GPCET
Pioneering Innovative Education

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 R20 Regulations

B. Tech. - Regular Four-Year Degree Program

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

(For batches admitted from the Academic Year 2021 - 2022)

(For batches admitted from the Academic Year 2022 - 2023)

&

B. Tech. - Lateral Entry Scheme

(For batches admitted from the Academic Year 2021 - 2022)

(For batches admitted from the Academic Year 2022 - 2023)

(For batches admitted from the Academic Year 2023 - 2024)

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 – R20

B.Tech Regular Four Year Degree Programme
(for the batches admitted from the academic year 2020- 2021)
&
B.Tech (Lateral Entry Scheme)
(for the batches admitted from the academic year 2021 - 2022)

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, grantedby 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 thatcourse.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Minor: Minor are coherent sequences of courses which may be taken in addition to the courses required for theB.Techdegree.

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 suchelectives 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 ofTechnology (M.Tech) / Master of Business Administration (MBA).

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

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

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

Regulations: The regulations, common to all B.Tech programs offered by Institute, are designated as "GPCET Regulations – R20" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 16 to 18 weeks of academic work equivalent to normally 90 workingdays.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 ofthe semester.

Program Outcomes: The essential skill sets that need to be acquired by every student during her/his program ofstudy. 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 batchesadmitted from the academic year 2020-21
&
For B.Tech Lateral Entry batches admitted from the academic year 2021 -2022

1. Award of B.Tech. Degree

A student will be declared eligible for the award of the B.Tech. degree if he/she fulfils the followingacademic 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 extendedby two years at themost and these two years would not be counted in the maximum time permitted for graduation.

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

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

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

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

3. Courses of study

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

S.No.	Name of the Branch	Branch Code
1.	Civil Engineering	01
2.	Electrical and Electronics Engineering	02
3.	Mechanical Engineering	03
4.	Electronics and Communication Engineering	04
5.	Computer Science and Engineering	05
6.	Computer Science and Engineering -Artificial Intelligence	31
7.	Computer Science and Engineering -Internet of Things	35

Credits:

i. Credit: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture) or two hours of practical work/field work per week.
ii. Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year.
iii. Choice Based Credit System (CBCS): The CBCS provides choice for students to select from the prescribed courses.

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

	Semester	
	Periods / Week	Credits
Theory	03	03
Tutorial	01	01
Practical	03	1.5
Internship (IV/VI evaluated inV/VII resp.)	-	1.5/3.0
Project work	-	12

5. Course Structure

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

S.No.	Category	Category Description	Abbreviated Category	Credits
1	Humanities and social science	Humanities and social science including Management courses	HS	10.5
2	Basic Sciences	Basic Science courses	BS	21
3	Engineering Science courses	Engineering Science Courses including workshop, drawing, basics of electrical/mechanical/compute r etc.	ES	24
4	Professional core	Professional core Courses	PC	51
5	Open Electives	Open Elective Courses- from other technical/ emerging and job oriented	OE	12
6	Professional Courses	Professional Elective Courses relevant to chosen specialization/ branch	PE	18
7	Project Work	Project Work, Seminar, Internship in industry elsewhere	PW	16.5
8	Mandatory courses	Environmental Studies, Induction training, UniversalhumanValues, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge (Non-Credit)	MC	0
9	Skill Oriented Courses	Skill Oriented Courses relevantto domain, interdisciplinary, communication skill, industry	SC	10
		Total Credits		160

6. Weightage for course evaluation

Course Pattern

- The entire course of study is for four academic years. Semester pattern shall be followed in allyears.
- 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 whenoffered.
- When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case,he/she shallbe in the academic regulations into which he/she is readmitted.

Evaluation Process

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition, Internships carried out after IV Semester & VI Semester shall be evaluated for 100 marks each and the Internship along with Project Work carried out in VIII Semester shall be evaluated for 200 marks.

- For theory subjects, the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examination.
- For practical subjects, the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examination.

Internal Examinations:

i. For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination consists of objective paper for 10 marks and subjective paper for 30 marks with duration of 1hour 50 minutes (20 minutes for Objective paper and 90 minutes for subjective paper). The marks obtained in subjective paper will be condensed to 20 marks. The remaining 10 marks shall be awarded based on the submission of assignments by the student. A student has to submit two assignments in every subject each for 10 marks.

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

iii. Subjective paper shall be set for 30 marks containing3 either or descriptive questions of equal weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 20 marks.

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

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

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

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

End Examinations:

End examination of theory subjects shall have the following pattern:
There shall be 6 questions and all questions are compulsory. Question 1 shall contain 5 compulsory short answer questions for a total of 10 marks such that each question carries 2 marks. There shall be short answer questions from each unit. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them. Each of these questions from 2 to 6 shall cover one unit of the syllabus.
End examination of theory subjects consisting of two parts of different subjects, for eg: Electrical & Mechanical Technology, shall have the following pattern:
Question paper shall be in two parts viz., Part A and Part B with equal Weightage. In each part, there shall be 3 either-or type questions each for 10 Marks.

Note: The answers for Part A and Part B shall be written in two separate answer books.
For practical subjects there shall be a continuous evaluation during the semester for 40 sessional marks and end examination shall be for 60 marks. Day-to-day work in the laboratory shall be evaluated for 40 marks by the concerned laboratory teacher based on the regularity/record/ viva. The end examination shall be conducted by the concerned laboratory faculty and senior expert in the same subject of the department.

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

There shall be mandatory courses with zero credits. There shall be no external examination. However, attendance in the mandatory course shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40%or more in the internalexaminations. 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.

For the subject having design and/or drawing, such as Engineering Drawing, the distribution shall be 40 marks for internal evaluation and 60 marks for end examination.

Day-to-day work shall be evaluated for 10 marks by the concerned subject faculty based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 30 marks. Considering of 80% weightage to the better mid exam and 20% to theother 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. The sum of day-to-day evaluation and the internal test marks will be the final sessional marksfor the subject.

In the end examination pattern for Engineering Drawing there shall be 5 questions, either/or type, of 12 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 thesyllabus.

There shall be five Professional Elective Courses from V Semester to VII and for each elective thereshall be choices such that the student shall choose a course from the list of choice courses offered by the department for that particular elective.

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

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

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

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 itis an optional feature of the B. Tech. programme.

a. Students who have a CGPA of 8.0 or above (up to II semester) and without any backlog subjectswill be permitted to register for Minor discipline programme. A SGPA and CGPA of 8.0 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Minor discipline registration active else Minor discipline registration will be cancelled.
b. Students aspiring for a Minor must register at the beginning of IV Semester and must opt for aMinor in

a discipline other than the discipline he/she has registered in.

c. In order to earn a Minor in a discipline a student has to earn 20 extra credits by studying four theory subjects each for 4 credits and two MOOCs offered by NPTEL (notified by the Department corresponding to the Minor Programme) each for 2 credits and with a minimum duration of 8 weeks.

d. The student has to acquire a certificate for the concerned course from the NPTEL in order to earn 2 Credits.

e. Students are not allowed to register and pursue more than two courses in any semester. Students may complete the Minor before VIII semester.

f. Each department shall enlist a set of subjects from its curriculum which are core for the discipline without any prerequisites. The Evaluation pattern of theory subjects will be similar to the regular programme evaluation.

g. Students are not allowed to pursue minor discipline programme subjects under Self-study.Classes for the courses of the minor shall be conducted beyond the regular hours.

Student may enlist their choices of Minor discipline programmes in order of preference, to which they wish to join. It will not be permissible to alter the choices after the application has been submitted. However, students are allowed to opt for only one Minor discipline programme in the order of preference given by the student.

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

i. Completion of a Minor discipline programme requires no addition of time to the regular Four year Bachelors' programme. That is, Minor discipline programme should be completed by the end of final year B. Tech. program along with the major discipline.

j. The Concerned Head of the department will arrange separate course/class work and time table of the various Minor programmes. Attendance regulations for these Minor discipline programmes will be as per regular courses.

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

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

m. This Minor in a discipline will be mentioned in the degree certificate as Bachelor of Technologyin XXX with Minor in YYY. For example, Bachelor of Technology in **Computer Science & Engineering** with Minor in **Electronics & Communication Engineering**. The fact will also be reflected in the transcripts, along with the list of courses for Minor programme with CGPA mentioned separately.

Honors degree in a discipline:

a. This concept is introduced in the curriculum for all conventional B. Tech. programmes. The main objective of Honors degree in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B. Tech. programme.

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

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

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

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

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

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

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

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

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

National Service Scheme (NSS)/Yoga is compulsory for all the Undergraduate students. The student participationshall be for aminimumperiod of 45 hours duringthe firstyear. GradeswillbeawardedasVerygood, Good, Satisfactory in the mark sheet on the basis of participation, attendance, performance and behaviour. If a student gets Unsatisfactorygrade, he/she has to repeat the above activity in the subsequent years along withthenext yearstudents.

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

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

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

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

There shall also be a mandatoryfull internship in the final semester (VIII Semester) of the Programmealong with the project work. The organization in which the student wishes to carry out the Internship need to be approved by Internal Department Committee comprising Head of the Department and two senior faculty. The faculty of the respective department monitors the studentinternship program along with project work. At the end of the semester, the candidate shall submita certificate of internship and a project report. The project report and presentation shall be internally evaluated for 60 marks by the departmental committee consisting of Head of the Department, Project supervisor and a senior faculty member. The Viva-Voce shall be conducted for140 marks by a committee consisting of HOD, Project Supervisor and an External Examiner.

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

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

The student can choose between a skill advanced course being offered by the college or to choose acertificatecourse being offered by industries/Professional bodies/APSSDC or any other accredited bodies which are duly approved by the Internal Department Committee. Thecreditsassignedto theskilladvancedcourseshall be awarded to the studentuponproducingthe Course Completion Certificatefrom theagencies/professionalbodies.

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

7. Attendance Requirements:

- A student shall be eligible to appear for external examination and promoted to next semester,if he/she acquires a minimum attendance of 40% in every subject (Theory/Laboratory) being offered in that semester along with an aggregate attendance of 75% of all the subjects (Theory/Laboratory) offered in that semester.
- Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee. However, a student who has been condoned for shortage of attendance need to acquire a minimum of 40% in each subject (Theory/ Laboratory) being offered in that semester.
- Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their examination registration shall stand cancelled.
- A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek re-admission for that semester when offered next.
- A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

8. Minimum Academic Requirements:

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

A student shall be deemed to have satisfied the minimum academic requirements and earned thecredits allotted to each theory, practical, design, drawing subject or project, if he/she secures notless than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. In case of mandatory courses, internships, project work viva – voce, he/she should secure 40% of the total marks.

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.

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 regularand one supplementary examinations of IV Semester. One regular examination of V Semester.

And if a student is detained for want of credits for particular academic year by sections 8.2 and 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.

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.

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

9. Course Pattern:

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

When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in theacademic 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 candidateshall 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 obtainedby the student fall.

Table – Conversion into Grades and Grade Points assigned

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

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

For **mandatory** courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the lettergrade 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 thestudent 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 thatsemester.

(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 pointswill 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. Gradesare 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 iseligiblefor the award of B. Tech. degree, he/she shall be placed in one of the following four classes.

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

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 yearsat 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 proposalsubmitted by the student and the committee shall decide whether or not to permit the student(s)to avail the Gap Year.

13. Transitory Regulations:

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the courseare 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 inthe academic regulations into which they get readmitted.

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

14. Minimum Instruction Days:

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

15. Medium of Instruction

The Medium of Instruction is **English** for all courses, laboratories, internal and externalexaminations 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 inthe 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 thecampus 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 consideredas cases of plagiarism.

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

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

(ix) Any material to be uploaded to social media sites need to be approved by Head of the Department concerned/Dean/Principal.

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

(xi) Dress Code

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

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

17. Punishments for Malpractice cases – Guidelines

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

S.No.	**Nature of Malpractice/Improper conduct**	**Punishment**
1	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cellphones,pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body ofthe 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 inthe answer paper or in letters to the examiners or	Cancellation of the performance in that course.

	writes to the examiner requesting him to award pass marks.	
3	Copying detected on the basis of internal evidence,suchas, 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 withany other student or persons in or outside the exam hallin 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 willbe 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 signsor 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 resultin damage to or destruction of property in the examination hall or any part of the College campus or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case shall be registered against them.

	engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
9	Leaves the exam hall taking away answer script or intentionally tears up the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in thatcourse and all the other courses includingpractical 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 theexaminationhall.	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.No7to 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 theCollege will be handed over to police and, a police case shall be registered against them.
12	Impersonates any other student in connection withthe 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 studentwho has been impersonated, shall be cancelled in all the courses of the examination including practicals and project work of

		that semester/year. The student is rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
13	If any malpractice is detected which is not covered in the above S.No 1 to S.No 12 items, it shall be reported to the college academic council for further action and award suitable punishment.	
14	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable punishment.	

ACADEMIC REGULATIONS FOR B. TECH.(R20)
(LATERAL ENTRY SCHEME)

(Effective for the students getting admitted into II year through Lateral Entry Scheme fromthe Academic Year 2021-2022 and onwards)

1. **Award of B.Tech. Degree**

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

(a) Pursues a course of study for not less than three academic years and in not more than six academic years.
(b) Registers for 121 credits and secures all *121* credits from III semester to VIII semester ofRegular B. Tech. program.
(c) Students, who fail to fulfil the requirement for the award of the degree in six consecutive academic years from the year of admission, shall forfeit their seat.
(d) The regulations **3** to 7 are to be adopted as that of B. Tech. (Regular).

2. **Minimum Academic Requirements:**

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

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he/she securesnot less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. For the Seminar & Comprehensive viva-voce he should secure 40% in the internal evaluation.

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

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

And in case a student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before thecommencementof 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 inthe 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-admittedwhen the semester is offered after fulfilment of academic regulations, he shall be in the academic regulations into which he is readmitted.

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

5. **Award of Class:**

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

<table>
<tr><th>Class Awarded</th><th>CGPA Secured</th><td rowspan="5">From the Aggregate Marks secured for 121 Credits (i.e II Year to IVYear)</td></tr>
<tr><td>First Class with Distinction</td><td>≥ 7.5</td></tr>
<tr><td>First Class</td><td>$\geq 6.5 < 7.5$</td></tr>
<tr><td>Second Class</td><td>$\geq 5.5 < 6.5$</td></tr>
<tr><td>Pass Class</td><td>$\geq 4.0 < 5.5$</td></tr>
</table>

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).

PROGRAMME CURRICULUM STRUCTURE UNDER R20 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
20SIP01	Physical Activities - Sports, Yoga and Meditation, Plantation	MC	0	0	6	0	-	-	-
20SIP02	Career Counselling/Lectures by eminent People	MC	2	0	2	0	-	-	-
20SIP03	Orientation to all branches - career options, tools, etc.	MC	3	0	0	0	-	-	-
20SIP04	Orientation on admitted Branch - corresponding labs, tools and platforms	EC	1	0	4	0	-	-	-
20SIP05	Proficiency Modules & Productivity Tools	ES	2	1	2	0	-	- http://www.gpcet.ac.in/	-
20SIP06	Assessment on basic aptitude and mathematical skills	MC	1	0	4	0	-	-	-
20SIP07	Remedial Training in Foundation Courses	MC	2	1	2	0	-	-	-
20SIP08	Universal Human Values, painting, sculpture, pottery, music, dance	MC	1	0	2	0	-	-	-
20SIP09	Communication Skills - focus on Listening, Speaking, Reading, Writing skills, debates, enacting a play.	BS	2	1	2	0	-	-	-
TOTAL			14	3	24	0			-

PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – MECHANICAL ENGINEERING

I SEMESTER (I YEAR)									
S.NO	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A30002	Mathematics-I	BS	3	0	0	3	40	60	100
A30003	Engineering Physics	BS	3	0	0	3	40	60	100
A30501	Python Programming	ES	3	0	0	3	40	60	100
A30001	Communicative English	HS	3	0	0	3	40	60	100
A30301	Engineering Graphics and Computer aided Drafting	ES	1	0	4	3	40	60	100
A30006	Communicative English Lab	HS	0	0	3	1.5	40	60	100
A30007	Engineering Physics Lab	BS	0	0	3	1.5	40	60	100
A30502	Python Programming Lab	ES	0	0	3	1.5	40	60	100
TOTAL			13	00	13	19.5	320	480	800

II SEMESTER (I YEAR)									
S.NO	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A30010	Mathematics-II	BS	3	0	0	3	40	60	100
A30012	Engineering chemistry	BS	3	0	0	3	40	60	100
A30505	C and Data Structures	ES	3	0	0	3	40	60	100
A30303	Engineering Mechanics	ES	3	0	0	3	40	60	100
A30302	Engineering Workshop	ES	1	0	4	3	40	60	100
A30013	Engineering Chemistry Lab	BS	0	0	3	1.5	40	60	100
A30506	C and Data Structures Lab	ES	0	0	3	1.5	40	60	100
A30304	Applied Mechanics Lab	ES	0	0	3	1.5	40	60	100
A30032	Universal Human Values	MC	2	0	0	0	100*	-	100*
TOTAL			15	00	13	19.5	320	480	800

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

PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

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
A30014	Transform Techniques and NumericalMethods	BS	3	0	0	3	40	60	100
A30305	Thermodynamics	PC	3	0	0	3	40	60	100
A30306	Mechanics of Solids	PC	3	0	0	3	40	60	100
A30307	Material Science and Engineering	PC	3	0	0	3	40	60	100
A30019	Managerial Economics and FinancialAnalysis	HS	3	0	0	3	40	60	100
A30308	Mechanics of Solids Laboratory	PC	0	0	3	1.5	40	60	100
A30309	Material Science and EngineeringLaboratory	PC	0	0	3	1.5	40	60	100
A30310	Computer Aided Drafting Laboratory	ES	0	0	3	1.5	40	60	100
A30311	Solid Works (Skill oriented course)	SC	1	0	2	2	40	60	100
A30035	Universal Human Values	MC	3	0	0	3	40	60	100
TOTAL			18	0	11	21.5	400	600	1000

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
A30011	Probability & Statistics	BS	3	0	0	3	40	60	100
A30312	Manufacturing Technology	PC	3	0	0	3	40	60	100
A30313	Kinematics of Machinery	PC	3	0	0	3	40	60	100
A30314	I.C. Engines	PC	3	0	0	3	40	60	100
A30315	Fluid Mechanics and Hydraulic Machines	PC	3	0	0	3	40	60	100
A30317	Manufacturing Technology Laboratory	PC	0	0	3	1.5	40	60	100
A30318	Fluid Mechanics and Hydraulic Machines Laboratory	PC	0	0	3	1.5	40	60	100
A30319	I.C Engines Laboratory	PC	0	0	3	1.5	40	60	100
A30320	CAD	SC	1	0	2	2	40	60	100
TOTAL			16	00	11	21.5	360	540	900
Internship 2 Months (Mandatory) during summer vacation									

PROGRAMME CURRICULUM STRUCTURE UNDER R20 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
A30322	Thermal Engineering	PC	3	0	0	3	40	60	100
A30323	Dynamics of Machinery	PC	3	0	0	3	40	60	100
A30324	Design of Machine Elements	PC	3	0	0	3	40	60	100
	Professional Elective-I	PE	3	0	0	3	40	60	100
	Open Elective-I	OE	3	0	0	3	40	60	100
A30325	Machine Tools Laboratory	PC	0	0	3	1.5	40	60	100
A30326	CAD/CAM Laboratory	PC	0	0	3	1.5	40	60	100
A30327	Machine Drawing Practice	SC	0	0	3	2	40	60	100
A30034	Gender Sensitization	MC	2	0	0	0	100*	0	100
A30334	INTERNSHIP	PW	0	0	0	1.5	100	0	100
A30335	COMMUNITY SERVICE PROJECT		0	0	0	0	0	0	0
TOTAL			17	00	9	21.5	420	480	900

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

PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – MECHANICAL ENGINEERING

VI SEMESTER (III YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A30340	Non Conventional Source of Energy	PC	3	0	0	3	40	60	100
A30329	Design of Transmission Systems	PC	3	0	0	3	40	60	100
A30330	Heat Transfer	PC	3	0	0	3	40	60	100
	Professional Elective-II	PE	3	0	0	3	40	60	100
	Open Elective-II	OE	3	0	0	3	40	60	100
A30331	Heat Transfer Laboratory	PC	0	0	3	1.5	40	60	100
A30238	Computational Laboratory	ES	0	0	3	1.5	40	60	100
A30021	PROFESSIONAL English Communication Skills Laboratory	ES	0	0	3	1.5	40	60	100
A30321	ANSYS SKILL	SC	1	0	2	2	40	60	100
A30036	Indian Constitution	MC	2	0	0	0	100*	0	100*
TOTAL			17	00	11	21.5	420	480	900

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – 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
1	Professional Elective courses-III	PE	3	0	0	3	40	60	100
2	Professional Elective courses-IV	PE	3	0	0	3	40	60	100
3	Professional Elective courses-V	PE	3	0	0	3	40	60	100
4	Open Elective Courses-III	OE	3	0	0	3	40	60	100
5	Open Elective Courses-IV	OE	3	0	0	3	40	60	100
A30022	Professional Ethics	HS	3	0	0	3	40	60	100
A30341	FlexiSim Lab	SC	1	0	2	2	40	60	100
	Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester	PW	0	0	0	3	100	0	100
TOTAL			**19**	**00**	**2**	**23**	**380**	**420**	**800**
Industrial/Research Internship (Mandatory) 2 Months during summer vacation									
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			4	0	0	4	40	60	100

***There is a provision for the Universities/Institutions to implement AICTE mandatory course "Universal Human Values 2: Understanding Harmony" under Humanities and social science Elective in seventh semester for 3 credits.**

VIII SEMESTER (IV YEAR)

Cou rse Cod e	Title of the Course	Category	Periods per Week			Cred its	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A30370	Project (Major Project) Project work, seminar and internship in industry (Internship along with Project Work)	PW	0	0	0	12	60	140	200
Internship (6 Months)									
TOTAL			**0**	**0**	**0**	**12**	**60**	**140**	**200**

PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – MECHANICAL ENGINEERING

PROFESSIONAL ELECTIVES

Professional Elective – 1	
Course Code	**Title of the Course**
A30351	Machining Processes
A30352	Computer Integrated Manufacturing
A30353	Principles of Management
A30354	Flexible Manufacturing System
A30381	Work System Design
Professional Elective – 2	
Course Code	**Title of the Course**
A30355	Production and Operations Management
A30356	Refrigeration and Air Conditioning
A30357	Mechanical Vibrations
A30358	Metal Forming Processes
Professional Elective – 3	
Course Code	**Title of the Course**
A30359	Unconventional Machining Process
A30360	Electrical and Hybrid Vehicles
A30361	Finite Element Method
A30362	Artificial Intelligence for Mechanical Engineers
A30383	Social Innovation in Industry 4.0
Professional Elective – 4	
Course Code	**Title of the Course**
A30363	Industrial Engineering
A30364	Power Plant Engineering
A30365	Composite Materials and Testing
A30366	Automation and Robotics
A30385	Introduction to Composites
A30389	Fundamentals Of Manufacturing Process
Professional Elective – 5	
Course Code	**Title of the Course**
A30367	Additive Manufacturing
A30368	Operations Research
A30369	Design for Plasticity

A30370	Cryogenic Engineering
A30387	Rapid manufacturing

ROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

OPEN ELECTIVES

Course Code	Title of the Course	Offered by
A30181	Basic Civil Engineering	CE
A30182	Building Planning and Construction	CE
A30183	Disaster Management	CE
A30184	Water Resources Conservation	CE
A30281	Fundamentals of Electrical Engineering	EEE
A30282	Renewable Energy Sources	EEE
A30283	Electrical Measuring Instruments	EEE
A30284	Control Systems Engineering	EEE
A30381	Optimization Techniques	ME
A30382	Mechanical Technology	ME
A30383	Automobile Systems and Applications	ME
A30384	Manufacturing Processes	ME
A30481	Principles of Communication Systems	ECE
A30482	Signal Processing & Applications	ECE
A30483	Fundamentals of IoT	ECE
A30484	Introduction to Embedded Systems	ECE
A30474	Introduction To Internet Of Things	ECE
A30579	The Joy of Computing Using Python	CSE
A30581	Basic Data Structures	CSE
A30582	Fundamentals of DBMS	CSE
A30583	Basics of Software Engineering	CSE
A30584	Python for Every One	CSE
A30585	Computer Organisation and Operating Systems	CSE
A30586	Ethical Hacking	CSE
A30587	Fundamentals of Web Technologies	CSE
A30588	Introduction to Java Programming	CSE
A33147	Agile Methodologies	CAI
A33148	Human Computer Interaction	CAI
A33149	AI Foundations for Everyone	CAI
A33150	Introduction to Data Science	CAI
A33545	Adhoc and Wireless Sensor Networks	CSO
A33546	Ethics in Information Technology	CSO
A33547	Drone Technologies	CSO
A33548	Computer Communication Networks	CSO
A30081	Research Methodology	H&S
A30082	Intellectual Property Rights	H&S
A30083	National Service Scheme	H&S
A30084	Yoga	H&S
A30085	Design Thinking	H&S
A30086	Management Science	H&S

A30087	Entrepreneurship Development	H&S
A30094	Entrepreneurship	H&S
A30091	Management Information System	H&S

A30002 – MATHEMATICS – I

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

1. Course Description

Course Overview

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

Course Pre/co requisites

- Linear Algebra
- Differentiation
- Integration

2. Course Outcomes (COs)

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

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

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

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

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

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

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

3. Course Syllabus

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

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linearequations. Eigen values and Eigen vectors and their properties, Clayey-Hamilton theorem (without proof), finding inverse and power of a matrix by Clayey-Hamilton theorem, Diagonalisation of amatrix.

UNIT-II: Quadratic forms

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

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor'sand Maclaurin's theorems with remainders (without proof).

UNIT-III: Multivariable Calculus

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions oftwo variables, method of Lagrange multipliers with three variables only.

UNIT-IV: Double Integrals

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

UNIT-V:TripleIntegrals and Special Functions

Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates, Beta and Gamma functions and their properties, relation between beta and gamma functions.

4. Books and Materials

Text Books:

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

Reference Books:

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30003 – ENGINEERING PHYSICS
(Common to CE &ME)

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

1. Course Description

Course Overview

The laws of physics play a key role in the development of science, engineering and technology. Sound knowledge of physical principles is of paramount importance in understanding new discoveries, recent trends and latest developments in the field of engineering. To keep in pace with the recent scientific advancements in the areas of emerging technologies, the syllabi of engineering physics has been thoroughly revised keeping in view of the basic needs of all engineering branches by including the topicslike mechanics, acoustics, material properties, lasers and fiber optics ,superconductors are introduced, The applications of nanomaterials relevant to engineering branches are to be familiarized.

