SRI KRISHNADEVARAYA UNIVERSITY :: ANANTAPUR
College of Engineering & Technology
Academic Regulations 2019 (R19) for
B. Tech (Regular-Full time)

(With effect from the Academic Year 2019-20 for the students admitted into I year I semester)

1. Award of B.Tech. Degree

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

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

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

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

3. Programs offered by the College:

The following programs are offered at present as specializations for the B. Tech. course from 2019- 2020

S. No.	Branch	Program Code
01.	Computer Science & Engineering	01
02.	Electronics and Communication Engineering	02
03.	Mechanical Engineering	03
04.	Electrical and Electronics Engineering	04
05.	Civil Engineering	05

and any other course as approved by the authorities of the University from time to time.

The entire course of study is of four academic years in semester pattern (for regular students) and of three academic years in semester pattern (for lateral entry students).

4. About Program related terms:

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/Tutorial) 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 criterion:

	Semester	
	Hours / Week	Credits
Theory (Lecture/Tutorial)	02	02
	03	03
	04	04
Practical	02	01
	03	1.5
	04	02
Project stage - I	04	02
Project stage – II	14	07

5. Weights for Course Evaluation:

5.1 **Course Pattern:**

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

5.2 **Evaluation Process:**

The performance of a student in each semester for academic year I,II,III,IV shall be evaluated subject wise with a maximum of 100 marks for theory and 75 marks for practical subject. Project stage-I, Socially relevant project and Internship shall be evaluated for 50 marks each & Project stage-II shall be evaluated for 200 marks whereas mandatory courses with no credits shall be evaluated for 30 internal marks.

1. For theory subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
2. For practical subjects the distribution shall be 25 marks for Internal Evaluation and 50 marks for the End- Examination.

5.3 **Internal Examination Evaluation:**

i. For theory subjects, during the semester there shall be 2 midterm examinations. Each midterm examination consists of subjective paper for 25 marks with duration of 1hour 30 minutes.

   First midterm examination shall be conducted for the first half of the syllabus in the middle of the semester and second midterm examination shall be conducted for the second half of the syllabus towards the end of the semester. A weightage of 0.75 for better score and 0.25 for the other score will be considered for awarding the sessional marks in both the midterm examinations. There shall be two assignments in each semester for award of 05marks so that midterm component will be 30marks (25 for midterm examinations + 05 marks for assignments).

   ***Note 1:** The subjective paper shall contain Section A with 2 questions of equal weightage of 10 marks and student shall answer any one.Section B shall contain 4 questions equal weightage of 5 marks and student shall answer any three .Any fraction (0.5 & above) shall be rounded off to the next higher mark.
   ***Note 2:** The assignment shall contains 5 questions of equal weightage of 1 mark each. Which are essay type questions/numerical problems/software development.

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

Final Internal marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 75% weightage given to the better mid exam and 25% to the other.

For Example:

Marks obtained in first mid : 24
Marks obtained in second mid : 20
Final Internal Marks: (24x0.75) + (20x0.25) = 23

If the student is absent for any one midterm examination, the final internal marks shall be arrived at by considering 75% weightage to the marks secured by the student in the appeared examination and zero to the other. For Example:

Marks obtained in first mid : Absent
Marks obtained in second mid : 24
Final Internal Marks: (24x0.75)+ (0x0.25) =18

5.4 **End Examination Evaluation:**

i. End examination of theory subjects shall have the following pattern:
   a. There shall be 8 questions and each question carries 14 marks and Student shall answer any five of them.

5.5 For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 50 end examination marks. Day-to-day work in the laboratory shall be evaluated for 25 marks by the concerned laboratory teacher based on the regularity/record/viva/Internal test. The end examination shall be conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.

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

5.7 The Engineering Drawing/Graphics course, offered is to be treated as a Theory Course. Evaluation method adopted shall be same as for any other Theory Course. The Internal evaluation for sessionals will be 15 marks for day-to-day work in the class that shall be evaluated by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm exams in a semester for a duration of 2 hrs each, evenly distributed over the syllabi, for 15 marks giving a weightage of 0.75 for the better score and 0.25 for the other score will be considered. The sum of day to day evaluation and the internal tests will be the final sessionals for the subject

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5.8 The laboratory records and internal test papers shall be preserved for a minimum of 2 years in the respective departments as per the Institution norms and shall be produced to the Committees as and when the same are asked for.

