rectilinear Motion – Kinematics Problems, Kinetics – Problems, Work & Energy – Impulse Moment, Direct Central Impact – coefficient of restitution, Curvilinear Motion – Projectile Motion, Work & Energy in Curvilinear motion.		
Unit – V	**Frames and Vibrations**	Lecture Hours: 12
Analysis of Perfect Frames: Types of frames – cantilever frames and simply supported frames – Analysis of frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads. **Mechanical Vibrations:** Definitions, Concepts-Simple Harmonic motion-Free vibrations-Simple, Compound and Torsional pendulum- Simple problems		

Text Books:	
1	Engineering Mechanics by Jayakumar, Kumar, PHI, 2014
2	Singer's Engineering Mechanics Statics and Dynamics,Vijay Kumar Reddy, Suresh Kumar. BS Publications 2015
3	Engineering Mechanics – B. Bhattacharyya, Oxford University Publications, 2015
Reference Books:	
1	Engineering Mechanics by Seshigiri Rao, Rama Durgaiah, Universities Press, 2005
2	Engineering Mechanics by Shames & Rao – Pearson Education.
3	Engineering Mechanics by Fedrinand L.Singer – Harper Collings Publishers

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

ENGINEERING GRAPHICS AND COMPUTER AIDED DRAFTING

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

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

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

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

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

Title of the Course	Engineering Chemistry Lab				
Branches for which this course is offered:	CE,ME	L	T	P	C
		0	0	3	1.5

Course Overview

- Will learn practical understanding of the redox reactions
- Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineers these to suit diverse applications
- Will also learn the hygiene accepts of water would be in a position to design methods to Produce Portable water using modern technology.

Course Objectives

- To impart training for handling of different instruments.
- To familiarize with digital and instrumental methods of analysis
- To know the knowledge in the determination of different water samples
- To impart the knowledge in the colorimetric samples
- To excel in the analysis of moisture percentage in the samples.

Course Outcomes:

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

CO 1	Determine the cell constant and conductance of solutions
CO 2	Prepare advanced polymer materials
CO 3	Determine the physical properties like surface tension, adsorption and viscosity
CO 4	Estimate the Iron and Calcium in cement
CO 5	Calculate the hardness of water and calculation of dissolved oxygen percentages
CO 6	Determination of percentage of Iron in Cement sample by colorimetry.

List of Experiments
1. Determination of Hardness of a groundwater and tap water sample.
2. Determination of dissolved oxygen in the given samples by using Winkler's method
3. Estimation of active chlorine content in Bleaching powder.
4. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base
5. Determination of cell constant and conductance of solutions
6. Potentiometry - determination of redox potentials and emfs
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of a polymer
9. Determination of viscosity of the solutions using Viscometer-I
10. Determination of viscosity of the solutions using Viscometer-II
11. Determination of percentage of Iron in Cement sample by colorimetry
12. Estimation of Calcium in port land Cement
13. Preparation of nanomaterials
14. Adsorption of acetic acid by charcoal
15. Determination of percentage Moisture content in a coal sample

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

G.PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

(DATA STRUCTURES LABORATORY

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

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

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

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

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

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

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

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

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

APPLIED MECHANICS LABORATORY

Title of the Course:	**APPLIED MECHANICS LABORATORY**				
Branches for which this course is offered:	**I B.Tech II SEMESTER – ME & CE**	L	T	P	C
		0	0	3	1.5

Course Objectives:
This lab is aimed at making the student understand the concepts of Engineering Mechanics through demonstrable experiments

Course Outcomes:	
After successful completion of the course, the student will be able to	
CO1	Acquire knowledge of static and dynamic behavior of the bodies.
CO2	Acquire the knowledge, so that they can understand physical phenomenon with the help of various theories.
CO3	Explain the physical phenomenon with help of diagrams.
CO4	with broad vision with the skills of visualizing and developing their own ideas, and to convert those ideas in to engineering problems and solving those problems with the acquired knowledge of the Engineering mechanics
CO5	Apply the principles of mechanics to analyze structural and machine elements.
CO6	Identify the different types of beams and the types of loading. Derive expressions to determine the bending stress, deflection and shear stress in beams subjected to various types loading.

Course Content:		
Experiment-I	**Bending Test on Simply Supported Beam**	Lecture Hours: 3
Experiment -II	**Support Reactions of a Beam** To find experimentally the reactions at the supports of a simply supported beam and verify the same with analytical values	Lecture Hours: 3
Experiment -III	**Bell Crank Lever** To verify the Principle of moments using the	Lecture Hours: 3

	Bell Crank lever apparatus	
Experiment -IV	**Friction Plane** To determine the coefficient of Static Friction between two surfaces	Lecture Hours: 3
Experiment -V	**Bending Test on Cantilever Beam**	Lecture Hours: 3
Experiment -VI	**Compound Pendulum** To estimate the acceleration due to gravity using a compound pendulum	Lecture Hours: 3
Experiment -VII	**Single Gear Crab** To understand the gear arrangement and establish the law of machine	Lecture Hours: 3
Experiment -VIII	**Double Gear Crab** To compare the efficiency of Single and Double Gear Crab	Lecture Hours: 3
Experiment -IX	**Differential Pulley Block** To establish law of machine	Lecture Hours: 3
Experiment -X	**Differential Axle and Wheel** To understand the velocity ratio of the machine and to interpret the law of machine	Lecture Hours: 3

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

CO-ENGINEERING LABORATORY

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

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

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

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

COURSE STRUCTURE

III – SEMESTER

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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
A2014	Transform Techniques and Numerical Methods	BS	3	0	0	3	30	70	100
A2305	Thermodynamics	PC	3	1	0	4	30	70	100
A2306	Mechanics of Solids	PC	3	0	0	3	30	70	100
A2307	Material Science and Engineering	PC	3	0	0	3	30	70	100
A2308	Engineering Drawing for Mechanical Engineers	PC	2	0	2	3	30	70	100
A2309	Mechanics of Solids Laboratory	PC	0	0	4	2	30	70	100
A2310	Material Science and Engineering Laboratory	PC	0	0	3	1.5	30	70	100
A2311	Computer Aided Drafting Laboratory	PC	0	0	3	1.5	30	70	100
A2015	Quantitative Aptitude and Reasoning - I	BS	1	0	0	1	30	70	100
A2031	Environmental Science	MC	2	0	0	0	100*	0	100*
	TOTAL		17	01	12	22	270	630	900

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2014 –TRANSFORM TECHNIQUESAND NUMERICAL METHODS

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

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: Theory of transforms (Laplace transforms, Fourier transforms) and Fourier series, solutions of algebraic & transcendental equations, Interpolation, curve fitting, Numerical solutions of differentiation, Integration, solutions of ODE of first order. The mathematical skills developed through this course form a necessary base to analyze and design problems encountered in their Engineering specialization.

Course Pre/corequisites

A2002 – Mathematics – I

A2010 – Mathematics – II

2. Course Outcomes (COs)

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

A2014.1 Apply Laplace transforms to solve ordinary differential equations.

A2014.2 Build Fourier series and Fourier transforms of a given function.

A2014.3 Apply numerical methods to solve algebraic and transcendental equations.

A2014.4 Derive interpolating polynomials using interpolation formulae

A2014.5 Solve differential and integral equations numerically

3. Course Syllabus

UNIT I

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

UNIT II

Fourier series & Fourier transforms: Fourier series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic Continuation – Half-range Fourier sine and cosine expansions- Parseval's formula-Complex form of Fourier series.Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

UNIT III

Solutions of Algebraic and transcendental equations &Interpolation: Introduction-The Bisection method-The Method of False Position-Iteration Method –Newton - Raphson Method.

Interpolation, Finite differences, Other difference operators and relations between them, Differences of a polynomial, Missing terms, Newton's interpolation formulae, Interpolation with unequal intervals: Lagrange's interpolation formula.

UNIT IV

Numerical Differentiation, Integration and Curve fitting: Numerical differentiation: Derivatives using Newton's interpolation formulae. Numerical integration: Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule. Method of least squares**,** Fitting a straight line, second degree parabola and other curves of the form $y = ae^{bx}$, $y = ab^{x}$, $y = ax^{b}$ by the method of least squares.

UNIT V

Numerical Solution of Ordinary Differential Equations of First Order: Taylor's series method, Picard's method, Euler's and modified Euler's Method, Runge-Kutta methods, Predictor and Corrector methods: Milne's method, Adams-Bashforth-Moulton method. Numerical solution of Laplace equations using finite difference approximation

4. Books and Materials

Text Book(s)

1. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 43rd Edition, NewDelhi, 2014
2. E. Rukmanghadachari, E Keshava Reddy, *Engineering Mathematics*, Pearson publications

Reference Book(s)

1. B. V. Ramana, Higher Engineering Mathematics, 23rd Reprint, Tata Mc-Graw Hill Education Private Limited, New Delhi, 2015.
2. S. S. Sastry, *Introductory methods of numerical analysis,* PHI learning private limited

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2305 – THERMODYNAMICS

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

1. Course Description

Course Overview

This course is the field of physics that deals with the relationship between heat and work in a substance during different types of thermodynamic processes. It focuses largely on how a heat transfer is related to various energy changes within a system undergoing a thermodynamic process, which are guided by the laws of thermodynamics. The course is extended to study the properties of pure substance, analysis of power cycles and also the Refrigeration cycles.

Course Pre/corequisites

A2004- Applied Physics

2. Course Outcomes (COs)

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

A2305.1: Apply the concepts of thermodynamics in the form of Work and Heat to various engines

A2305.2: Make use of energy equations for steady flow of fluids.

A2305.3: Apply the thermodynamic laws to various applications.

A2305.4: Determine the efficiency of the cycles for various applications.

A2305.5: Analyze basic laws of ideal gas, power cycles and refrigeration cycles for various applications

3. Course Syllabus

UNIT-I

Basic concepts- Macroscopic and microscopic approaches, thermodynamic system, state, property, process and cycle, quasi static process, thermodynamic equilibrium, quasi-static process, Zeroth law of thermodynamics,

Work & Heat transfer- Work transfer, types of work transfer, point and path functions, heat transfer, comparison of work transfer and heat transfer

UNIT-II

First law of thermodynamics- First law applied to a process and a cycle, forms and transformation of energy, internal energy and enthalpy, PMM I.

Flow systems- Control volume, steady flow process, mass balance and energy balance, applications of steady flow processes.

UNIT-III

Second law of thermodynamics- Heat engine, statements of second law and their equivalence, refrigeration and heat pump, reversibility and irreversibility, Carnot cycle and Carnot's theorem, thermodynamic temperature scale, efficiency of heat engine, PMM II

Entropy- Clausius' theorem, entropy as a property, T-S plot, Clausius inequality, principle of entropy increase and its applications, available energy, quality of energy, dead state, availability.

UNIT-IV

Properties of gases and gas mixtures-Ideal gas, equation of state, Avogadro's law, internal energy and enthalpy of ideal gas, entropy change of ideal gas, mixture of gases- Dalton's law of partial pressure , specific heats, internal energy and enthalpy of gas mixtures, Atmospheric air, Psychrometric Properties, Degree of saturation, Adiabatic Saturation, Carrier's Equation Psychrometric chart.

UNIT - V

Power Cycles : Otto, Diesel, Dual Combustion cycles, Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis, comparison of Cycles.

Refrigeration Cycles: Brayton and Rankine cycles, Bell-Coleman cycle, vapour compression cycle, performance Evaluation.

4. Books and Materials

Text Book(s)

P. K. Nag, "*Engineering Thermodynamics*", Tata McGraw Hill, 4th Edition, 2008.

Reference Book(s)

1. Y. V. C. Rao, "*An Introduction to Thermodynamics*", Universities Press, 3rd Edition, 2013.

2. K. Ramakrishna, "*Engineering Thermodynamics*", Anuradha Publishers, 2nd Edition, 2011.

3.YunusCengel, Michael A. Boles, "*Thermodynamics-An Engineering Approach*", Tata McGraw Hill,7th Edition, 2011.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2306– MECHANICS OF SOLIDS

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

1. Course Description

Course Overview

This course deals with the fundamental concepts of stress, strain and deformation of solids with applications to bars and beams. The students will understand the theory of elasticity including strain/displacement and hooks law relationships. This course also provides students with the knowledge about stresses in circular shafts and thin and thick cylinders. The student will be able to analyze forces, stresses, strains and deflection of various mechanical components used in industrial applications.

Course Pre/corequisites

1. A2004- Applied Physics
2. A2303 - Engineering Mechanics

2. Course Outcomes (COs)

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

A2306.1	Analyze the types of stresses, strains and elastic constants of mechanical components
A2306.2	Construct shear force and bending moment diagrams for beams subjected to various loads.
A2306.3	Formulate the bending and shear stress equations and shear stress distribution for beams and shafts
A2306.4	Solve problems related to slope and deflection equations for beams subjected to various loads
A2306.5	Estimate hoop and longitudinal stresses in thin and thick cylinders

3. Course Syllabus

UNIT I

Simple Stresses and Strains - Deformable bodies, elasticity and plasticity , types of stresses and strains, Hooke's law, stress – strain diagram for mild steel, working stress, factor of safety, lateral strain, Poisson's ratio and volumetric strain, elastic moduli and the relationship between them, bars of varying section, composite bars, temperature stresses. Strain energy, resilience, gradual, sudden, impact and shock loadings, simple applications.

UNIT II

Shear Force and Bending Moment-Definition of beam, types of beams, concept of shear force and bending moment,shear force and bending moment diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load uniformly varying

loads and combination of these loads, point of contra flexure, relation between shear force, bending moment and rate of loading at a section of a beam.

UNIT III

Flexural Stresses-Theory of simple bending, assumptions, derivation of bending equation- M/I=F/Y = E/R, neutral axis, determination of bending stresses, section modulus of rectangular and circular sections (solid and hollow),I,T,angle and channel sections, design of simple beam sections.

Shear Stresses- Derivation of formula, shear stress distribution across various beam sections like rectangular, circular, triangular, I, T and angle sections.

UNIT IV

Torsion of Circular Shafts - Theory of pure torsion, derivation of torsion equations, assumptions made in the theory of pure torsion, torsional moment of resistance, polar section modulus.

Deflection of Beams- Bending into a circular arc slope, deflection and radius of curvature, differential equation for the elastic line of a beam, double integration and Macaulay's methods, determination of slope and deflection for cantilever and simply supported beams subjected to point loads.

UNIT V

Thin Cylinders &Thick Cylinders-Thin seamless cylindrical shells, derivation of formula for longitudinal and circumferential stresses, hoop, longitudinal and volumetric strains, changes in diameter, and volume of thin cylinders, thin spherical shells,riveted boiler shells. A thick cylinder Lame's equation, cylinders subjected to inside and outside pressures, thick spherical shells, compound cylinders.