Course Pre/co-requisites

Bridge Course

2. Course Outcomes (COs)

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

A30003.1 Apply mechanics for solving engineering problems
A30003.2 Apply the principles of acoustics for noise cancellation and in designing buildings
A30003.3 Analyse the applications of ultrasonic in various engineering fields
A30003.4 Explain the principles of physics in dielectrics and magnetic materials
A30003.5 Interpret the concepts of lasers and optical fibers in various applications
A30004.6 Elucidate the applications of superconductors and nanomaterials

3. Course Syllabus

UNIT I **8 hrs**

Mechanics – 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 **10 hrs**

Acoustics: Classification of Sound, decibel, Weber–Fechner law – Sabine's formula, derivation using growthand decay method – Absorption coefficient and its determination – factors affectingacoustics of buildings and their remedies.

Ultrasonics: Introduction-magnetostriction effect and piezo electric effect-Production of ultrasonicsby 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

DIELECTRIC AND MAGNETIC MATERIALS **8 hrs**

Dielectric Materials: Introduction to Dielectrics - Types of polarizations-Electronic and ionic polarizations with mathematical Derivations-orientation polarization(quantitative) -Frequency dependence of polarization- Lorentz(internal) field-Claussius -Mosotti equation-Applications of Dielectrics.

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

UNIT IV

LASERS AND FIBEROPTICS **8 hrs**

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 lasers

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

UNIT V

SUPERCONDUCTORS AND NANO MATERIALS **8 hrs**

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

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

4. Books and Materials

Text Book(s):

1. Gaur R.K. and Gupta S.L., "*Engineering Physics*"-Dhanpat Rai publishers, 2012.
2. M.N.Avadhanulu&P.G.Kshirsagar"*A Text book of Engineering Physics*"-S.Chand Publications,2017
3. T.MadhuMohan,T.VijayaKrishna,B.K.Pandey,Manoj.K.Harbola,S.Chaturvedi, "*Engineering Physics*", Cengage,2019.

Reference Book(s)

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, KURNOOL (AUTONOMOUS)

30501 – PYTHON PROGRAMMING

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

1. Course Description

Course Overview

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

Course Pre/Co-requisites

The course has no specific prerequisite and co-requisites.

2. Course Outcomes (COs)

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

A30501.1 Comprehend the fundamental concepts of computer hardware and problem solving Abilities.

A30501.2 Knowledge on the basic concepts of algorithms, flow charts and python programming.

A30501.3 Ability to analyze the procedure for providing input and acquire output from the program along with implementation of control statements.

A30501.4 Interpret the importance of functions in programming

A30501.5 Analyze and modularize the problem and its solution by using functions.

A30501.6Ability to relate the concepts of strings, files and pre-processors to the real world Applications.

3. Course Syllabus

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

Basics of Python Programming – Introduction to computer and python programming, History of python, Basics of python programming, python character set, tokens, data types, output function, multiple assignments, formatting numbers and strings.

Operators and Expressions -Arithmetic Operators, Comparison Operators, Assignment and In- place or Shortcut Operators, Unary Operators, Bitwise Operators, Shift Operators, Logical Operators, Membership Operators, Identity Operators, Operator Precedence and Associatively, Expressions in Python.

Decision statements -Boolean type, Boolean operators, numbers, strings with Boolean operators, decision making statements, conditional expressions.

Loop control statements -while loop, range function, for loop, nested loops, break and continue statements.

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

Functions -Basics of functions, syntax, use of a function, local and global scope of a variable, return statement, recursive functions, lambda functions, parameters and arguments in functions.

Modules -The from...import statement, Name of Module, Making your own Modules, dir() function, The Python Module, Modules and Namespaces, Packages in Python, Standard Library modules, Globals(), Locals() and Reload(), Function Redefinition.

Exceptions -Introduction, Handling Exceptions, Multiple Except Blocks, else Clause, Raising Exceptions, finally Block, Re-raising Exception.

File Handling -Introduction, Need of file handling, text input and output files, seek function, binary files. Extracting data from a file and performing some basic operations on it.

4. Books and Materials

Text Book(s)

1. Programming and problem solving with python by Ashok NamdevKamthane,Amit Ashok Kamthane., McGraw-Hill Education.
2. Python programming using problem solving approach by ReemaThareja, Oxford.

Reference Book(s)

1. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, “Fundamentals of Python”, CENGAGE, 2015.
3. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition,O’Reilly, 2016.

OR

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30001 – COMMUNICATIVE ENGLISH

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

1. Course Description

Course Overview:

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

Course Pre/co-requisites:

The course has no specific pre/co-requisites

Course Outcomes(COs)

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

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

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

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

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

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

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

Course Syllabus

UNIT – I

Listening: Listening for comprehension.

Speaking: Introducing oneself and describing people, places and objects.

Reading: Skimming and scanning pieces of information.

Writing: Summary writing.

Grammar and Vocabulary: Sentences and Clauses. Preposition, Parts of speech. One word substitutes.

Text: On the Conduct of Life: William Hazlitt. If: Rudyard Kipling

UNIT –II

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

UNIT –III

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

UNIT –IV

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

UNIT – V

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

Books and Materials Text Book**:**
Language and Life:A Skills Approach, Orient BlackSwan, Hyderabad. 2018.

Reference Books:

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30301-ENGINEERING GRAPHICS AND COMPUTER AIDED DRAFTING

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

1. Course Description

Course Overview

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

Course Pre/co-requisites

The course has no specific prerequisite and co-requisites

2. Course Outcomes (COs)

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

A30301.1 Construct various curves like ellipse, parabola, hyperbola etc which are used in Engineering drawing.
A30301.2 Apply orthographic projection concepts to draw projections of points, lines, planes and solids.
A30301.3 Apply development concepts to draw development of surfaces of simple solids.
A30301.4 Apply isometric projection concepts to draw isometric projections of right Regular solids
A30301.5 Apply orthographic projection concepts to convert isometric view to orthographic views.
A30301.6 Make use of AutoCAD Software to draw 2D diagrams of various objects

3. Course Syllabus

PART -A

UNIT I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance – DrawingInstruments and their Use – Conventions in Drawing – Lettering – BIS Conventions.
Curves used in Engineering Practice:

a) Conic Sections- Ellipse, Parabola & Hyperbola – General method only.
b) Rectangular Hyperbola – General method only.
c) Cycloid, Epicycloids and Hypocycloid

UNIT II

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

UNIT III

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

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

UNIT IV

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

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

UNIT V

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

PART –B (PRACTICEONLY)

Introduction to Computer Aided Drafting:

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

4. Books and Materials

Text Book(s):

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30006 – COMMUNICATIVE ENGLISH LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course Description

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

Course Pre/co requisites

A30001-Communicative English

2. Course Outcomes (COs)

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

A30006.1 Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills

A30006.2 Apply communication skills through various language learning activities

A30006.3Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.

A30006.4 Evaluate and exhibit acceptable etiquette essential in social and professional settings

A30006.5 Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

A30006.6 Improve upon speaking skills over telephone, role plays and public speaking

3. Course Syllabus

List of topics to be covered:

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

13. Oral Presentations
14. Précis Writing and Paraphrasing
15. Spotting errors

4. Books and Materials

Text Books:

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

Reference Books:

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30007 – ENGINEERING PHYSICS LABORATORY
(COMMON TO CE & ME)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course Description

Course Overview

This course imparts practical and conceptual knowledge of Engineering Physics applicable to the domain of civiland mechanical engineering. The laboratory work of the course is aimed to ensure that the student comprehends the concepts of Engineering Physics through demonstrable and executable experiments. This course will enable the student to determine the rigidity modulus of wire, moment of inertia of fly wheel, ultrasonic velocity in liquid, Poisson's ratio of aluminum and rubber, spring constant , numerical aperture and acceptance angle of an optical fiber, wavelength of laser source, hair size, verification of Hooke's law and three laws of a stretched string, study the magnetic field along the axis of a current carrying coil, B-H Curve and strainmeasurement by using strain gauge.

Course Pre/co-requisites:

A30003-Engineering Physics

2. Course Outcomes (COs)

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

A30007.1 Estimate the mechanical properties of materials

A30007.2 Determine moment of inertia of a flywheel

A30007.3 Measure the velocity of ultrasonic in liquid by applying the basic

A30007.4 Determine the wavelength of laser, particle size, numerical aperture and acceptance angle by applying the principles of lasers and optical fibers

A30007.5 Measure the elastic constants, Poisson's ratio of the Materials

A30007.6 Measure the strain of the metal bar by using strain gauge.

3. Course Syllabus

(Any 12 of the following)

1. Parallelogram law of co-planar 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. Determination of dielectric constant by charging and discharging method.
6. Magnetic field along the axis of a circular coil carrying current
7. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)
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. Sonometer: Verification of the three laws of stretched strings
13. Poisson's Ratio of aluminum and rubber
14. Determination of the elastic constants of the material of a flat spiral spring
15. Determination of the spring constant of the material of a flat spiral spring

4. Laboratory Equipment/Software/Tools Required

1. Torsion Pendulum
2. Fly Wheel
3. Laser Source
4. B-H Curve kit
5. Strain Gauge
6. Acoustic Grating
7. Optical Fiber Kit
8. Optical Fiber sensor
9. Stewart-Gee's Apparatus
10. Poisson's Ratio Apparatus

5. Books and Materials

Text Book(s):

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30502 – PYTHON PROGRAMMING LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course Description

Course Overview

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

Course Pre/Co-requisites

A30501-Python Programming

2. Course Outcomes (COs)

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

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

A30502.2 Understand and implement modular approach using python

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

A30502.4 Understands about files and its applications.

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

A30502.6 Select appropriate programming construct for solving the problem

3. Course Syllabus

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

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

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

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

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

	dictionary data structure. b) Python program to split a string based on a delimiter and join the string usinganotherdelimiter.
Experiment-6	a) Python Program to Convert Decimal to Binary, Octal and Hexadecimal without usingbuilt inmethods. b) Write a function nearly equal to test whether two strings are nearly equal. Two strings aand b are nearly equal when a can be generated by a single mutation on b.
Experiment-7	a) Write a function dups to find all duplicates in the list. b) Write a function cumulative product to compute cumulative product of a list ofnumbers.
Experiment-8	a) Write a function reverse to reverse a list. Without using the reverse function. b) Write function to compute gcd, lcm of two numbers using recursion.
Experiment-9	a) Write a program to perform addition of two square matrices. b) Write a program to perform multiplication of two square matrices.
Experiment-10	a) Write a program to print each line of a file in reverse order. b) Write a program to compute the number of characters, words and lines in a file.

4. Laboratory Equipment/Software/Tools Required

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

5. Books and Materials

Text Book(s)

a. 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

b. Algorithmic Problem Solving with Python, John B. Schneider ,Shira Lynn Broschat, JessDahmen.

c. Think in Python, Allen Downey, Green Tea Press, Needham, Massachusetts.

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30010 – MATHEMATICS – II

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

1. Course Description

Course Overview

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

Course Pre/co requisites

- Calculus
- Vectors

2. Course Outcomes (COs)

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

A30010.1 Apply the mathematical principles to solve second and higher order differential equations.

A30010.2 Analyze the non- homogeneous linear differential equations along with method of variation of parameters.

A30010.3 Apply the concept of higher order differential equations to the various streams likeMassspring system and L-C-R Circuit problems.

A30010.4 Apply a range of techniques to find solutions of standard PDEs and basic properties of standard PDEs.

A30010.5 Analyze the vector calculus involving divergence, curl and their properties alongwithvectoridentities.

A30010.6 Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals.

3. Course Syllabus

UNIT-I: Differential Equations of First and Higher Order

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

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

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

UNIT-III: Partial Differential Equations – First order

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

UNIT-IV: Vector differentiation

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

UNIT-V: Vector integration

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

4. Books and Materials

Textbooks:

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

References:

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30012 – ENGINEERING CHEMISTRY

Hours Per Weeks			Hours Per Semester			Credit	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	40	60	100

1. Course Description

Course Overview

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

Course Pre/Co requisites

Bridge Course

2. Course Outcomes (COs)

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

A30012.1 To illustrate the molecular orbital energy levels for different molecularspeciesand Apply Schrodinger wave equation and particle in a box.

A30012.2 To differentiate between pH metry, Potentiometric and conductometrictitrations.

A30012.3 Explain the preparation properties and applications of polymers anddescribe the mechanism of conduction in conducting polymers.

A30012.4 Understand the principles of different analytical instruments andexplaintheir applications.

A30012.5 Explain the concept of nano clusters nano wires and characterize theapplications of SEM & TEM.

A30012.6 Explain of different types of colloids, their preparations, properties andapplications

3. Course Syllabus

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

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

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

Unit – 4: Instrumental MethodsandApplications: Electromagnetic spectrum. Absorption of radiation:Beer- Lambert's law. Principle and applications of pH metry, potentiometer, Conductometry, UV-spectroscopy, IR Spectroscopy. Chromatography- Basic principle- TLC- Separation of organic mixtures **Unit – 5: Nano materials and Colloidal chemistry**:
Nano materials : Introduction to nano materials: Nano particles, nano clusters, (CNT's) and nano wires. Chemical synthesis of nano materials- Sol gel method. Characterization: principle and application of scanning electron microscope (SEM) and Transmission Electron Microscope (TEM).
Colloidal chemistry: Introduction to colloidal chemistry - colloidal, Micelle formation, synthesis of

colloids (any two methods with examples), properties and applications.

4. Books and Materials

Text Books:

1. Jain and Jain, *Engineering Chemistry,* 16/e, Dhanpat Rai,2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' *Physical Chemistry,* Oxford University Press,2010.
3. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, *Engineering Chemistry* Mc Graw Hill Education (India) Pvt Ltd, New Delhi 2016

4. B.K Sharma *Engineering Chemistry,* Krishna Prakashan, Meerut.

Reference Books:

1. J. D. Lee, *Concise Inorganic Chemistry,* 5/e, Oxford UniversityPress,2008.
2. Skoog and West, *Principles of Instrumental Analysis,* 6/e,Thomson,2007.
3. Ben L. Feringa and Wesley R. Browne, *Molecular Switches,* 2/e, Wiley-VCH,2011.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30505-C AND DATA STRUCTURES

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

1. Course Description

Course Overview

The aim of this course is to provide insight in C programming concepts and organizing many data types logicallyin a way data can easily be accessed, modified, and configured. It covers the concepts of C Data types, Control Statements, Arrays, Functions, Structures, files, along with data structure concepts such as Stacks, Queues, Linked Lists, with standard algorithms for searching and sorting. It improves the problem-solving ability of a learner to a great extent.

Course Pre/co requisites

- Computer Programming
- Mathematics

2. Course Outcomes (COs)

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

A30505.1 Apply fundamental programming concepts of C for solving general purpose problems.

A30505.2 Implement functions for organized software development.

A30505.3 Apply various operations on linear data structures.

A30505.4 Design techniques for efficient searching and sorting of a given application.

A30505.5 Develop programs on stacks and Queues for real time applications

A30505.6 Analyze Linear and nonlinear programming for efficiency.

3. Course Syllabus

Unit-I

Data Types, Operators and Control Statements- Data Types and Sizes, Variables, Constants, Operators, Type Conversions, Precedence and Order of Evaluation, Control statements.

Unit-II

Arrays-Indexing**,** Array Initialization,One Dimensional Array, Two-Dimensional Array**,** Variable Length Arrays, Functions.

Unit-III

Structures, Unions, Storage Class Specifiers, Bit Fields, Enumerations, typedef, Pointers, Files- read, append andwrite operations.

Unit-IV

Sorting Techniques- Selection Sort, Bubble Sort, Quick Sort, **Searching Techniques** -Sequential Search, Binary Search, Hashed List Searches.

Unit-V

Linked lists- Definition, Single linked list, Circular linked list, Double linked list, Circular Double linked list, Application of linked lists. **Stacks**- Definition, Representation of Stack, Stack Operations, **Queues**- Definition, Representations of Queues, Queue Operations

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30303- ENGINEERING MECHANICS

(Common to CE & ME)

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

1. Course Description

Course Overview

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 forceson the mating parts will be analyzed to design various systems with negligible effort loss.

Course Pre/co-requisites

A30303-Engineering Physics

2. Course Outcomes (COs)

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

A30303.1 Analyze the basic concepts of rigid bodies subjected to different types of loads andsupports.

A30303.2 Analyze the motion of the bodies considering friction and external loads.

A30303.3 Determine centroids, centre of gravity, moment of inertia of simple and compositefigures

.A30303.4 Analyze the motion of particle without considering forces and considering forces, dev elop equations for different motions.

A30303.5 Apply Newton's laws and conservation laws to elastic collisions and motion of rigidbodies.

A30303.6 Analyze the perfect frames using different methods and concepts of Mechanicalvibrations.

3. Course Syllabus

UNIT I

Introduction to Engineering Mechanics – Basic concepts - System of Forces – Moment of Forces and its Application – Couples and Resultant of Force System – Equilibrium of System of Forces - Degrees of Freedom – Free body diagrams –Types of Supports – Support reactions for beams with different types of loads.

UNIT II

Friction: Friction covering, types of friction, limiting friction, laws of Friction, static and dynamic friction, motion of bodies, ladder friction, wedge friction.

UNIT III

Centroid and Center of Gravity: Centroids of simple figures, centroids of composite sections. Centre ofgravity and its implications, centre of gravity of composite sections.

Moment of Inertia: Area & Mass moment of Inertia – radius of gyration, parallel axis– perpendicular axis theorem – simple Problems.

UNIT IV

Kinematics: Equations of motion for rigid bodies, constant and variable acceleration, rectilinear and curvilinear motion, motion under gravity -projectile motion, problems on kinematics

Kinetics: Principles of dynamics - Newton's Laws of motion, D'Alembert's principle in rectilinear translation, principle of work and energy, problems on kinetics.

UNIT V

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 methodfor vertical loads, horizontal loads and inclined loads.

Mechanical Vibrations: Definitions, concepts-simple harmonic motion-Free vibrations-Simple,compound and torsional pendulum- simple problems

4. Books and Materials

Text Book(s):

1. S S Bhavikatti, *Engineering Mechanics*, 4th edition, New Age International, 2008.
2. S. Timoshenko, D. H. Young and J. V. Rao, *Engineering Mechanics*, Tata McGraw-Hill Company,2013

Reference Book(s)

1. R. K. Bansal, *Engineering Mechanics*, Lakshmi Publications, 2007.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30302 – ENGINEERING WORKSHOP

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	3	14	0	42	3	40	60	100

1. Course Description

Course Overview

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

Course Pre/co-requisites

This course has no Pre/co-requisites

2. Course Outcomes (COs)

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

A30302.1 Apply wood working skills to make products.

A30302.2 Perform metal cutting operations in the fitting section to make models.

A30302.3 Perform simple welding operations to join to metal pieces.

A30302.4 Apply sheet metal working skills to make required models.

A30302.5 Evaluate the performance analysis of various pumps and turbines.

A30302.6Perform general maintenance works on own at house/ work place.

3. Course Syllabus

1. **Fitting Trade–**Making ofaL-fitfromthegivenM.SFlatmaterialpiece.
2. **Fitting Trade–**Making foursquare joint from the given M.SFlatmaterialpiece.
3. **Carpentry Trade–**Making of across lap joint asperspecification.
4. **CarpentryTrade-**Tomakeadovetailjointasperspecification.
5. **Tinsmith–**Making of an open scoop with the given sheet metal
6. **Tinsmith–**Making ofasquare tinwiththegivensheetmetal
7. **Foundry:** Preparation of asand mould using a singlepiecepattern
8. **Welding**: Preparation of a single V butt joint
9. **Welding**: Preparation of single lap joint
10. **House Wiring:** One bulb connected by one one-way switch

11. **House Wiring:** One bulb connected by twoTwo- way switches
12. **House Wiring:** Staircasewiring
13. **House Wiring:**Tubelightwiring
15. **House Wiring:** Go-DownWiring

4. Laboratory Equipment/Software/Tools Required

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

5. Books and Materials

Text Book(s)

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

Reference Book(s)

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

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30013 – ENGINEERING CHEMISTRY LABORATORY

Hours Per Weeks			Hours Per Semester			Credit	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course Description

Course Overview

- This course introduces the basic concepts of practical understanding of the redox reactions which is the foundation for engineering discipline.
- The emphasis of this course is laid on the basics of the preparation and propertiesof synthetic polymers and other material that would provide sufficient impetus to engineers these to suit diverse applications which includes the hygiene accepts of water would be in a position to design methods to Produce Portable water using modern technology.

Course Pre/co requisites:

A30012- Engineering Chemistry

2. Course Outcomes (COs)

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

A30013.1 Determine the cell constant and conductance of solutions

A30013.2 Prepare advanced polymer materials.

A30013.3 Determine the physical properties like surface tension, adsorption and viscosity

A30013.4 Estimate the Iron and Calcium in cement

A30013.5 Calculate the hardness of water and calculation of dissolved oxygen percentages

A30013.6 Determination of percentage of Iron in Cement sample by colorimetry

3.Course Syllabus

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. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and EMFs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a polymer (Bakelite)
8. Determination of viscosity of the solutions using Viscometer-I-
9. Determination of viscosity of the solutions using Viscometer-II
10. Estimation of Calcium in Portland Cement
11. Determination of percentage of Iron in Cement sample by colorimetry
12. Preparation of nanomaterials by precipitation method.

4.Book and Materials

Reference Book(s):

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30506-C AND DATA STRUCTURES LABORATORY

(COMMON TO CIVIL AND MECHANICAL)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course Description

Course Overview

This course provides practical experience in using C language and Data structures. This course covers C fundamentals, Structures, Unions, Files, Searching and sorting techniques, Stacks, Queue and Linked list concepts. It improves the problem-solving ability of a learner to a great extent.

Course Pre/co requisites

- Computer Programming
- C and Data Structures

2. Course Outcomes (COs)

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

A30506.1 Develop fundamental programs in C for solving general purpose problems.

A30506.2 Implement functions for reusability and easy maintenance

A30506.3 Apply various operations on linear data structures.

A30506.4 Design techniques for efficient searching and sorting of a given application.

A30506.5 Develop programs on stacks and Queues for real time applications.

A30506.6 Apply Linear and nonlinear programming for efficiency.

3. Course Syllabus

1. Write a C program to find the roots of a Quadratic equation.
2. Write a C program to check whether the number is prime or not.
3. Write a C program to generate multiplication tables from 11 to 20.
4. Write a C program to find the maximum of a set of numbers.
5. Write a C program to generate Pascal Triangle.
6. Write a C program to read two matrices and print their sum and product in the matrix form.
7. Write a C program to accept a line of characters and print the number of Vowels, Consonants,blank spaces, digits and special characters.
8. Write a C program to merge two files.
9. Write C programs using recursion for finding GCD and LCM of two numbers.
10. Write a C program to exchange two numbers using pointers.
11. Write a program to perform Linear Search on the elements of a given array.
12. Write a program to perform Binary Search on the elements of a given array.

13. Write a C program to sort a list of elements using the bubble sort algorithm.
14. Write a C program to sort a list of elements using the merge sort algorithm.
15. Write a C program to sort a list of elements using the quick sort algorithm.
16. Write a C Program to Implement a Stack using an Array.
17. Write a C Program to Implement a Queue using an Array.
18. Write a program in C to create and display Singly Linked List.
19. Write a program in C to create and display a doubly linked list.
20. Write a program in C to create and display a circular linked list.

4. Laboratory Equipment/Software/Tools Required

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

5. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30304 APPLIED MECHANICS LABORATORY (Common to CE & ME)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

2. Course Description

Course Overview

This course imparts intensive and extensive practical knowledge on the concepts of Engineering Mechanics in the field of mechanical engineering. This course provides the knowledge in deflection of various beams, efficiencies, velocity ratio and mechanical advantage of single and double gear crab. This lab is aimed atmaking the student understand the concepts of Engineering Mechanics through demonstrable experiments. The student should be able to develop practical capabilities, so that they can apply the knowledge gained inthis course to solve complex engineering problems.

Course Pre/corequisites:

A30303- Engineering MechanicsA30003- Engineering Physics

2. Course Outcomes (COs)

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

A30304.1 Acquire knowledge of static and dynamic behavior of the bodies.

A30304.2 Verify the Principle of moments using the bell crank lever apparatus.

A30302.3 Determine velocity ratio, mechanical advantage and efficiency of single and double gearcrab

A30304.4 Determine the velocity ratio of the machine and to interpret the law of machine

A30304.5 Analyze the coefficient of static friction between two surfaces

A30304.6 Apply laws of mechanics to determine efficiency of simple machines with considerationoffriction

3. Course Syllabus

1. To conduct Bending Test on Simply Supported Beam
2. To find experimentally the reactions at the supports of a simply supported beam and verifythe same with analytical values
3. To verify the Principle of moments using the Bell Crank lever apparatus.
4. To determine the coefficient of Static Friction between two surfaces
5. To conduct Bending Test on Cantilever Beam.
6. To estimate the acceleration due to gravity using a compound pendulum
7. To understand the gear arrangement and establish the law of machine
8. To compare the efficiency of Single and Double Gear Crab
9. To establish law of machine
10. To understand the velocity ratio of the machine and to interpret the law of machine

4. Laboratory Equipment/Software/Tools Required

1. Bell crank lever
2. Friction Plane
3. Single and Double Gear Crab
4. Compound Pendulum
5. Simply Supported and Cantilever beam

5. Books and Materials

Text Book(s):

1. S S Bhavikatti, *Engineering Mechanics*, 4th edition, New Age International, 2008.
2. S. Timoshenko, D. H. Young and J. V. Rao, *Engineering Mechanics*, Tata McGraw-Hill Company,2013

Reference Book(s)

1. R. K. Bansal, *Engineering Mechanics*, Lakshmi Publications,2007.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30032-UNIVERSAL HUMAN VALUES

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

1. Course Description

Course Overview:

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

Course Pre/Co-requisites:

The course has no specific pre/co-requisites

2.Course Outcomes(COs)

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

A30032.1 Understand the significance of value inputs in a classroom and start applying them in theirlife andprofession

A30032.2 Distinguish between values and skills, happiness and accumulation of physical facilities, theSelf and theBody, Intention and Competence of an individual, etc.

A30032.3 Understand the value of harmonious relationship based on trust and respect in their life andprofession

A30032.4 Understand the role of a human being in ensuring harmony in society and nature.

A30032.5 Distinguish between ethical and unethical practices, and start working out the strategy toactualize aharmonious environment wherever they work.