5.9 Procedure for Conduct and Evaluation of MOOC:

- There shall be a Discipline Centric Elective Course through Massive Open Online Course

(MOOC) in IV Year 2nd semester as Program Elective course. The student shall register for the course (Minimum of 40 hours) offered by authorized Institutions/Agencies, through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor for each of the MOOC subjects offered and the mentor appointed shall conduct the internal examinations following the guidelines given in 5.3. Further, the external examination for the MOOC subject will be conducted in line with other regular subjects (5.4) based on the syllabi of the respective subject provided in the curriculum. A MOOC course may be studied either in online or in conventional manner (or) MOOC online courses conducted under SWAYAM can be given weightage as per the norms.

- From second year onwards, every student should register at least one online course in each semester as mandatory and audit course. he/she should submit course completion certificate in each semester.

5.10 There shall be two Open Electives and three inter-disciplinary electives which are **Choice Based Credit Courses (CBCC)** from III Year I Semester onwards, wherein the students have to choose inter-disciplinary electives offered by various other departments. These courses can be pursued in MOOC manner or the Conventional manner.

5.11 A **Socially relevant Project** is introduced in II Year 2nd, III Year 1st, III Year 2nd and IV Year 1st Semester for 0.5 credits in each semester. The student has to spend 15 Hrs./semester on any socially relevant project and submit a report for evaluation. This shall be evaluated for 50 marks in each of the above semesters by a committee consisting of Head of the department, Project mentor and one senior faculty member of the department. A student shall acquire 0.5 credits assigned, when he/she secures 40% or more marks for the total of 50 marks. In case, if a student fails, he/she shall resubmit the report. There shall be no external evaluation.

5.12 There shall be one **Comprehensive online examination** with zero credits conducted by the institution at the end of III Year 2nd semester with 100 objective questions for 100 marks on the subjects studied up to III Year 2nd semester.

Student shall be declared to have passed the Comprehensive online examination only when he/she secures 40% or more marks in the examination. In case, the student fails, he/she shall reappear as and when III Year 2nd semester supplementary examinations are conducted.

5.13 An **Internship/Industrial Training/Research Projects in National Laboratories/Academic Institutions** is introduced for 2 credits in the curriculum. It is introduced at the end of III Year 2nd semester i.e., during summer vacation for a period of 4 weeks. The student shall submit a diary and a technical report for evaluation. This shall be evaluated in the IV Year 1st semester for 50 marks by a committee consisting of Head of the Department along with two senior faculty members of the Department. A student shall acquire 2 credits assigned, when he/she secures 40% or more marks for the total of 50 marks. In case, if a student fails, he/she shall reappear as and when the IV Year 1st semester supplementary examinations are conducted. There shall be no external evaluation.

5.14 **Procedure for Conduct and Evaluation of Project Stage – I:**

There shall be a presentation of **Abstract of the main project** in the IV Year 1st Semester. After selecting the specific topic, the student shall collect the information and prepare a report, showing his/her understanding of the topic and submit the same to the department before presentation. The report and the presentation shall be evaluated by the departmental committee consisting of Head of the Department, Project supervisor and a senior faculty member. It shall be evaluated for 50 marks. A student shall acquire 2 credits assigned to the Project stage-I, when he/she secures 40% or more marks for the total of 50 marks. The

Project stage-I shall be evaluated at the end of IV Year 1st semester by the department committee. There shall be no external evaluation for Project stage-I.
In case, if a student fails in Project stage-I, a reexamination shall be conducted within a month. In case if he/she fails in the reexamination also, he/she shall not be permitted to register for Project Stage-II. Further, such students shall reappear as and when IV Year 1st semester supplementary examinations are conducted.

5.17 **Procedure for Conduct and Evaluation of Project Stage – II:**
Out of a total of 200 marks for the **Project stage - II**, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination (Viva-voce). The Viva-Voce shall be conducted by a committee consisting of HOD, Project Supervisor and an External Examiner nominated by the head of the Institution**.** Project work shall start in IV Year 1st semester and shall continue in the IV Year 2nd semester. The evaluation of project work shall be conducted at the end of the IV Year 2nd semester.The Internal Evaluation shall be made by the departmental committee (Head of the Department, senior faculty member of the department and Supervisor), on the basis of two seminars given by each student on the topic of his/her project.