4. Books and Materials

Text Book(s)

R. K .Bansal, Strength of Materials, Laxmi Publications, 10th edition, Hyderabad, India, 2007.

Reference Book(s)

1. S. Ramamrutham, Strength of Materials, Dhanpat Rai Publications, 17th edition, New Delhi, India, 2012.

2. S.S. Bhavikatti, Strength of Materials, Vikas Publishing House, 3rd edition, New Delhi, India, 2008

3. R.K Rajput, Strength of Materials, S. Chand & Company, 6th edition, New Delhi, India Timoshenko, 2015

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2307 – MATERIAL SCIENCE AND ENGINEERING

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

1. Course Description

Course Overview

This course provides the awareness to the students about basic concepts involving the properties of matter and its applications to various areas of science and engineering. It is a course which combines the fundamental sciences, chemistry and physics. Students will be able to learn about metals, ceramics, polymers, and composites. This course makes the student to understand the structures, properties, processing, testing, heat treatment and applications of metallic, non-metallic, ceramic and composite materials.

Course Prerequisites

1. **A2004** Applied Physics
2. **A2005** Engineering Chemistry

2. Course Outcomes (COs)

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

A2307.1 Identify the properties of the crystallization of ferrous and nonferrous materials.

A2307.2 Construct the equilibrium diagrams by experimental methods.

A2307.3 Make use of advanced composite materials in manufacturing of components and sophisticated machine.

A2307.4 Improve the properties of ferrous and nonferrous materials using different heat treatment processes.

A2307.5 Select the suitable materials for various engineering applications.

3. Course Syllabus

UNIT I

Bonds in solids – metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys, determination of grain size, necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT II

Experimental methods of construction of equilibrium diagrams, isomorphous alloy systems, equilibrium cooling and heating of alloys, lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni, Al-Cu, and Fe-Fe_3C

UNIT III

Structure and properties of white cast iron, malleable cast iron, grey cast iron, spheroidal graphite cast iron, alloy cast irons. Classification of steels, structure and properties of plain carbon steels, low alloy steels, hadfield manganese steels, tool and die steels.Structure and properties of copper and its alloys, aluminum and its alloys, titanium and its alloys.

UNIT IV

Effect of alloying elements on iron – iron carbon system, annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface - hardening methods, age hardening treatment, cryogenic treatment of alloys. Heat treatment of plastics. Crystalline ceramics, glasses, cermet's.

UNIT V

Classification of composites, various methods of component manufacture of composites, particle, reinforced materials, fiber reinforced materials, polymer composites, metal ceramic mixtures, metal -matrix composites and carbon – carbon composites.

4. Books and Materials

Text Book(s):

1. Sidney H. Avner, *Introduction to Physical Metallurgy*, US, 2nd edition,Tata McGraw-Hill, 2007.

2. Donald R. Askeland, *Essential of Materials Science and Engineering*, USA, 3rd Edition, Cengage Publisher, 2013.

Reference Book(s)

1. William D. Callister, *Materials Science and Engineering,* 8th Edition, 2010.

2. Kodgire V.D*, Material Science and Metallurgy*, 12thedition, Everest publishing house, 2002.

3. U.C. Jindal, Material *Science and Metallurgy*, Pearson educations, 2011.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2308 –ENGINEERING DRAWING FOR MECHANICAL ENGINEERS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	2	28	0	28	3	30	70	100

1. Course Description

Course Overview

This course will make the students to learn about various projection methods to represent the details of different objects. This course deals with drawing of sections of solids, interpenetration of solids, isometric and perspective projections of different planes and solids. The student will acquire skills to put idea of an object, assembly of parts on a drawing sheet, which can be understood universally.

Course Pre/corequisites

A2301 -Engineering Graphics and Computer Aided Drafting.

2. Course Outcomes (COs)

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

A2308.1 Apply orthographic projection concepts to draw projections of right regular solids.

A2308.2 Make use of sectional planes to draw sectional views of a solid.

A2308.3 Apply isometric projection concepts to draw isometric projections of right regular solids and sectioned solids.

A2308.4 Construct Intersection curves when one right regular solid penetrates another right regular solid.

A2308.5 Make use of perspective projection concepts to draw simple planes and right regular solids.

3. Course Syllabus

UNIT I

Sections of Solids – Introduction to sectional planes, sectional view of right regular solids like cylinder, prism, pyramid and cone, finding the true shapes of the sections, development of surfaces of sectional solids.

UNIT II

Isometric Projections – Introduction to isometric views, isometric views of regular solids like cylinder, prism, pyramid and cone and isometric projections of sectional views of these solids.

UNIT III

Conversion of isometric views to orthographic views – Introduction, drawing front, top, left and right side views of the given isometric view of an object.

UNIT IV

Intersection of Right Regular Solids - Introduction, projections of curves of intersection of cylinder and cylinder, cylinder and prism, square prism and square prism.

UNIT V

Perspective Projections- Introduction, perspective projection of plane figures and simple solids by using visual ray method and vanishing point method.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

1. N.D. Bhatt*, Engineering Drawing,* Charotar Publishing House, 53rd edition 2016.
2. K. Venugopal, *Engineering Drawing and Graphics,* New age International Publishers, 5th edition, 2004.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2309 – MECHANICS OF SOLIDS LABORATORY

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

1. Course Description

Course Overview

This laboratory course is to perform experiments which are related to Mechanics of Solids subjected to understand the properties of solid materials like tensile, compressive strength, hardness and impact value of different materials. These properties can be estimated by the equipment like hardness apparatus, universal testing machine and Izod impact apparatus. The students will be able to develop practical capabilities, so that they can apply the knowledge gained in this course to solve complex engineering problems.

Course Pre/corequisites

1. A2303 - Engineering Mechanics
2. A2304-Engineering Mechanics Laboratory
3. A2306-Mechanics of Solids

2. Course Outcomes (COs)

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

A2309.1 Analyze the stress-strain diagram for different materials using universal testing machine

A2309.2Compare the hardness values for various materials using hardness testing machine

A2309.3 Determine modulus of elasticity, bending stresses and deflection for different beams

A2309.4 Estimate the stiffness and shear modulus of springs using tension test

A2309.5 Asses the toughness and impact strength using impact testing machine.

3. Course Syllabus

1. Conduct tensile test on mild steel specimen using Universal Testing Machine
2. Conduct compression test on mild steel specimen using Universal Testing Machine
3. Conduct shear test on mild steel specimen using Universal Testing Machine
4. Determine the modulus of elasticity and flexural rigidity of simply supported beam material.
5. Determine deflection of the cantilever beam.
6. Determine hardnessof the given specimen by Brinell's hardness test
7. Determine hardness of the given specimen by Rockwell hardness test
8. Determine energy absorbed and toughness of specimen by conducting Charpy Impact test.
9. Determine energy absorbed and toughness of specimen by conducting Izod Impact test.
10. Estimate the stiffness and modulus of rigidity of spring using tensile test
11. Estimate the stiffness and modulus of rigidity of spring using compression test
12. Conduct deflection test on Continuous beam.
13. Determine compressive strength of wood and concrete.
14. Determine the modulus rigidity of the given mild steel specimen by conducting Torsion test.

4. Laboratory Equipment/Software/Tools Required

1. Universal Testing Machine
2. Compression Machine
3. Brinell's and Rockwell Hardness Testing Machine
4. Simply supported and Cantilever beam
5. Spring Testing Machine
6. Charphy and Izod Testing machine

5. Books and Materials

Text Book(s)

R. K .Bansal, *Strength of Materials*, Laxmi Publications, 10th edition, Hyderabad, India, 2007.

Reference Book(s)

1. S. Ramamrutham, *Strength of Materials*, Dhanpat Rai Publications, 17th edition, New Delhi, India, 2012.

2. S.S. Bhavikatti, *Strength of Materials*, Vikas Publishing House, 3rd edition, New Delhi,India, 2008

3. R.K Rajput, *Strength of Materials*, S. Chand & Company, 6th edition, New Delhi, India, 2015

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2310– MATERIAL SCIENCE AND 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	30	70	100

1. Course Description

Course Overview

This course provides the practical knowledge about structure of a metal or any alloy with its physical and mechanical properties through microscopic examination. It reveals details like grain size, shape and presence of defects etc. It also reveals the history of heat treatments given to the metal or alloys which influence the mechanical properties and deformation behaviour of metals for a particular application. The student will be able to use this knowledge in selecting suitable materials for various engineering applications based on their properties.

Course Pre/corequisites

1. A2004 Applied Physics
2. A2005 Engineering Chemistry
3. A2307 Material Science and Engineering

2. Course Outcomes (COs)

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

A2310.1	Make use of different material samples for investigating micro structures.
A2310.2	Interpret the microstructures of materials usingmetallurgical microscope
A2310.3	Measure the hardenability of mild steel samples.
A2310.4	Improve the properties of materials using various heat treatment processes.
A2310.5	Compare the properties of different materials with temperature variation.

3. Course Syllabus

1. Mounting and preparation of specimen.
2. Preparation and study of the micro structure of ferrous metal.
3. Preparation and study of the microstructure of nonferrous metals (Cu, Al).
4. Preparation and study of the microstructure of mild steel, low carbon steels, high carbon steels
5. Study of the micro structures of cast irons.
6. Study of the micro structures of non-ferrous alloys.
7. Study of the micro structures of heat-treated steels.
8. Hardenability of steels by jomney end quench test.
9. Find out the hardness of various treated and untreated steels.
10. Fracture testing of materials.

4. Laboratory Equipment/Software/Tools Required

1. Mounting press apparatus.
2. Inverted trinocular metallurgical microscopes.
3. Belt surface grinding machine.
4. Dry and wet linisher grinding machine.
5. Metallographic disc polishing machine.
6. Jomney end quench test apparatus.
7. Muffel furnace with digital timer.

5. Books and Materials

Text Book(s)

1. Sidney H. Avner, *Introduction to Physical Metallurgy*, US, 2nd edition, Tata McGraw-Hill, 2007.
2. Donald R. Askeland, *Essential of Materials Science and Engineering*, USA, 3rd Edition, Cengage publisher, 2013.

Reference Book(s)

1. Kodgire V.D*, Material Science and Metallurgy*, 12th edition, Everest publishing house,2002.
2. William D. Callister, *Materials Science and Engineering,* 8th Edition,2010.
3. V. Rahghavan*, Elements of Material Science*, PHI, 5th Edition, 2004.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2311 – COMPUTER AIDED DRAFTING LABORATORY

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

1. Course Description

Course Overview

This laboratory course deals with basic drawing fundamentals and process of preparing the drawing of an object on the screen of a computer. Also this laboratory course makes the students understand the commands in AutoCAD software to create 2-D mechanical components. The students will use this knowledge to draw the mechanical components for various industrial applications.

Course Pre/corequisites

A2301 - Engineering Graphics and Computer Aided Drafting

A2308 - Engineering Drawing for Mechanical Engineers

2. Course Outcomes (COs)

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

A2311.1	Identify the commands in AutoCAD software to draw required objects
A2311.2	Create the mechanical components in 2 – Dimensional using AutoCAD commands
A2311.3	Draw the projections of solids using AutoCAD commands
A2311.4	Draw the sectional views of solids using AutoCAD commands
A2311.5	Draw the orthographic views of solids from isometric views using AutoCAD commands

3. Course Syllabus

1. Introduction to AutoCAD
2. Exercise on usage of AutoCAD2-D commands with absolute co-ordinate system.
3. Exercise on usage of AutoCAD 2-D commands with relative co-ordinate system.
4. Exercise on usage of AutoCAD2-D commands with polar co-ordinate system.
5. Exercise on usage of AutoCAD 2-D editing commands.
6. Draw simple figures like polygon and general multiline figures using AutoCAD commands
7. Draw the title block with necessary text and projection symbol.
8. Draw projections of cone using AutoCAD commands.
9. Draw projections of cylinder using AutoCAD commands.
10. Draw projections of prism using AutoCAD commands.
11. Draw sectional view of cylinder using AutoCAD commands
12. Draw sectional view of cone using AutoCAD commands
13. Draw sectional view of prism using AutoCAD commands
14. Draw the Orthographic views from the given isometric view

4. Laboratory Equipment/Software/Tools Required

1. Computer systems installed with operating system
2. AutoCAD Software

5. Books and Materials

Text Book(s)

K.L.Narayana, P.Kannaiah, *A text book on Engineering Drawing*, SciTech Publications, 2014.

Reference Book(s)

R.B. Choudary, *Engineering graphics with AutoCAD*, Anuradha Publishers, 2015.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2015 –QUANTITATIVE APTITUDE AND REASONING – I

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

1. Course Description

Course Overview

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

Course Pre/corequisites

This course has no specific prerequisite and corequisite.

2. Course Outcomes (COs)

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

A2015.1	Identify the problems by applying mathematical fundamentals
A2015.2	Apply the suitable logical methods to solve the problems
A2015.3.	Solve the various problems by using quantitative mathematical fundamentals
A2015.4	Analyse the comprehensive data with logical ability

3. Course Syllabus

UNIT I

Coding, decoding and blood relations

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

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

UNIT II

Direction sense and data arrangement

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

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

UNIT III

Syllogism, Clocks and Calendars

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

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

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

UNIT IV

Number system

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

UNIT V

Ratios, percentages, Profit and Loss

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

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

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

4. Books and Materials

Text Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2031 – ENVIRONMENTALSCIENCE

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

1. Course Description

Course Overview

This course is designed to create environmental awareness and consciousness among the present generation to become environmental responsible citizens. This course covers multidisciplinary nature of environmental studies, natural resources: renewable and non-renewable resources; ecosystems; biodiversity and its conservation; environmental pollution; social issues and the environment, manufacture of eco-friendly products, awareness on environment to the people; human population and the environment; pollution control acts and field work. This course is divided into five chapters for convenience of academic teaching followed by field visits.

Course Pre/corequisites

This course has no pre/corequisites

2. Course Outcomes (COs)

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

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

3. Course Syllabus

UNIT I

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

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

UNIT II

Ecosystems: Ecosystem Definition. Structure of an ecosystem: Producers, Consumers and Decomposers. Function of ecosystems: Food chains, food webs and energy flow in an ecosystem. Ecological pyramids: Pyramid of number, Pyramid of biomass and Pyramid of energy, aquatic ecosystems (ponds, rivers, lake, ocean, estuaries).

Biodiversity and Its Conservation: Introduction and definition, levels of biodiversity**,** values of biodiversity. hot spots and threats to biodiversity, in-situ and ex-situ conservation of biodiversity.

UNIT III

Environmental Pollution: Definition, causes, effects and control measures of air pollution, water pollution, nuclear hazards, global warming, acid rains and ozone layer depletion. role of an individual in prevention of pollution, solid waste management and disaster management: floods, earthquakes, cyclone and landslides.

UNIT IV

Social Issues and the Environment: Concept of sustainable development: sustainable development goals. threats to sustainability: population explosion, crazy consumerism. water conservation, rainwater harvesting and environmental ethics, environment protection act-public awareness.