A30032.6 Analyze the value of maintaining ethical values in critical situations

3.Course Syllabus

UNIT – I

Course Introduction - Need, Basic Guidelines, Content and Process for ValueEducation

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

UNIT –II

Understanding Harmony in the Human Being - Harmony in Myself

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

UNIT –III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

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

UNIT –IV

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

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

UNIT – V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics:

a) Ability to utilize the professional competence for augmenting universal human order,b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models

Case studies of typical holistic technologies, management models and production, systems, Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
b) At the level of society: as mutually enriching institutions and organizations

4. Books and Materials

Text Book:

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

Reference Books:

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

COURSE STRUCTURE

III – SEMESTER

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
A30014	Transform Techniques and Numerical Methods	BS	3	0	0	3	40	60	100
A30305	Thermodynamics	PC	3	0	0	3	40	60	100
A30306	Mechanics of Solids	PC	3	0	0	3	40	60	100
A30307	Material Science and Engineering	PC	3	0	0	3	40	60	100
A30019	Managerial Economics and FinancialAnalysis	HS	3	0	0	3	40	60	100
A30308	Mechanics of Solids Laboratory	PC	0	0	3	1.5	40	60	100
A30309	Material Science and Engineering Laboratory	PC	0	0	3	1.5	40	60	100
A30310	Computer Aided Drafting Laboratory	PC	0	0	3	1.5	40	60	100
A30311	Solid Works (Skill oriented course)	SC	1	0	2	2	40	60	100
A30031	Environmental Science (Mandatory course)	MC	2	0	0	0	100*	0	100*
		TOTAL	17	0	13	21.5	360	540	900

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A30014 –TRANSFORM TECHNIQUES AND 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	40	60	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: 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 derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Pre/corequisites

A3002 – Mathematics – I

A3010 – Mathematics – II

2. Course Outcomes (COs)

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

A30014.1 Apply Laplace transforms to solve ordinary differential equations.

A30014.2 Build Fourier series and Fourier transforms of a given function.

A30014.3 Apply numerical methods to find our solution of algebraic equations using different methods under different conditions, and numerical solution of system of algebraic equations.

A30014.4 Understand and apply the concepts of curve fitting, numerical differentiation and integration

A30014.5 Interpret the numerical solutions of ordinary differential equations employing Taylor series, Euler’s, Picard’s and Runga-kutta methods

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 (AUTONOMOUS)

COURSE STRUCTURE

A30305 – THERMODYNAMICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	14	0	3	40	60	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 thermodynamicprocess, 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

A30004- Applied Physics

2. Course Outcomes (COs)

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

A30305.1: Apply the concepts of thermodynamics in the form of Work and Heat to various engines

A30305.2: Make use of energy equations for steady flow of fluids.

A30305.3: Apply the thermodynamic laws to various applications.

A30305.4: Determine the efficiency of the cycles for various applications.

A30305.5: 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, Psychometric Properties, Degree of saturation, Adiabatic Saturation, Carrier's Equation Psychometric 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 (AUTONOMOUS)

COURSE STRUCTURE

A30306– 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	40	60	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. A3004- Applied Physics
2. A3303 - Engineering Mechanics

2. Course Outcomes (COs)

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

A30306.1 Analyze the types of stresses, strains and elastic constants of mechanical components

A30306.2 Construct shear force and bending moment diagrams for beams subjected to various loads.

A30306.3 Formulate the bending and shear stress equations and shear stress distribution for beams and shafts

A30306.4 Solve problems related to slope and deflection equations for beams subjected to various loads

A30306.5 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 supportedand 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 (AUTONOMOUS)

COURSE STRUCTURE

A30307 – 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	40	60	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. **A30004** Applied Physics
2. **A30005** Engineering Chemistry

2. Course Outcomes (COs)

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

A30307.1 Identify the properties of the crystallization of ferrous and nonferrous materials.

A30307.2 Construct the equilibrium diagrams by experimental methods.

A30307.3 Make use of advanced composite materials in manufacturing of components and sophisticated machine.

A30307.4 Improve the properties of ferrous and nonferrous materials using different heat treatment processes.

A30307.5 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 carbonsteels, low alloy steels, hadfield manganese steels, tool and die steels.Structure and properties of copperand 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*, 12th edition, 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

A30019 – MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

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

2. 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

3. Course Outcomes (COs)

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

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

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

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

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

A30019.5 Analyze and prepare financial statements to assess financial health of business.

3. Course Syllabus

UNIT I

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Relation with other disciplines –Demand Analysis: Types, Determinants, 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

A30308 – 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	3	0	0	42	1.5	40	60	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. A30303 - Engineering Mechanics
2. A30304-Engineering Mechanics Laboratory
3. A30306-Mechanics of Solids

2. Course Outcomes (COs)

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

A30308.1 Analyze the stress-strain diagram for different materials using universal testing machine

A30308.2Compare the hardness values for various materials using hardness testing machine

A30308.3 Determine modulus of elasticity, bending stresses and deflection for different beams

A30308.4 Estimate the stiffness and shear modulus of springs using tension test

A30308.5 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 hardness of 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

A30309– 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	40	60	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. A3004 Applied Physics
2. A3005 Engineering Chemistry
3. A3307 Material Science and Engineering

2. Course Outcomes (COs)

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

A30309.1 Make use of different material samples for investigating micro structures.

A30309.2 Interpret the microstructures of materials usingmetallurgical microscope

A30309.3 Measure the hardenability of mild steel samples.

A30309.4 Improve the properties of materials using various heat treatment processes.

A30309.5 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.

COURSE STRUCTURE

A30310 – 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	3	0	0	42	1.5	40	60	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

A3301 - Engineering Graphics and Computer Aided Drafting
A3308 - Engineering Drawing for Mechanical Engineers

2. Course Outcomes (COs)

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

A30310.1 Identify the commands in AutoCAD software to draw required objects

A30310.2 Create the mechanical components in 2 – Dimensional using AutoCAD commands

A30310.3 Draw the projections of solids using AutoCAD commands

A30310.4 Draw the sectional views of solids using AutoCAD commands

A30310.5 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

A30311 - SOLID WORKS (SKILL ORIENTED COURSE)

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

1. Course Description

Course Overview

This laboratory course helps to Covers creation, retrieval and modification of 3-D and layout drawings using basic SolidWorks commands. Includes skills needed to create parametric modelsof parts and assemblies.

Course Pre/corequisites

A3310-Computer Aided Drafting Laboratory

2. Course Outcomes (COs)

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

A30311.1 Construct complex geometries of machine components in sketcher mode.

A30311.2 Demonstrate competency with multiple drawing and modification commands in Solid Works.

A30311.3 Plan 2D and 3D drawings based on design constraints

A30311.4 Create three-dimensional assemblies incorporating multiple solid models.

A30311.5 Apply industry standards in the preparation of technical mechanical drawings..

3. Course Syllabus

1. Part Modelling
   a) Sketcher
   b) Features
   c) Surfacing
   d) Sheetmetal Introduction
2. Assembly
   a) Top Down Assembly
   b) Bottom Up Assembly
   c) Assembly Mates Standard
   d) Assembly Checks

3. Drawing

   a) 3D to 2D

   b) Dimensioning with model reference

4. Laboratory Equipment/Software/Tools Required

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

5. Books and Materials

Text Book(s)

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

Reference Book(s)

1. Computer Aided Design Laboratory by M. N. SeshaPraksh&Dr. G. S. Servesh – Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A30031 – ENVIRONMENTALSCIENCE (Mandatory Course)

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

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

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

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

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

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

3. Course Syllabus

UNIT 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.

COURSE STRUCTURE

IV – SEMESTER

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
A30011	Probability & Statistics	ES	3	0	0	3	40	60	100
A30312	Manufacturing Technology	PC	3	0	0	3	40	60	100
A30313	Kinematics of Machinery	PC	3	0	0	3	40	60	100
A30314	I.C. Engines	PC	3	0	0	3	40	60	100
A30315	Fluid Mechanics and HydraulicMachines	PC	3	0	0	3	40	60	100
A30317	Manufacturing Technology Laboratory	ES	0	0	3	1.5	40	60	100
A30318	Fluid Mechanics and Hydraulic Machines Laboratory	PC	0	0	3	1.5	40	60	100
A30319	I.C Engines Laboratory	PC	0	0	3	1.5	40	60	100
A30320	CAD (Skill oriented course)	SC	1	0	2	2	40	60	100
TOTAL			15	0	11	21.5	360	540	900
Internship 2 Months (Mandatory) during summer vacation									
Honors/Minor courses (The hours distribution can be3-0-2 or 3-1-0 also)			4	0	0	4	40	60	100

COURSE STRUCTURE

A30011 – PROBABILITY AND STATISTICS

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

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in

engineering. Topics to be covered in this course include: Descriptive statistics and methods for data science, Probability, Probability distributions, Estimation and Testing of hypothesis, large sample tests, and Small sample tests. The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Pre/co requisites

This course has no pre/co-requisites.

2. Course Outcomes (COs)

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

A30011.1 Adopt correlation methods and principle of least squares, regression Analysis

A03011.2 Apply discrete and continuous probability distributions. A30011.3 Classify the concepts of data science and its importance.

A30011.4 Interpret the association of characteristics and through correlation and regression tools.

A30011.5 Design the components of a classical hypothesis test.

A30011.6 Infer the statistical inferential methods based on small and large sampling tests.

3. Course Syllabus

UNIT-I

Descriptive statistics Introduction, Measures of Variability (dispersion) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, principle of least squares, method of least squares, regression lines, regression coefficients and their properties.

UNIT-II

Probability: Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT-III

Probability distributions: Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties**.**

UNIT-IV

Estimation and Testing of hypothesis, large sample tests : Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems.

UNIT-V

Small sample tests: Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

4. Books and Materials

Textbooks:

1. Miller and Freunds, *Probability and Statistics for Engineers,*7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics,* 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. S. Ross, *A First Course in Probability,* Pearson Education India, 2002.
2. W. Feller*, an Introduction to Probability Theory and its Applications*, 1/e, Wiley, 1968.

COURSE STRUCTURE

A30312 – 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	40	60	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

A3307 – Material Science and Engineering

2. Course Outcomes (COs)

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

A30312.1 Select suitable material for preparing the patterns

A30312.2 Make use of moulding systems to prepare a product

A30312.3 Recommend the melting and solidification processes for designing the gating system.

A30312.4 Identify the suitable special casting and welding processes used for the given application

A30312.5 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.

COURSE STRUCTURE

A30313 – 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	40	60	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. **A30003 –** Applied Physics
2. **A30303** - Applied Mechanics

2. Course Outcomes (COs)

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

A30313.1 Differentiate mechanism, machine and structure with respect to kinematic motions.

A30313.2 Analyse the mechanism of straight-line motion, steering and Hooke's joint as per suitable applications.

A30313.3 Draw velocity and acceleration diagrams by using relative velocity method and instantaneous center method.

A30313.4 Solve the problems related to gears and gear trains using suitable methods.

A30313.5 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.*

COURSE STRUCTURE

A30314 – 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	40	60	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

A3305- Thermodynamics

2. Course Outcomes (COs)

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

A30314.1: Identify constructional features and working principles of the S.I and C.I engines.

A30314.2: Analyze the stages of combustion in S.I and C.I engines for better performance.

A30314.3: Apply various performance methods to increase the engine efficiency.

A30314.4: Identify constructional features and working principles of air compressors.

A30314.5: 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.I and 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

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COURSE STRUCTURE
A30315– 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	40	60	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

A3303- Engineering Mechanics

2. Course Outcomes (COs)

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

A30315.1 Analyze properties of fluids under different conditions

A30315.2 Identify the fluid flow patterns using different equations

A30315.3 Determine fluid flow using devices and principles of fluid mechanics

A30315.4 Apply boundary layer concepts to various types of flow and forces exerted by jet on vanes

A30315.5 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, 19

COURSE STRUCTURE

A30317 – 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	40	60	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

A30312 - Manufacturing Technology

2. Course Outcomes (COs)

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

A30317.1	Identify various casting and welding equipments used in manufacturing processes
A30317.2	Choose suitable Sand properties of green sand to get quality specimen.
A30317.3	Determine the sequence of process to complete a job
A30317.4	Make use of various welding, foundry and forming equipments to prepare the job
A30317.5	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, 7th edition, 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, 18th edition, 2013.

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COURSE STRUCTURE

A30318 – 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	40	60	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

A30303 **-** Engineering Mechanics

A30315 - Fluid mechanics and hydraulic machines

2. Course Outcomes (COs)

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

A30318.1	Analyze procedure for performance of various experiments
A30318.2	Calibrate flow discharge measuring devices used in pipes, channels and tanks.
A30318.3	Analyze the fluid flow through pipes with different materials and sizes.
A30318.4	Determine coefficient of discharge of fluid flow through pipes
A30318.5	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.

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COURSE STRUCTURE

A30319 – 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	40	60	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

A30314 - I.C. Engines

2. Course Outcomes (COs)

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

A30319.1: Construct valve and port timing diagram of SI engine and CI engine.

A30319.2: Analyze the influence of variations in TDC and BDC operations of I.C engine

A30319.3: Calculate the power and efficiencies of I.C engines.

A30319.4: Test the performance of IC engine at various loads and Air fuel ratio.

A30319.5: 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.

COURSE STRUCTURE

A30320 - COMPUTER AIDED DRAFTING LABORATORY (SKILL COURSE)

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

1. Course Description

Couse Overview

This laboratory course deals in this competency-based course students will learn the fundamentals of drafting in a modern, networked, computer lab using AutoCAD drafting software. The course will cover the concepts and application of orthographic projection, isometric representation, and basic dimensioning. Topics also include line type conventions, lettering, freehand drafting, geometric construction, sections, and auxiliary views. Advanced students will learn 3-D modelling techniques and have the opportunity to use AutoDesk's Inventor Software. This course includes classroom instruction and laboratory activities. The students will use this knowledge to draw the mechanical components for various industrialapplications.

Course Pre/co requisites

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:

A30320.1 understand and interpret drawings of machine components so as to prepareassembly drawings either manually and using standard CAD packages.

A30320.2 Understand the basic analytical fundamentals that are used to create andmanipulate geometric models in a computer program

A30320.3 Create 2D and 3D models of Engineering Components and gain practical experiencein handling 2D drafting and 3D modelling software systems.

A30320.4 Apply the basic principles associated with CADD and to demonstrate commondrafting techniques and shortcuts used by professionals.

A30320.5 Model the 3-D geometric information of machine components including assemblies,and automatically generate 2-D production drawings.

3. Course Syllabus

1. Exercise on usage of Auto CAD 2D Commands with Absolute co-ordinate system
2. Exercise on usage of Auto CAD 2D Commands with Relative co-ordinate System
3. Exercise on usage of Auto CAD 2D Commands with polar Co-ordinate system
4. Exercise on usage of auto cad on 2d editing commands
5. Creation of Simple Figures like Polygon and General Multiline Figures
6. Drawing of a title block with necessary text and Projection Symbol
7. Drawing of Curves like Parabola, Spiral, Involute using B-spline or Cubic Spline
8. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone etcand dimensioning
9. Drawing sectional views of prism, pyramid, cylinder, cone
10. Drawing front view, top view and side view of objects from the given pictorial views
11. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from3-D model
12. Drawing isometric projection of simple object
13. Drawing of Sectional View of Cone
14. Drawing of Sectional View of Prism
15. Drawing Front View, Top View and Side View of Objects from the Given Pictorial Views
16. Creation Of 3-D Models of Simple Objects and obtaining 2-D Multi view Drawings From3-D Model
17. Drawing isometric projection of Simple object

4. Laboratory Equipment/Software/Tools Required

1. PC with AUTO CAD software package

5. Books and Materials

Text Book(s)

1. CAD/CAM Theory and Practice by Ibrahim Zeid and R Siva Subramanian.
2. CAD/CAM by Mikell P. Groover and Emory W. Zimmers, Jr.

Reference Book(s)

1. CAD/CAM Principles and Applications by P.N. RAO.
2. Engineering Drawing by Dr.K.L.Narayana,Dr.P.Kannaiah

COURSE STRUCTURE – V SEMESTER

V SEMESTER (III YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A30322	Thermal Engineering	PC	3	0	0	3	40	60	100
A30323	Dynamics of Machinery	PC	3	0	0	3	40	60	100
A30324	Design of Machine Elements	PC	3	0	0	3	40	60	100
	Professional Elective-I	PE	3	0	0	3	40	60	100
	Open Elective-I	OE	3	0	0	3	40	60	100
A30325	Machine Tools Laboratory	PC	0	0	3	1.5	40	60	100
A30326	CAD/CAM Laboratory	PC	0	0	3	1.5	40	60	100
A30327	Machine Drawing Practice	SC	1	0	2	2	40	60	100
A30034	Gender Sensitization	MC	2	0	0	0	100*	0	100
A30334	INTERNSHIP	PW	0	0	0	1.5	100	0	100
A30335	COMMUNITY SERVICE PROJECT		0	0	0	0	0	0	0
TOTAL			17	00	9	21.5	420	480	900

Professional Elective – 1	
Course Code	Title of the Course
A30351	Machining Processes
A30352	Computer Integrated Manufacturing
A30353	Principles of Management
A30354	Flexible Manufacturing System
A30381	Work System Design

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COURSE STRUCTURE

A30322– 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	40	60	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

A30307 - Thermodynamics

2. Course Outcomes (COs)

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

A30322.1 Apply power cycles and efficiency enhancement methods to generate power

A30322.2 Calculate the chimney height and draught for maximum discharge

A30322.3 Determine the characteristics of flow through nozzle

A30322.4 Construct the various velocity triangles of steam turbines

A30322.5 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

COURSE STRUCTURE

A30323 – DYNAMICS 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	3	40	60	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

A30003-Engineering physics

A30308-Engineering Mechanics

A30315- Kinematics of Machines

2. Course Outcomes (COs)

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

A30323.1 Apply gyro-principles to stabilize the motion of vehicle.

A30323.2 Analyse the forces of the Flywheel in IC Engine

A30323.3 Estimate the range of speeds of various governors suitable for applications

A30323.4 Solve problems on balancing of rotating masses and reciprocating masses in V- engine and multi cylinder engines

A30323.5 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.

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COURSE STRUCTURE

A30324 – 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	40	60	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

A30308 - Engineering Mechanics

A30313 - Mechanics of Solids

A30317 - Machine Drawing

2. Course Outcomes (COs)

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

A30324.1 Apply the design process and theories of failure for designing different machine elements.

A30324.2 Solve the problems related to simple and complex components under different loads using Goodman's and Soderberg's criteria.

A30324.3 Estimate the stress induced in riveted and bolted joints under different load conditions

A30324.4 Analyze the failures in shafts, cotter joint and knuckle joint subjected to various loads.

A30324.5 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.

A30325– 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	40	60	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:

A30325.1 Identify various machine tools used in machine shop

A30325.2 Distinguish the constructional features and operations of general purpose machines

A30325.3 Determine the sequence of operations to process a job

A30325.4 Make use of various machining operations to perform metal cutting

A30325.5 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.

COURSE STRUCTURE

A30326– 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	40	60	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

A30311 - Computer Aided Drafting Laboratory

2. Course Outcomes (COs)

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

A30326.1 Construct complex geometries of machine components in sketcher mode.

A30326.2 Create programs to generate analytical and synthetic curves used in engineering practice.

A30326.3 Plan 2D and 3D drawings based on design constraints

A30326.4 Applying CAD/CAM concept to product design and manufacturing.

A30326.5 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.

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COURSE STRUCTURE

A30327– MACHINE DRAWING PRACTICE

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

1. Course Description

Course Overview

This course 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

A30317 - Engineering Drawing

2. Course Outcomes (COs)

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

A30327.1 Construct the conventional representation of different materials used in engineering practice.

A30327.2 Identify the machine elements and designation of material.

A30327.3 Apply the drawing techniques to draw various parts of assembly drawing, tolerances, roughness.

A30327.4 Improve visualization ability of surface roughness and its indications with respect to the material surface

A30327.5 Plan the production drawings based on design constraints.

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. Parts not usually sectioned.
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 & their liberal 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 &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.
Other machine parts- Screw jack, Machine Vice, single tool post.
Valves: Steam stop valve, feed check valve. Non return value.

4. Books and Materials

Text Book(s)

Machine Drawing – N Siddeswar, P. Kannaiah, VVS Sastry, Mc Graw Hill,2015
Machine Drawing- K.L. Narayana, P.Kannaiah & K.Venkata Reddy, New Age Publishers, 4th Edition, 2012.

Reference Book(s)

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

COURSE STRUCTURE
A30034 – GENDER SENSITIZATION

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

1. Course Description

Course Overview

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

Course Pre/corequisites

This course has no pre requisites

2. Course Outcomes (COs)

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

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

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

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

A30034.4 Equip to work and live together as equals

A30034.5 Develop a sense of appreciation of women in all walks of life

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

1. Sen, Amartya. "*More than one Million Women are Missing*" New York Review of Books 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

COURSE STRUCTURE

A30351– 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	40	60	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

A30305 - Material Science and Engineering

A30316 **-** Manufacturing Technology

2. Course Outcomes (COs)

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

A30351.1 Identify the various machining processes and machine tools

A30351.2 Classify various metal cutting machines such as lathe, milling, drilling, boring, grinding, shaping, Slotting and planer machines.

A30351.3 Choose the suitable tools for machining processes.

A30351.4 Compare the constructional features of machines suitable for various machining operations.

A30351.5 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.

COURSE STRUCTURE
A30352 – COMPUTER INTEGRATED MANUFACTURING

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

1. Course Description

Course Overview

This course provides manufacturing approach of using computers to control the entire production process. This integration allows individual processes to exchange information with each other and initiate actions. Through the integration of computers, manufacturing can be faster and lesserror-prone, although the main advantage is the ability to create automated manufacturing processes.

Course Prerequisites

Manufacturing Technology

2. Course Outcomes (COs)

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

A30352.1	Identify various Production process.
A30352.2	Understand the detailed insight into automation of manufacturing and manufacturing informatics..
A30352.3	Compare Computer aided production planning and Traditional production planning
A30352.4	Make use of FMS Planning and control the production system.
A30352.5	Analyze the Robot Anotomy and its usages in Production environment.

3. Course Syllabus

UNIT I
INTRODUCTION

Brief introduction to CAD and CAM – Manufacturing Planning, Manufacturing control Introduction to CAD/CAM – Concurrent Engineering - CIM concepts – Computerised elements of CIM system –Types of production –– Basic Elements of an Automated system – Levels of Automation – Lean Production and Just-In Time Production.

UNIT II
PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING

Process planning – Computer Aided Process Planning (CAPP) – Logical steps in Computer Aided Process Planning – Aggregate Production Planning and the Master Production Schedule – Material Requirement planning – Capacity Planning- Control Systems

UNIT III
CELLULAR MANUFACTURING

Group Technology (GT), Part Families – Parts Classification and coding – Simple Problems in Opitz Part Coding system – Production flow Analysis – Cellular Manufacturing – Composite part concept – Machine cell design and layout – Quantitative analysis in Cellular Manufacturing – Rank Order Clustering Method - Arranging Machines in a GT cell – Hollier Method – Simple Problems.

UNIT IV

FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS)

Types of Flexibility - FMS – FMS Components – FMS Application & Benefits – FMS Planning and Control– Quantitative analysis in FMS – Simple Problems. Automated Guided Vehicle System (AGVS) – AGVS Application – Vehicle Guidance technology – Vehicle Management & Safety.

UNIT V

Robot Anatomy and Related Attributes – Classification of Robots- Robot Control systems – End Effectors – Sensors in Robotics – Robot Accuracy and Repeatability - Industrial Robot Applications – Robot Part Programming – Robot Accuracy and Repeatability – Simple Problems.

INDUSTRY 4.0 (TO BE ADDEDD)

4. Books and Materials

Text Book(s)

1. Mikell.P.Groover "*Automation, Production Systems and Computer Integrated Manufacturing*", Prentice Hall of India, 2008.
2. Radhakrishnan P, Subramanyan S.and Raju V., "*CAD/CAM/CIM*", 2nd Edition, New Age International (P) Ltd, New Delhi, 2000

Reference Book(s)

1. S.Kant Vajpayee "*Principles of Computer Integrated Manufacturing*", 1999, Prentice Hall of India, New Delhi.

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COURSE STRUCTURE
A30353 – 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	40	60	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:

A30353.1 Build organization structure and managerial skills to obtain the leadership qualities.

A30353.2 Select suitable plant layout as per the requirements of production process.

A30353.3 Apply work improvement techniques in an organization for increasing the productivity

A30353.4 Choose suitable type of Plant maintenance for industrial safety.

A30353.5 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.

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COURSE STRUCTURE

A30354 – 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	40	60	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:

A30354.1 Identify FMS layouts and its significance in manufacturing process

A30354.2 Apply various material handling and storage systems as per applications

A30354.3 Differentiate cellular vs Flexible Manufacturing system for scheduling problems

A30354.4 Solve the problems on performance of computer controlling the flexible manufacturing systems

A30354.5 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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A30381 –WORK SYSTEM DESIGN

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

1. Course Description

Course Overview

The Work System Design course focuses on understanding and optimizing the systems in which work is performed to enhance productivity, efficiency, and worker well-being. The course covers fundamental principles, techniques, and tools used to analyse and improve work environments, methods, and processes. It blends theories of ergonomics, human factors, and system efficiency with practical approaches such as lean principles and work measurement techniques.

Course Pre/corequisites

No Course Pre/corequisites

2. Course Outcomes (COs)

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

A30381.1: identify and describe the key components of a work system, including human resources, technology, tasks, processes, and environment.

A30381.2 Conduct method studies and time-motion analyses to optimize work processes.

A30381.3 Apply ergonomic principles to design workspaces that enhance comfort, safety, and productivity.

A30381.4 Apply lean principles (e.g., 5S, Just-in-Time, Value Stream Mapping) to eliminate waste and improve. system efficiency

A30381.5: Demonstrate the ability to apply work system design principles across different sectors such as manufacturing, healthcare, services, and more.

3.Course Syllabus

Unit-I

Work System Design: Introduction and Concept of Productivity, Measurement of Productivity, Productivity Measures, Productivity Measurement Models, Factors Influencing Productivity, Causes of Low Productivity, Productivity Measurement Models, Productivity Improvement Techniques, Numerical Problems on productivity, Case study on productivity.

Unit-II

Work Study: Basic Concept, Steps Involved in Work Study, Concept of Work Content, , Techniques of Work Study, Human Aspects of Work Study, Method Study: Basic Concept, Steps Involved in Method Study, Recording Techniques, Operation Process Charts, Operation Process Charts: Examples.

Unit-III

Flow Process Charts, Flow Process Charts: Examples, Two-Handed-Process Charts, Multiple Activity Charts, Flow Diagrams, String Diagrams, Principles of Motion Economy, Micro-Motion Study, Therbligs, SIMO Charts.