UNIT V

Human population and the Environment: population growth, variation, value education-HIV/Aids-women and child welfare-role of it in environment and human health, fieldwork-visit to a local area to document environmental 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 Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

IV – SEMESTER

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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
A2312	Fluid Mechanics and Hydraulic Machines	PC	3	0	0	3	30	70	100
A2313	Kinematics of Machinery	PC	3	0	0	3	30	70	100
A2314	I.C. Engines	PC	3	0	0	3	30	70	100
A2315	Manufacturing Technology	PC	3	0	0	3	30	70	100
A2316	Computer Aided Machine Drawing	PC	2	0	2	3	30	70	100
A2317	Fluid Mechanics and Hydraulic Machines Laboratory	PC	0	0	3	1.5	30	70	100
A2318	I.C Engines Laboratory	PC	0	0	3	1.5	30	70	100
A2319	Manufacturing Technology Laboratory	PC	0	0	3	1.5	30	70	100
A2016	Quantitative Aptitude and Reasoning - II	BS	1	0	0	1	30	70	100
A2320	Socially Relevant Project-I	PW	0	0	2	1	100	0	100
A2321	Comprehensive Assessment-I	PC	0	0	0	1	100	0	100
A2047	Human Values and Professional Ethics	MC	2	0	0	0	100*	0	100*
	TOTAL		17	00	13	22.5	470	630	1100

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2312– FLUID MECHANICS & HYDRAULIC MACHINES

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

1. Course Description

Course Overview

This course deals with the basic principles of fluid mechanics, various types of flows, boundary layer concepts and flow through the pipes. In addition, this course provides knowledge about hydraulic turbines and pumps. The student should be able to develop theoretical capabilities, so that they can apply the knowledge gained in this course to solve complex engineering problems.

Course Pre/corequisites

A2303- Engineering Mechanics

2. Course Outcomes (COs)

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

A2312.1 Analyze properties of fluids under different conditions

A2312.2 Identify the fluid flow patterns using different equations

A2312.3 Determine fluid flow using devices and principles of fluid mechanics

A2312.4 Apply boundary layer concepts to various types of flow and forces exerted by jet on vanes

A2312.5 Estimate the performance of hydraulic turbines and pumps for various design considerations

3. Course Syllabus

UNIT I

Fluid Statics- Dimensions, units and Physical properties of fluids and their influence on fluid motion, atmospheric, gauge and vacuum pressure.

Measurement of pressure - Piezometer, u-tube and differential manometers, hydrostatic forces on a plane area, buoyancy, centre of buoyancy, meta-centre and meta-centre height.

UNIT II

Fluid Kinematics - Stream line, path line, streak line and stream tube, classification of flows, equation of continuity for one dimensional flow.

Fluid Dynamics - surface and body forces, Euler's and Bernoulli's equations for flow along a stream line, momentum equation, its application and force on pipe bend.

UNIT III

Closed Conduit Flow - Laminar and turbulent flow through pipes, Reynolds experiment, significance of Reynold's number, formulae for laminar flow through circular pipes.

Turbulent flow - Darcy Weisbach equation, minor losses in pipes, pipes in series and pipes in parallel, total energy line-hydraulic gradient line and measurement of flow

UNIT IV

Boundary Layer Flow - Introduction, drag force on a flat plate due to boundary layer, turbulent boundary layer on a flat plate, analysis of turbulent boundary layer, separation of boundary layer.

Basics of Turbo Machinery - Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

UNIT V

Hydraulic Turbines - Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design, draft tube theory-functions and efficiency, unit and specific quantities, characteristic curves.

Hydraulic Pumps - Classification and working principle of centrifugal and reciprocating pumps.

4. Books and Materials

Text Book(s)

R K Bansal, *A Text Book of Fluid Mechanics and Hydraulic Machines*, Laxmi Publications, 9th edition, 2015.

Reference Book(s)

1. P. N. Modi and S.M. Seth, *Hydraulics and Fluid mechanics including Hydraulics Machines*, Rajsons Publications Pvt.Ltd, 20th Edition, 2013.
2. D.S. Kumar, *Fluid Mechanics and Fluid Power Engineering*, Kotaria& Sons, 9th Edition, 2013.
3. Rajput, *Fluid Mechanics and Hydraulic Machines*, S.Chand& Co, 6th Edition, 1998.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2313 – KINEMATICS OF MACHINERY

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

1. Course Description

Course overview

This course deals with movement of various parts of machine through kinematics and then considering the forces and their effects on various mechanisms. By this course, student will gain the knowledge on analysing the forces acting on various parts of machines and mechanisms such as gears, cams to give required output.

Course Pre/corequisites

1. **A2003 –** Applied Physics
2. **A2303** - Applied Mechanics

2. Course Outcomes (COs)

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

A2313.1	Differentiate mechanism, machine and structure with respect to kinematic motions.
A2313.2	Analyse the mechanism of straight-line motion, steering and Hooke's joint as per suitable applications.
A2313.3	Draw velocity and acceleration diagrams by using relative velocity method and instantaneous center method.
A2313.4	Solve the problems related to gears and gear trains using suitable methods.
A2313.5	Analyze cam profile design with specified contours

3. Course Syllabus

UNIT I

Introduction - Mechanisms, elements or links, classification, rigid link, flexible and fluid link, types of kinematic pairs, constrained motion, mechanism, machines, structure, classification of machines, kinematic chain, inversion of mechanisms, inversions of quadratic cycle chain, single and double slider crank chains.

UNIT II

Straight Line Motion Mechanisms-Exact and approximate copiers and generated types Peaucellier, Hart and Scott Russel, grasshopper, Watt, Tchebicheff and Robert mechanisms and straight line motion, pantograph.

Steering Mechanisms - conditions for correct steering, Davis steering gear, Ackerman's steering gear mechanisms, velocity ratio. Hooke's joint single and double Hooke's joint, universal coupling application problem

UNIT III

Velocity and Acceleration Diagrams - Velocity and acceleration, motion of link in machine determination of velocity and acceleration, graphical method, application of relative velocity

method slider crank mechanism, four bar mechanism, acceleration diagrams for simple mechanisms.

Instantaneous Centre Method - Instantaneous centre of rotation, centrode and axode, relative motion between two bodies, three centres in - line theorem, locating instantaneous centres for simple mechanisms and determination of angular velocity of points and links, Klein's construction, analysis of slider crank mechanism for displacement, velocity and acceleration of slider using analytical method.

UNIT IV

Gears - Higher pairs, friction wheels and toothed gears, types, law of gearing, condition for constant velocity ratio for transmission of motion, velocity of sliding, phenomena of interference, methods to avoid interference, condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact.

Gear Trains - Introduction, types of gears, simple, compound, reverted and epicyclic gear trains, train value, methods of finding train value or velocity ratio, tabular column method for epicyclic gear trains and compound epicyclic gear trains, torque in epicyclic gear trains.

UNIT V

Cams-Introduction to cam and follower, types of followers and cams, terminology, types of follower motion, uniform velocity, simple harmonic motion, uniform acceleration, maximum velocity, maximum acceleration during outward and return strokes, drawing of cam profiles.

Analysis of Motion of Followers - Tangent cam with roller follower, circular arc (convex) cam with flat faced and roller follower.

4. Books and Materials

Text Book(s)

S S.Rattan*. Theory of Machines,* MGH Publishers,3rd Edition, *2013.*

Reference Book(s)

1. R.S.Khurmi and Guptha*. Theory of Machines,* Chand Publications, New Delhi, 2016
2. J.E. Shiegley, *The theory of Machines,* McGraw Hill*.* 2014.
3. R.L.Norton*, Kinematics and Dynamics of Machinery,* Tata McGraw Hill, *2011.*

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2314 – I.C. ENGINES

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

1. Course Description

Course Overview

This course deals with imparting the knowledge of engine components, working principles of IC engines, auxiliary systems, and the combustion aspects of SI and CI engines in addition to the methods of improving performance. The students will be aware of the latest developments in the field of IC engines like MPFI, CRDI etc. and also familiar with the working of Reciprocating and Rotary Compressors.

Course Pre/co requisites

A2305- Thermodynamics

2. Course Outcomes (COs)

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

A2314.1: Identify constructional features and working principles of the S.I and C.I engines.

A2314.2: Analyze the stages of combustion in S.I and C.I engines for better performance.

A2314.3: Apply various performance methods to increase the engine efficiency.

A2314.4: Identify constructional features and working principles of air compressors.

A2314.5: select suitable automobile systems for internal combustion engine.

3. Course Syllabus

UNIT I

I.C engines- Parts of I.C engines, classification, working of I.C. engines, two stroke & four stroke S.Iand C.I engines, valve and port timing diagrams.

UNIT II

Fuel system- Fuel supply systems, types of carburetor, air filters, mechanical and electrical fuel pump, gasoline injection systems.

Cooling systems- Cooling requirements, air cooling, liquid cooling, thermo siphon, water and forced circulation system

Lubrication systems- Flash, pressurized and mist lubrication.

Ignition system- function of an ignition system, battery coil ignition system, magneto coil ignition system, electronic ignition system using contact breaker.

UNIT III

Fuels and combustion:

S.I engine- Normal combustion and abnormal combustion, importance of flame speed and effect of engine variables, type of abnormal combustion, pre-ignition and knocking , fuel requirements and fuel rating, anti knock additives, combustion chambers

C.I engines - Stages of combustion, delay period and its importance, effect of engine variables, diesel knock combustion chambers, fuel requirements and fuel rating.

UNIT IV

Testing and Performance- parameters of performance, measurement of cylinder pressure, fuel consumption, air intake, exhausts gas composition, brake power, determination of frictional losses and indicated power, performance test, heat balance sheet.

UNIT V

Air compressors- reciprocating compressors, volumetric efficiency, single stage and multi stage compressors, problems related to reciprocating compressors, working principles of roots blower, vane type blower, centrifugal compressor, axial flow compressors.

4. Books and Materials

Text Book(s)

1. R.K. Rajput, "*Thermal Engineering*", 9th Edition, Lakshmi Publications, 2013

Reference Book(s)

1. V. Ganesan, *Internal Combustion Engines,* 4th Edition, Tata McGraw Hill, New Delhi, 2012.

2. Rudramoorthy, *Thermal Engineering*, Tata McGraw-Hill, New Delhi,10th Edition, 2010

3.Pulkrabek, . *Engineering fundamentals of IC Engines*, ,Pearson, PHI, 2nd Edition,2009

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2315 – MANUFACTURING TECHNOLOGY

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

1. Course Description

Course Overview

This course provides details about converting raw material into finished products using casting and welding 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

A2307 – Material Science and Engineering

2. Course Outcomes (COs)

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

A2315.1 Select suitable material for preparing the patterns

A2315.2 Make use of moulding systems to prepare a product

A2315.3 Recommend the melting and solidification processes for designing the gating system.

A2315.4 Identify the suitable special casting and welding processes used for the given application

A2315.5 Identify the process parameters and defects to get quality product

3. Course Syllabus

UNIT I

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 II

Risers- Types, function, casting design considerations, design of feeding systems like sprue, runner, gate, riser and molding flasks.

Solidification of Casting-Concept, solidification of pure metal,pure alloys, short and long freezing range alloys.

UNIT III

Special Casting Processes - Centrifugal, die, investment casting, methods of melting, crucible melting, cupola operation, steel making processes, casting inspection anddefects.

UNIT IV

Welding Process - Classification of welding processes, types of welds, welded joints, gas welding, arc welding, forge welding, resistance welding, thermit welding, plasma (air and water) welding, heat affected zones in welding, welding defects, causes and remedies.

UNIT V

Special Welding Process - Applications of inert gas welding, TIG welding, MIG welding, submerged arc welding, friction welding, induction welding, explosive welding, laser welding, soldering, brazing, adhesive bonding, destructive and non-destructive testing of welds.

Cutting of Metals - Oxy acetylene gas cutting, water plasma, cutting of ferrous and non-ferrous metals.

4. 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.

3. R.K. Jain, *Production Technology*, Khanna Publishers, 18thedition, 2013.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2316– COMPUTER AIDED MACHINE DRAWING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	2	28	0	28	3	30	70	100

1. Course Description

Course Overview

This course is used to communicate the necessary technical information required to manufacture and assemble machine components through drawings. These drawings follow rules laid down in national and International Organizations for Standards (ISO). Hence, the knowledge of different standards is very essential. This course enables students to draw machine elements using conventional drawing methods and AutoCAD software.

Course Pre/corequisites

A2308 - Engineering Drawing for Mechanical Engineers

2. Course Outcomes (COs)

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

A2316.1 Construct different materials used in engineering practice through conventional representation.

A2316.2 Develop skills related to the dimensioning, sectioning and development of views.

A2316.3 Apply suitable techniques to draw various parts of assembly drawing.

A2316.4 Make use of the orthographic and isometric projections to draw machine elements

A2316.5 Plan the part or assembly drawings as per the conventions.

3. Course Syllabus

UNIT I

Machine Drawing Conventions - Need for drawing conventions- introduction to IS conventions, conventional representation of material, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.

Methods of dimensioning - General rules for sizes and placement of dimensions for holes, centers, curved and tapered features.

Title boxes, their size, location and details-common abbreviations and their usage.

UNIT II

Drawing of Machine Elements and simple parts - Selection of Views, additional views for the following machine elements and parts with drawing proportions: popular forms of screw threads, bolts, nuts, stud bolts, tap bolts, set screws, keys, cottered joints and knuckle joint, rivetted joints for plates, flanged and protected flanged joint, shaft coupling, spigot and socket pipe joint, journal, and foot step bearings.

UNIT III

Assembly Drawings - Drawings of assembled views for the part drawings of the following.

Engine parts- stuffing boxes, cross heads, eccentrics, petrol engine-connecting rod, piston assembly. Machine parts- screw jack, machine vice, single tool post. Valves-steam stop valve, feed check valve.

4. Laboratory Equipment/Software/Tools Required

1. Computer systems installed with operating system
2. AutoCAD software

5. Books and Materials

Text Book(s)

K.L. Narayana, P.Kannaiah&K.VenkataReddy,*Machine Drawing,* New Age Publishers, 4th Edition, 2012.

Reference Book(s)

1. N Siddeswar, P. Kannaiah, V.V.S Sastry, *Machine Drawing*, Mc Graw Hill, 2015

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2317 – FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY

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

1. Course Description

Course Overview

This course imparts intensive and extensive practical knowledge on the concepts of Fluid Mechanics and Hydraulic Machines in the field of mechanical engineering. This course provides the knowledge in measuring the pressure and discharge using different machines at various conditions. It also provides the performance analysis of various hydraulic machines. The student should be able to develop practical capabilities, so that they can apply the knowledge gained in this course to solve complex engineering problems.

Course Pre/corequisites

A2303 - Engineering Mechanics

A2312 - Fluid mechanics and hydraulic machines

2. Course Outcomes (COs)

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

A2317.1	Analyze procedure for performance of various experiments
A2317.2	Calibrate flow discharge measuring devices used in pipes, channels and tanks.
A2317.3	Analyze the fluid flow through pipes with different materials and sizes.
A2317.4	Determine coefficient of discharge of fluid flow through pipes
A2317.5	Evaluate the performance analysis of various pumps and turbines.