Unit-IV

Memo-Motion Study, Cycle graph and Chrono-Cycle Graph, Critical Examination Techniques, Development and Selection of New Method, Installation and Maintenance of Improved Methods, Work Measurement: Basic Concept, Techniques of Work Measurement, Steps Involved in Time Study, Steps and Equipment of Time Study , Performance Rating, Performance Rating: Examples, Allowances, Computation of Standard Time-I, Computation of Standard Time-II, Case Study

Unit-V

Work Sampling: Basics, Procedure of Work Sampling Study, Numerical Problems on work sampling, Introduction to Synthetic Data and PMTS, Introduction to MTM and MOST, Ergonomics: Basic Concept, Industrial Ergonomics, Ergonomics: Anthropometry, Man-Machine System-1 , Man-Machine System-2, Case Study: Office Chair, Case Study: Tower Crane Cabin, Case Study: Car Seat, Case Study: Computer System, Case Study: Assembly Line.

4. Books and Materials

1. Introduction to Work Study: International Labor Office (ILO), Geneva.
2. Motion and Time Study Design and Measurement of Work: Ralph M. Barnes, Wiley, The University of California.
3. Industrial Engineering and Production Management: M. Telsang, S. Chand and Company Ltd.

Kanishka Bedi, Management and Entrepreneurship, Oxford University Press, Delhi, 2009

1. Good Enough! To Launch Your Company, by Randal Wimmer, Joshua Ducharme, 2023
2. Start Your Business With Confidence, by Jeff Bezos, 2023

Reference Online Resources/Materials:

1. https://onlinecourses.nptel.ac.in/noc24_mg93/announcements?force=true

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
A30340	Non Conventional Source of Energy	PC	3	0	0	3	40	60	100
A30329	Design of Transmission Systems	PC	3	0	0	3	40	60	100
A30330	Heat Transfer	PC	3	0	0	3	40	60	100
	Professional Elective-II	PE	3	0	0	3	40	60	100
	Open Elective-II	OE	3	0	0	3	40	60	100
A30331	Heat Transfer Laboratory	PC	0	0	3	1.5	40	60	100
A30238	Computational Laboratory	PC	0	0	3	1.5	40	60	100
A30021	PROFESSIONAL English Communication Skills Laboratory	PC	0	0	3	1.5	40	60	100
A30321	ANSYS SKILL	SC	1	0	2	2	100	0	100
A30036	Indian Constitution	MC	2	0	0	0	100*	0	100*
TOTAL			17	01	08	21.5	420	480	900

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

Professional Elective – 2	
Course Code	Title of the Course
A30355	Production and Operations Management
A30356	Refrigeration and Air Conditioning
A30357	Mechanical Vibrations
A30358	Metal Forming Processes

COURSE STRUCTURE

A30340 – 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	40	60	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. A30003Engineering Physics
2. A30004Engineering Chemistry
3. A30005Environmental Studies

2. Course Outcomes (COs)

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

A30340.1 Identify various conventional and non-conventional sources of energy.

A30340.2 Estimate the energy collection using suitable equipment.

A30340.3 Compare different energy conversion systems within the available resources for better utilization.

A30340.4 Make use of the suitable energy storage methods for real-time requirements.

A30340.5 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

A30329 – DESIGN OF TRANSMISSION SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	14	0	3	40	60	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

A30308 - Engineering Mechanics
A30313 - Mechanics of Solids
A30317 - Machine Drawing
A30324 - Design of Machine Elements

2. Course Outcomes (COs)

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

A30329.1	Assess the type of stresses induced in crane hooks, C-clamps and drives subjected to various loadings.
A30329.2	Design different types of bearings for suitable applications.
A30329.3	Design springs and power screws under different load conditions as per the practical situation.
A30329.4	Solve the problems related to spur and helical gears for power transmission.
A30329.5	Analyze the stresses induced in IC engine parts subjected to various loads.

3. Course Syllabus

UNIT I

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 and selection 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.

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.

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.

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COURSE STRUCTURE

A30330 – 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	40	60	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

A30307**-** Thermodynamics

2. Course Outcomes (COs)

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

A30330.1 Apply laws of heat transfer in thermal analyses of engineering systems.

A30330.2 Calculate the amount of heat transfer in conduction, convection and radiation modes.

A30330.3 Discuss the concept of conduction heat transfer and its applications.

A30330.4 Analyze the free and forced convective heat transfer for fluids.

A30330.5 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.

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 –IV

Radiation

Radiative Heat Transfer: Emission Characteristics and Laws of Black-Body Radiation – Irradiation – Total and Monochromatic

Quantities– Laws of Planck, Wien, Kirchoff, Lambert, Stefan And Boltzmann – Heat Exchange Between Two Black Bodies –

Concepts of Shape Factor – Emissivity – Heat Exchange Between Gray Bodies – Radiation Shields – Electrical Analogy

for Radiation Networks.

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.

MASS TRANSFER-Introduction to mass transfer operations; Molecular diffusion in gases, liquids and solids; diffusivity measurement and prediction; multi-component diffusion.

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.

COURSE STRUCTURE

A30331 – 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	40	60	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

A30330- Heat Transfer

2. Course Outcomes (COs)

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

A30331.1 Analyze thermal conductivity in various materials.

A30331.2 Calculate heat transfer coefficient in various materials.

A30331.3 Select appropriate materials for improving effectiveness of heat transfer.

A30331.4 Test the performance and there by improve effectiveness of heat exchanger.

A30331.5 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.

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COURSE STRUCTURE

A30238 – Computational Laboratory

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course Description

Course overview

This course 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:

A30238.1 Understand the use of software tools for modelling and analysis of mathematical concepts for engineering applications

A30238.2 calculate the inverse of any matrix using MATLAB

A30238.3 Model and analyze Monte-Carlo simulation for suitable applications

A30238.4 Assess the Standard Normal Distributionand its importance in engineering applications

A30238.5 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

COURSE STRUCTURE

A30021 – Professional English Communication Skills laboratory

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course Description

Course overview:

English language connects people from different regions, cultures and nations. English language has a determinating effect on the job opportunities and professional growth of the student. Due to the changes in the world economy, Multinational companies have gained ground and also have become more competent. The ability to use a language efficiently is very much required to remain employable. The ability to express fluently in both written as well as oral form of language is very much essential for the career growth.In the corporate world, proper English means both the ability to make grammatically correct sentences and also other related skills for effective communication like presentation skills, convincing and negotiation skills and interpersonal. The student has to update according to the ongoing changes and advancements. The situation in most of the companies has changed, the mere domain knowledge doesn't guarantee one a good job.The emphasis should be on functional English usage exercises. In order to strengthen, the English speaking ability of the present generation, the syllabus framed focuses on practical oriented exercises and real life situations than mere study of literature.

Course Prerequisites

Communicative English, Communicative English Lab

2. Course Outcomes (COs)

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

A30021.1.Use techniques at different levels to convince the employers.

A30021.2. Use technology to convince the audience with skills.

A30021.3. Realize where exactly he has to improve.

A30021.4. Communicate effectively using the ICT tools.

A30021.5. Learn and be competent in heterogeneous groups.

3. Course Syllabus

1. Icebreaker activities
2. Listening Comprehension
3. Reading Comprehension
4. Power Point Presentation
5. Group Discussion
6. Debate
7. Project Report Writing
8. SWOT and TOWS Analysis
9. Profiling a Company

10. Email writing

11. Application Letter

12. Etiquettes

4. References:

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

Online Learning Resources/Virtual Labs:

1. Dhanavel, S P. English for Communication Skills for Students of Science and Engineers. New Delhi: Mittal Books India. 2009.

2. Lewis, Norman, Word Power made Easy. Haryana, Penguin Random House India. 2009.

3. Mohan, Krishna and N P Krishna, Speaking English Effectively, India, MacMillan.2009.

COURSE STRUCTURE

A30321-ANSYS SKILL

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

1. Course Description

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:

A30321.1 Apply mathematical skills in the design and analysis of model generations and analysis.

A30321.2 Exercise analytical skills in model verifications and interpretations of FEAresults.

A30321.3 Apply knowledge from component design in projects

A30321.4 Detailing a conceptual design involves determining material specifications,Dimensions, tolerances, performance measures, etc

A30321.5Understand the basic concepts of modelling for analysis and manufacturability.

3. Course Syllabus

I. Introduction to Analysis Software Package

II. Structural analysis: (Any 4 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 square plate considering conduction.
5. Analysis of a square plate considering conduction and convection
6. Static Analysis of beam

4. Laboratory Equipment/Software/Tools Required

1. ANSYS

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

A30036 – 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:

A30036.1 Understand historical background of the constitution making and its importance for building a democratic India.

A30036.2 Explain the role of President and Prime Minister.

A30036.3 Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

A30036.4 Understand the value of the fundamental rights and duties for becoming good citizen of India

A30036.5 Analyze the decentralization of power between central, state and local self-government.

A30036.6 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)

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COURSE STRUCTURE

A30355 – 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	40	60	100

5. 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:

A30355.1 Apply the knowledge in management tools to apply in technical organizations.

A30355.2 Apply forecasting techniques to predict future demand and other parameters.

A30355.3 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.

A30355.4 Apply quality improvement techniques and methods for improvement of quality of product and process

A30355.5 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. *Panneerselvam , "Production and Operations management",* PHI, 3 rd Edition, 2012.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A30356 - 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	40	60	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

A30307 Thermodynamics
A30314 Thermal Engineering-I
A30322 Thermal Engineering-II

2. Course Outcomes (COs)

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

A30356.1 Make use of the terminologies and the basic principles associated with refrigeration and air conditioning systems.

A30356.2 Distinguish between the components of refrigeration and air conditioning systems

A30356.3 Estimate the efficiency of refrigeration and air-conditioning systems under various load conditions.

A30356.4 Discuss the constructional features of domestic, industrial refrigeration and air conditioning systems.

A30356.5 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, 2^{nd} edition, 2013
2. Dossat, *Principles of Refrigeration,* Pearson Education, 4^{th} edition, 2007.
3. P.L. Ballaney, *Refrigeration and Air Conditioning,* 2^{nd} edition, 2012.

COURSE STRUCTURE
A30357 – 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	40	60	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

A30323 - Dynamics of Machinery

2. Course Outcomes (COs)

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

A30357.1 Identify the need and importance of vibration analysis in vibratory conditions

A30357.2 Develop the equations of motion for free and forced vibrations with damped and undamped conditions

A30357.3 Analyze frequency and time response of vibratory systems

A30357.4 Solve the problems related to single and multi-degree of vibratory systems with damped and undamped conditions.

A30357.5 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.

COURSE STRUCTURE

A30358 – 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	40	60	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

A30201 – Material Science and Engineering

2. Course Outcomes (COs)

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

A30358.1 Apply hot working and cold working processes to workpiece for obtaining a final product

A30358.2 Apply the mechanism of deformation for different metals.

A30358.3 Analyze the effect of process parameters influencing metal forming.

A30358.4 Identify the metal forming process used for given application.

A30358.5 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.

PROGRAMME CURRICULUM STRUCTURE UNDER R20 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
1	Professional Elective courses-III	PE	3	0	0	3	40	60	100
2	Professional Elective courses-IV	PE	3	0	0	3	40	60	100
3	Professional Elective courses-IV	PE	3	0	0	3	40	60	100
4	Open Elective Courses-III/ Job oriented elective	OE	3	0	0	3	40	60	100
5	Open Elective Courses-IV/ Job oriented elective	OE	3	0	0	3	40	60	100
A30022	**Professional Ethics**	HS	3	0	0	3	40	60	100
A30341	**Flexisim Lab**	SC	1	0	2	2	40	60	100
	Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester	PW	0	0	0	3	100	0	100
TOTAL			**19**	**00**	**2**	**23**	**380**	**420**	**800**
Industrial/Research Internship (Mandatory) 2 Months during summer vacation									
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			4	0	0	4	40	60	100

***There is a provision for the Universities/Institutions to implement AICTE mandatory course "Universal Human Values 2: Understanding Harmony" under Humanities and social science Elective in seventh semester for 3 credits.**

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A30022 - PROFESSIONAL ETHICS

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

1. Course Description

Course Overview

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

Course Pre/co requisites

A30035 – Universal Human Values- understanding harmony

2. Course Outcomes (COs)

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

A30022.1 To identify ethical dilemmas and take ethical decisions.
A30022.2 To consider the importance of maintaining professional competence and pursuing life-long learning.
A30022.3 To understand patterns and channels of communication and their efficiency.
A30022.4 To analyze and evaluate available data and information from a variety of sources
A30022.5 To demonstrate leadership qualities in teams effectively and efficiently.
A30022.6 The importance of applying an enquiring mind when collecting and assessing data and information.

3. Course Syllabus

UNIT I ETHICS AND PROFESSIONALISM

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

UNIT II PERSONAL EFFECTIVENESS

Prioritising, organising and managing time effectively, Using technologyeffectively- Using email effectively

How to manage email, Maintaining professional competence and lifelong learning- Continuing professionaldevelopment, Personal development plan, How to craft your CV for the job ofyour dreams, Tips to prepare for an interview, The interview, Getting it wrong, Getting it right

UNIT III COMMUNICATION AND INTERPERSONAL SKILLS

Introduction, The communicationprocess- What can go wrong?, Barriers and distortions to the communications process, How good are you at communicating? Formal and informal communication, Six elements of effective communication, Communicating in the workplace- Errors and Solutions, Report Writing- the purpose of and the best practices in report writing. Interpersonal skills**-** Interpersonal skills, Personal qualities, Verbal communication Non-verbal communication

UNIT IV SOCIAL AWARENESS

How to enhance your commercialawareness, SWOT analysis, Deciding when to seek the help of experts

Suitability, acceptability, feasibility (SAF) model

UNIT V LEADERSHIP AND TEAM WORKING

Introduction, The nature of leadership, Situational leadership, Leadership in action, Action-centered leadership (Adair), Factors influencing leadership style, Blake and Mouton grid, Examples of outstandingleaders, Team development, Motivation, Accountability, responsibility and authority.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

1. Professional Ethics in Engineering" by I A Dhotre V S Bagad

2. Professional Ethics In Engineering" by Dr V Jayakumar and Lakshmi Publications

3. Engineering Ethics: Challenges and Opportunities" by W Richard Bowen

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COURSE STRUCTURE

A30341 - FLEXSIM LAB (SKILL LAB)

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

1. Course Description

Course Overview

This course provides fundamental knowledge on 3D simulation software, simulates, predicts, and visualizes business systems in various departments: manufacturing, material handling, healthcare, warehousing, mining, logistics, and more. It is both powerful and user-friendly.

Course Pre/corequisites

Machining Process, Industrial Engineering

2. Course Outcomes (COs)

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

A30341.1. Develop 3D virtual model using flexsim software and allocating resources more efficiently

A30341.2. To develop a lean assemble model and reduce the model's waiting time and queue sizes.

A30341.3. Establish optimum batch sizes and part sequencing

A30341.4. Study the effect of setup times and tool changeovers

A30341.5. Optimize prioritization and dispatching logic for goods and services

3.Course Syllabus

1. Develop and simulate a given model in flexsim software and collect data for the model
2. Design for lean assembly line
3. Simulation for Routing & Scheduling on Flexsim
4. Simulation for bottleneck or Line balancing on Flexsim
5. conveyor-based assembly line
6. Health care model using Flexsim
7. Automatic pallet load stacker
8. warehouse storage system
9. Optimize Production schedule using flexisim sim
10. Logistic loops in flexisim

Books and MaterialsText Book(s)

(2) "Release Notes and History". *FlexSim Documentation*. Retrieved 2021-01-22.

(3) *"FlexSim 2023 Update 2: NVIDIA Omniverse, USD, Restricted Models, and more". FlexSim. Retrieved 2023-08-21.*

PROFESSIONAL ELECTIVES

PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – MECHANICAL ENGINEERING

Professional Electives

Professional Elective – 1	
Course Code	**Title of the Course**
A30351	Machining Processes
A30352	Computer Integrated Manufacturing
A30353	Principles of Management
A30354	Flexible Manufacturing System
A30381	Work System Design
Professional Elective – 2	
Course Code	**Title of the Course**
A30355	Production and Operations Management
A30356	Refrigeration and Air Conditioning
A30357	Mechanical Vibrations
A30358	Metal Forming Processes
Professional Elective – 3	
Course Code	**Title of the Course**
A30359	Unconventional Machining Process
A30360	Electrical and Hybrid Vehicles
A30361	Finite Element Method
A30362	Artificial Intelligence for Mechanical Engineers
A30383	Social Innovation in Industry 4.0
Professional Elective – 4	
Course Code	**Title of the Course**
A30363	Industrial Engineering
A30364	Power Plant Engineering
A30365	Composite Materials and Testing
A30366	Automation and Robotics
A30385	Introduction to Composites
A30389	Fundamentals Of Manufacturing Process
Professional Elective – 5	
Course Code	**Title of the Course**
A30367	Additive Manufacturing
A30368	Operations Research
A30369	Design for Plasticity

A30370	Cryogenic Engineering
A30387	Rapid manufacturing

Professional Elective – 1	
Course Code	Title of the Course
A30351	Machining Processes
A30352	Computer Integrated Manufacturing
A30353	Principles of Management
A30354	Flexible Manufacturing System
A30381	Work System Design

COURSE STRUCTURE
A30351– 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	40	60	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

A30305 - Material Science and Engineering

A30316 **-** Manufacturing Technology

2. Course Outcomes (COs)

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

A30351.1 Identify the various machining processes and machine tools

A30351.2 Classify various metal cutting machines such as lathe, milling, drilling, boring, grinding, shaping, Slotting and planer machines.

A30351.3 Choose the suitable tools for machining processes.

A30351.4 Compare the constructional features of machines suitable for various machining operations.

A30351.5 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)

4. Kalpakzian, *Manufacturing Technology,* Pearson, 6th edition 2010
5. Milton C.Shaw, *Metal cutting Principles*, oxford Second Edn, 2nd edition, 2012.
6. K. L. Narayana, *Production Technology*, IK International Publishers, 2nd revised edition, 2013.

COURSE STRUCTURE
A30352 – COMPUTER INTEGRATED MANUFACTURING

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

5. Course Description

Course Overview

This course provides manufacturing approach of using computers to control the entire production process. This integration allows individual processes to exchange information with each other and initiate actions. Through the integration of computers, manufacturing can be faster and lesserror-prone, although the main advantage is the ability to create automated manufacturing processes.

Course Prerequisites

Manufacturing Technology

6. Course Outcomes (COs)

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

A30352.1 Identify various Production process.

A30352.2 Understand the detailed insight into automation of manufacturing and manufacturing informatics..

A30352.3 Compare Computer aided production planning and Traditional production planning

A30352.4 Make use of FMS Planning and control the production system.

A30352.5 Analyze the Robot Anotomy and its usages in Production environment.

7. Course Syllabus

UNIT I
INTRODUCTION

Brief introduction to CAD and CAM – Manufacturing Planning, Manufacturing control Introduction to CAD/CAM – Concurrent Engineering - CIM concepts – Computerised elements of CIM system –Types of production -– Basic Elements of an Automated system – Levels of Automation – Lean Production and Just-In Time Production.

UNIT II
PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING

Process planning – Computer Aided Process Planning (CAPP) – Logical steps in Computer Aided Process Planning – Aggregate Production Planning and the Master Production Schedule – Material Requirement planning – Capacity Planning- Control Systems

UNIT III
CELLULAR MANUFACTURING

Group Technology (GT), Part Families – Parts Classification and coding – Simple Problems in Opitz Part Coding system – Production flow Analysis – Cellular Manufacturing – Composite part concept – Machine cell design and layout – Quantitative analysis in Cellular Manufacturing – Rank Order Clustering Method - Arranging Machines in a GT cell – Hollier Method – Simple Problems.

UNIT IV

FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS)

Types of Flexibility - FMS – FMS Components – FMS Application & Benefits – FMS Planning and Control– Quantitative analysis in FMS – Simple Problems. Automated Guided Vehicle System (AGVS) – AGVS Application – Vehicle Guidance technology – Vehicle Management & Safety.

UNIT V

Robot Anatomy and Related Attributes – Classification of Robots- Robot Control systems – End Effectors – Sensors in Robotics – Robot Accuracy and Repeatability - Industrial Robot Applications – Robot Part Programming – Robot Accuracy and Repeatability – Simple Problems.

INDUSTRY 4.0 (TO BE ADDEDD)

8. Books and Materials

Text Book(s)

1. Mikell.P.Groover "*Automation, Production Systems and Computer Integrated Manufacturing*", Prentice Hall of India, 2008.
2. Radhakrishnan P, Subramanyan S.and Raju V., "*CAD/CAM/CIM*", 2nd Edition, New Age International (P) Ltd, New Delhi, 2000

Reference Book(s)

2. S.Kant Vajpayee "*Principles of Computer Integrated Manufacturing*", 1999, Prentice Hall of India, New Delhi.

COURSE STRUCTURE

A30353 – 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	40	60	100

5. 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

6. Course Outcomes (COs)

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

A30353.1 Build organization structure and managerial skills to obtain the leadership qualities.

A30353.2 Select suitable plant layout as per the requirements of production process.

A30353.3 Apply work improvement techniques in an organization for increasing the productivity

A30353.4 Choose suitable type of Plant maintenance for industrial safety.

A30353.5 Appraise social responsibilities of engineer and ways to protect our environment

7. 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.

8. Books and Materials

Text Book(s)

O.P. Khanna*, Industrial management and engineering economics*, Khanna publishers, 8th edition, 2018.

Reference Book(s)

3. T.R. Banga & S C Sharma, *Industrial Organization and Engineering Economics*, Khanna Publishers, 5th edition, 2016.

4. P.C. Punmia & K.K. Khandelwal, *Project planning and control with PERT & CPM*, LP Publication, New Delhi, 7th edition, 2012.

COURSE STRUCTURE

A30354 – 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	40	60	100

6. 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

7. Course Outcomes (COs)

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

A30354.1 Identify FMS layouts and its significance in manufacturing process

A30354.2 Apply various material handling and storage systems as per applications

A30354.3 Differentiate cellular vs Flexible Manufacturing system for scheduling problems

A30354.4 Solve the problems on performance of computer controlling the flexible manufacturing systems

A30354.5 Plan FMS data base as per simulation of scheduling problems

8. 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.

9. 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)

5. H.K. Shivanand, M.M.Benal, V.Koti, *Flexible Manufacturing Systems,* New Age International Publishers, 2012.

6. Radhakrishnan. P and Subramanian. S, *CAD/CAM/CIM*, Wiley Eastern Ltd., New Age International Ltd, 1994.

7. Groover M.P, *Automation, Production Systems and Computer Integrated Manufacturing,* Prentice Hall of India Pvt., New Delhi, 1996.

COURSE STRUCTURE

A30381 –WORK SYSTEM DESIGN

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

2. Course Description

Course Overview

The Work System Design course focuses on understanding and optimizing the systems in which work is performed to enhance productivity, efficiency, and worker well-being. The course covers fundamental principles, techniques, and tools used to analyse and improve work environments, methods, and processes. It blends theories of ergonomics, human factors, and system efficiency with practical approaches such as lean principles and work measurement techniques.

Course Pre/corequisites

No Course Pre/corequisites

2. Course Outcomes (COs)

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

A30381.1: identify and describe the key components of a work system, including human resources, technology, tasks, processes, and environment.

A30381.2 Conduct method studies and time-motion analyses to optimize work processes.

A30381.3 Apply ergonomic principles to design workspaces that enhance comfort, safety, and productivity.

A30381.4 Apply lean principles (e.g., 5S, Just-in-Time, Value Stream Mapping) to eliminate waste and improve. system efficiency

A30381.5: Demonstrate the ability to apply work system design principles across different sectors such as manufacturing, healthcare, services, and more.

3.Course Syllabus

Unit-I

Work System Design: Introduction and Concept of Productivity, Measurement of Productivity, Productivity Measures, Productivity Measurement Models, Factors Influencing Productivity, Causes of Low Productivity, Productivity Measurement Models, Productivity Improvement Techniques, Numerical Problems on productivity, Case study on productivity.

Unit-II

Work Study: Basic Concept, Steps Involved in Work Study, Concept of Work Content, , Techniques of Work Study, Human Aspects of Work Study, Method Study: Basic Concept, Steps Involved in Method Study, Recording Techniques, Operation Process Charts, Operation Process Charts: Examples.

Unit-III

Flow Process Charts, Flow Process Charts: Examples, Two-Handed-Process Charts, Multiple Activity Charts, Flow Diagrams, String Diagrams, Principles of Motion Economy, Micro-Motion Study, Therbligs, SIMO Charts.

Unit-IV

Memo-Motion Study, Cycle graph and Chrono-Cycle Graph, Critical Examination Techniques, Development and Selection of New Method, Installation and Maintenance of Improved Methods, Work Measurement: Basic Concept, Techniques of Work Measurement, Steps Involved in Time Study, Steps and Equipment of Time Study , Performance Rating, Performance Rating: Examples, Allowances, Computation of Standard Time-I, Computation of Standard Time-II, Case Study

Unit-V

Work Sampling: Basics, Procedure of Work Sampling Study, Numerical Problems on work sampling, Introduction to Synthetic Data and PMTS, Introduction to MTM and MOST, Ergonomics: Basic Concept, Industrial Ergonomics, Ergonomics: Anthropometry, Man-Machine System-1 , Man-Machine System-2, Case Study: Office Chair, Case Study: Tower Crane Cabin, Case Study: Car Seat, Case Study: Computer System, Case Study: Assembly Line.

8. Books and Materials

4. Introduction to Work Study: International Labor Office (ILO), Geneva.
5. Motion and Time Study Design and Measurement of Work: Ralph M. Barnes, Wiley, The University of California.
6. Industrial Engineering and Production Management: M. Telsang, S. Chand and Company Ltd.

Kanishka Bedi, Management and Entrepreneurship, Oxford University Press, Delhi, 2009

3. Good Enough! To Launch Your Company, by Randal Wimmer, Joshua Ducharme, 2023
4. Start Your Business With Confidence, by Jeff Bezos, 2023

Reference Online Resources/Materials:

2. https://onlinecourses.nptel.ac.in/noc24_mg93/announcements?force=true

Professional Elective – 2	
Course Code	**Title of the Course**
A30355	Production and Operations Management
A30356	Refrigeration and Air Conditioning
A30357	Mechanical Vibrations
A30358	Metal Forming Processes

COURSE STRUCTURE

A30355 – 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	40	60	100

10. 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.

5. Course Outcomes (COs)

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

A30355.1 Apply the knowledge in management tools to apply in technical organizations.

A30355.2 Apply forecasting techniques to predict future demand and other parameters.

A30355.3 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.

A30355.4 Apply quality improvement techniques and methods for improvement of quality of product and process

A30355.5 Determine the inventory and to be able to apply selected techniques for its control and management under different circumstances

6. 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

7. 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. *Panneerselvam , "Production and Operations management",* PHI, 3 rd Edition, 2012.

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COURSE STRUCTURE

A30356 - 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	40	60	100

5. 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

A30307	Thermodynamics
A30314	Thermal Engineering-I
A30322	Thermal Engineering-II

6. Course Outcomes (COs)

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

A30356.1	Make use of the terminologies and the basic principles associated with refrigeration and air conditioning systems.
A30356.2	Distinguish between the components of refrigeration and air conditioning systems
A30356.3	Estimate the efficiency of refrigeration and air-conditioning systems under various load conditions.
A30356.4	Discuss the constructional features of domestic, industrial refrigeration and air conditioning systems.
A30356.5	Select suitable refrigeration and air-conditioning systems for domestic as well as industrial applications.

7. 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.

8. 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)

4. Manohar Prasad, *Refrigeration and Air Conditioning*, New Age, 2nd edition, 2013
5. Dossat, *Principles of Refrigeration,* Pearson Education, 4th edition, 2007.
6. P.L. Ballaney, *Refrigeration and Air Conditioning,* 2nd edition, 2012.

COURSE STRUCTURE
A30357 – 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	40	60	100

5. 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

A30323 - Dynamics of Machinery

6. Course Outcomes (COs)

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

A30357.1	Identify the need and importance of vibration analysis in vibratory conditions
A30357.2	Develop the equations of motion for free and forced vibrations with damped and undamped conditions
A30357.3	Analyze frequency and time response of vibratory systems
A30357.4	Solve the problems related to single and multi-degree of vibratory systems with damped and undamped conditions.
A30357.5	Differentiate discrete and continuous systems pertain to numerical methods.

7. 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.

8. 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.

4. B.C. Nakra and K. K. Chowdary, *Mechanical Measurements*, New Delhi,Tata McGraw-Hill, 2nd edition, 2004.

5. Leonard Meirovitch, *Elements of vibration analysis*, Tata McGraw-Hill, 2nd edition, 2007.

COURSE STRUCTURE

A30358 – 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	40	60	100

5. 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

A30201 – Material Science and Engineering

6. Course Outcomes (COs)

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

A30358.1 Apply hot working and cold working processes to workpiece for obtaining a final product

A30358.2 Apply the mechanism of deformation for different metals.

A30358.3 Analyze the effect of process parameters influencing metal forming.

A30358.4 Identify the metal forming process used for given application.

A30358.5 Examine effects of friction, lubrication and causes of common defects in metal forming

7. 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.

8. 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.

Professional Elective – 3	
Course Code	Title of the Course
A30359	Unconventional Machining Processes
A30360	Electrical and Hybrid Vehicles
A30361	Finite Element Method
A30362	Artificial Intelligence for Mechanical Engineers
A30383	Social Innovation in Industry 4.0

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COURSE STRUCTURE

A30359–UNCONVENTIONAL 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	40	60	100

1. Course Description

Course Overview

Modern manufacturing methods are also named as non-conventional machining methods. These methods form a group of processes which removes excess material by various techniques involving mechanical, thermal, electrical chemical energy or combination of these energies. There is no cutting of metal with the help of metallic tool having sharp cutting edge.

Course Pre/corequisites

Machine tools

2. Course Outcomes (COs)

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

A30359.1 Apply the selection for processing of different materials and the range of applications with the importance of modern manufacturing technologies

A30359.2 Make use of the basic mechanism, working principle, process parameters, Applications, limitations and advantages of electro chemical machining(ECM), electrochemical grinding(ECG), & Chemical Machining CM

A30359.3 Apply the basic mechanism, working principle, process parameters, Applications, limitations and advantages of Electric Discharge machining

A30359.4 Analyze basic basic mechanism, working principle, process parameters, Applications, limitations and advantages ofElectron Beam Machining(EBM) &Laser Beam Machining (LBM)**3.**

A30359.5 Applying the above mechanisms for various materials based on the application.

3. Course Syllabus

UNIT-I

Need for Modern Manufacturing Methods: Non-traditional machining methods

Classification of non-traditional processes - their selection for processing of different materials and the range of applications with overview of all techniques, study of material removal phenomena

UNIT-II

Ultrasonic machining Elements of the process, mechanics of material removal, process parameters,applications and limitations.

Abrasive jet, Water jet and abrasive water jet machining: Basic mechanics of material removal,descriptive of equipment, process variables, applications and limitations.

UNIT-III

Electro – Chemical Processes: Fundamentals of electro chemical machining, electro chemical grinding, electro chemical honing and deburring process metal removal rate in ECM, Tooling, process variables, applications, economic aspects of ECM..

Chemical Machining: Fundamentals of chemical machining- Principle of material removal- maskants – etchants- process variables, advantages and applications

UNIT-IV

Thermal Metal Removal Processes: Basic principle of spark erosion (**EDM**), Wire cut EDM, and Electric Discharge Grinding processes - Mechanics of machining, process parameters, selection of tool electrode and dielectric fluids, choice of parameters for improved surface finish and machining accuracy -Applications of different processes and their limitations.

Plasma Machining: Principle of material removal, description of process and equipment, process variables, scope of applications and the process limitations.

UNIT - V

Electron Beam Machining: Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes - process mechanics, parameters, applications and limitations.

Laser Beam Machining: Process description, Mechanism of material removal, process parameters, capabilities and limitations, features of machining, applications and limitations.

4. Books and Materials

Text Book(s)

1. Advanced machining processes, VK Jain, Allied publishers., 4th Edition, 2008.

Reference Book(s)

1. Manufacturing processes for engineering materials by SeropeKalpakjian and Steven R Schmid 5edn, Pearson Pub.,

2. Modern Machining Process , Pandey P.C. and Shah H.S., TMH.,

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COURSE STRUCTURE

A30360– ELECTRICAL AND HYBRID VEHICLES

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

1. Course Description

Course Overview

Hybrid Electric Vehicle course is a professional course wherein students are taught dynamics, charging, battery assembling, designing engines, interior and exterior spacing etc. The ultimate gaol of the course is to provide students with a knowledge of Electrical and hybrid vehicles which provides equality power, range, cost and safety of a conventional vehicle while reducing fuel cost and harmful emission.

Course Pre/corequisites : IC Engines and Thermal Engineering.

2. Course Outcomes (COs)

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

A30360.1: Understand the basics of electric and hybrid vehicles

A30360.2: Understand the concepts of drive trains for hybrid and electric vehicles

A30360.3: Understand the working of components involved in electric propulsion

A30360.4: Understand the energy storage options and concepts of matching the drive system of hybrid vehicles to IC engines

A30360.5: Design the battery vehicle and hybrid vehicles and to understand the energy management strategies

3. Course Syllabus

UNIT-I

Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Conventional Vehicle Drive-trains: Basics of vehicle performance, vehicle power source characterization, transmission characteristics.

UNIT-II

Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

UNIT-III

Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems.

UNIT - V

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

4. Books and Materials

Text Book(s)

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.

2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.

Reference Book(s)

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

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COURSE STRUCTURE

A30361 – FINITE ELEMENT METHOD

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

1. Course Description

Course overview

This course deals applications of Mechanics of Solids, Heat transfer problems with required Boundary conditions by using Numerical Methods. By this course, student will learn the principles involved in discretization in finite element approach, form stiffness matrices and force vectors for simple elements

Course Pre/corequisites

1. **A1003-**AppliedPhysics
2. **A1303**-Applied Mechanics

2. Course Outcomes (COs)

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

A30361.1	Understand the concepts behind formulation methods in FEM.
A30361.2	Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.
A30361.3	Develop element characteristic equation and generation of global equation.
A30361.4	Able to apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi symmetric and dynamic problems
A30361.5	Able to apply suitable boundary conditions to a global equation for solve them displacements, stress and strains induced

3. Course Syllabus

Unit-I

INTRODUCTION: Equilibrium equations in elasticity subjected to body force, traction forces and point loads, stress strain relations in 3D elasticity, plane stress and plane strain, Boundary conditions, Initial conditions. Approximate methods for solving the differential equations: Rayleigh-Ritz method, Weighted residual methods, Galerkin's method. Integral formulation: Principle of a minimum potential energy, principle of virtual work, Generalized Finite element approach in solving these problems. Solution methods for solving simultaneous equations

UNIT II

Problems with One-dimensional geometry:

Bars: Formulation of stiffness matrix, Load vectors, Incorporation of boundary conditions: Elimination approach and penalty approach
Trusses: Plane truss and space truss elements, Example problems involving plane All truss elements. Examples involving multipoint constrains. Stress calculations.
Beams : Bending of beams, Interpolation functions, formulation of stiffness matrix and load vectors.Transformations of stiffness and load vectors

UNIT III

INTERPOLATION MODELS: Polynomial form of interpolation functions - linear, quadratic and cubic, simplex, complex, Multiplex elements, Selection of the order of the interpolation polynomial, Convergence requirements, 2D Pascal Triangle, Linear interpolation polynomials in terms of global coordinates for triangular (2D simplex) elements, Linear interpolation polynomials in terms of local coordinates for triangular (2D simplex) elements.

HIGHER ORDER AND ISOPARAMETRIC ELEMENTS: Lagrangian interpolation, Higher order one dimensional elements- quadratic, Cubic element and their shape functions, properties of shape functions, Shape functions of 2D quadratic triangular element in natural coordinates, 2D quadrilateral element shape functions – linear, quadratic

UNIT IV

FINITE ELEMENT APPLICATION IN SOLID MECHANICS: Problem modelling and Finite element analysis in 2D plane elasticity with triangular and quadrilateral elements, Isoparametric, sub parametric and super parametric elements. Interpolation, Jacobian, matrices relating strain and nodal displacements, stiffness matrix.

UNIT V

HEAT TRANSFER PROBLEMS: Steady state heat conduction with convective and heat flux boundary conditions, Functional approach, Galerkin approach formulation of element characteristic matrices and vectors in 1D and 2D problems. Temperature distribution in composite walls one dimensional and two dimensional fins and extended surfaces

4. Books and Materials

Text Book(s)

Rao, S. S., *Finite element method in engineering*, 5th Edition, Pergaman Int. Library of Science, 2010.

Chandrupatla T. R., *Finite Elements in engineering*, 2nd Edition, PHI, 2013

Reference Book(s)

1. . J.N.Reddy, "*Finite Element Method*"- McGraw -Hill International Edition.Bathe K. J. Finite Elements Procedures, PHI.

2. Cook R. D., et al. "*Conceptsand Application of Finite Elements Analysis*"- 4th Edition, Wiley & Sons, 2003.

COURSE STRUCTURE

A30362– ARTIFICAL INTELLIGENCE FOR MECHANICAL ENGINEERS

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

1. Course Description

Course Overview

The objectives of this course are : Provide a strong foundation of fundamental concepts in Artificial Intelligence. Discuss the various paradigms involved in solving an AI problems which involve perception, reasoning and learning . Apply the AI concepts to build an expert system to solve the real-world problems in mechanical engineering.

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:

A30362.1 Differentiate between a rudimentary Problem and an AI problem, it's Characteristics and problem-solving Techniques

A30362.2 Compare and contrast the various knowledge representation schemes of AI

A30362.3 Understand and analyze the various reasoning and planning techniques involved in solving AI problems

A30362.4 Understand the different learning techniques

A30362.5 Apply the AI techniques to solve the real-world problems

3. Course Syllabus

UNIT –I

Introduction: Definition, history, applications. **Problem Solving:** AI problems, AI Technique, Defining problem as a State-Space Search, problem Characteristics. **Heuristic Search Techniques:** Generate– and–test, Hill Climbing,Constraint Satisfaction.

UNIT-II

Knowledge Representation (Logic): Representing facts in logic, proposition logic, predicate logic, resolution and unification Knowledge Representation (Structured): Declarative representation, Semantic nets, procedural representation, frames. Neural Networks, Fuzzy logic.

UNIT-III

Reasoning: Probability and Bayes theorem, Certainty factors and Rule based systems, Bayesian Networks, Dempster - shafer Theory Planning: Components, goal stack planning, nonlinear planning, and hierarchical planning.

UNIT-IV

Learning: Introduction, Rote learning, learning by taking advice, learning in problem solving and learning from examples. Decision tree, Intelling Agents : classification, working of an agent, and multi agent systems, multi application.

UNIT-V

Expert System: Representing and Using Domain Knowledge, Expert systems shells, Explanation, Knowledge Acquisition. Perception and Action: Real Time Search, Vision, Speech Recognition. Action: Navigation, Manipulation, Robot architectures.

4. Books and Materials

Text Book(s)

1. Elaine Rich, Kevin Night, Shivashankar B Nair, “Artificial Intelligence”, 3/E, 2008
2. Russell Norvig, “Artificial Intelligence-Modern Approach”, 3/E, 2010

Reference Book(s)

1. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2012.

2. Nelson M. Mattos, “An Approach to Knowledge Base Management”, Springer Berlin Heidelberg, 1991 .

COURSE STRUCTURE

A30383-SOCIAL INNOVATION IN INDUSTRY 4.0

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

1.Course Description

Course Overview

The process of generating, implementing, and disseminating fresh and updated ideas, ideas, systems, and practices that help society in numerous ways is known as Social Innovation. Since the fourth industrial revolution (Industry 4.0) and the embedded technology diffusion progress are anticipated to grow exponentially in terms of technical change and socioeconomic impact, it becomes an urgent necessity for innovators to improve the world while implementing the Social Innovation concepts.

2.Course Outcomes (COs)

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

A30383.1 Understand the concept of Social Innovation and its relevance in Industry 4.0.

A30383.2Familiarity with design thinking, co-creation, and human-centred design.

A30383.3. Knowledge of emerging technologies (AI, IoT, Blockchain) and their social implications.

A30383.4. Understanding of sustainable business models and circular economy principles.

A30383.5. Awareness of social and environmental challenges in Industry 4.0.

3.Course Syllabus

Unit-I

Introduction to Social Innovation and Industry 4.0: traditional problem-solving approaches, key feature, elements, Complex Social Problems, Types of Innovation, Comparison, Collaboration, Sources of Social Innovation.

Unit-II

Design of Industry 4.0 and Social Innovation: Role of Design in Industry 4.0, Design Principles, Design Thinking, Benefits, Value creation in social innovations, Significance of value creation.

Unit-III

Cost Estimation Methodologies: Financial Management Principles, Cost Analysis, Classification of Costs, Budgeting and Resource Allocation, Budget preparation methodologies, Financial Sustainability, Impact Measurement, IPR, Patents, Copyrights,

Unit-IV

Design in Medical Devices: Introduction, Importance, Human-Centered Design, Process, Manufacturing consideration, Medical Device Regulations, Design control, Post Market Surveillance.

Unit-V

Design of Agricultural Implements: Principles of Design, Evolution, Challenges, Advanced Innovation, Regulatory, Safety Consideration.

Books and references

1.Hopkinson, N., Hague, R. and Dickens, P. eds., 2006. Rapid manufacturing: an industrial revolution for the digital age. John Wiley & Sons.

2.Nicolopoulou, K., Karataş-Özkan, M., Janssen, F. and Jermier, J. eds., 2016. Sustainable entrepreneurship and social innovation. Taylor & Francis.

PROFESSIONAL ELECTIVE IV	
Course Code	**Title of the Course**
A30363	Industrial Engineering
A30364	Power Plant Engineering
A30365	Composite Materials and Testing
A30366	Automation and Robotics
A30385	Introduction to Composites
A30389	Fundamentals Of Manufacturing Process

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COURSE STRUCTURE

A30363– INDUSTRIAL ENGINEERING

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

1. Course Description

Course Overview

This course covers a variety of state-of-the-art topics and technologies including methods engineering, work measurement, 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:

A30363.1 Apply the knowledge in management tools to apply in technical organizations.

A30363.2 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.

A30363.3 Apply various work study techniques towards productivity improvement in industrial and in real life environment.

A30363.4 Determine the inventory and to be able to apply selected techniques for its control and management under different circumstances.

A30363.5 Apply quality improvement techniques and methods for improvement of quality of product and process.

3. Course Syllabus

UNIT-I

Concepts of Management – Functions of Management, Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Y, Hertzberg's Two factor Theory of Motivation, Maslow's Hierarchy of Human needs, Organizational Structures,

UNIT-II

Plant Location: Definition, Factors affecting the Plant Location, Comparison of Rural and Urban sites, Selection of Plant Location.
Plant Layout: Definition, Objectives, Types of Plant Layout, Types of Production.

UNIT-III

Work Study – Definition, Objectives, Method Study – Steps Involved – Various Types of Process Charts –Micro motion and Memo motion Studies. Work Measurement - Definition, Steps involved - Equipment, Allowances, Standard Time Calculation. Work Sampling - Definition, Steps Involved.

UNIT-IV

Inventory Control – Need for Inventory, Types of Inventory, Inventory costs, EOQ Model , Inventory Model with Price Breaks . Inventory Control Systems, Selective Inventory Control- ABC, VED & FSN analysis.

UNIT - V

Inspection & Quality Control: Statistical Quality Control- Techniques-Variables and Attributes- Control Charts: X and R Charts; P Charts and C Charts. Acceptance Sampling Plan - Single Sampling and Double Sampling Plan. Introduction to TQM- Quality circles, Lean Manufacturing, Introduction to Industry 4.0.

4. Books and Materials

Text Book(s)

O.P.Khanna . "*Industrial Engineering and Management*" , , DhanpatiRai, 18th Edition, 2013.

Reference Book(s)

3. "*Work Study" by ILO(International Labour Organization).*
4. PanneerSelvam , *"Production and Operations management"*, PHI,2004.

COURSE STRUCTURE

A30364– POWER PLANT ENGINEERING

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

2. Course Description

This course is Familiarize the sources of energy, power plant economics, environmental aspects, outline the working components of different power plant. And also explain renewable energy sources characteristics, working principle and their types, layouts, and plant operations. This course extended to Impart types of nuclear power plants, and outline working principle and advantages and hazards.

Course Pre/corequisites

IC Engines

Thermal Engineering

2. Course Outcomes (COs)

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

A30364.1: Explain power plant economics and environmental considerations

A30364.2: Illustrate the working mechanism of coal based thermal power plants.

A30364.3: Illustrate the working mechanism of diesel and gas turbine power plants.

A30364.4: Summarize types of renewable energy sources and their working principle.

A30364.5: Demonstrate the working principle of nuclear power plants.

3. Course Syllabus

UNIT-I

Power Plant Economics and Environmental Considerations: Capital Cost, Investment of Fixed Charges, Operating Costs, General Arrangement of Power Distribution, Load Curves, Load Duration Curve. Definitions of Connected Load, Maximum Demand, Demand Factor, Average Load, Load Factor, and Diversity Factor - Tariff - Related Exercises. Effluents from Power Plants and Impact on Environment - Pollutants and Pollution Standards - Methods of Pollution Control. Inspection And Safety Regulations.

UNIT-II

Coal Based Thermal Power Plants: Rankine cycle-Improvisation, Layout of modern coal power plant, supercritical boilers, FBC Boilers, Subsystems of thermal power plants- Fuel and Ash Handling, Feed water treatment, Binary cycles and cogeneration systems. Advantages and limitaions of Coal Based Thermal Power plants.

UNIT-III

Diesel Power Plant: Diesel Power Plant, Construction, Plant lay out with auxiliaries, fuel storage. **Gas Turbine Plant**: Introduction - Classification - Construction - Layout with Auxiliaries - Principles of Working Closed and Open Cycle Gas Turbines. Advantages And Disadvantages Combined Cycle Power Plants.

UNIT-IV

Hydro Electric Power Plant: Water Power - Hydrological Cycle / Flow Measurement - Drainage Area Characteristics - Hydrographs - Storage and Pondage - Classification of Dams and Spill Ways.

Hydro Projects And Plant: Classification - Typical Layouts - Plant Auxiliaries - Plant Operation Pumped Storage Plants

UNIT - V

Power from Non-Conventional Sources: Utilization of Solar Collectors- Working Principle, Wind Energy - Types of Turbines - HAWT & VAWT-Tidal Energy. MHD power Generation. Nuclear Power Station: Nuclear Fuel - Nuclear Fission, Chain Reaction, Breeding and Fertile Materials - Nuclear Reactor -Reactor Operation. Types of Reactors: Pressurized Water Reactor, Boiling Water Reactor, Sodium-Graphite Reactor, Fast breeder Reactor, Homogeneous Reactor, Gas Cooled Reactor, Radiation Hazards and Shielding - Radioactive Waste Disposal.

4. Books and Materials

Text Book(s)

P.K. Nag, “Power Plant Engineering”, 3rd edition, TMH, 2013.

Reference Book(s)

1. Rajput, “A Text Book of Power Plant Engineering:, 4th edition, Laxmi Publications, 2012.
2. Ramalingam, “Power plant Engineering”, Scietech Publishers, 2013
3. Wakil, “Power plant technology”, M.M.EI TMH Publications.

COURSE STRUCTURE

A30365– COMPOSITE MATERIALS AND TESTING

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

1. Course Description

Course Overview

The objective for this course is to develop an understanding of the design, processing, and behavior of composite materials. This understanding will include concepts such as linear elastic analysis, anisotropic material behavior, damage criteria, and the analysis of laminated plates and also to develop a strong understanding of the role of constituents in overall response of composite lamina, and how a set of laminae with different orientations affects the overall laminate properties and response. Finally apply these concepts to analyze and design fiber-reinforced composites for engineering applications.

Course Pre/corequisites

Material science and engineering

2. Course Outcomes (COs)

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

A30365.1 Apply the selection of the different metal and ceramic matrix materials used in engineering composites and their properties.

A30365.2 Use design equations for the stiffness and strength variation in composites as functions of constituent properties and amounts

A30365.3 Analyze the effects of various load or displacement boundary conditions by applying laminate analysis to composite structures

.A30365.4 Use equations for the upper and lower bounds of the elastic modulus of a composite lamina

A30365.5 Apply the deformation and failure mechanisms in a composite lamina and laminate

3. Course Syllabus

UNIT-I

Introduction to Composite Materials: Introduction, Classification: Polymer Matrix Composites. Metal Matrix Composites, Ceramic Matrix Composites, Carbon–Carbon Composites, Fiber. Reinforced Composites and nature-made composites, and applications **Reinforcements:** Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and boron carbide. fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosets, Metal matrix and ceramic composites.

UNIT-II

Manufacturing methods: Autoclave curing, tape production, moulding methods, filament winding, hand layup, pultrusion, RTM. Compression moulding, tape winding.

Macromechanical Analysis of a Lamina: Introduction ,Definitions: Stress, Strain ,Elastic Moduli, Strain Energy. Hooke‟s Law for Different Types of Materials, Plane Stress Assumption, Reduction of Hooke‟s Law in Three Dimensions to Two Dimensions, Relationship of Compliance and Stiffness Matrix to Engineering Elastic Constants of a Lamina

UNIT-III

Micromechanical Analysis of a Lamina: Introduction, Volume and Mass Fractions, Density, and Void Content, Evaluation of the Four Elastic Moduli, Strength of Materials Approach, Semi Empirical Models ,Elasticity Approach, Elastic Moduli of Lamina with Transversely Isotropic Fibers, Ultimate Strengths of a Unidirectional Lamina, Coefficients of Thermal Expansion, Coefficients of Moisture Expansion

UNIT-IV

Macromechanical Analysis of Laminates: Introduction, Laminate Code, Stress– Strain Relations for a Laminate, In-Plane and Flexural Modulus of a Laminate , Hygrothermal Effects in a Laminate, Warpage of Laminates

UNIT - V

Failure Analysis and Design of Laminates: Introduction, Special Cases of Laminates, All Failure Criterion for a Laminate.

4. Books and Materials

Text Book(s)

1. Engineering Mechanics of Composite Materials- Isaac and M Daniel, Oxford University Press, 1994.

2. Mechanics of Composite Materials, R. M. Jones, Mc Graw Hill Company, New York, 1975.

Reference Book(s)

1. Analysis and performance of fibre Composites, B. D. Agarwal and L. J. Broutman Wiley-Interscience, New York, 1980.

2. Mechanics of Composite Materials, Second Edition (Mechanical Engineering)- Autar K. Kaw, Publisher: CRC

3. Finite Element Analysis of Composite Materials, Ever J. Barbero , CRC Press, 2007.

4. Analysis of Laminated Composite Structures, L. R. Calcote, Van Nostrand Rainfold, New York, 1969.

5. Mechanics of Composite Materials and Structures, Madhujit Mukhopadhyay, University Press, 2009. 6. Composite Materials Science and Engineering, Krishan K. Chawla, Springer, 2009 All

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COURSE STRUCTURE

A30366– AUTOMATION AND ROBOTICS

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

1. Course Description

Course Overview

This course covers the fundamental concepts of industrial robotic technology. Apply the basic mathematics to calculate kinematic and dynamic forces in robot manipulator. Understand the robot controlling and programming methods and describe concept of robot vision system

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:

A30366.1: Apply the knowledge in management tools to apply in technical organizations.

A30366.2: 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.

A30366.3: Apply various work study techniques towards productivity improvement in industrial and in real life environment .

A30366.4: Determine the inventory and to be able to apply selected techniques for its control and management under different circumstances.

A30366.5: Apply quality improvement techniques and methods for improvement of quality of product and process.

3. Course Syllabus

UNIT-I

Fundamentals of Robots: Introduction, definition, classification and history of robotics, robot characteristics and precision of motion, advantages, disadvantages and applications of robots. Introduction to matrix representation of a point in a space a vector in space, a frame in space, Homogeneous transformation matrices, representation of a pure translation, pure rotation about an axis

UNIT-II

Kinematics of robot: Forward and inverse kinematics of robots- forward and inverse kinematic equations for position and orientation, Denavit-Hartenberg(D-H) representation of forward kinematic equations of robots, The inverse kinematic of robots, Degeneracy and Dexterity, simple problems with D-H representation.

Differential motions and Velocities: Introduction, differential relationship, Jacobian, differential motions of a frame-translations, rotation, rotating about a general axis, differential transformations of a frame. Differential changes between frames, differential motions of a robot and its hand frame

UNIT-III

Control of Manipulators: Open- and Close-Loop Control, the manipulator control problem, linear control schemes, characteristics of second-order linear systems, linear second-order SISO model of a manipulator joint, joint actuators, partitioned PD control scheme, PID Control Scheme, computer Torque control, force control of robotic manipulators, description of force-control tasks, force control strategies, hybrid position/force control, impedance force/torque control.

UNIT-IV

Robot Vision: Introduction, architecture of robotic vision system, image processing, image acquisition camera, image enhancement, image segmentation, imaging transformation, Camera transformation and calibrations, industrial applications of robot vision.