3. Course Syllabus

1. Verification of Bernoulli's Equation
2. Calibration of Mouthpiece/orifice
3. Calibration of Triangular/Rectangular Notch
4. Calibration of Venturi meter
5. Calibration of Orifice meter
6. Determination of Friction Factor for a given pipe line
7. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
8. Calculate the Forces and efficiency of Impact of Jet on Vanes
9. Performance Test on Pelton Wheel
10. Performance Test on Single Stage Centrifugal Pump
11. Performance Test on Multi Stage Centrifugal Pump
12. Performance Test on Reciprocating Pump

4. Laboratory Equipment/Software/Tools Required

1. Flat vane and Hemi spherical vane
2. Notches
3. Orifices and Mouthpieces
4. Experimental setup for major and minor losses
5. Venturimeters and orifice meters
6. Bernoulli's Apparatus
7. Pelton Turbine
8. Single, Multi Stage centrifugal and Reciprocating Pumps

5. Books and Materials

Text Book(s)

R K Bansal, *A Text Book of Fluid Mechanics and Hydraulic Machines*, LaxmiPublications, 9th edition, 2015.

Reference Book(s)

1. P.N.Modi and S.M. Seth, *Hydraulics and Fluid mechanics including Hydraulics Machines*, Rajsons Publications Pvt.Ltd, 20th edition, 2013.
2. D.S. Kumar, *Fluid Mechanics and Fluid Power Engineering*, Kotaria& Sons, 9th edition 2013.
3. Rajput, *Fluid Mechanics and Hydraulic Machines*, S. Chand & Co, 6th edition, 1998.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2318– I.C ENGINES LABORATORY

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

1. Course Description

Course Overview

This course gives the opportunity to understand the working principle of IC engines both SI and CI engines, performance and characteristics in terms of heat balancing, economical speed variations, and air fuel ratio influence on the engine to reinforce classroom theory by having the student perform required tests. The students will do experiments on 4-stroke and 2-stroke petrol engines with required specifications, Multi cylinder SI engine, Single cylinder Diesel engine for performance and speed test. This knowledge helps the students to design an efficient I.C engine.

Course Pre/corequisites

A2314 - I.C. Engines

2. Course Outcomes (COs)

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

A2318.1: Construct valve and port timing diagram of SI engine and CI engine.

A2318.2: Analyze the influence of variations in TDC and BDC operations of I.C engine

A2318.3: Calculate the power and efficiencies of I.C engines.

A2318.4: Test the performance of IC engine at various loads and Air fuel ratio.

A2318.5: Calculate the efficiency of reciprocating air compressor

3. Course Syllabus

1. Draw valve timing diagram of an I.C engines
2. Draw port timing diagram of an I.C engines
3. Conduct the performance test on a 4 -stroke diesel engines
4. Conduct the performance test on 2-stroke petrol engine
5. Evaluate the engine friction by conducting morse test on 4-stroke multi cylinder engine
6. Conduct retardation and motoring test on 4- stroke engine
7. Calculate heat balance Sheet of an I.C engine.
8. Determine the air/fuel ratio and volumetric efficiency of an I.C engines.
9. Conduct Performance test on variable compression ratio engines for CI engines
10. Conduct Performance test on reciprocating air compressor.
11. To Study the working of boilers using Demo models.
12. Dismantling / assembly of engines to identify the parts and their position in an engine.

4. Laboratory Equipment/Software/Tools Required

1. 4-Stroke Cut section Model
2. 2-Stroke Cut section Model
3. 2-Stroke single cylinder petrol Engine

4. 4-stroke single cylinder petrol engine
5. 4-stroke single cylinder Diesel engine
6. 4-stroke multi cylinder diesel engine
7. 4-stroke multi cylinder Petrol engine
8. Reciprocating Air compressor test unit
9. 4 stroke Diesel Engine for Assembly/dismantling
10. Boiler Models

5. Books and Materials

Text Book

R.K. Rajput, "*Thermal Engineering*", 9th Edition, Lakshmi Publications, 2013

Reference Book

V. Ganesan, *Internal Combustion Engines,* 4th edition, Tata McGraw Hill, New Delhi, 2012.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2319 – MANUFACTURING TECHNOLOGY LABORATORY

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

1. Course Description

Course Overview

This laboratory course provides hands on learning experience working with casting, welding and forming machinery equipments.With the knowledge acquired through this course, the students will be able to prepare the products by reducing the wastage of material.

Course Pre/corequisites

A2315 - Manufacturing Technology

2. Course Outcomes (COs)

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

A2319.1 Identify various casting and welding equipments used in manufacturing processes

A2319.2 Choose suitable Sand properties of green sand to get quality specimen.

A2319.3 Determine the sequence of process to complete a job

A2319.4 Make use of various welding, foundry and forming equipments to prepare the job

A2319.5 Apply pattern making procedure for casting process

3. Course Syllabus

1. Design and manufacture wooden pattern for a given casting.
2. Determine the grain size, permeability and compressive strength of themoulding sand
3. Prepare a sand mold using the given single piece pattern
4. Prepare a sand mold using the given split piece pattern
5. Prepare a casting for the given solid pattern using green sand moulding processes
6. Prepare a V–Butt Joint using Arc Welding Process
7. Prepare a Lap Joint using Arc Welding Process
8. Prepare a lap Joint on the given work pieces using spot welding equipment.
9. Prepare a V–Butt Joint Using TIG Welding
10. Conduct piercing and blanking on a sheet metal by using fly press
11. Make rod bending using Hydraulic press
12. Make a V-shape bend on G.I sheet metal by using fly press.

4. Laboratory Equipment/Software/Tools Required

1. Wood turning lathe
2. Rammer
3. Sand properties testing machine
4. Permeability tester
5. Muffle furnace
6. Arc welding machine

7. Spot welding machine
8. TIG welding machine
9. Fly press
10. Hydraulic press

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.
3. R.K. Jain, *Production Technology*, Khanna Publishers, 18thedition, 2013.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2016 –QUANTITATIVE APTITUDE AND REASONING – II

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

1. Course Description

Course Overview

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

Course Pre/corequisites

This course has no specific prerequisite and corequisite.

2. Course Outcomes (COs)

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

A2016.1 Identify the problems by applying mathematical fundamentals.

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

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

A2016.4 Analyse the comprehensive data with logical ability.

3. Course Syllabus

UNIT I

Averages, Allegation, and mixtures

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

UNIT II

Time and work, pipes, and cisterns

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

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

UNIT III

Time, Speed and Distance

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

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

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

UNIT IV

Permutations, Combinations and Probability

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

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

UNIT V

Mensuration

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

4. Books and Materials

Text Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2047 – HUMAN VALUES AND PROFESSIONAL ETHICS

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2047.1 Apply human values and ethics in professional life.

A2047.2 Develop the moral ideals to maintain good relationships with people.

A2047.3 Solve environmental related problems by keeping health of human being into consideration.

A2047.4 Make use of the fundamental rights and human rights in life for individual dignity

A2047.5 Build the sound health system both physically and mentally by practicing yoga, karate, sports etc.

3. Course Syllabus

UNIT I

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

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

UNIT II

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

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

UNIT III

Environment issues, conservation, enrichment and sustainability, climate change, waste management, natural resource management (rain water harvesting, energy conservation, waste

land development, soil conservations and afforestation). health, hygiene & sanitation, health education, food and nutrition, safe drinking water, sanitation, swatch bharatabhiyan

UNIT IV

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

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

UNIT V

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

4. Books and Materials

Text Book(s):

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

Reference Book(s)

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

COURSE STRUCTURE

V – SEMESTER

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

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
A2322	Thermal Engineering	PC	3	0	0	3	30	70	100
A2323	Dynamics of Machinery	PC	3	1	0	4	30	70	100
A2324	Design of Machine Elements	PC	3	0	0	3	30	70	100
	Professional Elective-I	PE	3	0	0	3	30	70	100
	Open Elective-I	OE	3	0	0	3	30	70	100
A2325	Machine Tools Laboratory	PC	0	0	3	1.5	30	70	100
A2326	CAD/CAM Laboratory	PC	0	0	3	1.5	30	70	100
A2327	Production Drawing Practice	PC	0	0	2	1	30	70	100
A2328	Socially Relevant Project-II	PW	0	0	2	1	100	0	100
A2049	Gender Sensitization	MC	2	0	0	0	100*	0	100*
	TOTAL		17	01	10	21	340	560	900

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2322– THERMAL ENGINEERING

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

1. Course Description

Course Overview

This course is designed to provide a sound knowledge in various aspects of thermal equipments. It plays in the vital areas of power generation, Automobiles, Refrigeration and Air-Conditioning, energy sector. It also familiar with steam power plant, boilers, nozzles, gas turbines and jet propulsion

Course Pre/corequisites

A2307 - Thermodynamics

2. Course Outcomes (COs)

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

A2322.1 Apply power cycles and efficiency enhancement methods to generate power

A2322.2 Calculate the chimney height and draught for maximum discharge

A2322.3 Determine the characteristics of flow through nozzle

A2322.4 Construct the various velocity triangles of steam turbines

A2322.5 Analyze the working principle and performance of various thermal equipment

3. Course Syllabus

UNIT I

Rankine Cycle - Schematic layout, thermodynamic analysis, concept of mean temperature of heat addition and methods to improve cycle performance.

Boilers - Classification based on working principles & pressures of operation, L.P and H.P. boilers, mountings and accessories.

UNIT II

Draught - Classification, height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney and types of draught.

UNIT III

Steam Nozzles - Function of nozzle, flow through nozzles, thermodynamic analysis, exit velocity of nozzle, expansion in nozzle, velocity coefficient, condition for maximum discharge and critical pressure ratio.

Condensers - Classification, air leakage vacuum efficiency and condenser efficiency.

UNIT IV

Steam Turbines - Mechanical details, principle of operation, velocity diagrams, condition for maximum efficiency of steam turbines.

Gas Turbines - Ideal cycle, essential components, parameters of performance, actual cycle, regeneration, inter cooling and reheating, closed and semi-closed cycles.

UNIT V

Jet Propulsion - Working principles with schematic diagrams and representation on T-S diagram, thrust, thrust power and propulsion efficiency.

4. Books and Materials

Text Book(s)

1. R.K. Rajput, *Thermal Engineering*, 8th edition, Lakshmi Publications, 2010

2. V. Ganesan, *Gas Turbines*, Tata McGraw Hill, 3rd edition, New Delhi, 2010

Reference Book(s)

1. P. K. Nag, *Basic and Applied Thermodynamics*, 2nd edition, Tata McGraw Hill, 2012

2. R. Yadav, *Thermodynamics and Heat Engines*, Publishing House, 6th edition, Allahabad, 2002

3. Mahesh M Rathore, *Thermal Engineering*, McGraw-Hill, New Delhi, 2010

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2323 – DYNAMICS OF MACHINERY

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

1. Course Description

Course Overview

This course will provide the knowledge on how to analyse the forces acting on various parts of machines to give required output. This includes relative force analysis and calculation of gyroscopic couples, analysing forces acting on brakes and clutches, considering the effect of friction, balancing of reciprocating and rotating parts of machines.

Course Pre/corequisites

A2003-Engineering physics

A2308-Engineering Mechanics

A2315- Kinematics of Machines

2. Course Outcomes (COs)

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

A2323.1 Apply gyro-principles to stabilize the motion of vehicle.

A2323.2 Analyse the forces of the Flywheel in IC Engine

A2323.3 Estimate the range of speeds of various governors suitable for applications

A2323.4 Solve problems on balancing of rotating masses and reciprocating masses in V-engine and multi cylinder engines

A2323.5 Evaluate the critical speed of the shaft and simple vibration calculations of rotor systems

3. Course Syllabus

UNIT I

Brakes and Dynamometers- Simple block brakes, Band brake, internal expanding brake, braking of vehicle. Dynamometers, absorption and transmission types, General description and methods of operation.

Precession - Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aeroplanes and ships.

UNIT II

Turning Moment Diagrams and Fly Wheels - Turning moment diagrams for steam engine, IC Engine and multi cylinder engine. Crank effort - coefficient of Fluctuation of energy, coefficient of Fluctuation of speed – Fly wheels and their design, Fly wheels for Punching machines.

UNIT III

Governors - Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung governors with auxiliary springs. Sensitiveness, isochronism and hunting, Effort and power.

UNIT IV

Balancing of Rotating Masses - Balancing of rotating masses - single and multiple – single and different planes.

Balancing of Reciprocating Masses - Primary and secondary balancing of reciprocating masses. graphical methods of unbalanced forces and couples of multi-cylinder and V-engine.

UNIT V

Vibration - Free and forced vibration of single degree of freedom system, Role of damping, whirling of shafts and critical speeds, simple problems on free, forced and damped vibrations. torsional vibrations, two and three rotor systems.

4. Books and Materials

Text Book(s)

1. S S.Rattan. *Theory of Machine* , MGH Publishers, 3rd edition,*2013.*
2. R.L.Norton*, Kinematics and Dynamics of Machinery,* Tata McGraw Hill, *2011.*

Reference Book(s)

1. Thomos Bevan. *Theory of Machines,* Pearson education, 3rd edition, *2012.*
2. R.S.Khurmi and Guptha, *Theory of Machines,* Chand publications, New Delhi, 2016
3. J.E. Shiegley, *The theory of Machines,* McGraw Hill, 2014.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2324 – Design of Machine Elements

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

1. Course Description

Course Overview

This course focuses on designing various machine components by undergoing related theory like design process, stress, strain and theories of failures. This knowledge enables the students to design various mechanical components like joints, couplings, shafts and keys under different loading conditions.

Course Pre/corequisites

A2308 - Engineering Mechanics

A2313 - Mechanics of Solids

A2317 - Machine Drawing

2. Course Outcomes (COs)

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

A2324.1 Apply the design process and theories of failure for designing different machine elements.

A2324.2 Solve the problems related to simple and complex components under different loads using Goodman's and Soderberg's criteria.

A2324.3 Estimate the stress induced in riveted and bolted joints under different load conditions

A2324.4 Analyze the failures in shafts, cotter joint and knuckle joint subjected to various loads.

A2324.5 Design the keys, rigid and flexible couplings as per the standards suitable to applications.

3. Course Syllabus

UNIT I

Introduction - General considerations of design, Design process, selection of engineering materials, properties, stress and strains, Limits and fits, theories of failures.

UNIT II

Design for Fluctuating Loads - Stress concentration, notch sensitivity, design for fluctuating stresses, estimation of endurance strength, Goodman's line, Soderberg's line, design of components for finite and infinite life.

UNIT III

Design of Riveted Joints - Types of riveted joints, design of riveted joints. Boiler shell riveting design and eccentric loading design of riveted joints.

Design of Bolted Joints - Forms of screw threads. Stress in screw fasteners. Design of bolts with pre-stresses, design of bolted joints under eccentric loading, bolts of uniform strength.

UNIT IV

Design of Shafts - Design of solid and hollow shafts for strength and rigidity, design of shafts for combined bending and axial loads.

Design of cotters and knuckle joints - Design of cotter joints - spigot and socket, sleeve and cotter, Design of knuckle joint

UNIT V

Design of Keys- Introduction, types, stresses in keys and design of keys.

Design of couplings - Design of muff, split muff, flange couplings and flexible couplings.

4. Books and Materials

Text Book(s)

Bhandari. V B. *Design of Machine Elements*, 3/e, New Delhi, Tata McGraw Hill Book Company, 2009.