UNIT - V

Robot Applications In Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection

4. Books and Materials

Text Book(s)

1. Mikell P. Groover and Mitchell Weiss, Roger N. Nagel,Nicholas G.Odrey , *“Industrial Robotics”* — Mc Graw Hill, 1986.

2. John.J.Craig Addison, “Introduction to Robotics: Mechanics and Control”, Wesley, 1999.

Reference Book(s)

1. Saeed B. Niku, “*Introduction to Robotics – Analysis, System, Applications*”, 2nd Edition, John Wiley & Sons, 2010

2. H. Asada and J.J.E. Slotine, “*Robot Analysis and Control*”, 1st Edition Wiley- Interscience, 1986

3. Robert J. Schillin, “*Fundamentals of Robotics: Analysis and control*”, Prentice-Hall Of India Pvt. Limited, 1996

COURSE STRUCTURE
A30385-INTRODUCTION TO COMPOSITES

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

1. Course Description

Course Overview

This course provides a comprehensive introduction to composite materials, focusing on their properties, manufacturing processes, and applications. Students will explore the fundamental concepts of composites, including the types of materials used, the mechanics behind their performance, and the latest advancements in composite technology. This course is suitable for undergraduate students in materials science, engineering, or related fields, as well as industry professionals looking to enhance their knowledge of composite materials. No prior knowledge of composites is required.

2. Course Outcomes (COs)

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

A30385.1 Articulate the characteristics and classifications of composite materials

A30385.2 Evaluate the mechanical properties of composites, such as tensile strength, modulus of elasticity, and fatigue resistance,.

A30385.3 Describe and compare various composite manufacturing techniques, such as hand layup, resin transfer molding, and additive manufacturing, including their advantages and limitations.

A30385.4 Apply appropriate testing methods to assess the properties of composite materials and interpret the results to determine suitability for intended applications.

A30385.5 Evaluate the environmental implications of composite materials, including recycling, life cycle analysis, and the potential for sustainable materials.

3. Course Syllabus

Unit-I

Introduction to Composites: Definition & Classification of the composite materials, Advantages, limitations & Properties of composite materials. Production process and different types of Glass Fiber, Graphite & Ceramics Fibers. Aramid and Boron Fibers, Matrix - Properties and classifications.

Unit-II

Fabrication of Composites: Polymers as matrix material and its classification, Thermosets and thermoplastics, Properties of thermosets and thermoplastics, Thermoset materials and its production methods, Thermoplastics and metals as matrix materials, Ceramic and carbon matrices, Types of Fabrication process of a composite – "Hand Lay-Up & Bag Molding Process, Resin Transfer Molding Process". Fabrication of Thermoplastic, Metal and Ceramic Matrix based Composites.

Unit-III

Orthotropic Material: Basic concepts of Orthotropic material, Modelling of unidirectional composites, Density and volume fraction, Calculation of longitudinal modulus and failure modes for unidirectional composites, Transverse Modulus of Unidirectional Composite. Halpin-Tsai Relation for Transverse strength & modulus of unidirectional composites, Poisson's ratio of unidirectional composites.

Unit-IV

Tensors & Anisotropic materials: Failure modes of composite materials & other properties, Concept of Tensor, Stress Transformation (Two Dimensional), Analysis of Generally & Specially Orthotropic Lamina, Variation of elastic constants with respect to fiber orientation, Generalized Hooke's law for anisotropic materials. Elastic constants for specially orthotropic materials in plane stress. Relation between Engineering Constants and Elements of Stiffness and Compliance Matrices. Stress Strain Relations for a Lamina with Arbitrary Orientation.

Unit-V

Post-processing and costing in RM: Importance of Sign of Shear Stress in context of Strength of a Unidirectional Lamina, Resultant forces and moments. Relations between force and moment resultants and mid-plane strains and curvatures. Physical significance of extensional stiffness matrix [A], coupling matrix [B] and bending stiffness matrix [D] matrices. Lamination sequence (standard laminate code). Calculation of A, B and D Matrices, Simplification of Stiffness Matrices, Quasi-Isotropic Laminate, Failure of Composite Laminates.

References:

1. An Introduction to Composite Materials, T. W. Clyne, *University of Cambridge*, D. Hull, *University of Liverpool*, Published 2019.
2. Analysis And Performance of Fiber Composites, Third Edition, Bhagwan D. Agarwal Consultant Lombard, Illinois, USA. Lawrence J. Broutman, Consultant Chicago, Illinois, USA. K. Chandrashekhara, University of Missouri-Rolla Rolla, Missouri, USA. Copyright© 2006 by John Wiley & Sons, Inc.

COURSE STRUCTURE

A30389-FUNDAMENTALS OF MANUFACTURING PROCESSES

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

1. Course Description

Course Overview

This course aims to introduce learners to the basic manufacturing processes used in the production of goods, from traditional techniques to modern manufacturing technologies. It helps learners understand how raw materials are transformed into finished products and the role of different processes in achieving this transformation efficiently and economically.

2. Course Outcomes (COs)

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

A30385.1 Understand the fundamental principles of each process, including how raw materials are transformed into finished products.

A30385.2 Knowledge on various casting processes like sand casting, die casting, and investment casting, including the steps involved in casting and their industrial applications.

A30385.3 Knowledge of Forming and Shaping Techniques

A30385.4 Develop the ability to understand and apply various joining processes, such as welding, brazing, soldering, and mechanical fastening

A30385.5 Explore various machining processes (e.g., turning, milling, drilling) and the selection of appropriate cutting tools.

3. Course Syllabus

Course Syllabus

Unit-I

Introduction to Manufacturing: concept of manufacturing, need, scope, advantages, limitation, applications. **Improving properties:** Fe-C diagram, TTT diagram, heat treatment processes annealing, normalizing, quenching, tempering.

Unit-II

Casting: approach, steps, pattern, molding, gate and riser, solidification, casting processes: sand mould, shell mould, permanent mould casting, casting defect and their remedy.

Unit-III

Forming: approach, hot and cold forming, rolling, forging, extrusion, drawing-working principle, advantages, limitations and applications.

Unit-IV

Joining: approach, need, principle of fusion welding, gas welding, thermit welding, arc welding resistance welding, weld discontinuities and their remedy.

Unit-V

Machining: approach, mechanism, merchant's force circle diagram, Single point cutting tool, heat generation, cutting fluid.

4. Books and Materials:

1. M P Grover, Modern Manufacturing Processes, John Wiley (2002).
2. S Kalpakkajian, S R Schmid, Manufacturing Engineering and Technology, Pearson (2000)DeGarmo et al. Materials and Processes in Manufacturing, Prentice Hall of India, (1997).
3. R S Parmar, Welding process and technology, Khanna Publisher, New Delhi (2004).
4. P N Rao, Manufacturing Technology Vol. I & II, Tata McGraw Hill (2009).

PROFESSIONAL ELECTIVE V	
Course Code	**Title of the Course**
A30367	Additive Manufacturing
A30368	Operations Research
A30369	Design for Plasticity
A30370	Cryogenic Engineering
A30387	Rapid manufacturing

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COURSE STRUCTURE

A30367 – ADDITIVE MANUFACTURING

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

1. Course Description

Course Overview

Additive Manufacturing (AM) is a process of joining materials to make objects from 3D model data, usual y layer up on layer, as opposed to subtractive manufacturing methodologies, such as traditional machining. The basic principle of AM is that a model, initially generated using a three-dimensional Computer Aided Design (3D CAD) system, can be fabricated directly. AM technologies have significantly evolved over the last decade. Because of their potential to extensively transform the nature of manufacturing processes, e.g., by enabling "Freedom of Design" several industries have been attracted by these technologies. Using AM, manufacturing of highly complex parts can be an economically viable alternative to convention al manufacturing technologies.

2. Course Outcomes:

A30367.1: History and Development of Additive manufacturing, Applications, and RP data formats.

A30367.2: Basic Concept Reverse Engineering and Software's for Additive Manufacturing.

A30367.3: Principle, Process, Materials, Advantages of Solid and Liquid Based AM Systems.

A30367.4: Principle and Process of Selective Laser Sintering of Powder Based AM Systems.

A30367.5: Principle, Process, Advantages, Limitations, Applications of BPM, SDM, AM systems

3. COURSE SYLLABUS:

UNIT-I

Introduction to Additive Manufacturing (AM) Systems: History and Development of AM , Need of AM ,Difference between AM and CNC, Classification of AM Processes: Based on Layering Techniques, Raw Materials and Energy Sources, Classification of AM Processes, Benefits and Applications of AM, Representation of 3D model in STL format.

UNIT-II

CAD & Reverse Engineering: Basic Concept, Digitization techniques, Model Reconstruction, Data Processing for Additive Manufacturing Technology: Software's for Additive Manufacturing Technology: MIMICS, MAGICS. **Reverse Engineering (RE)** –Meaning, Use, RE – The Generic Process, Phase of RE Scanning, Contact Scanners, Noncontact Scanners, Point Processing, Application Geometric Model, Development.

UNIT-III

Solid and Liquid Based AM Systems: Stereo lithography (SLA): Principle, Process, Materials, Advantages, Limitations and Applications. Solid Ground Curing (SGC): Principle, Process, Materials, Advantages, Limitations, Applications. Fusion Deposition Modelling (FDM): Principle, Process, Materials, Advantages, Limitations, Applications. Laminated Object Manufacturing (LOM): Principle, Process, Materials, Advantages, Limitations, Applications.

UNIT-IV

Powder Based AM Systems : Principle and Process of Selective Laser Sintering (SLS), Advantages, Limitations and Applications of SLS, Principle and Process of Laser Engineering Net Shaping Advantages ,Limitations and Applications of LENS, Principle and Process of Electron Beam Melting (EBM), Advantages, Limitations and Applications of EBM.

UNIT –V

Other Additive Manufacturing Systems: Three Dimensional Printing (3DP): Principle, Process, Advantages, Limitationsand Applications. **Ballistic Particle Manufacturing (BPM):** Principle, Process, Advantages, Limitations, Applications. **Shape Deposition Manufacturing (SDM):** Principle,Process, Advantages, Limitations, Applications.

Text Books:

1. "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing" by Ian Gibson and David Rosen.

Reference Books:

1. "Additive Manufacturing Technologies" by Ian Gibson and David Rosen.
2. "Additive Manufacturing of Metals: From Fundamental Technology to Rocket Nozzles, Medical Implants, and Custom Jewelry (Springer Series in Materials Science)" by John O Milewski.

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COURSE STRUCTURE

A30368 – 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	40	60	100

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and Corequisite

2. Course Outcomes (COs)

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

A30368.1 Apply various Operations Research models and methods to real world problems.

A30368.2 Solve Linear Programming, assignment, sequencing, game theory, queuing, transportation and project management problems for optimum solution.

A30368.3 Evaluate various alternatives available to find optimal solution for real world problems.

A30368.4 Choose the best strategies to maximize the profit or minimize loss in the presence of a competitor.

A30368.5 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.

COURSE STRUCTURE
A30369 – Design for Plasticity

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

1. Course Description

Course Overview

This course offers more advanced topics of Mechanics of solids .it is the branch of mechanics that deals with the calculation of stresses and strains in a body, made of ductile material, permanently deformed by a set of applied forces

Course Pre/co requisites

This course pre requisites are engineering mechanics , mechanics of solids

2. Course Outcomes (COs)

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

A30369.1 Analyze the types of stresses, strains and elastic constants of mechanicalcomponents

A30369.2 Classify the concepts of crystalline structure

A30369.3 Apply the kirchoff theorem to real life problems

A30369.4 Solve problems related to slope and deflection equations for beams subjected to various loads

A30369.5 Apply continuity equations on flow problems in mechanical structures

3. Course Syllabus

UNIT-I

Brief review of fundamentals of elasticity: Concept of stress, stress invariants, principal Stresses, engineering and natural strains, octahedral strain, deviator and spherical strain tensors, strain rate and strain rate tensor, , generalized Hooke’s law, numerical problems.

UNIT-II

Plastic Deformation of Metals: Crystalline structure in metals, mechanism of plastic deformation, factors affecting plastic deformation, strain hardening, recovery, re crystallization and grain growth,. Yield Criteria: Introduction, yield or plasticity conditions, Von Mises and Tresca criterion,

UNIT-III Kinematics: Infinitesmial deformations, Affine transformation, Strain, characterization of rigid displacement, kirchhoff theorem, pure strains and its decomposition, mean strain theorem

UNIT-IV

Bending of Beams: Stages of plastic yielding, analysis of stresses, linear and nonlinear stress strain curve, problems. Torsion of Bars: Introduction, plastic torsion of a circular bar, elastic perfectly plastic material, elastic work hardening of material, problems.

UNIT-V

Slip Line Field Theory: Introduction, basic equations for incompressible two-dimensional flows, continuity equations, stresses in conditions of plain strain, convention for slip lines, geometry of slip line field, properties of the slip lines, construction of slip line nets.

4. Books and Materials

1. Theory of Plasticity Chakraborty Elsevier 3rd Edition
2. Theory of Plasticity and Metal forming Process Sadhu Singh Khanna Publishers, Delhi

5. Reference Books

1. S.S. Bhavikatti, Strength of Materials, Vikas Publishing House, 3rd edition, New Delhi, India, 2004.
2. 2.R.K Rajput, Strength of Materials, S. Chand & Company, 6th edition, New Delhi, IndiaTimoshenko, 2015

COURSE STRUCTURE

A30370– CRYOGENIC ENGINEERING

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

1. Course Description

Course Overview

This course deals with understanding of cryogenic and its applications. It provides understanding of liqueification of gases. Also this course helps in better understanding for usage of cryogenic for refrigeration systems.

Course Pre/corequisites

The course prerequisites are Material science and Engineering, Thermal Engineering.

2. Course Outcomes (COs)

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

A30370.1: Understand the concept of cryogenic system and its applications.

A30370.2: Know the concepts of liquefaction of gasses.

A30370.3: Understand the concept of gas separation.

A30370.4: Understand the concept of low temperature insulation and handling of cryogenic liquids

A30370.5: Understand the concept of cryogenic refrigeration system

UNIT – I

Introduction to Cryogenic Systems: Historical development, Low Temperature properties of Engineering Materials, Mechanical properties- Thermal properties- Electric and magnetic properties– Cryogenic fluids and their properties. Applications of Cryogenics: Applications in space, Food Processing, super- conductivity, Electrical Power, Biology, Medicine, Electronics and Cutting Tool Industry. Low temperature properties of engineering materials.

UNIT – II

Gas liquefaction: Introduction-Production of low temperatures-General Liquefaction systems-Liquefaction systems for Neon, Hydrogen and Helium –Critical components of Liquefaction systems

UNIT – III

Cooling by adiabatic de-magnetization - Gas separation and cryogenic systems-separation of gases-Rectifying Columns-Air separating- single and double columns, Air separation plant.

UNIT – IV

Cryogenic fluid storage: Cryogenic Storage vessels and Transportation, Cryogenic fluid transfer systems. Cryogenic Insulation Thermal insulation and their performance at cryogenic temperatures, Super Insulations, Vacuum insulation and Powder insulation.

UNIT – V

Cryogenic Refrigeration systems: Ideal Refrigeration systems, Refrigeration using liquids and gases as refrigerant- Refrigerators using solids as working media. gases as refrigerant- Refrigerators using solids as working media.

Text Books

1. Randall F. Barron, Cryogenic Systems, Oxford University Press, New York

2. Mamata Mukhopadhyay, Fundamentals of Cryogenic Engineering, PHI, Delhi

Reference Books

1. Domkundwar, Arora & Domkundwar, Course in Refrigeration & Air-Conditioning, Dhanpatrai &Co, New Delhi

COURSE STRUCTURE

A30387-RAPID MANUFACTURING

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

3. Course Description

Course Overview

This course introduces the fundamental principles and technologies of **Rapid Manufacturing** (RM), which includes **Rapid Prototyping (RP)**, **Additive Manufacturing (AM)**, and other related techniques. The course aims to provide learners with an understanding of how these technologies can drastically reduce time-to-market, improve product customization, and enable complex geometries that are difficult to achieve using traditional manufacturing methods

Course Pre/corequisites

Manufacturing Technology

2. Course Outcomes (COs)

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

A30387.1: Understanding of Rapid Manufacturing Technologies.

A30387.2 Familiarity with reverse engineering Processes.

A30387.3 Knowledge on Photo Polymerization Techniques

A30387.4: Rapid Tooling and Its Applications

A30387.5: Exploration of Emerging Technologies and Trends.

3. Course Syllabus

Unit-I

Introduction to Rapid Manufacturing: Additive Manufacturing, Additive Manufacturing Applications, Rapid Prototyping, Rapid tooling, Classification of Additive manufacturing, Product Development Process, Design for Modularity, Design for Manufacturing guidelines, Design for Assembly, Subtractive versus Rapid Manufacturing.

Unit-II

Reverse Engineering: Reverse Engineering Process, 3D Scanning Process, Reverse Engineering Hardware, Optical Techniques, Transitive Techniques, Co-ordinate Measuring Machine

Unit-III

Polymerization processes: Photo polymerization, photo polymerization materials, Stereolithographic Process, Powder based processes, Extrusion based processes, Sheet Stacking processes.

Unit-IV

3D printing processes: 3D printing processes Technical challenges, Dropet formation technologies, Priniting Process Modeling, Beam Deposition processes, Materials in Rapid Manufacturing.

Unit-V

Post-processing and costing in RM: Post-processing concerns, Product costing for Rapid, Rapid Product Development, CAD/CAM, Rapid Product Development, CAE and CIM, Rapid Product Development, Technomatix, Plant Simulation, Rapid Manufactiuring, case studies.

4. Books and Materials

1. Kamrani, A.K. and Nasr, E.A., 2010. Engineering design and rapid prototyping. Springer Science & Business Media.
2. Gebhardt, A., 2011. Understanding additive manufacturing.
3. Gibson, I., Rosen, D.W. and Stucker, B., 2014. Additive manufacturing technologies (Vol. 17). New York: Springer.
4. Hopkinson, N., Hague, R. and Dickens, P. eds., 2006. Rapid manufacturing: an industrial revolution for the digital age. John Wiley & Sons.
5. Pham, D. and Dimov, S.S., 2012. Rapid manufacturing: the technologies and applications of rapid prototyping and rapid tooling. Springer Science & Business Media.

OPEN ELECTIVES

PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

OPEN ELECTIVES

Course Code	Title of the Course	Offered by
A30181	Basic Civil Engineering	CE
A30182	Building Planning and Construction	CE
A30183	Disaster Management	CE
A30184	Water Resources Conservation	CE
A30281	Fundamentals of Electrical Engineering	EEE
A30282	Renewable Energy Sources	EEE
A30283	Electrical Measuring Instruments	EEE
A30284	Control Systems Engineering	EEE
A30381	Optimization Techniques	ME
A30382	Mechanical Technology	ME
A30383	Automobile Systems and Applications	ME
A30384	Manufacturing Processes	ME
A30481	Principles of Communication Systems	ECE
A30482	Signal Processing & Applications	ECE
A30483	Fundamentals of IoT	ECE
A30484	Introduction to Embedded Systems	ECE
A30474	Introduction To Internet Of Things	ECE
A30581	Basic Data Structures	CSE
A30582	Fundamentals of DBMS	CSE
A30583	Basics of Software Engineering	CSE
A30584	Python for Every One	CSE
A30585	Computer Organisation and Operating Systems	CSE
A30586	Ethical Hacking	CSE
A30587	Fundamentals of Web Technologies	CSE
A30588	Introduction to Java Programming	CSE
A33147	Agile Methodologies	CAI
A33148	Human Computer Interaction	CAI
A33149	AI Foundations for Everyone	CAI
A33150	Introduction to Data Science	CAI
A33545	Adhoc and Wireless Sensor Networks	CSO
A33546	Ethics in Information Technology	CSO
A33547	Drone Technologies	CSO
A33548	Computer Communication Networks	CSO
A30081	Research Methodology	H&S
A30082	Intellectual Property Rights	H&S
A30083	National Service Scheme	H&S
A30084	Yoga	H&S
A30085	Design Thinking	H&S
A30086	Management Science	H&S
A30087	Entrepreneurship Development	H&S
A30094	Entrepreneurship	H&S
A30091	Management Information System	H&S

COURSE STRUCTURE
A30181 – BASIC CIVIL ENGINEERING

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and co requisite

2. Course Outcomes (COs)

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

A30181.1 Classify various materials and components used in building construction.

A30181.2 List out different domains like Structural, Transportation and Geotechnical Engineering in Civil engineering stream.

A30181.3 Identify types of soils and foundations for various structures.

A30181.4 Measure the linear and angular parameters using concepts of surveying.

A30181.5 Develop water supply system for domestic and irrigational needs.

3. Course Syllabus

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE
A30182 – BUILDING PLANNING AND CONSTRUCTION

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30182.1 Plan buildings by adhering to laws laid by regulatory bodies.

A30182.2 Classify different masonry types of brick and stones used in construction.

A30182.3 Select appropriate floors and roofs for a proposed building.

A30182.4 Identify building materials which can be employed in construction.

A30182.5 Make use of damp proofing techniques to prevent ingress of water in buildings.

3. Course Syllabus

UNIT-I

Residential Buildings: Introduction, Different types of residential buildings- Detached house, semi-detached house, row house or chawls, block of flats or terrace house, duplex type houses, selection of site for residential building, factors effecting the selection of site, components of building, by-laws and regulations, orientation of buildings-factors effecting orientation, C.B.R.I suggestions for obtaining optimum orientation.

UNIT-II

Masonry: Stone masonry - definitions of terms used in masonry, materials for stone masonry, classifications of stone masonry, dressing of stones. Brick masonry - introduction, types of bricks, bonds in brick work, comparison of brick masonry and stone masonry. Composite masonry-introduction, stone composite masonry, brick-stone masonry, concrete masonry, hollow clay blocks masonry, reinforced brick masonry.

UNIT-III

Floors and Roofs: Ground floor - components of a floor, materials used for floor construction, different types of flooring, upper floors - introduction, steel joist and stone or precast concrete Slab floor, Jack arch floors, reinforced cement concrete floors, Ribbed or hollow tiled flooring, precast concrete floors, timber floors, types of roofs- pitched roofs, single roofs, double or purlin roofs, trussed roofs.

UNIT-IV

Doors and Windows: Introduction, frame, shutters, head, sill, horn, rebate, location of doors and windows, size of doors and windows, types of doors, classifications of doors - arrangement of components, method or manner of construction, working operations, metal doors, types of windows, classifications of windows, ventilators, fixtures and fastenings, installing door and window frames.

UNIT-V

Damp proofing: Introduction, causes of dampness on buildings, effects of dampness on buildings, precautions, materials used for damp proofing, methods of damp proofing, DPC treatment in building problems, fire hazards, fire resisting properties of common building materials.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE
A30183 – DISASTER MANAGEMENT

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite.

2. Course Outcomes (COs)

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

A30183.1 Classify different kind of hazards/disasters and their effects on environment.

A30183.2 Analyze the causes of hazards/disasters which effects human life.

A30183.3 Apply disaster management through engineering applications.

A30183.4 Apply suitable mitigation measures to minimize the effects of hazards and disasters.

3. Course Syllabus

UNIT-I

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

UNIT-II

Types of Environmental Hazards and Disasters: Natural hazards and disasters, man induced hazards and disasters, natural hazards - planetary hazards/disasters, extra planetary hazards/disasters, planetary hazards - endogenous hazards – exogenous hazards.

UNIT-III

Endogenous Hazards: Endogenous hazards, volcanic eruption, earthquakes, landslides, volcanic hazards/disasters - causes and distribution of volcanoes, hazardous effects of volcanic eruptions, environmental impacts of volcanic eruptions, earthquake hazards/disasters, causes of earthquakes, distribution of earthquakes, hazardous effects of earthquakes, earthquake hazards in India, human adjustment, perception and mitigation of earthquake.

UNIT-IV

Exogenous Hazards/disasters: Exogenous hazards/disasters, infrequent events, cumulative atmospheric hazards/disasters infrequent events: cyclones, lightning, hailstorms cyclones:

tropical cyclones and local storms, destruction by tropical cyclones and local storms (causes, distribution human adjustment, perception and mitigation) cumulative atmospheric hazards/disasters: floods- droughts, cold waves, heat waves. Floods: causes of floods, flood hazards India, flood control measures (human adjustment, perception and mitigation). Droughts: impacts of droughts, drought hazards in India, drought control measures, extra planetary hazards/disasters, man induced hazards/disasters, physical hazards/disasters-soil erosion.

UNIT-V

Soil Erosion: Mechanics and forms of soil erosion, factors and causes of soil erosion, conservation measures of soil erosion. Chemical hazards/disasters, release of toxic chemicals, nuclear explosion, sedimentation processes. Sedimentation processes: global sedimentation problems- regional sedimentation problems, sedimentation and environmental problems, corrective measures of erosion and sedimentation. Biological hazards/disasters: population explosion.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE
A30184 – WATER RESOURCES CONSERVATION

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The Course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30184.1 Interpret ground and surface water utilization for conservation of water resources.

A30184.2 Apply the concepts of artificial ground water recharge to increase ground water level.

A30184.3 Make use of the concepts of harvesting for preservation of water.

A30184.4 Utilizenew technologies like ion exchange and UV radiation techniques to recycle and reuse waste water.

A30184.5 Plan efficient use of water resources with minimum energy.

3. Course Syllabus

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

4. Books and Materials

Text Book(s)

1. Ramakrishnan S., *Ground water*, Sci -Tech Publications, 2ndedition, 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, 1stedition, 2018.
2. Murthy J.V.S, *Watershed Management*, New Age International Publishers, 2ndedition, 2017.
3. Murthy V.V.N*, Land and Water Management*, Kalyani Publications, 1stedition, 2018.

COURSE STRUCTURE
A30281 – FUNDAMENTALS OF ELECTRICAL ENGINEERING

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

A30281.1 Apply network reduction techniques and knowledge of alternating quantities to calculate current, voltage and power for complex circuits.

A30281.2 Analyze the electrical circuits using nodal analysis, mesh analysis and network theorems.

A30281.3 Demonstrate the working principle and operation of DC machines, AC machines and single-phase transformers.

A30281.4 Test the Performance of DC machines, AC machines and single-phase transformers.

3. Course Syllabus

UNIT-I

DC Circuits: Circuit concept, types of network elements, ohm's law, types of sources voltage - current relationship for passive element (R, L & C), Kirchhoff's laws, network reduction techniques: series, parallel, combination of series and parallel, delta - star transformation, loop and nodal analysis.

Network Theorems: Thevenin's, Norton's, superposition and maximum power transfer theorems (DC excitation only).

UNIT-II

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

UNIT-III

D.C Generators: Constructional details of D.C. generator, principle of operation of D.C. generators, types of D.C generators, E.M.F equation.

D.C Motors: Principle of operation of DC motors, back emf, torque equation, Swinburne's test, speed control of DC motors by armature and field control methods.

UNIT-IV

1-phase Transformers: Principle of operation, constructional details, E.M.F. equation, losses and efficiency, OC and SC tests.