Reference Book(s)

1. R.S. Kurmi and J.K. Gupta, *Machine Design*, New Delhi, S.Chand Publishers, 2005
2. Joseph E.Shigely, *Mechanical Engineering Design*, New Delhi, TMH Publishers, 9th edition, 2011
3. S. Md. Jalaludeen, *Design Data Hand Book*, First Edition, Anuradha Publications, 2009. [Prescribed Data Book]

NOTE: Prescribed Data Book is permitted to carry for examinations.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2325– MACHINE TOOLS LABORATORY

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

1. Course Description

Course Overview

This laboratory course provides hands on learning experience working with machines like Lathe, Drilling, Milling, Shaping, and etc. This course provides the constructional features and operational principle of these machines. Using these conventional machines, the learner will be able to remove unwanted materials from the metal and improve the surface through finishing process to get the final product.

Course Pre/corequisites

A1351 - Machining Processes

2. Course Outcomes (COs)

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

A2325.1 Identify various machine tools used in machine shop

A2325.2 Distinguish the constructional features and operations of general purpose machines

A2325.3 Determine the sequence of operations to process a job

A2325.4 Make use of various machining operations to perform metal cutting

A2325.5 Prepare models using required machine tools

3. Course Syllabus

1. Demonstrate the construction and operation of general purpose machines:
    a. Lathe machine
    b. Drilling machine
    c. Milling machine
    d. Shaper machine
    e. Slotting machine
    f. Cylindrical grinder
    g. Surface grinder, tool and cutter grinder
2. To perform step turning and taper turning operations on lathe machine.
3. To perform thread cutting and knurling operations on lathe machine.
4. To drill a hole and perform tapping operation using drilling machine.
5. To perform shaping operation on shaping machine.
6. To perform slotting operation on slotting machine.
7. To perform milling operations (groove cutting/ gear cutting) on universal milling machine.
8. To perform grinding operations using cylindricaland surface grinding machine.
9. To perform grinding operation using grinding tool angle machine.

4. Laboratory Equipment/Software/Tools Required

1. Lathe Machine
2. Drilling Machine
3. Milling Machine
4. Shaper Machine
5. Slotting Machine
6. Cylindrical Grinder
7. Surface and tool grinder
8. Cutter grinder

5. Books and Materials

Text Book(s)

R.K. Jain and S.C. Gupta, *Production Technology*, Khanna Publishers, 17th edition, 2012.

Reference Book(s)

1. B.S.RaghuVamshi, *Workshop Technology*, Vol II, Dhanpat Rai & Co, 10th edition, 2013.
2. K.L.Narayana, *Production Technology*, IK International Publishers, 2nd Revised edition, 2013.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2326– CAD / CAM LABORATORY

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

1. Course Description

Course Overview

This laboratory course helps to design various mechanical components using 2D and 3D Software. In addition, this course provides knowledge about generating NC program with different CAM software packages and simulate the program for validation.

Course Pre/corequisites

A2311 - Computer Aided Drafting Laboratory

2. Course Outcomes (COs)

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

A2326.1 Construct complex geometries of machine components in sketcher mode.

A2326.2 Create programs to generate analytical and synthetic curves used in engineering practice.

A2326.3 Plan 2D and 3D drawings based on design constraints

A2326.4 Applying CAD/CAM concept to product design and manufacturing.

A2326.5 Analyze G and M codes for turning and milling components.

3. Course Syllabus

1. 2D Drafting using Auto CAD or any drafting package
2. Modelling of component in 3D – V block
3. Modelling of component in 3D – Open Bearing
4. Modelling of component in 3D – Angular block
5. Modelling of component in 3D – Dovetail Guide
6. Assembly of a screw jack parts
7. Assembly of a knuckle joint
8. Assembly of an Oldham's coupling
9. Assembly of a footstep bearing
10. Machining of simple components on CNC Lathe and CNC Milling Machine

4. Laboratory Equipment/Software/Tools Required

1. Computer systems installed with operating system
2. AutoCAD software
3. CNC Lathe Machine
4. CNC Milling Machine

5. Books and Materials

Text Book(s)

M. N. Sesha Prakash, C.S.Suresh , *Computer Aided Design Lab Manual,* 1st edition*, 2006.*

Reference Book(s)

Chang, T. C., Wysk, R. A., Wang, H. P, *Computer aided Manufacturing*, Prentice Hall, 2nd edition, 1998.

COURSE STRUCTURE

A2327– PRODUCTION DRAWING PRACTICE

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

1. Course Description

Course Overview

This course deals with the convenient way of creating a design of various components used in various engineering disciplines. It provides the detailed specifications of materials, limits, fits, tolerances and surface roughness. This course also provides good knowledge in production systems and their applications related to engineering problems.

Course Pre/corequisites

A2317 - Machine Drawing

2. Course Outcomes (COs)

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

A2327.1 Construct the conventional representation of different materials used in engineering practice.

A2327.2 Identify the machine elements and designation of material.

A2327.3 Apply the drawing techniques to draw various parts of assembly drawing, tolerances, roughness.

A2327.4 Improve visualization ability of surface roughness and its indications with respect to the material surface

A2327.5 Plan the production drawings based on design constraints.

3. Course Syllabus

UNIT I

Conventional Representation of Materials -Conventional representation of parts, screw joints, welded joints, springs, and gears, electrical, hydraulic and pneumatic circuits, methods of indicating notes on drawings.

UNIT II

Limits, Fits and Tolerances - Types of fits, exercises involving selection/interpretation of fits and estimation of limits from tables.

UNIT III

Detailed and Part Drawings -Drawing of parts from assembly drawings with indications of size, tolerances, roughness, and tolerances.

4. Books and Materials

Text Book(s)

K.L.Narayana & P. Kannaiah, *Production and drawing*, New Age International, 2009

Reference Book(s)

R.K.Jain , *Machine Drawing*, Khanna Publications, New Delhi, 2012.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2034 – GENDER SENSITIZATION

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

1. Course Description

Course Overview

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

Course Pre/corequisites

This course has no pre requisites

2. Course Outcomes (COs)

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

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

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

1. Sen, Amartya. "*More than one Million Women are Missing*" New York Review of Books 37, 20 (20 December1990). print
2. TripiLahiri, Bythe Numbers: Where Indian Women Work, Women's Studies Journal (14November2012) <http://blogs.wsj.com/Indiareal time/2012/11/14/by - the - numbers where - Indian - Women - work

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

VI – SEMESTER

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
A2701	Managerial Economics & Financial Analysis	HS	3	0	0	3	30	70	100
A2329	Design of Transmission Systems	PC	3	1	0	4	30	70	100
A2330	Heat Transfer	PC	3	0	0	3	30	70	100
	Professional Elective-II	PE	3	0	0	3	30	70	100
	Open Elective-II	OE	3	0	0	3	30	70	100
A2331	Heat Transfer Laboratory	PC	0	0	3	1.5	30	70	100
A2238	MATLAB Programming Laboratory	ES	0	0	3	1.5	30	70	100
A2017	Professional English Communication Skills	HS	0	0	2	1	30	70	100
A2020	Comprehensive Assessment-II	PC	0	0	0	1	100	0	100
A2033	Indian Constitution	MC	2	0	0	0	100*	0	100*
	TOTAL		17	01	08	21	340	560	900

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2701 – MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

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

5. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

6. Course Outcomes (COs)

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

A2701.1 Analyze the concepts of managerial economics and financial accounting to make better decisions in the organization

A2701.2 Analyze the demand, production, cost and break even to know interrelationship among variables and their impact

A2701.3 Classify the market structure to decide the fixation of suitable price

A2701.4 Apply capital budgeting techniques to select best investment opportunity

A2701.5 Analyze and prepare financial statements to assess financial health of business.

3. Course Syllabus

UNIT I

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Relation with other disciplines –Demand Analysis: Types, Determinants, Laws, GST-Implications. **Elasticity of Demand:** Types, Measurement and Significance, methods of demand Forecasting.

UNIT II

Production function: Isoquants and Iso-costs, MRTS, Least Cost Combination of Inputs. Laws of Production

Cost & Break-Even Analysis: Cost concepts, Break-even Analysis (BEA)-Determination.

UNIT III

Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, oligopoly.

Pricing: Objectives, Policies, Methods, Cross Subsidization

UNIT IV

Capital: significance, Types, Components, Factors, Methods and sources of raising finance.

Capital Budgeting: Nature and scope, features, Methods - Payback Method, Accounting Rate of Return (ARR), Net Present Value, Profitability Index, Internal rate of return.

UNIT V

Accounting Principles: Concepts, Conventions, Double Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts with simple adjustments.

Financial Analysis through Ratios: Importance, types- Liquidity Ratios, Activity Ratios, Turnover Ratios and Profitability ratios.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2329 – DESIGN OF TRANSMISSION SYSTEMS

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

1. Course Description

Course Overview

This course focuses on designing various machine components by undergoing related theory like design process, stress, strain and theories of failures. This knowledge enables the students to design various mechanical components like curved beams, drives, bearings, gears, springs and IC engine parts under different loading conditions.

Course Pre/co requisites

A2308 - Engineering Mechanics
A2313 - Mechanics of Solids
A2317 - Machine Drawing
A2324 - Design of Machine Elements

2. Course Outcomes (COs)

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

A2329.1 Assess the type of stresses induced in crane hooks, C-clamps and drives subjected to various loadings.

A2329.2 Design different types of bearings for suitable applications.

A2329.3 Design springs and power screws under different load conditions as per the practical situation.

A2329.4 Solve the problems related to spur and helical gears for power transmission.

A2329.5 Analyze the stresses induced in IC engine parts subjected to various loads.

3. Course Syllabus

UNIT I

Design of curved beams - Stresses in curved beams, Expression for radius of neutral axis for rectangular, circular, trapezoidal and T-Section. Design of crane hooks, C –clamps.

Design of power transmissions systems- Design of flat belt drives, v-belt drives & rope drives, selection of wire ropes, design procedure for chain drives

UNIT II

Design of bearings - Types of journal bearings, lubrication, bearing materials, journal bearing design, ball and roller bearings, static loading of ball & roller bearings, bearing life, failure of bearings.

UNIT III

Design of mechanical springs - Stress and deflections of helical springs, springs for fatigue loading, natural frequency of helical springs, energy storage capacity, helical torsion springs, concentric springs, design of leaf springs

UNIT IV

Design of power screws - Types, efficiency of the screw, design of compound screw, differential screw, possible failures

Design of spur & helical gears - Spur gears, helical gears, bending strength, design analysis of spur and helical gears, estimation of centre distance, module, face width, check for dynamic and wear considerations.

UNIT V

Design of IC engine parts - Pistons; design of piston, cylinder, connecting rod, crank shafts, centre and over hung cranks.

4. Books and Materials

Text Book(s)

Bhandari, V B., *Design of Machine Elements*, 3rd edition, New Delhi, Tata McGraw Hill Book Company, 2009.

Reference Book(s)

1. R.S. Kurmi, J.K. Gupta, *Machine Design*, New Delhi, S. Chand Publishers, 2005
2. Joseph E.Shigely, *Mechanical Engineering Design*, New Delhi, TMH Publishers, 9th edition, 2011
3. S. Md. Jalaludeen, *Design Data Hand Book*, First edition, Anuradha Publications, 2009

   [Prescribed Data Book]

NOTE: Prescribed Data Book is permitted to carry for examinations.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2330 – HEAT TRANSFER

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

1. Course Description

Course Overview

This course is an introduction to the principal concepts and methods of heat transfer. The objectives of this course are to develop the fundamental principles and laws of heat transfer and to explore the implications of these principles for system behavior; to formulate the models necessary to study, analyze and design heat transfer systems through the application of these principles; to develop the problem-solving skills essential to good engineering practice of heat transfer in real-world applications.

Course Pre/corequisites

A2307- Thermodynamics

2. Course Outcomes (COs)

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

A2330.1 Apply laws of heat transfer in thermal analyses of engineering systems.

A2330.2 Calculate the amount of heat transfer in conduction, convection and radiation modes.

A2330.3 Discuss the concept of conduction heat transfer and its applications.

A2330.4 Analyze the free and forced convective heat transfer for fluids.

A2330.5 Analyze the concept of radiative heat transfer between black bodies and grey bodies.

3. Course Syllabus

UNIT I

Conduction Heat Transfer- Fourier rate equation, general heat conduction equation in cartesian, cylindrical and spherical coordinates, simplification and forms of the field equations.

UNIT II

One Dimensional Steady State Heat Conduction- In homogeneous slabs, hollow cylinders and spheres, overall heat transfer coefficient , electrical analogy, critical radius/thickness of insulation, with variable thermal conductivity, internal heat generation and negligible internal resistance.

Heat Transfer in Extended Surface (Fins)- Efficiency, effectiveness and temperature distribution on long fin, fin with insulated tip and short fin, application to errors in temperature measurement.

UNIT III

Convective Heat Transfer- Dimensional analysis, Buckingham π theorem and its application for developing semi , empirical non-dimensional correlations for convective heat transfer , significance of non-dimensional numbers, concepts of continuity, momentum and energy equations, concepts of hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat **transfer for flow over** – flat plates, cylinders and spheres in external flows and internal flows for forced convection and free convection.

UNIT IV

Heat Transfer with Phase Change- Boiling- Pool boiling, regimes, determination of heat transfer coefficient in nucleate boiling, critical heat flux and film boiling.

Condensation- Film wise and drop wise condensation, nusselt's theory of condensation on a vertical plate, film condensation on vertical and horizontal cylinders using empirical correlations.

UNIT V

Heat Exchangers- Classification of heat exchangers, overall heat transfer coefficient and fouling factor, concepts of LMTD and NTU methods, problems using LMTD and NTU methods.

Radiative Heat Transfer- Laws of radiation, heat exchange between black bodies and grey bodies, radiation shields.

4. Books and Materials

Text Book(s)

R.C. Sachdeva, *Fundamentals of Engineering Heat and Mass Transfer*, New Age International, 4th edition, New Delhi, 2010.

Reference Book(s)

1. C P Kothandaraman, S Subramanyan, *Heat and Mass Transfer Data Book* , New Age International (P) Ltd Publishers, 9th edition, 2018

   [Prescribed Data Book]

2. P.K.Nag, *Heat Transfer*, 3rd edition, Tata McGraw Hall, New Delhi, 2011

3. Holman.J.P, *Heat Transfer*, 10th edition, Tata McGraw Hall, New Delhi, 2012

NOTE: Prescribed Data Book is permitted to carry for examinations.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2331 – HEAT TRANSFER LABORATORY

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

1. Course Description

Course Overview

This laboratory course provides with fundamental and industrial knowledge about modes of heat transfer, like conduction, convection and radiation, and their applications. The laboratory experiments deals with calculation of thermal conductivity and heat transfer coefficients in various materials like brass, copper, bronze etc. Students will gain practical knowledge through lab experiments by making use of various types of equipments such as pin fin, lagged pipe, emissivity apparatus, Stefan's Boltzmann apparatus, heat exchanger apparatus etc.

Course Pre/corequisites

A2330- Heat Transfer

2. Course Outcomes (COs)

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

A2331.1 Analyze thermal conductivity in various materials.

A2331.2 Calculate heat transfer coefficient in various materials.

A2331.3 Select appropriate materials for improving effectiveness of heat transfer.

A2331.4 Test the performance and there by improve effectiveness of heat exchanger.

A2331.5 Calculate emissivity and Stefan's Boltzmann constant for various bodies through radiation.

3. Course Syllabus

1. To determine thermal conductivity of insulating powder material through concentric sphere apparatus.
2. To determine the thermal conductivity of a metal rod along its length.
3. To determine overall heat transfer co-efficient of composite slab
4. To determine heat transfer coefficient for natural convection through pipe
5. To determine the heat transfer coefficient for forced convection through pipe.
6. To determine heat transfer in pin-fin.
7. To determine the effectiveness and overall heat transfer coefficient of double pipe heat exchanger with Parallel and counter flow arrangement.
8. To determine Emissivity of a grey body through emissivity apparatus.
9. To determine Stefan Boltzmann constant.
10. To determine the critical Heat flux at different temperatures of water.
11. To visualize the process of nucleate and film boiling on the heating element.

4. Laboratory Equipment/Software/Tools Required

1. Concentric Sphere apparatus.
2. Metal Rod apparatus
3. Composite Slab apparatus
4. Natural convection apparatus
5. Forced convection apparatus
6. Pin-fin apparatus
7. Parallel and counter flow heat exchanger.
8. Emissivity apparatus.
9. Stefan's Boltzmann apparatus.
10. Critical Heat flux apparatus.
11. Drop and film wise condensation apparatus.

5. Books and Materials

Text Book

R.C. Sachdeva, *Fundamentals of Engineering. Heat and Mass Transfer*, New Age International, 4th edition, New Delhi, 2010.

Reference Book

C P Kothandaraman, S Subramanyan, *Heat and Mass Transfer Data Book* , New Age International (P) Ltd Publishers, 9th edition, 2018 .[Prescribed Data Book]

NOTE: Prescribed Data Book is permitted to carry for examinations.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2238 – MATLAB PROGRAMMING

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	2	30	70	100

1. Course Description

Course overview

This course site is the result of several iterations of an introductory course I have given at MIT, the last of which was called DR. MATLAB. In that course I strived to change the usual pattern of teaching/learning MATLAB from a programming view point to a mathematical one. The idea is that by thinking about mathematical problems, students are prodded into learning MATLAB for the purpose of solving the problem at hand. The down-side to this approach is that it is somewhat based on the idea that people are already excited about mathematics, or can be excited about it. That said, as I taught the course at MIT, it was not a big problem

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2238.1 Understand the use of software tools for modelling and analysis of mathematical concepts for engineering applications

A2238.2 calculate the inverse of any matrix using MATLAB

A2238.3 Model and analyze Monte-Carlo simulation for suitable applications

A2238.4 Assess the Standard Normal Distributionand its importance in engineering applications

A2238.5 Model and analyze simple engineering concepts and its importance in engineering applications

3. LAB Syllabus

1. Computer Generation of Random Numbers

2. Chi-square goodness-of-fit test.

3. Test for Standard Normal Distribution
4. Testing Random Number Generators.
5. Let Find the determinant and inverse of A (using Matlab).
6. Monte-Carlo Simulation.
7. Simulation of Single Server Queuing System
8. Simulation of Two-Server Queuing System.

4. Books and Materials

Text Book(s)

Rudrapratap singh., Getting Started withMATLAB- 7,The Mathwork Inc, 2007

Reference Book(s)

1. Introduction to Numerical Methods and Matlab Programming for Engineers, Todd Young and Martin J. Mohlenkamp, May 5, 2015
2. MATLAB for Engineering Applications, ABDULLAH ALSHEHRI

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2016 - PROFESSIONAL ENGLISH COMMUNICATION SKILLS

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

1. Course Description

Course Overview

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

Course Pre/co requisites

1. A2001- Functional English
2. A2006- English Language Communication Skills Lab

2. Course Outcomes

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

A2016.1	Recall vocabulary and enhance accuracy in grammar.
A2016.2	Understand and communicate effectively in speaking and in writing.
A2016.3	Apply language structures to construct good relations.
A2016.4	Identify and develop effective technical writing skills.
A2016.5	Determine and develop personal presentation techniques.
A2016.6	Design necessary skills to deliver presentation confidently for improving in respective domains.

3. Course Syllabus

UNIT I: COMMUNICATION SKILLS:

1. Reading Comprehension –General and Technical 2. Listening Comprehension 3. Vocabulary Development 4. Common Errors.

UNIT II: WRITING SKILLS:

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

UNIT III: PRESENTATION SKILLS:

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

UNIT IV: GETTING READY FOR JOB:

1 Debates 2 Group discussions 3 Job Interviews

UNIT V: INTERPERSONAL SKILLS:

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

4. Books and Materials

Text Books:

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2048 – 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:

A2048.1 Understand historical background of the constitution making and its importance for building a democratic India.

A2048.2 Explain the role of President and Prime Minister.

A2048.3 Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

A2048.4 Understand the value of the fundamental rights and duties for becoming good citizen of India

A2048.5 Analyze the decentralization of power between central, state and local self-government.

A2048.6 Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

3. Course Syllabus

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

Local Administration: District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: 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. SubashKashyap, *Indian Constitution*, National Book Trust.

Reference Book(s)

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

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
A2334	Operations Research	PC	3	0	0	3	30	70	100
A2335	Metrology and Measurements	PC	3	0	0	3	30	70	100
	Professional Elective-III	PE	3	0	0	3	30	70	100
	Open Elective-III	OE	3	0	0	3	30	70	100
A2336	Computer Aided Engineering Laboratory	PC	0	0	4	2	30	70	100
A2337	Metrology and Measurements Laboratory	PC	0	0	4	2	30	70	100
A2338	Mini-Project/Internship	PW	0	0	4	2	100	0	100
A2339	Project Work Phase - I	PW	0	0	4	2	100	0	100
	TOTAL		15	00	10	20	380	420	800

COURSE STRUCTURE

A2334– OPERATIONS RESEARCH

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

1. Course Description

Course Overview

Operations Research is a science of modelling and optimization of available 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 corequisites.

2. Course Outcomes (COs)

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

A2334.1 Apply various Operations Research models and methods to solve real world problems.

A2334.2 Solve Linear Programming, assignment, sequencing, game theory, queuing, transportation and project management problems for optimum solution.

A2334.3 Evaluate various alternatives available to find optimal solution for real world problems.

A2334.4 Choose the best strategies to maximize the profit or minimize loss in the presence of a competitor.

A2334.5 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 Models- 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.

Books and Materials Text Book(s)

a. S.D. Sharma, *Operations Research*, New Delhi: Kedarnath Publications, 2017.
b. 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*, 9 th edition, Pearson,Boston, 2015.
2. Prem Kumar Gupta & D S Hira, *Operations Research*, Revised edition, New Delhi, S.ChandPublishing, 2015.

COURSE STRUCTURE

A2335– Metrology and Measurements

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	0	30	70	100

1. Course Description

Course Overview

This course is designed in such a way that it gives an overview of Limits and Fits, linear measurements and angular measurements, gauges, comparators, optical measuring methods, measurement of flatness and roughness of surface. And also learn about the screw thread and gear measuring methods, Alignment tests on machine tools

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:

A2335.1 to understand the Limits, Fits and Tolerance. Indian standard system – International Standard organization system.

A2335.2 Explain the principles of working of the most commonly used instruments for measuring linear and angular distances.

A2335.3 study the different types of Comparators, optical measuring instruments, flatness measurement methods and measuring methods of surface roughness

A2335.4 understand, Screw thread elements and measuring methods, Gear tooth profile measurement.

A2335.5 understand working of various All instruments used for measuring for displacement, temperature and pressure.

A2335.6 understand working of various instruments used for measuring for flow, speed, stress, strain and Vibration.

3. Course Syllabus

UNIT – I

LIMITS, FITS, TOLERANCES AND GAUGES:

Introduction, Limits, tolerance, tolerance build-up, compound tolerances, terminology for limits and fits, system of writing tolerance, Unilateral, Bi-lateral systems; Relation between tolerance and cost; types of fits, hole and shaft basis systems, standard limit systems-Indian standard system, interchangeability and selective assembly. Taylor's principle – Design of go and No-go gauges, plug, ring, snap, gap, taper, profile and position gauges.

UNIT – II

STANDARDSOFMEASUREMENTS:

Line standards, End standards and Wave length standards.

LINEAR AND ANGULAR MEASUREMENT:

Vernier caliper, vernier height gauge, micrometers, telescopic gauge, dial bore gauge, slip gauges, vernier and optical bevel protractor, sine principle and sine bars, angle gauges, sprit level, clinometers, rollers and spheres used to determine the tapers.

UNIT –III

COMPARATORS:

Introduction; Need of comparators; Basic Principles of Operation, uses, essential characteristics; classification of comparators- Mechanical, optical, mechanical optical, Electrical and Electronic Comparators, pneumatic comparators, multi check comparators, Eden-Rolt-Millionth comparator and their uses in mass production, linear variable differential transformer (LVDT)

UNIT – IV

SCREW THREAD MEASUREMENT:

Screw thread terminology, errors in threads; pitch errors; measurement of various elements of thread; measurement of major, minor and effective diameter; Tool maker's microscope and its uses, optical projector.

GEAR METROLOGY:

Terminology of gear tooth, measurement of tooth thickness-chordal thickness method-constant chord method-base tangent method-measurement over pins or balls Parkinson gear tester.

UNIT – V

SURFACE TEXTURE:

Introduction, factors affecting the surface roughness, reasons for controlling surface texture, orders of geometrical irregularities, Elements of surface texture, methods of measuring surface finish analysis of surface traces.

MEASUREMENT OF FORCE, PRESSURE, AND TEMPERATURE

Force measurement – Direct, Indirect, Load cells; Measurement of pressure – Bourdon gauge, Diaphragm, Bellows, Piezoelectric sensor; Temperature measurement –Thermocouple, Resistance Temperature Detectors, Thermistor, liquid in glass thermometer, bimetallic strip thermometers, and pyrometers.

4. Books and Materials

Text Book(s)

(1) Mechanical Measurements ,Beckwith, Marangoni, Linehard, PHI, PE

(2) Measurement systems: Application and design, Doeblin Earnest. O. Adaptation by Manik and Dhanesh, TMH,2012.

(3) Engineering Metrology, R.K. Jain, Khanna Publishers, 20th edition, 2013

Reference Book(s)

(1) Engineering Metrology, Mahajan, DhanpatRai, 2nd edition, 2013.

(2) BIS standards on Limits & Fits (3) Fundamentals of Dimensional Metrology,Connie Dn ,CENGAGE LEARNERS

COURSE STRUCTURE

A2336 – COMPUTER AIDED 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	2	30	70	100

2. Course Description Course Overview

This course provide fundamental knowledge of measuring principles, configuration and functional description of instruments with static, dynamic inputs and error control. The concepts and working of instrumentation devices for displacement, flow, dynamic and other mechanical measurement applications. Instrumentation practices and automatic control system for monitoring industrial real time processes within limits of parameter specifications

Course Pre/corequisites

- Computer aided drafting lab
- Computer aided design Lab

2. Course Outcomes (COs)

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

A2336.1 Apply mathematical skills in the design and analysis of model generations and analysis.

A2336.2 Exercise analytical skills in model verifications and interpretations of FEAresults.

A2336.3 Apply knowledge from component design in projects

A2336.4 Detailing a conceptual design involves determining material specifications,Dimensions, tolerances, performance measures, etc

A2336.5 Understand the basic concepts of modelling for analysis and manufacturability.

3. Course Syllabus

I. Introduction to Analysis Software Package

II. Structural analysis: (Any Six exercises)

1. Analysis of a rectangular plate with a hole.

2. Analysis of a truss member under loading.
3. Analysis of a bracket plate with axial loading
4. Analysis of a bracket plate with eccentric loading
5. Static Analysis of Prismatic bar
6. Static Analysis of a Corner Bracket
7. Static Analysis of beam
8. Analysis of Thermally Loaded support Structure
9. Analysis of Hinged support member
10. Analysis of Tapered plate under transverse load

III. Thermal analysis: (Any two exercises)

1. Analysis of a square plate considering conduction.
2. Analysis of a square plate considering conduction and convection.
3. Analysis of a compound bodies considering conduction and convection.

4. Laboratory Equipment/Software/Tools Required

1. ANSYS
2. ALG Nastran
3. Star-CCM+
4. Fluent
5. FIRE. CFX
6.

Books and MaterialsText Book(s)

1. ANSYS tutorials in the PDF format will be provided by the instructor.

2. Class handouts and notes will be the primary learning resources for the lecture-basedtopics

Reference Book(s)

R.B. Choudary, *Engineering graphics with AutoCAD*, Anuradha Publishers, 2015

COURSE STRUCTURE

A2337 – METROLOGY & MEASUREMENTS 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	2	30	70	100

Course Description

Course Overview

This course provide fundamental knowledge of principles of linear measurements gauges, comparators, optical measuring methods, measurement of flatness and roughness of surface. And also learn about the screw thread and gear measuring methods, Alignment tests on machine tools

Course Pre/corequisites

Manufacturing Technology, Machining Process

Course Outcomes (COs)

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

A2336.1 Apply mathematical skills in the linear measurements

A2336.2 Understand the optical measuring methods.

A2336.3 Apply knowledge of comparators in industrial projects

A2336.4 Detailing a conceptual design involves determining material specifications,Dimensions, tolerances, performance measures, etc

A2336.5 Understand the basic concepts of screw threads and gear measuring methods

4. Course Syllabus

Section A:(Any 6 experiments)

1. Measurement of bores by internal micrometers and dial bore indicators.

2. Use of gear teeth vernier calipers and checking the chordal addendum and chordal height of spur gear.

3. Alignment test on the lathe and milling machine

4. Study of Tool makers microscope and its application

5. Angle and taper measurements by Bevel protractor, Sine bars, spirit level etc.

6. Thread measurement by Two wire/ Three wire method.

7. Surface roughness measurement by Talysurf instrument.

8. Use of straight edge and sprit level in finding the flatness of surface plate.

Section B:

1. Calibration of Pressure Gauges

2. Calibration of transducer or thermocouple for temperature measurement.

3. Study and calibration of LVDT transducer for displacement measurement.

4. Study and calibration of capacitive transducer for angular measurement.

5. Study and calibration of photo and magnetic speed pickups for the measurement of speed.

6. Study and calibration of a rotometer for flow measurement.

7. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.

8. Study and calibration of Mcleod gauge for low pressure

Books and MaterialsText Book(s)

(1) Engineering Metrology, Mahajan, DhanpatRai, 2nd edition, 2013.