UNIT-V

3-Phase Induction Motors: Principle of operation, types of induction motors, slip, torque equation, torque-slip characteristics.

3-phase Alternators: Principle of operation - constructional details-EMF equation.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE

A30282 – RENEWABLE ENERGY SOURCES

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30282.1 Apply the principles of Renewable energy sources for the construction of Power generating station.

A30282.2 Analyze the various energy conversion systems and their limitations.

A30282.3 Analyze Renewable energy sources for various environmental conditions.

A30282.4 Analyze the generation principles and operation of variety of sources of energy.

3. Course Syllabus

UNIT-I

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

UNIT-II

Solar Energy Collection, Storage and Applications: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors. **Storage and Applications:** Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT-III

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

Bio-Mass: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. engine operation and economic aspects.

UNIT-IV

Other Sources of Energy: Resources, types of wells, methods of harnessing the energy, potential in India. Ocean energy: OTEC, principles utilization, setting of OTEC plants, thermodynamic cycles. **Tidal and wave energy:** Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-V

Energy Storage and Economy: Energy storage - energy in transportation - Magneto hydrodynamic power generation- hydrogen economy

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE

A30283 – ELECTRICAL MEASURING INSTRUMENTS

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30283.1 Categorise various electrical instruments used for measuring electrical parameters.

A30283.2 Design appropriate arrangement for extension of range in measuring instruments.

A30283.3 Analyze the errors and compensations in various electrical measuring instruments.

A30283.4 Measure current, voltage, power and energy in 1-phase and 3-phase circuits.

A30283.5 Estimate the unknown quantities of resistance, inductance and capacitance using bridges.

3. Course Syllabus

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

AC Bridges: Measurement of Inductance, Maxwell's bridge, Anderson's bridge. Measurement of capacitance, Desauty's bridge, Schering bridge.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE
A30284 – CONTROL SYSTEMS ENGINEERING

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

1. Course Description

Course Overview

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

Course Pre/corequisites

A30002- Mathematics-I

2. Course Outcomes (COs)

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

A30284.1	Determine the transfer function of a given system using different techniques.
A30284.2	Analyze the response of a given system in time and frequency domains.
A30284.3	Test the stability, observability and controllability of a given system.
A30284.4	Apply suitable technique for calculating the gain margin and phase margin of a given system.

3. Course Syllabus

UNIT-I

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

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

UNIT-II

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

UNIT-III

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

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

UNIT-IV

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

UNIT-V

Compensators: Lag, lead, lead - lag networks.

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE
A30381 – OPTIMIZATION TECHNIQUES

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and Corequisite

2. Course Outcomes (COs)

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

A30381.1 Apply various Operations Research models and methods to real world problems.

A30381.2 Solve Linear Programming, assignment, sequencing, game theory, queuing, transportation and project management problems for optimum solution.

A30381.3 Evaluate various alternatives available to find optimal solution for real world problems.

A30381.4 Choose the best strategies to maximize the profit or minimize loss in the presence of a competitor.

A30381.5 Decide the best operating policy for the efficient use of resources.

3. Course Syllabus

UNIT I

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

UNIT II

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

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

UNIT III

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

UNIT IV

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

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE
A30382 – MECHANICAL TECHNOLOGY

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30382.1 Identify the types of engines and their cycles.

A30382.2 Classify the reciprocating air compressors and their working principles.

A30382.3 Discus the constructional features of domestic refrigeration and air conditioning systems.

A30382.4 Inspect the mechanism of power transmission elements of various engineering systems.

A30382.5 Select suitable engineering materials and welding methods for real time applications.

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE

A30383 – AUTOMOBILE SYSTEMS AND APPLICATIONS

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30383.1 Identify the different parts of the automobile systems used in daily life.

A30383.2 Analyze brakes, steering, axles, suspension and frames of an engine for better performance.

A30383.3 Inspect the mechanism of power transmission elements, and applications of various engineering systems.

A30383.4 Compare the significance of various engines in terms of their performance.

A30383.5 Classify various electrical systems that are used for efficient functioning of automobiles.

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

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

UNIT IV

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

UNIT V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE
A30384 – MANUFACTURING PROCESSES

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

1. Course Description

Course Overview

This course provides details about converting raw material into finished products using various manufacturing processes. With the knowledge acquired through this course, the students will be able to manufacture the products by reducing the wastage of material.

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30384.1 Identify the properties of crystallization of ferrous and nonferrous materials.

A30384.2 Select suitable material for preparing the patterns.

A30384.3 Make use of moulding systems to prepare a product.

A30384.4 Identify the suitable special casting process used for the given application.

A30384.5 Identify the suitable welding process used for the given application.

3. Course Syllabus

UNIT I

Engineering Materials-Industrial Bonds in crystallization of metals, grain and grain boundaries, Determination of Grain size, solid solutions and types, structure and properties of various materials.

UNIT II

Casting: Introduction, steps involved in making a casting, advantages of casting, applications, pattern making, types of patterns, materials used for patterns, pattern allowances, principles of gating system, gating ratio, design of gating system, mould materials, types of moulds, molding methods and molding machines.

UNIT III

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

UNIT IV

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

UNIT V

Welding: Classification of welding processes, types of welds, welded joints, gas welding, arc welding, forge welding, resistance welding, thermit welding, plasma (air and water) welding, TIG welding, MIG welding, welding defects, causes and remedies.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

1. Schmid and Kalpakin, *Manufacturing Technology*, Pearson education, 7th edition, 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, 18th edition, 2013.

COURSE STRUCTURE
A30481 – PRINCIPLES OF COMMUNICATION SYSTEMS

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

1. Course Description

Course Overview

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

Course Pre/corequisites

A30405 - Signals and Systems

2. Course Outcomes (COs)

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

A30481.1	Explain the operation of different analog communication systems.
A30481.2	Analyze the performance of different modulation schemes used in analog communication systems.
A30481.3	Make use of sampling theorem to generate pulse modulation signals.
A30481.4	Analyze the performance of AM, FM and PM receivers in the presence of noise.
A30481.5	Choose an appropriate modulation technique to design an analog communication system.

3. Course Syllabus

UNIT - I

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

UNIT - II

Angle Modulation: Generation and demodulation of Frequency Modulation (FM) and Phase modulation (PM) signals. Narrow band frequency Modulation and wide band frequency modulation.

UNIT - III

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

UNIT - IV

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

UNIT - V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

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COURSE STRUCTURE

A30482 – SIGNAL PROCESSING AND APPLICATIONS

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

1. Course Description

Course Overview

This is an introductory course to all communication engineering subjects. This course deals withclassification of signals and systems in continuous and discrete time domains. The representation of signals in frequency domain is discussed in detail. This course also presents the sampling process of the signals and applications of the signals in various fields.

This course serves as an elementary subject for signal and image processing.

Course Pre/Co-requisites

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

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:
A30482.1 Distinguish between different signals and systems.
A30482.2 Make use of Fourier series for the representation of signals.
A30482.3 Analyze different signals by using an appropriate transform.
A30482.4 Examine the transmission characteristics of linear systems.
A30482.5 Select an appropriate transform to find the transfer function of linear systems.

3. Course Syllabus

UNIT - I

Classification of Signals: Continuous time and discrete time, analog and digital, periodic and aperiodic, energy and power, even and odd, causal and non-causal, deterministic and random, standard test signals.
Operations on signals: Time shifting, time scaling, time reversal and combined operations.

UNIT - II

Classification of Systems: Continuous time and discrete time, analog and digital, instantaneous and dynamic, causal and non-causal, linear and non-linear, time-invariant and time varying, stableand unstable. LTI Systems - Continuous, discrete time systems and properties of LTI systems.

UNIT – III

FOURIER SERIES

Representation of the Fourier series, Properties of Fourier Series and Dirichlet's conditions.

FOURIER TRANSFORMS:

Deriving Fourier Transform from Fourier series, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform.

UNIT – IV

SAMPLING: Sampling of continuous time signals, sampling theorem, reconstruction of signal from its samples, the effect of under sampling- aliasing, practical aspects of sampling.

UNIT –V Applications of Signal Processing

Audio and video processing, Image processing, Speech processing, Biomedical engineering and Control systems.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

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COURSE STRUCTURE

A30483 – FUNDAMENTALS OF IOT

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

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

A30483.1 Analyze IoT applications using IoT enablers and connectivity layers, components.

A30483.2 Distinguish sensors and actuators in terms of their functions and applications.

A30483.3 Interface I/O devices, Sensors using Arduino UNO.

A30483.4 Develop Raspberry Pi Interfacing programs using python concepts.

A30483.5 Apply Raspberry Pi and Arduino Uno programming for IoT bases projects.

3. Course Syllabus

UNIT-I

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

UNIT-II

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

UNIT-III

Programming with Arduino: Introduction to Arduino UNO, Arduino IDE, Basic commands, serial commands. LED Interface, switch interface, serial interface, temperature sensor interface.

UNIT-IV

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

UNIT-V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

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COURSE STRUCTURE

A30484 – INTRODUCTION TO EMBEDDED SYSTEMS

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

1. Course Description

Course Overview

This course provides an introduction to embedded systems and their architecture considerations. Focus is on TM4C123GH6PM microcontroller which includes internal architecture, instruction set, register organization, addressing modes, on-chip peripherals and data communication protocols. This course is accompanied by a laboratory course directly linked to the lecture topics for hands-on learning of the material. This course will be useful to students as a first level course for embedded systems.

Course Pre/Corequisites

A30432 - Microprocessors and Microcontrollers

2. Course Outcomes (COs)

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

A30484.1 Analyze the embedded systems features and architecture considerations

A30484.2 Develop Programs using TM4C123GH6PM Microcontroller

A30484.3 Make use of Peripherals of TM4C123GH6PM to interface I/O Devices

A30484.4 Apply Serial Communication Protocols for interfacing serial Devices.

A30484.5 Design Embedded Applications using TM4C123GH6PM Controller

3. Course Syllabus

UNIT - I

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

UNIT - II

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

UNIT - III

OVERVIEW OF TM4C123GH6PM: I/O Pin Multiplexing, Pull Up/Down Registers, GPIO Control, Programming System Registers, Watchdog Timer, Need of Low Power for Embedded Systems, System Clocks and Control, Hibernation Module on TM4C, Active Vs Standby Current Consumption. Introduction to Interrupts, Interrupt Vector Table, Interrupt Programming. Basic Timer, Real Time Clock (RTC), Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

UNIT - IV

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

UNIT - V

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

4. Books and Materials

Text Book(s)

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

References

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

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COURSE STRUCTURE

A30474 - INTRODUCTION TO INTERNET OF THINGS

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

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

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

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

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

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

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

3. Course Syllabus

Unit I

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

UNIT-II

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

Unit III

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

UNIT-IV

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

UNIT-V

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

4. Books and Materials

Text Book(s)

1. S. Misra, A. Mukherjee, and A. Roy, 2020. Introduction to IoT. Cambridge University Press.
2. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
3. Jeeva Jose, *Internet of Things,* 1st edition, Khanna Book Publishing, 2019.
4. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain, *Internet of Things with Raspberry Pi and Arduino,* 1st edition, CRC Press, 2019.

Reference Book(s)

1. Vijay Madisetti, Arshdeep Bahga, *Internet of Things – A hands on Approach*, 1st Edition, University press, 2014.
2. Adrian McEwen, Hakim Cassimally, *Designing the Internet of Things*, 1st edition, John Wiley and sons 2014.

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COURSE STRUCTURE

A30579 – THE JOY OF COMPUTING USING PYTHON

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

1. Course Description

Course Overview

"The Joy of Computing Using Python" is an engaging introduction to programming with Python, designed for beginners. The course covers fundamental concepts such as variables, control structures, functions, and data structures in a hands-on manner. Students will learn to write and debug code while exploring practical applications in problem-solving and data manipulation. Emphasis is placed on building computational thinking and fostering creativity through interactive projects. By the end, participants will have a solid foundation in Python and the confidence to tackle more advanced programming challenges. The course combines theoretical knowledge with practical exercises to ensure a well-rounded learning experience.

Course Pre/Corequisites

Basic Mathematics, Computer Operation

2. Course Outcomes (Cos)

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

A30579.1 Demonstrate proficiency in Python basics, including variables, loops, and conditionals for simple applications.

. A30579.2 Apply abstraction and problem-solving techniques to develop applications and games using Python..

A30579.3 Implement and analyze algorithms such as recursion and sorting in practical scenarios

A30579.4 Handle and analyze data using techniques like image Processing, sentiment analysis, and natural language processing.

A30579.5 Develop interactive and automated solutions, including browser automation and calendar manipulation, using Python.

3. Course Syllabus

UNIT-I

Motivation for Computing, Welcome to Programming!! Introduction to Anaconda, Spyder IDE, Variables and Expressions: Design your own calculator, Loops and Conditionals: Hopscotch once again, Lists Crowd computing, Permutations: Jumbled Words.

UNIT-II

Abstraction Everywhere: Apps in your phone, Magic Square hit, Dobble game, Counting Candies: Crowd to the rescue Birthday, Guess the movie, Dictionaries, Sorting and Searching.

UNIT-III

Substitution Cipher: What's the secret!! Sentiment, Tic tac toe: Let's play, Recursions, Snakes and Ladders: Down the memory lane. Spiral Traversing, Track the route.

UNIT-IV

Tuples, Lottery Simulation, Image Processing, Anagrams, Sentiment Analysis: Analyse your Facebook data, Natural Language Processing, six degrees of separation: Meet your favourites Image, Calculation of the Area: Don't measure.

UNIT-V

Flames, Data Compression, Browser Automation, Fun with Calendar, Page Rank: How Google Works!

4. Books and Materials

Textbook(s)

1. **Charles R. Severance.** *Python for Everybody: Exploring Data Using Python 3.* A beginner-friendly book that explains core Python concepts like variables, loops, conditionals, and functions. It also delves into topics such as web scraping, databases, and data visualization.
2. **Allen B. Downey.** *Think Python: How to Think Like a Computer Scientist.* An introductory textbook that emphasizes problem-solving and computational thinking, aligning well with beginner-level courses in Python.

Reference Book(s)

1. **Al Sweigart.** *Automate the Boring Stuff with Python.* A highly practical reference for automating everyday tasks like file management, web scraping, and working with Excel files using Python.
2. **John Zelle.** *Python Programming: An Introduction to Computer Science.* A more computer science-oriented introduction to Python that dives into computational theory and algorithms along with Python coding.
3. **Luciano Ramalho.** *Fluent Python: Clear, Concise, and Effective Programming.* A good reference for more advanced users, focusing on writing more Pythonic and efficient code.
4. **Mark Lutz.** *Learning Python.* A comprehensive book that covers the Python language in-depth. It's a good resource for beginners and intermediate programmers who want to dive deeper into the language

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A30581 – BASIC DATA STRUCTURES

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

4. 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.

5. Course Outcomes (Cos)

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

A30581.1 Analyze the time and space complexities of algorithms.

A30581.2 Apply various operations on linear data structures.

A30581.3 Design searching and sorting techniques for a given application.

A30581.4 Develop nonlinear programming for optimization techniques.

6. 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.

7. Books and Materials

Text Book(s)

1. Debasis Samanta, *Classic Data Structures*, 2nd edition, PHI, 2014.

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A30582 – FUNDAMENTALS OF DBMS

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

1. Course Description

Course Overview

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

Course Pre/Corequisites

The course has no specific prerequisite and co-requisites.

2. Course Outcomes (COs)

A30582.1 Apply suitable data models for given application.

A30582.2 Design database using integrity constraints and ACID properties.

A30582.3 Construct optimized SQL queries to solve real time problems.

A30582.4 Apply suitable normal form to eliminate data redundancy.

A30582.5 Choose appropriate index structure to improve performance.

3. Course Syllabus

UNIT-I

Introduction: Basics of database system applications, principle of database systems, view of data - data abstraction, instances and schemas, data models, database Languages - DDL, DML, ER diagrams.

UNIT-II

Relational Model: Fundamentals of relational model - Integrity constraints over relations, enforcing integrity constraints, querying relational data, logical data base design, views, ACID properties.

UNIT-III

SQL: Basic SQL queries, introduction to sub queries, correlated sub queries, set - comparison operators, aggregate operators, NULL values, logical operators, joins.

UNIT-IV

Normalizations: Redundancy issues, decompositions, functional dependencies, various normal forms.

UNIT-V

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A30583 – BASICS OF SOFTWARE ENGINEERING

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

1. Course Description

Course Overview

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

Course Pre/Corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

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

A30583.1 Apply the phases of software development life cycle in application development.

A30583.2 Identify software requirements for construction.

A30583.3 Design requirement engineering process for change management.

A30583.4 Apply the design concepts for design models.

A30583.5 Construct the various testing techniques for software systems.

3. Course Syllabus

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

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

4. Books and Materials

Text Book(s)

1. Roger S. Pressman, *Software Engineering*, A Practitioner's Approach, McGraw Hill, International Edition, 8^{th} edition, 2015.

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A30584 – PYTHON FOR EVERYONE

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

1. Course Description

Course Overview

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

Course Pre/Corequisites

The course has no specific prerequisite and corequisite.

2. Course Outcomes (COs)

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

A30584.1 Apply the basic constructs of Python to solve problems.

A30584.2 Organize lists, tuples and dictionaries appropriately to solve complex problems.

A30584.3 Build functions to increase code reusability.

A30584.4 Implement modular programming for organized software development.

A30584.5 Make use of exception handling for robust programming.

3. Course Syllabus

UNIT-I

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

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

UNIT-II

Data Structures: Sequence, lists, tuples, sets, dictionaries. Functional programming: filter (), map (), reduce (), python strings.

UNIT-III

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

UNIT-IV

Modules: The from…import statement, making your own modules, dir() function, the python module, modules and namespaces, packages, standard library modules.

UNIT-V

Exceptions: Introduction, handling exceptions, multiple except blocks, else clause, raising exceptions, finally block, re-raising exception.

File Handling: Introduction, need of file handling, text input and output files, seek function, binary files, extracting data from a file.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A30585 – COMPUTER 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	40	60	100

1. Course Description

Course Overview

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

Course Pre/Corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

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

A30585. 1 Analyze the fundamentals of computer organization in designing a system.

A30585.2 Apply the concepts of programming language to solve system problems.

A30585.3 Make use of the Operating Systems design structure and its services for system programming.

A30585.4 Develop Process Scheduling algorithms and Inter-Process Communication systems for resource management.

A30585.5 Classify memory management techniques and virtual memory mechanisms for apt implementations.

3. Course Syllabus

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A30587 – FUNDAMENTALS OF WEB TECHNOLOGIES

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

1. Course Description

Course Overview

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

2. Course Outcomes (COs)

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

A30587.1	Apply the principles of creating an effective web page.
A30587.2	Apply the elements of design with regard to the web.
A30587.3	Create the language of the web: HTML and CSS.
A30587.4	Develop skills in analyzing the usability of a web site.
A30587.5	Understand how to plan and conduct user related to web usability.

3. Course Syllabus

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

4. Books and Materials**Text Book(s)**

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

Reference Book(s)

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A30588 – INTRODUCTION TO JAVA PROGRAMMING

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

1. Course Description

Course Overview

This course makes the students to study the syntax, semantics and features of Java Programming Language. Learn the method of creating Multi-threaded programs and handle exceptions. Learn Java features to create GUI applications & perform event handling exceptions.

2. Course Outcomes (COs)

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

A30588.1 Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP like encapsulation, Inheritance and Polymorphism.

A30588.2 Demonstrate an ability to design and develop java programs, analyze, and interpretobject oriented data and report results.

A30588.3 Demonstrate an ability to design an object oriented system, swing components andmultithreaded processes as per needs and specifications.

A30588.4 Demonstrate an ability to visualize and work on laboratory and multidisciplinary tasks like console and windows applications both for standalone and Applets programs.

A30588.5 Demonstrate skills to use latest object oriented programming language and software t oanalyze OOP problems.

A30588.6 Develop confidence for self-education and ability for life-long learning. needed foradvanced java technologies

3. Course Syllabus

UNIT-I

The History and Evolution of Java:

Java"s Lineage, The Creation of java, how java changed the internet, **Java's magic:** The byte code, **Servlets:** java on the server side, java Buzzwords, Evolution of java.

An Overview of Java:

Object Oriented Programming, Two control statements, Using blocks of codes, Lexical issues,The java class Libraries.

Data Types, Arrays and Variables:

UNIT-II

Operators:

Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logic operators, The assignment operator, The ? Operator, Operator Precedence, Using Parentheses.

Control Statements:
Java‟s selection Statements, Iteration statements, Jump Statements.

Introducing Classes:
Class Fundamentals, Declaring Objects, Assuming Object reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The Finalize() method, A
Stack class. Overloading Methods, Using Object as Parameter, Argument Passing, Returning Objects, Recursion, Introducing Access control, Understanding static, Introducing Nested and Inner classes, Exploring the String class, Using Command line Arguments, Varargs: variable- Length Arguments.

UNIT-III

Inheritance:
Basics, Using super, creating a multi-level hierarchy, when constructors are executed, method overriding, dynamic method dispatch, using abstract class, using final with inheritance, the objectclass.

Packages and Interfaces: Packages, Access protection, Importing Packages, Interfaces, Default Interfaces, Default interface methods, Use static methods in an Interface, Final thoughts on Packages and interfaces.

Exception Handling: Exception handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try statements, throw, throws, finally, Java Built-in Exceptions, Creating your own exception subclasses, Chained Exceptions, Three Recently added Exceptions features, Using Exceptions.

UNIT-IV

Multithreaded Programming:
The java Thread Model, The main thread , Creating Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Interthread Communication, Suspending, resuming and stopping threads, Obtaining a thread state, Using Multithreading.

Input and Output operations:
I/O basics, Reading Console input, Writing console Output, The PrintWriter class, Reading andwriting files, Automatically closing a file.

UNIT-V

Introducing Swing: The Origins of Swing, Two Key Swing Features, Components and Containers, The Swing Packages, A Simple Swing Application, Event Handling, Create a SwingApplet.

Exploring Swing: JLabel and ImageIcon, JTextField, The Swing Buttons, JScrollPane, JList,JComboBox, JTree, JTable.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

1. “Programming with Java” T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan PearsonEdition.

COURSE STRUCTURE

A33147-AGILE METHODOLOGIES

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

1. Course Description

Course Overview

This course provide the students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software, good understanding of software design and a set of software technologies and APIs, to do a detailed examination and demonstration of Agile development and testing techniques, understand the benefits and pitfalls of working in an Agile team and Agile development and testing.

Course Pre/Corequisites

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2. Course Outcomes (COs)

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

1. Realize the importance of interacting with business stakeholders in determining the requirements for a software system
2. Perform iterative software development processes: how to plan them, how to execute them.
3. Point out the impact of social aspects on software development success.
4. Develop techniques and tools for improving team collaboration and software quality.
5. Perform Software process improvement as an ongoing task for development teams.
6. Show how agile approaches can be scaled up to the enterprise level.

3. Course Syllabus

UNIT I AGILE METHODOLOGY

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT II AGILE PROCESSES

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT

Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V AGILITY AND QUALITY ASSURANCE

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development

4. Books and Materials

Text Book(s)

1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.

2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

Reference Book(s)

1. Craig Larman, ―Agile and Iterative Development: A Manager‗s Guide‖, Addison-Wesley, 2004.

2. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.

COURSE STRUCTURE
A33148-HUMAN COMPUTER INTERACTION

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

1. Course Description

Course Overview:

This course provide the students with knowledge of foundations of Human Computer Interaction, can familiar with the design technologies for individuals and persons with disabilities, aware of mobile Human Computer interaction.

Course Pre/Corequisites

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2. Course Outcomes (COs)

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

A33148.1 Understand the structure of models and theories of human computer interaction and vision.
A33148.2 Understand the usability engineering models
A33148.3 Understand the cognitive models in user interface
A33148.4 Apply the user interface for mobile ecosystem
A33148.5 Design an interactive web interface on the basis of models studied.
A33148.6 Apply speech recognition and multimodal system

3. Course Syllabus

UNIT I:

Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices –Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

UNIT II:

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

UNIT III:

Cognitive models –Socio-Organizational issues and stake holder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV:

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

UNIT V:

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Recent Trends: Speech Recognition and Translation, Multimodal System

4. Books and Materials

Text Book(s)

1. David 1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004
2. Brian Fling, "Mobile Design and Development", First Edition , O Reilly Media Inc., 2009

Reference Book(s)

1. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009.

COURSE STRUCTURE

A33149-AI FOUNDATIONS FOR EVERYONE

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

1. Course Description

Course Overview:

This course provide the students with knowledge of Artificial Intelligence, machine learning environment, searching Technique for Problem Solving, Natural Language Processing and Robotics

Course Pre/Corequisites

- - -

2. Course Outcomes (COs)

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

1. Apply searching techniques for solving a problem
2. Design Intelligent Agents
3. Develop Natural Language Interface for Machines
4. Design mini robots
5. Summarize past, present and future of Artificial Intelligence

3. Course Syllabus

UNIT-I Introduction

Introduction: What is AI, Foundations of AI, History of AI, The State of Art.Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT-II Solving Problems by searching

Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

UNIT-III Reinforcement Learning & Natural Language Processing

Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

UNIT-IV Natural Language for Communication

Natural Language for Communication: Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, reconstructing the 3D World, Object Recognition from Structural information, Using Vision.

UNIT-V Robotics

Robotics: Introduction, Robot Hardware, Robotic Perception, Planning to move, Planning uncertain movements, Moving, Robotic software architectures, application domains Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right direction, What if AI does succeed.

4. Books and Materials

Text Books

1. Stuart J.Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rdEdition, Pearson Education, 2019.

Reference Books

1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.

2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.

COURSE STRUCTURE

A33150- INTRODUCTION TO DATA SCIENCE

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

1. Course Description

Course Overview:

This course provide the students with knowledge of concepts, techniques and tools they need to deal with various facets of data science, practice, including data collection and integration, basic types of data and basic statistics. Identify the importance of data reduction and data visualization techniques

Course Pre/Corequisites

- - -

2. Course Outcomes (COs)

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

1. Understand basic terms what Statistical Inference means.
2. Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data
3. describe the data using various statistical measures
4. utilize R elements for data handling
5. perform data reduction and apply visualization techniques.

3. Course Syllabus

UNIT - I

Introduction: Definition of Data Science- Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting. Basics of R: Introduction, REnvironment Setup, Programming with R, Basic Data Types.

UNIT - II

Data Types & Statistical Description

Types of Data: Attributes and Measurement, What is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes,Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting, Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays, Class. Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

UNIT - IV

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements. Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List. Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT - V

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation. Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

4. Books and Materials

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014

2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.

3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.

2. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.

3. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.