(2) BIS standards on Limits & Fits (3) Fundamentals of Dimensional Metrology,Connie Dn ,CENGAGE LEARNERS

VIII SEMESTER (IV YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
	Professional Elective-IV	PE	3	0	0	3	30	70	100
	Open Elective-IV	OE	3	0	0	3	30	70	100
A2340	Project Work Phase - II	PW	0	0	16	8	60	140	200
	TOTAL		06	00	16	14	120	280	400

PROFESSIONAL ELECTIVES

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – MECHANICAL ENGINEERING

Professional Electives

Professional Elective – 1	
Course Code	**Title of the Course**
A2351	Machining Processes
A2352	Non-Conventional Sources of Energy
A2353	Principles of Management
A2354	Flexible Manufacturing System
Professional Elective – 2	
Course Code	**Title of the Course**
A2355	Production and Operations Management
A2356	Refrigeration and Air Conditioning
A2357	Mechanical Vibrations
A2358	Metal Forming Processes
Professional Elective – 3	
Course Code	**Title of the Course**
A2359	Modern Manufacturing Methods
A2360	Automobile Engineering
A2361	Finite Element Method
A2362	Artificial Intelligence for Mechanical Engineers
Professional Elective – 4	
Course Code	**Title of the Course**
A2363	Industrial Engineering
A2364	Power Plant Engineering
A2365	Composite Materials
A2366	Automation and Robotics

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R19 REGULATIONS

B. TECH – MECHANICAL ENGINEERING

Open Electives

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2351– MACHINING PROCESSES

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

1. Course Description

Course Overview

This course provides fundamental understanding of the basic concepts, terminology and geometry of tools required in the machining and finishing processes. This course covers constructional features, operation and specifications of various machines like lathe, milling, drilling, boring, broaching, and grinding machines. It also covers finishing operations such as lapping and honing. Student will apply this knowledge in manufacturing components.

Course Pre/corequisites

A2305 - Material Science and Engineering

A2316 - Manufacturing Technology

2. Course Outcomes (COs)

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

A2351.1 Identify the various machining processes and machine tools

A2351.2 Classify various metal cutting machines such as lathe, milling, drilling, boring, grinding, shaping, Slotting and planer machines.

A2351.3 Choose the suitable tools for machining processes.

A2351.4 Compare the constructional features of machines suitable for various machining operations.

A2351.5 Categorize the components of the machines.

3. Course Syllabus

UNIT I

Elementary Treatment of Metal Cutting Theory - Elements of cutting process, geometry of single point tool and angles, chip formation and types of chips, built up edge and its effects, chip breakers. Mechanics of orthogonal cutting, Merchant's Force diagram, cutting forces, cutting speed, feed, depth of cut, heat generation, tool life, coolants and machinability.

UNIT II

Engine Lathe - Principle of working, specifications of lathe, types of lathes, work holders and tool holders. Taper turning, thread turning and attachments for Lathes. Turret and capstan lathes, collet chucks, other work holders, tool holding devices, box and tool layout. Principal features of automatic lathes, classification, single spindle and multi spindle automatic lathes, tool layout and cam design.

UNIT III

Drilling and Boring Machines - Principle of working, specifications, types, operations performed, tool holding devices, twist drill, Boring tools, machining time calculation.

Shaping, Slotting and Planer machines - Principle of working, principal parts, specifications, classification, operations performed and machining time calculations.

UNIT IV

Milling Machines - Principle of working, specifications, classification of milling machines, principal features, machining operations, types and geometry of milling cutters, methods of indexing, accessories of milling machines.

UNIT V

Grinding Machines - Theory of grinding, classification, cylindrical and surface grinding machine, tool and cutter grinding machine, special types of grinding machines

Grinding wheel - Different types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, honing and broaching machines, comparison of grinding, lapping and honing

4. Books and Materials

Text Book(s)

1. R.K. Jain and S.C. Gupta, *Production Technology*, Khanna Publishers, 17th edition, 2012.
2. B. S. Raghu Vamshi, *Workshop Technology*, Vol II, DhanpatRai & Co, 10th edition, 2013.

Reference Book(s)

1. Kalpakzian, *Manufacturing Technology,* Pearson, 6th edition 2010
2. Milton C.Shaw, *Metal cutting Principles*, oxford Second Edn, 2nd edition, 2012.
3. K. L. Narayana, *Production Technology*, IK International Publishers, 2nd revised edition, 2013.

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COURSE STRUCTURE
A2352 – NON-CONVENTIONAL SOURCES OF ENERGY

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

1. Course Description

Course Overview

This course provides the awareness to the students about basic concepts of various conventional and non-conventional sources of energy like fossil fuels, coal and solar energy, wind energy, bio-mass etc. It also covers the collection of various energy sources, their storage methods, conversion techniques and applications. The learner will be able to apply the knowledge gained from this course to solve real world energy problems during energy crisis.

Course Prerequisites

1. A2003 Engineering Physics
2. A2004 Engineering Chemistry
3. A2005 Environmental Studies

2. Course Outcomes (COs)

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

A2352.1 Identify various conventional and non-conventional sources of energy.

A2352.2 Estimate the energy collection using suitable equipment.

A2352.3 Compare different energy conversion systems within the available resources for better utilization.

A2352.4 Make use of the suitable energy storage methods for real-time requirements.

A2352.5 Analyze the advanced power generation systems like Magneto Hydro Dynamics and other methods for future requirements.

3. Course Syllabus

UNIT I

Principles of solar radiation- Role and potential of renewable energy sources, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation sun shine, solar radiation data.

UNIT II

Solar energy collection and storage- Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

Solar energy storage- stratified storage, solar ponds, solar Applications, solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT III

Wind energy - Wind energy conversion, power from wind, properties of air and wind, types of wind Turbines, operating characteristics.

Bio-mass - Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, and combustion characteristics of bio-gas, utilization for cooking,

UNIT IV

Tidal energy and wave energy - Tides and tidal power stations, modes of operation, tidal project examples, turbines and generators for tidal power generation.

Wave energy - Conversion, properties of waves, power content, types of ocean thermal energy conversion systems.

UNIT V

Geothermal energy - Resources, methods of harnessing the energy, Potential in India.

Magneto Hydro Dynamics (MHD) - Principles of MHD Power generation, ideal MHD generator performance, practical MHD generator, MHD technology, Fuel cells.

4. Books and Materials

Text Book(s)

1 G.D. Rai, *Non-conventional sources*, Khanna Publishers, New Delhi, 2014.

2 John Twidell and Tony Weir, Renewable Energy Resources, CRC Press, 2015.

Reference Book(s)

1. B.H. Khan, Non-Conventional Energy Resources, McGraw-Hill, 2015.

2. S.P. Sukhatme and J.K. Nayak, Solar Energy, Tata McGrawHIll, 2009.

COURSE STRUCTURE
A2353 – PRINCIPLES OF MANAGEMENT

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

1. Course Description

Course Overview

This course deals with workforce and management problems in industries. It also deals with the optimum utilization of the resources for achieving higher productivity. Quality and cost controls are also other important factors which contribute to the day to day supervision issues.

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:

A2353.1 Build organization structure and managerial skills to obtain the leadership qualities.

A2353.2 Select suitable plant layout as per the requirements of production process.

A2353.3 Apply work improvement techniques in an organization for increasing the productivity

A2353.4 Choose suitable type of Plant maintenance for industrial safety.

A2353.5 Appraise social responsibilities of engineer and ways to protect our environment

3. Course Syllabus

UNIT I

Management - Definition, Henry Fayol's principles of management, types of business organization, proprietorship, partnership, joint stock, cooperative society, advantages and disadvantages.

UNIT II

O**rganization -** Definition, types of organization, types of leadership, quality of good leader, motivation, Maslow's theory of motivation, hierarchy of needs, process of communication.

Concept of project work - Project planning, market survey, project capacity, selection of site for project, types of plant layout, job, batch and mass production with their advantages and disadvantages, production planning and control, introduction to cpm and pert, comparison.

UNIT III

Material Management - Definition, functions, Purchase, objectives, different methods of purchasing, purchase procedure, comparative statement, purchase order, tender, storekeeping, store management, bin card, material issue requisition, material returned note, store ledgers,

codification of stores, inventory management, definition, functions of inventory control, advantages of inventory control.

UNIT IV

Quality - Definition, factors affecting quality, advantages of quality control, inspection, different types of inspection total quality management, meaning, principles of total quality management.

Plant Maintenance - Definition, types of maintenance, preventive maintenance, break down maintenance, total productive maintenance.

UNIT V

Industrial Safety - Meaning, accident, causes for accident, direct and indirect losses due to an accident, personal protective devices for preventions of accidents, safety department, role of safety officer, safety supervisor, safety committee, fire prevention and protection, fire triangle, principles of fire extinguishing, various classes of fire.

4. Books and Materials

Text Book(s)

O.P. Khanna*, Industrial management and engineering economics*, Khanna publishers, 8th edition, 2018.

Reference Book(s)

1. T.R. Banga & S C Sharma, *Industrial Organization and Engineering Economics*, Khanna Publishers, 5th edition, 2016.

2. P.C. Punmia & K.K. Khandelwal, *Project planning and control with PERT & CPM*, LP Publication, New Delhi, 7th edition, 2012.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2354 – FLEXIBLE MANUFACTURING 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	30	70	100

1. Course Description

This course deals with a configuration of interconnected processing workstations with computer terminals that process the end-to-end creation of a product, from loading/unloading functions to machining and assembly to storing to quality testing and data processing.

Course Pre/corequisites

A1351-Machining Processes

2. Course Outcomes (COs)

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

A2354.1 Identify FMS layouts and its significance in manufacturing process

A2354.2 Apply various material handling and storage systems as per applications

A2354.3 Differentiate cellular vs Flexible Manufacturing system for scheduling problems

A2354.4 Solve the problems on performance of computer controlling the flexible manufacturing systems

A2354.5 Plan FMS data base as per simulation of scheduling problems

3. Course Syllabus

UNIT I

FMS Introduction and Description-Need for FMS, Introduction, Basic Components of FMS, Significance of FMS, General layout and configuration of FMS, Objectives of FMS.

UNIT II

Automated Material Movement and Storage System-Introduction, types of AGV and their principle of working, advantages, limitation and general AGV guide path, robots, benefits of using industrial robots, basic components and benefits of automated storage and retrieval systems, conveyors and pallet flotation system.

UNIT III

Manufacturing Cell and Planning, Scheduling of FMS - Introduction, description and classifications of cell, unattended machining, cellular versus flexible manufacturing, FMS planning, types of flexibility, FMS application and flexibility, single, product, single batch, n - batch scheduling problem, knowledge based scheduling system.

UNIT IV

Computer Control and Software for Flexible Manufacturing Systems - Introduction, composition of FMS, hierarchy of computer control, computer control of work center and assembly lines, FMS supervisory computer control, types of software specification.

UNIT V

FMS Simulation - Application of simulation, model of FMS, simulation software, manufacturing data systems, data flow, FMS database systems, planning for FMS database.

4. Books and Materials

Text Book(s)

1. Jha, N.K "*Handbook of Flexible Manufacturing Systems*", Academic Press Inc.1991.

2. Viswanadham, N.; and Narahari, Y, *Performance Modelling of Automated Manufacturing System,* Prentice-hall, 2009.

Reference Book(s)

1. H.K. Shivanand, M.M.Benal, V.Koti, *Flexible Manufacturing Systems,* New Age International Publishers, 2012.

2. Radhakrishnan. P and Subramanian. S, *CAD/CAM/CIM*, Wiley Eastern Ltd., New Age International Ltd, 1994.

3. Groover M.P, *Automation, Production Systems and Computer Integrated Manufacturing,* Prentice Hall of India Pvt., New Delhi, 1996.

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COURSE STRUCTURE

A2355 – PRODUCTION AND OPERATIONS MANAGEMENT

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

7. Course Description

Course Overview

This course covers a variety of state-of-the-art topics and technologies including Forecasting Techniques, quality control, facilities planning and design, production and inventory control. This course helps students in better understanding of real world industrial procedures and processes.

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:

A2355.1 Apply the knowledge in management tools to apply in technical organizations.

A2355.2 Apply forecasting techniques to predict future demand and other parameters.

A2355.3 Make use of plant layout design to facilitate material flow and processing of a product in the most efficient manner through the shortest possible time.

A2355.4 Apply quality improvement techniques and methods for improvement of quality of product and process

A2355.5 Determine the inventory and to be able to apply selected techniques for its control and management under different circumstances

3. Course Syllabus

UNIT-I

Functions of Production Planning & Control, productivity, productivity measurement, generating new products, product development, aggregates planning, aggregate planning strategies

UNIT-II

Forecasting – Importance of forecasting – Types of forecasting, their uses – General Principles of forecasting – Forecasting techniques – qualitative methods and quantitative methods – accuracy of forecasting methods. Scheduling Policies – Techniques

UNIT-III

Factors affecting facilities location, mathematical models for facilities location
Types of facilities layout: product layout, process layout, group technology layout, Assembly line balancing.

UNIT-IV

Lean Management, philosophy and creation of lean enterprise, JIT concepts-Kanban System-Elements of total quality management, Six Sigma Quality Control, MRP, lot sizing techniques in MRP, objectives of ISO 9000 series, Benefits of ISO 9000 series, Steps in ISO 9000 registrations.

UNIT - V

Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – various models, Simple Problems

4. Books and Materials

Text Book(s)

Ajay K Garg *"Production and Operations Management", ,*McGrawHill, 2015.

Reference Book(s)

1. S.N. Chary, "*Operations Management"* McGrawHill, 6th Edition,2019
2. *P*anneerselvam *, "Production and Operations management",* PHI, 3 rd Edition, 2012.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2356 - REFRIGERATION AND AIR CONDITIONING

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

1. Course Description

Course Overview

This course provides fundamentals of refrigeration and air conditioning ideally suited to daily life. It covers various refrigeration cycles like vapour compression refrigeration systems, vapour absorption refrigeration systems. This course also provides the knowledge of psychrometry and psychometric processes used for the purpose of various air conditioning methods like summer, winter and year-round air conditioning and the applications of refrigeration and air conditioning systems. The learner will be able to estimate the efficiency of refrigeration and air-conditioning systems under various load conditions.

Course Prerequisites

A2307	Thermodynamics
A2314	Thermal Engineering-I
A2322	Thermal Engineering-II

2. Course Outcomes (COs)

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

A2356.1	Make use of the terminologies and the basic principles associated with refrigeration and air conditioning systems.
A2356.2	Distinguish between the components of refrigeration and air conditioning systems
A2356.3	Estimate the efficiency of refrigeration and air-conditioning systems under various load conditions.
A2356.4	Discuss the constructional features of domestic, industrial refrigeration and air conditioning systems.
A2356.5	Select suitable refrigeration and air-conditioning systems for domestic as well as industrial applications.

3. Course Syllabus

UNIT I

Refrigeration - Introduction, terminology and principles.

Air refrigeration - Air refrigeration cycles-reversed Carnot cycle, Bell-Coleman cycle, air refrigeration systems.

UNIT II

Vapour compression refrigeration system (VCRS) - Vapour compression refrigeration system , Carnot vapour compression refrigeration cycle, working and analysis, standard vapour compression refrigeration system, working and analysis, effects of sub cooling and super heating.

Refrigerants - Selection of refrigerants and nomenclature of refrigerants.

UNIT III

Vapour absorption systems - Types of refrigeration systems, vapour absorption refrigeration systems, absorbent, refrigerant combinations, water-ammonia systems, water-lithium bromide system, contrast between the two systems, modified version of aqua-ammonia system with rectifier and analyzer assembly.