4. Paul Teetor, "R Cookbook", O'Reilly, 2011

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A33545- AD HOC AND WIRELESS SENSOR NETWORKS

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

1. Course Description

Course Overview:

This course provide the students with knowledge of Ad-hoc & Sensor Networks, various fundamental and emerging protocols of all layers, issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks, nature and applications of Ad-hoc and sensor networks, various security practices and protocols of Ad-hoc and Sensor Networks.

Course Pre/Corequisites

Computer networking concepts

2. Course Outcomes (COs)

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

1. Identify different issues in wireless ad hoc and sensor networks.
2. To analyze protocols developed for ad hoc and sensor networks.
3. To identify and address the security threats in ad hoc and sensor networks.
4. Establish a Sensor network environment for different type of applications.

3. Course Syllabus

UNIT I -MAC & TCP IN AD HOC NETWORKS

Fundamentals of WLANs, IEEE 802.11 Architecture, Self-configuration and Auto configuration, Issues in Ad-Hoc Wireless Networks, MAC Protocols for Ad-Hoc Wireless Networks,Contention Based Protocols-TCP over Ad-Hoc networks, TCP protocol overview-TCP and MANETs, solutions for TCP over Ad-Hoc Networks.

UNIT II-ROUTING IN AD HOC NETWORKS

Routing in Ad-Hoc Networks, Introduction, Topology based versus Position based Approaches, Proactive, Reactive, Hybrid Routing Approach, Principles and issues ,Location services,DREAM ,Quorums based location service, Grid–Forwarding strategies, Greedy packetforwarding ,Restricted directional flooding, Hierarchical Routing, Issues and Challenges inproviding QoS.

UNIT III-MAC, ROUTING & QOS IN WIRELESS SENSOR NETWORKS

Introduction, Architecture, Single node architecture, Sensor network design considerations ,Energy Efficient Design principles for WSNs, Protocols for WSN, Physical Layer : Transceiver Design considerations, MAC Layer Protocols ,IEEE802.15.4 Zigbee, Link Layer and Error Control issues-Routing Protocols, Mobile Nodes and Mobile Robots, Data Centric & ContentionBased Networking ,Transport Protocols & QOS, Congestion Control issues ,Application Layersupport.

UNIT IV -SENSOR MANAGEMENT

Sensor Management, Topology Control Protocols and Sensing Mode Selection Protocols, Time synchronization, Localization and positioning, Operating systems and Sensor Networkprogramming, Sensor Network Simulators.

UNIT V -SECURITY IN AD HOC AND SENSOR NETWORKS

Security in Ad-Hoc and Sensor networks, Key Distribution and Management, Software based Antitamper techniques, water marking techniques, Defence against routing attacks, Secure Adhoc routing protocols, Broadcast authentication WSN protocols, TESLA, Biba, Sensor NetworkSecurity Protocols, SPINS.

4. Books and Materials

TEXT BOOKS:

1) Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication: In Wired and Wireless Networks", Springer, 2006.
2) Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition), World Scientific Publishing, 2011.
3) C.Siva Ram,Murthy and B.S.Manoj, “Ad Hoc Wireless Networks–Architectures and Protocols”, Pearson Education, 2004.

REFERENCE BOOKS:

1) C.K.Toh, “Ad Hoc Mobile Wireless Networks”, Pearson Education, 2002.
2) Erdal Çayırcı , Chunming Rong, “Security in Wireless Ad Hoc and Sensor Networks”, John Wiley and Sons, 2009

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A33546- ETHICS IN INFORMATION TECHNOLOGY

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

1. Course Description

Course Overview:

This course provide the students with knowledge about professional ethics and understand Organizational culture and Climate, impact of IT Profession, software development Cyber laws and regulations in society. Familiarize with standards, policies, procedures and controls for Information Security Management.

Course Pre/Corequisites

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2. Course Outcomes (COs)

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

1. understand professional ethics and organizational culture conduct in information technology.
2. choose various leadership styles and the suitability for the specific organization
3. identify the possible Computer crimes and the rules and regulations for protection.
4. describe the various types of IPR and the procedures for obtaining IPR
5. explain the various types of Social Networking and issues
6. relate to the different national and international organizational models with intellectual ability.

3. Course Syllabus

UNIT 1: Overview of Professional Ethics

Professional Ethics - Big Picture View - Organizational Culture and Climate- Senses of 'EngineeringEthics- Leadership theories: Transactional, Transformational, charismatic leadership, situationalleadership- Participative style of management- Engineers as Managers - Concept of Continuousimprovement- PDCA Cycle- Suggestion Schemes and Quality circles

UNIT 2: Cyber-Crimes and Cyber Laws

Ethics for IT Workers and IT Users-IT Professionals-IT professional malpractice-IT , IT Act cyber laws - Information Technology Act, 2000 ("IT Act") - Digital Signature - Confidentiality, Integrity and Authenticity (CIA)

UNIT 3: Intellectual Property Rights

Key Issues-Intellectual Property - Software CopyRights- Patents- Patentable Software related Products- IPR Procedures- Patent Application, Publication, examination, awarding

UNIT 4: Software Development and Information Technology

Strategies to Engineer Quality Software-Key Issues in Software Development- The impact of IT onthe Standard of Living and Productivity -Industry 4.0 standards and applications in areas like Food,Water, Energy and Health care

UNIT 5: Social Networking, Ethics of Information Technology OrganizationsSocial Networking Web Site - Business Applications of Online Social Networking-Social NetworkingEthical IssuesOnline Virtual Worlds- Key ethical issues for Organizations- Outsourcing-WhistleBlowing-Green Computing-ICT

Industry Code for Conduct.

4. Books and Materials

Text Book:

1. George Reynolds, “Ethics in Information Technology”, CENGAGE Learning Fourth Edition, 2012. ISBN: 9788131518755, 8131518752

Reference Books:

1. Richard A. Spinello, “Case Studies in Information Technology Ethics”, Prentice Hall, Second Edition, 2003. ISBN:978-0130991508.

2. Sara Base, “A Gift of Fire:social, legal, and ethical issues for computing and the Internet”, Prentice Hall, Second Edition, 2008, ISBN: 978-0132492676

3. IT Act https://indiacode.nic.in/bitstream/123456789/1999/3/A2000-21.pdf

4. IPR in India Laws and Procedures: https://www.india-briefing.com/news/intellectualproperty-rights-india-laws-procedures-registration-14312.html/

5. Industry 4.0 the Fourth Industrial Revolution https://www.i-scoop.eu/industry-4-0/

6. ISMS Policy Oil India https://oilweb.oilindia.in/policy/Information_Security_Polciy_2013.pdf

COURSE STRUCTURE

A33547 - DRONE TECHNOLOGIES

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

1. Course Description

Course Overview:

This course provide the students with knowledge about the basics of drone concepts, fundaments of design, fabrication and programming of drone, flying and operation of drone, various applications of drone, safety risks and guidelines of fly safely.

Course Pre/Corequisites

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2. Course Outcomes (COs)

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

1. Analyze the impact of drone technology on various businesses.
2. Compare and contrast different methods of programming a drone.
3. Identify the various flight controls and management tools used in drone operation.
4. Utilize drones effectively in insurance inspections and claim assessments.
5. Design and implement safety protocols for operating drones in various scenarios.

3. Course Syllabus

UNIT I-INTRODUCTION TO DRONE TECHNOLOGY

Drone Concept - Vocabulary Terminology- History of drone - Types of current generation of drones based on their method of propulsion- Drone technology impact on the businesses- Drone business through entrepreneurship- Opportunities/applications for entrepreneurship and employability

UNIT II-DRONE DESIGN, FABRICATION AND PROGRAMMING

Classifications of the UAV -Overview of the main drone parts- Technical characteristics of the parts -Function of the component parts -Assembling a drone- The energy sources- Level of autonomy- Drones configurations -The methods of programming drone- Download program - Install program on computer- Running Programs- Multi rotor stabilization- Flight modes -Wi-Fi connection.

UNIT III-DRONE FLYING AND OPERATION

Concept of operation for drone -Flight modes- Operate a small drone in a controlled environment- Drone controls Flight operations –management tool –Sensors-Onboard storage capacity -Removable storage devices- Linked mobile devices and applications

UNIT IV-DRONE COMMERCIAL APPLICATIONS

Choosing a drone based on the application -Drones in the insurance sector- Drones in delivering mail, parcels and other cargo- Drones in agriculture- Drones in inspection of transmission lines and power distribution -Drones in filming and panoramic picturing

UNIT V-FUTURE DRONES AND SAFETY

The safety risks- Guidelines to fly safely -Specific aviation regulation and standardization- Drone license- Miniaturization of drones- Increasing autonomy of drones -The use of drones in swarms

4. Books and Materials

Text Book:

Editor(s):Sachi Nandan Mohanty, J.V.R. Ravindra, G. Surya Narayana, Chinmaya Ranjan Pattnaik, Y. Mohamed Sirajudeen

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A33548 -COMPUTER COMMUNICATION NETWORKS

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

1. Course Description

Course Overview:

This course provide the students with knowledge of data communication and networking, comprehend the layering architecture of OSI reference model and TCP/IP protocol suite, different protocols associated with each layers.

Course Pre/Corequisites

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2. Course Outcomes (COs)

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

1. Understand the components and layered architecture of communication networks
2. Identify the protocols and services of data link layer.
3. Analyze the different LAN technologies for building networks.
4. Describe the wireless WAN technologies for wireless transmission.
5. Design network model and determine the routing protocols for different applications.
6. Construct communication networks for supporting different applications

3. Course Syllabus

Unit I :Physical Layer

Uses of Computer Networks – Network Hardware – Network Software – Reference Models – Example Networks – Example Data Communication Services – Network Standardization –The Theoretical Basis for Data Communication – Transmission Media – WirelessTransmission – The Telephone System – Narrow band ISDN , Broadband ISDN and ATM –Cellular Radio – Communication Satellites

Unit II :Data Link Layer

Data Link Layer Design Issues – Error Detection and Correction – Elementary Data Link Protocols – Sliding Window Protocols – Protocol Specification and Verification – Example Data Link Protocols – The Channel Allocation Problem – Multiple Access Protocols – IEEE Standard 802 for LANS and MANS – Bridges – High Speed LANS – Satellite Networks

Unit III :Network Layer

Network Layer Design Issues – Routing Algorithms – Congestion Control Algorithms –Internetworking – The Network Layer in the Internet – The Network Layer in ATM Networks Transport LayerTransport Service – Elements of Transport Protocols – A simple transport protocol – TheInternet Transport Protocols (TCP and UDP) – The ATM AAL Layer Protocols – Performance Issues

Unit IV : Application Layer

Network Security – Domain Name System (DNS) – Simple Network Management Protocol (SNMP) – Electronic Mail – Usenet News – The World Wide Web – Multimedia

Unit V :ATM Networks

Introduction - ATM – Historical perspective – protocol architecture – logical connectives – cells – transmission of ATM cells – SDH – SONET – Switches. ATM Protocol – Connection setup – routing , switching

4. Books and Materials

Text Book(s)

1. Andrew S.Tanenbaum , Computer Networks, Prentice Hall of India ,1997
2. Rainer Handel, Manfred N.Huber, Stefan Schroder, ”ATM Networks”, Addison Wesley, 1999.

Reference Book(s)

1. W.Stallings ,Data and Computer Communication, Prentice Hall of India ,New Delhi, Fourth Edition ,1996
2. F.Halsai ,Data Communications, Computer Networks and Open Systems, Addison Wesley Publications , Third Edition ,1994.
3. Peterson, Computer Networks, Second edition.

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COURSE STRUCTURE
A30081 – RESEARCH METHODOLOGY

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30081.1 Interpret the importance of literature survey to identify the research problem.

A30081.2 Develop suitable research methodologies to conduct engineering research.

A30081.3 Apply the principles of research to gather the required data from various sources.

A30081.4 Evaluate the gathered data by using appropriate statistical techniques.

A30081.5 Prepare and present the research report effectively with the help of visual aids.

3. Course Syllabus

UNIT-I

Research Methodology: Objectives and motivation of research, types of research, research approaches, significance of research, research methods verses methodology, research and scientific method, important of research methodology, research process, criteria of good research, problems encountered by researchers in India, benefits to the society in general, defining the research problem: definition of research problem, problem formulation, necessity of defining the problem, technique involved in defining a problem.

UNIT-II

Literature Survey: Importance of literature survey, sources of information, assessment of quality of journals and articles, information through internet. Literature review: need of review, guidelines for review, record of research review.

UNIT-III

Research Design: Meaning of research design, need of research design, feature of a good design important concepts related to research design, different research designs, basic principles of experimental design, developing a research plan, design of experimental set-up, use of standards and codes.

UNIT-IV

Data Collection: Collection of primary data, secondary data, data organization, methods of data grouping, diagrammatic representation of data, graphic representation of data. Sample designed for sampling, some important sampling definitions, estimation of population, role of statistics for data analysis, parametric v/s non-parametric methods, descriptive statistics, measures of central tendency and dispersion, hypothesis testing, use of statistical software. Data analysis: deterministic and random data, uncertainty analysis, tests for significance: chi-square, student's t-test, regression modeling, direct and interaction effects, anova, F-test, time series analysis, autocorrelation and autoregressive modeling.

UNIT-V

Research Report Writing: Format of the research report, synopsis, dissertation, thesis its differentiation, references/bibliography/webliography, technical paper writing/journal report writing, making presentation, use of visual aids. Research proposal preparation: writing a research proposal and research report, writing research grant proposal.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

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COURSE STRUCTURE

A30082 – INTELLECTUAL PROPERTY RIGHTS

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30082.1 Analyze ethical and professional issues which arise in the intellectual property law context.

A30082.2 Apply intellectual property law principles (including copyright, patents, designs and trademarks) to real problems.

A30082.3 Analyze the social impact of intellectual property law and policy.

A30082.4 Make use of copyrighted material so that it does not obstruct the progress of human knowledge.

A30082.5 Analyze IPR policies before filing patentable inventions and discoveries.

3. Course Syllabus

UNIT-I

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

UNIT-II

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

UNIT-III

Law of Copy Rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: foundation of patent law, patent searching process, ownership rights and transfer.

UNIT-IV

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: misappropriation right of publicity, false advertising.

UNIT-V

New Developments of Intellectual Property: New developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law, international development in trade secrets law.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

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COURSE STRUCTURE
A30083 – NATIONAL SERVICE SCHEME

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

1. Course Description

Course Overview

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

Course Pre/corequisites

This course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30083.1 Classify the organizational structure of NSS and its activities.

A30083.2 Identify the methods of mobilization and importance of youth Leadership.

A30083.3 Develop a sense of social and civic responsibility and provide solutions to individual and community problems.

A30083.4 Recognize the need for lifelong learning capabilities with the concepts of volunteerism and its functions.

A30083.5 Develop capacity to meet emergencies and natural disasters.

3. Course Syllabus

UNIT-I

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

UNIT-II

NSS Programmes and Activities - Concept of regular activities, special camping, Day Camps, basis of adoption of village/slums. Methodology of conducting Survey, financial pattern of the scheme, other youth prog. /schemes of Goal, coordination with different agencies, maintenance of the Diary.

UNIT-III

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

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

UNIT-IV

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

UNIT-V

Volunteerism and Shramdan: Indian Tradition of volunteerism, needs & importance of volunteerism, motivation and constraints of volunteerism, shramdan as a part of volunteerism.

4. Books and Materials

Reference Book(s)

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

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COURSE STRUCTURE
A30084 – YOGA

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

1. Course Description

Course Overview

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

Course Pre/corequisites

There is no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30084.1 Improve physical conditioning related to flexibility through participation in yoga.

A30084.2 Develop and maintain a personal yoga practice.

A30084.3 Recognize and apply the value and benefits of an on-going yoga practice.

A30084.4 Select asanas appropriate for personal needs.

A30084.5 Identify and apply relaxation techniques for stress reduction.

3. Course Syllabus

UNIT-I

Introduction of human body and its systems, definition of anatomy and physiology and importance in yogic practices, respiratory system, digestive system, endocrine system. Origin of yoga & its brief development, meaning of yoga & its importance, yoga as a science of art (yoga philosophy), meaning of meditation and its types and principles.

UNIT-II

Classification of yoga/types of yoga - hatha yoga, raja yoga, laya yoga, bhakti yoga, gyan yoga, karma yoga, asthang yoga.

UNIT-III

Classification of asanas and its mechanism, cultural asana (standing, sitting, supinline, praline position & topsy-turvy), meditative asana and relaxative asana, nervous system, circulatory system.

UNIT-IV

Introduction of Kriya, bandha and mudra, importance of KRIYA and its scientific approach, importance of BANDHA and its scientific approach, importance of MUDRA and its scientific approach.

UNIT-V

Effect of asanas on various systems, difference between asana and exercise, difference between pranayama and deep breathing and yogic diet.

4. Books and Materials

References:

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

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COURSE STRUCTURE

A30085 – DESIGN THINKING

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

1. Course Description

Course Overview

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

Course Pre/corequisites

This course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30085.1 Appreciate various design processes for creativity and innovation.

A30085.2 Develop design ideas through different techniques.

A30085.3 Identify the significance of reverse engineering about products.

A30085.4 Make use of design drawings to communicate ideas effectively.

A30085.5 Build organizations that support creative and innovative thinking.

3. Course Syllabus

UNIT-I

Introduction to design thinking, definition, why is design thinking important, how is design thinking different, process of design - introduction – product life cycle - design ethics, creativity, innovation and design, design process - creativity and innovation in design process - design limitation, preparing mind for innovation-the physics of innovation.

UNIT-II

Idea generation- The idea, generation process, mind mapping tool. Experimentation-What works, learning launch tool, strategic opportunities, creative people, creative organizations, ideas, and tools to help both people and organizations work more creatively.

UNIT-III

Creative thinking - generating design ideas - lateral thinking –analogies – brainstorming - mind mapping - national group technique – synectic's - development of work - analytical thinking - group activities recommended.

UNIT-IV

Reverse engineering - introduction - reverse engineering leads to new understanding about products -reasons for reverse engineering - reverse engineering process - step by step – case study.

UNIT-V

Basics of drawing to develop design ideas- introduction - many uses of drawing - communication through drawing – drawing basis - line - shape/ form – value – colour – texture –overview of drawing -practice using auto cad recommended.

4. Books and Materials

Text Book(s)

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

Reference Online Resources

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A30086 – MANAGEMENT SCIENCE

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30086.1 Apply the concepts, theories, and principles of management in professional life.

A30086.2 Design suitable organization structure for managing the operations in the organization.

A30086.3 Apply principles of management to the various functional areas of an organization such as Human Resource, Marketing and Production.

A30086.4 Evaluate cost and time of each business project by using PERT and CPM techniques.

A30086.5 Formulate the new strategies that enhance competitive edge.

3. Course Syllabus

UNIT-I

Introduction to Management: Concept-Nature and importance of management, functions-evaluation of scientific management, modern management-motivation theories-leadership styles-decision making process-designing organization structure-principles and types of organization.

UNIT-II

Operations Management: Plant location and layout, methods of production, work-study- statistical quality control through control charts, objectives of inventory management, need for inventory control – EOQ & ABC analysis (simple problems)

Marketing Management: Meaning, nature, functions of marketing, marketing mix, channels of distribution - advertisement and sales promotion - marketing strategies - product life cycle.

UNIT-III

Human Resource Management: Significant and basic functions of HRM-Human Resource Planning (HRP), job evaluation, recruitment and selection, placement and induction-wage and salary administration, employee training and development – Methods - Performance appraisal - employee grievances - techniques of handling Grievances.

UNIT-IV

Strategic Management: Vision, mission, goals and strategy- corporate planning process-environmental scanning-SWOT analysis-Different steps in strategic formulation, implementation and evaluation.

Project Management: Network analysis-PERT, CPM, identifying critical path-probability-project cost analysis, project crashing.

UNIT-V

Contemporary Management Issues & Practices: Basic concepts of MIS-Materials Requirement Planning (MRP),Just-In-Time (JIT) system, Total Quality Management(TQM)-Six Sigma and Capability Maturity Models (CMM) evies, Supply Chain Management, Enterprise Resource Planning (ERP), Performance Management, Business Process Outsourcing(BPO), business process re-engineering, bench marking, and balance score card.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

1. Ashima B. Chhalill, P. Vijaya Kumar, N. AppaRaohalill, *Introduction to Management Science*, 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

A30087 – ENTREPRENEURSHIP DEVELOPMENT

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

1. Course Description

Course Overview

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

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

A30087.1 Analyze the nature of entrepreneurship, risk and reward in modern business scenario.

A30087.2 Identify the business challenges and opportunities by various case studies.

A30087.3 Assess the promotion and institutional support by various agencies in India.

A30087.4 Evaluate the role of angel investors in promotion and expansion of start-ups in India.

A30087.5 Prepare effective and feasible project proposals and project reports.

3. Course Syllabus

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

4. Books and Materials

Text Books:

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

Reference Books:

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A30094 – ENTREPRENEURSHIP

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

4. Course Description

Course Overview

This course provides a comprehensive exploration of entrepreneurship as a key driver of business growth and economic value. It offers essential frameworks for success and pathways to sustainable development, covering each theme with both conceptual and practical insights. By the end of the course, students will understand entrepreneurship's role in economic progress, gain clarity on success factors and risk mitigation, and develop skills to navigate the challenges of entrepreneurship effectively.

Course Pre/corequisites

B3719- Entrepreneurship and Start -Up

2. Course Outcomes (COs)

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

A30094.1: Identify business opportunities through market research and competitive analysis.
A30094.2 Apply ideation techniques to create prototypes and MVPs for new ventures.
A30094.3 Evaluate the dynamics of business growth and the role of entrepreneurship in employment creation.
A30094.4: Analyze the impact of technological innovation on entrepreneurship
A30094.5: Explore funding sources and create financial strategies for startups.

3. Course Syllabus

UNIT-I

The Entrepreneurial Process Entrepreneurial Journey
Introduction to the entrepreneurial process, key stages, milestones, and challenges. Success stories and case studies of prominent entrepreneurs
Entrepreneurial Discovery-Techniques for identifying business opportunities and unmet market needs. Tools such as market research, competitive analysis, and consumer behavior insights.
Ideation and Innovation: Ideation and Prototyping-Creative techniques for generating ideas. Steps for developing prototypes and minimum viable products (MVP) using iterative methods and design thinking.

UNIT-II

Testing, Validation, and Commercialization-Strategies for product testing and customer validation. Refining business ideas based on feedback and scaling ideas into commercially viable products and services.
Disruption as a Success Driver-Understanding disruption in industries and its role in driving entrepreneurial success. Case studies of disruptive businesses and lessons on leveraging disruption for growth.
Technological Innovation and Entrepreneurship– 1 -The impact of emerging technologies (AI, blockchain, IoT, etc.) on entrepreneurship. Leveraging technology for innovation and competitive advantage.

UNIT-III

Technological Innovation and Entrepreneurship – 2
Advanced strategies for integrating technological innovation into startups. Digital transformation, automation, and scaling through tech-enabled processes.
Raising Financial Resources
Overview of funding sources such as venture capital, angel investors, and crowdfunding. Strategies for securing funding and best practices for financial management.
Education and Entrepreneurship-The role of education in fostering entrepreneurship. Developing entrepreneurial skills in academic institutions and promoting entrepreneurship as a career path.

UNIT-IV
Beyond Founders and Founder-Families Challenges of scaling a business beyond the founder. Building strong leadership teams and succession planning for family-owned and founder-led businesses.

India as a Start-up Nation-Overview of India's startup ecosystem. Government policies, initiatives, and success stories that support and promote startups in India.

National Entrepreneurial Culture-Examining how different national cultures influence entrepreneurship. A comparative study of entrepreneurial ecosystems across the globe

UNIT-V

Entrepreneurial Thermodynamics-The dynamics of business growth and the concept of "entrepreneurial energy." Strategies for maintaining momentum and managing burnout in startups**.**

Entrepreneurship and Employment-How entrepreneurship contributes to job creation and economic growth. The relationship between startups, employment generation, and economic development**.**

Start-up Case Studies-In-depth analysis of real-world startups. Lessons learned from both successful ventures and failures across various industries.

4. Books and Materials

Text Book(s)

1. Arya Kumar, Entrepreneurship, Pearson, Delhi, 2012.
2. Poornima M, Entrepreneurship Development –Small Business Enterprises, Pearson, Delhi, 2009

Reference Book(s)

5. Michael H. Morris, et. al., Entrepreneurship and Innovation, Cengage Learning, New Delhi, 2011
6. KanishkaBedi, Management and Entrepreneurship, Oxford University Press, Delhi, 2009
7. Good Enough! To Launch Your Company, by Randal Wimmer, Joshua Ducharme, 2023
8. Start Your Business With Confidence, by Jeff Bezos, 2023

Reference Online Resources/Materials:

3. https://onlinecourses.nptel.ac.in/noc24_mg93/announcements?force=true

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A30091 – MANAGEMENT INFORMATION SYSTEM

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	2	42	0	0	2	40	60	100

1. Course Description

1. The objective of this course focuses on the design, implementation and management of information systems in organizations.

2. It integrates technology, people, and processes to provide effective solutions for business operations and decision-making.

3. The course provides a deep understanding of how information systems support organizational functions, improve business processes, and drive strategic initiatives.

2. Course Outcomes (COs)

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

A30091.1 Understand the Fundamentals of Management Information Systems

A30091.2 Understand the Foundations of Business Intelligence (BI)

A30091.13Understand IT Strategy and its Role in Business Success

A30091.4 Technologies are shaping modern IT infrastructures and driving innovation

A30091.1 Understand and Apply Knowledge Management Principles

3. Course Syllabus

UNIT I

Introduction to Management Information systems: Types of MIS, Capabilities, Complements, CCR Framework; Role of manager with respect to IT in an organization, Database management systems, Data Warehousing

UNIT II

Foundations of business intelligence, Data and Text Mining, Strategic Enterprise Systems - ERP, SCM, CRM, SRM, Operational Support Systems - Manufacturing Systems, Sales and Marketing Systems, HRIS, Finance and Accounting Systems

UNIT III

IT Strategy and Balanced Scorecard – IT strategies, IT- business alignment, balanced scorecard, cloud and vendor strategies, Mobile and E-commerce – B2C, B2B and e-procurement, C2C and mobile commerce

UNIT IV

Emerging Technologies – Cloud computing, Big Data Technologies, Internet of Things, Bring Your Own Device (BYoD,) Virtual Reality, Augmented Reality, Block chain, Artificial Inelligence.

UNIT V

Knowledge Management – Decision Support Systems, Expert Systems, Learning Management Systems, Executive Information Systems, Social , ethical and security Issues in Management information system

4. Books and Materials

1. Kenneth C. Laudon & Jane P. Laudon. “Management Information Systems”. Pearson Publishing.
2. Reading material from Harvard Business School Repository