Other refrigeration Systems- Steam jet refrigeration systems, Thermoelectric refrigeration system, Vortex refrigeration system.

UNIT IV

Psychrometry - Introduction to air-conditioning, classification, ASHRAE nomenclature pertaining to air-conditioning, applications of air-conditioning, psychrometry, air - water vapour mixtures, psychrometric properties, psychrometric or air-conditioning processes, psychrometric chart

UNIT V

Air-conditioning - Mathematical analysis of air-conditioning loads, related aspects, numerical problems, different air-conditioning systems, central, station air-conditioning system, unitary air-conditioning system, window air-conditioner and packaged air-conditioner, components related to air-conditioning systems.

4. Books and Materials

Text Book(s):

S. C. Arora and Domkundwar, *A Course in Refrigeration and Air conditioning*, Dhanpatrai and sons, 2013

Reference Book(s)

1. Manohar Prasad, *Refrigeration and Air Conditioning*, New Age, 2nd edition, 2013
2. Dossat, *Principles of Refrigeration,* Pearson Education, 4th edition, 2007.
3. P.L. Ballaney, *Refrigeration and Air Conditioning,* 2nd edition, 2012.

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COURSE STRUCTURE
A2357 – MECHANICAL VIBRATIONS

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

1. Course Description

Course Overview

The Subject deals with analysing free and forced vibration of linear systems and developing efficient continuous vibrational system. The students can understand the importance of vibrations in mechanical design of machine parts. The student should be able to develop theoretical capabilities, so that they can apply the knowledge gained in this course to solve complex engineering problems.

Course Pre/corequisites

A2323 - Dynamics of Machinery

2. Course Outcomes (COs)

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

A2357.1 Identify the need and importance of vibration analysis in vibratory conditions

A2357.2 Develop the equations of motion for free and forced vibrations with damped and undamped conditions

A2357.3 Analyze frequency and time response of vibratory systems

A2357.4 Solve the problems related to single and multi-degree of vibratory systems with damped and undamped conditions.

A2357.5 Differentiate discrete and continuous systems pertain to numerical methods.

3. Course Syllabus

UNIT I

Fundamentals of Vibration–Introduction, classification of vibration systems, harmonic motion, natural frequency & response, effects of vibration, superposition of simple harmonic motions.

UNIT II

Single Degree Freedom Systems–Undamped and damped free vibrations-forced vibrations, coulomb damping, response to harmonic excitation, rotating unbalance and support excitation, vibration isolation and transmissibility.

Two Degree Freedom Systems – Free vibration of spring - coupled system - mass coupled system - Bending vibration of two degree of freedom system - Forced vibration - Vibration Absorbers.

UNIT III

Multi Degree Freedom Systems – Matrix formulation, stiffness and flexibility influence coefficients, eigen value problem, normal modes and their properties, free and forced vibration by modal analysis. Vibration measuring instruments - Vibrometer, velocity meters and accelerometers.

UNIT IV

Numerical Methods – Rayleigh's method, Dunkerely's method, Rayleigh - Ritz method. Critical speeds of shafts- Critical speeds without and with damping.

UNIT V

Continuous systems – Free vibration of strings – longitudinal oscillations of bars-traverse vibrations of beams - Torsional vibrations of shafts, self - excitated vibrations, stability.

Critical speed of the shafts – Whirling of Shafts, critical speed of shafts and problems.

4. Books and Materials

Text Book(s)

1. G. K. Grover, *Mechanical Vibration*, Nemchand & Brothers, 8th Edition, 2009.
2. V. P. Singh, *Mechanical Vibration*, Dhanpat Rai & Co Pvt.Ltd, 3rd Edition, 2012.

Reference Book(s)

1. J.S. Rao and K. Gupta, *Introductory Course on Theory & Practice of Mechanical Vibrations*, New Age International (p) Ltd, 2nd edition, 2012.
2. B.C. Nakra and K. K. Chowdary, *Mechanical Measurements*, New Delhi,Tata McGraw-Hill, 2nd edition, 2004.
3. Leonard Meirovitch, *Elements of vibration analysis*, Tata McGraw-Hill, 2nd edition, 2007.

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COURSE STRUCTURE
A2358 – METAL FORMING PROCESSES

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

1. Course Description

Course Overview

This course deals with the processes to obtain finished product without actual removal of metal from the workpiece. It provides details about forming processes like rolling, forging, extrusion, wire drawing, sheet metal working, processing of plastics and rapid manufacturing process. With the knowledge acquired through this course, the learner will be able to manufacture the products by reducing the wastage of material.

Course Pre/corequisites

A2201 – Material Science and Engineering

2. Course Outcomes (COs)

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

A2358.1 Apply hot working and cold working processes to workpiece for obtaining a final product

A2358.2 Apply the mechanism of deformation for different metals.

A2358.3 Analyze the effect of process parameters influencing metal forming.

A2358.4 Identify the metal forming process used for given application.

A2358.5 Examine effects of friction, lubrication and causes of common defects in metal forming

3. Course Syllabus

UNIT I

Hot and Cold working – Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth, comparison of properties of cold and hot worked parts.

UNIT II

Rolling – Bulk deformation processes, economics of bulk forming, principles and theory of rolling, types of rolling mills and products, forces in rolling and power requirements, applications and limitations, defects in rolled products.

Forging Processes – Principles of forging, types of forging, forging defects, forces in forging of strip and applications

UNIT III

Extrusion Processes – Mechanics of hot and cold extrusion, forward extrusion and backward extrusion, forces in extrusion of cylindrical and non cylindrical components, characteristics and defects in extruded parts.

Wire Drawing – Process mechanics and its characteristics, determination of degree of drawing, drawing force and defects in products.

UNIT IV

Sheet Metal Working – Cold working processes, blanking and piercing, bending and forming, drawing and its types, hot and cold spinning operations, and defects in sheet metal products.

UNIT V

Processing of Plastics – Injection and blow moulding, calendaring, thermo forming, compression moulding, transfer moulding.

Rapid Manufacturing – Concepts of rapid manufacturing, classification of rapid prototyping processes, Applications of rapid prototyping process.

4. Books and Materials

Text Book(s):

Schmid and Kalpakjin, *Manufacturing Technology*, Pearson Education, 7th edition, 2014.

Reference Book(s):

1. P. N. Rao, *Manufacturing Technology*, *Foundry forming and welding*, Volume I, McGrawHill education, fifth edition, 2018.
2. K.L. Narayana, *Production Technology*, I.K. International Pub, 3rd edition, 2013.
3. R.K. Jain, *Production Technology*, Khanna Publishers, 18th edition, 2013.

OPEN ELECTIVES

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

Open Electives

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

COURSE STRUCTURE
A2181 – BASIC CIVIL ENGINEERING

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and co requisite

2. Course Outcomes (COs)

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

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

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

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

A2181.4 Measure the linear and angular parameters using concepts of surveying

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

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE
A2182 – BUILDING PLANNING AND CONSTRUCTION

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

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

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

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

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

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

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

Floors and Roofs: Ground Floor-Components of a floor, Materials used for floor construction, Different types of flooring, Upper floors- Introduction, Steel joist and stone or precast concrete Slab floor, Jack arch floors, Reinforced cement concrete floors, Ribbed or hollow tiled flooring,

Precast concrete floors, Timber floors, Types of roofs- pitched roofs, Single roofs, Double or purlin roofs, Trussed roofs.

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2183 – DISASTER MANAGEMENT

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite.

2. Course Outcomes (COs)

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

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

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

A2183.3 Apply disaster management through engineering applications

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

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2184 – WATER RESOURCES CONSERVATION

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The Course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

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

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

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

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

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

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE
A2281 – FUNDAMENTALS OF ELECTRICAL ENGINEERING

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite.

2. Course Outcomes (COs)

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

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

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

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

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

3. Course Syllabus

UNIT I

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

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

UNIT II

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

UNIT III

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

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

UNIT IV

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

UNIT V

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

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

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COURSE STRUCTURE

A2282 – RENEWABLE ENERGY SOURCES

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

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

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

A2282.3 Analyze Renewable energy sources for various environmental conditions

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

3. Course Syllabus

UNIT I

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

UNIT II

Solar Energy Collection, Storage & Applications: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Storage & Applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT III

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

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

UNIT IV

Other Sources of Energy: Resources, types of wells, methods of harnessing the energy, potential in India. Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles.

Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

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COURSE STRUCTURE

A2283 – ELECTRICAL MEASURING INSTRUMENTS

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

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

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

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

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

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

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

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COURSE STRUCTURE

A2381 – OPTIMIZATION TECHNIQUES

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and Corequisite

2. Course Outcomes (COs)

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

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

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

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

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

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

3. Course Syllabus

UNIT I

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

UNIT II

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

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

UNIT III

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

UNIT IV

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

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

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COURSE STRUCTURE

A2382 – MECHANICAL TECHNOLOGY

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

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

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

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

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

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

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

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COURSE STRUCTURE

A2383 – INTRODUCTION TO AUTOMOBILE SYSTEMS

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

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

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

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

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

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

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

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COURSE STRUCTURE

A2481 – BASIC ELECTRONICS

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

1. Course Description

Course Overview

This course provides fundamentals of electronics and an understanding of a range of discrete semiconductor devices, including design, construction and testing of experimental electronic devices. This course makes the students, get expertise in analyzing principle of operation of p-n junction diode, special diodes, rectifiers, BJT and FET.

Course Pre/corequisites

A1003 –Engineering Physics

2. Course Outcomes (COs)

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

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

A2481.2 Analyze various applications of diodes and transistors.

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

A2481.4 Construct and analyze various combinational and sequential circuits used in digital systems.

3. Course Syllabus

UNIT I

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

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

UNIT II

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

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

UNIT III

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

UNIT IV

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

UNIT V

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

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2482 – INTRODUCTION TO COMMUNICATION SYSTEMS

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite.

2. Course Outcomes (COs)

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

A2482.1 Analyze the operation of basic communication system.

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

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

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

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

3. Course Syllabus

UNIT I

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

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

UNIT II

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

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

UNIT III

Angle Modulation: Phase modulation, Frequency Modulation.

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2483 – FUNDAMENTALS OF IOT

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

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

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

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

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

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

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

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2581 –BASIC DATA STRUCTURES

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

1. Course Description

Course Overview

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

Course Pre/Corequisites

The course has no specific prerequisite and co-requisites.

2. Course Outcomes (Cos)

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

A2581.1 Analyze the time and space complexities of algorithms

A2581.2 Apply various operations on linear data structures

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

A2581.4 Develop nonlinear programming for optimization techniques

3. Course Syllabus

UNIT I

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

UNIT II

Linear Data Structures: Stacks- Introduction, Definition, Representation of Stack, Operations on Stacks, Applications of Stacks, Queues- Introduction, Definition, Representations of Queues, Various Queue Structures, Applications of Queues.

UNIT III

Linked lists: Definition, Single linked list, Circular linked list, Double linked list, Circular Double linked list, Application of linked lists.

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2582 – FUNDAMENTALS OF DBMS

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

1. Course Description

Course Overview

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

Course Pre/Corequisites

The course has no specific prerequisite and co-requisites.

2. Course Outcomes (COs)

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

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE

A2583 – BASICS OF SOFTWARE ENGINEERING

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

1. Course Description

Course Overview

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

Course Pre/Corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

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

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

A2583.2 Identify software requirements for construction

A2583.3 Design requirement engineering process for change management

A2583.4 Apply the design concepts for design models

A2583.5 Construct the various testing techniques for software systems

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2584 –PYTHON FOR EVERYONE

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

1. Course Description

Course Overview

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

Course Pre/Corequisites

The course has no specific prerequisite and corequisite.

2. Course Outcomes (COs)

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

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

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

A2584.3 Build functions to increase code reusability

A2584.4 Implement modular programming for organized software development

A2584.5 Make use of exception handling for robust programming

3. Course Syllabus

UNIT I

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

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

Exceptions: Introduction, Handling Exceptions, Multiple Except Blocks, else Clause, Raising Exceptions, finally Block, Re-raising Exception.

File Handling: Introduction, need of file handling, text input and output files, seek function, binary files, Extracting data from a file.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2585 – COMPUTER ORGANIZATION AND OPERATING SYSTEMS

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

1. Course Description

Course Overview

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

Course Pre/Corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

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

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

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

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

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

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

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2586 – FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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

1. Course Description

Course Overview

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

Course Pre/Corequisites

The course has no specific prerequisite and co-requisites.

2. Course Outcomes (COs)

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

A2586.1 Analyze different fields in which AI is applied

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

A2586.3 Identify linear regression with single and multiple variables

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

A2586.5 Implement deep learning neural network models with TensorFlow

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A2081 – MANAGEMENT SCIENCE

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

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

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

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

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

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

3. Course Syllabus

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)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A2082 – RESEARCH METHODOLOGY

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2082.1	Interpret the importance of literature survey to identify the research problem.
A2082.2	Develop suitable research methodologies to conduct engineering research.
A2082.3	Apply the principles of research to gather the required data from various sources.
A2082.4	Evaluate the gathered data by using appropriate statistical techniques.
A2082.5	Prepare and present the research report effectively with the help of visual aids.

3. Course Syllabus

UNIT I

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

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
A2083 – INTELLECTUAL PROPERTY RIGHTS

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

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

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

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

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

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

3. Course Syllabus

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 Trade Marks, 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
A2084 – NATIONAL SERVICE SCHEME

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

1. Course Description

Course Overview

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

Course Pre/corequisites

This course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

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

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

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

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

A2084.5 Develop capacity to meet emergencies and natural disasters

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Reference Book(s)

1. 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, by. Published by the Tata Institute of Social Sciences (TISS), 1971.
3. National Service Scheme: guide-lines to project-masters, by Andhra University, Dept. of Sociology & Social Work. Published by Dept. of Sociology & Social Work, Andhra University, 1971.

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COURSE STRUCTURE
A2085 – YOGA

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

1. Course Description

Course Overview

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

Course Pre/corequisites

There is no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

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

A2085.2 Develop and maintain a personal yoga practice.

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

A2085.4 Select asanas appropriate for personal needs

A2085.5 Identify and apply relaxation techniques for stress reduction

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

4. Books and Materials

References:

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

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COURSE STRUCTURE

A2086 – DESIGN THINKING

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

1. Course Description

Course Overview

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

Course Pre/corequisites

This course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A2086.1 Appreciate various design processes for creativity and innovation

A2086.2 Develop design ideas through different techniques

A2086.3 Identify the significance of reverse engineering about products

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

A2086.5 Build organizations that support creative and innovative thinking

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

1. John.R.Karsnitz, Stephen O 'Brien and John P. Hutchinson, "*Engineering Design*", Cengage learning (International edition) Second Edition,2013.
2. 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=2mjSDlBaUlMthevirtualinstructor.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

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COURSE STRUCTURE

A2087 – ENTREPRENEURSHIP DEVELOPMENT

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

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

3. Course Syllabus

UNIT I

Introduction to Entrepreneurship: Introduction to entrepreneurship definition types of entrepreneur, entrepreneurial traits, Entrepreneur vs. Manager, Entrepreneur 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.