6. Attendance Requirements in Academics:

6.1. A student shall be eligible to appear for University examinations if he/she acquires a minimum
of 75% of attendance in aggregate of all the subjects in a semester.
6.2. 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.
6.3 Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
6.4 A stipulated fee shall be payable towards condonation of shortage of attendance to the Institution.
6.5 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
6.6 A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester when offered next.
6.7 The aggregate percentage of attendance can be rounded to next integer for the purpose of considering for condonation/detention.
For example:

- A candidate getting ≥64.5 may be condoned, may be rounded to 65. No attendance shall be added but for condoning purpose can only be considered.

7. Minimum Academic Requirements and Award of the Degree:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in section 6.

7.1 A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal and end examination marks taken together.

7.2 A student shall be promoted from II Year 2nd to III Year 1st Semester only if he/she fulfils the academic requirement of securing **24 credits** in the subjects that have been studied up to II Year 1st Semester.

7.3 A student shall be promoted from III Year 2nd semester to IV Year 1st semester only if he/she fulfils the academic requirements of securing **42 credits** in the subjects that have been studied up to III Year 1st semester

And in case a student is detained for want of credits for particular academic year by sections 7.2 and 7.3 above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the III Year 1st semester or IV Year 1st semester as the case may be.

7.4 A student shall register and put up minimum attendance in all 160 credits and earn all the 160 credits.

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

8. With–holding of Results:

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him/her or candidate or student, the result of the candidate shall be withheld and the candidate will not be allowed/promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

9. Award of Grades:

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

Structure of Grading of Academic Performance

Range in which the marks in the subject fall	Grade	Grade points Assigned
≥ 90	S (Superlative)	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)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

i. A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.

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

9.1. 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.,

$$SGPA = \Sigma (C_i \times G_i)/\Sigma C_i$$

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

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

$$CGPA = \Sigma (C_i \times S_i)/ \Sigma C_i$$

where "S_i" is the SGPA of the i^{th} semester and C_i is the total number of credits upto that semester.

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

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

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

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

10. Award of Class:

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

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 4.5 < 5.5$

11. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is 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 full-time entrepreneurship. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The Principal of the college shall take the decision on proposals submitted by the students. An evaluation committee constituted by the Principal of the College shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not.

12. Transitory Regulations:

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfillment of academic regulations. Candidates who have been

detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for rejoining into the succeeding year of their B. Tech from the date of commencement of class work, subject to Section **2** and they will follow the academic regulations into which they are readmitted.

13. Minimum Instruction Days for a Semester:

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

14. Medium of Instruction:

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

15. General Instructions:

a. The academic regulations should be read as a whole for purpose of any interpretation.

b. Malpractices rules-nature and punishments are appended.

c. Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.

d. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

e. The Principal may change or amend the academic regulations of common B.o.S or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Principal.

f. The above rules and regulations are to be approved/ratified by the College Academic Council as and when any modifications are to be done.

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

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

1. Award of B.Tech. Degree

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

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

b) Registers for *120* credits and secures all *120* credits from II to IV year of Regular B. Tech. program.

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

3. The regulations **3** to **6** except 5.1 are to be adopted as that of B. Tech. (Regular).

4. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.**5**

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

ii A student shall be promoted from III year 2nd Semester to IV year 1st Semester only if the student fulfills the academic requirements of securing **25 credits** of the subjects that have been studied up to III Year 1st Semester**.**

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

5. Course Pattern

5.1. The entire course of study is three academic years on semester pattern.

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

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

6. The regulations **8** to **16** 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).

7. Minimum Academic Requirements and Award of the Degree:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in section 6.

RULES FOR
DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

S. No.	**Nature of Malpractices/Improper conduct**	**Punishment**
	If the Candidate:	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
1 (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The Hall Ticket of the candidate is to be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred for four consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for four consecutive semesters from class work and all examinations, if his involvement is established. Otherwise, the candidate is debarred for two consecutive semesters from class work

		and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject only.
6	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. If the candidate physically assaults the invigilator/ officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or Intentionally tears of the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining

		examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all the examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9	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 clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person (s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations, depending on the recommendation of the committee.

Note: -

Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he has to register for End Examinations in that subject/subjects consequently and has to fulfill all the norms required for the award of Degree.

Sri Krishnadevaraya University College of Engineering & Technology
Curriculum B. Tech Course Structure – R19
MECHANICAL ENGINEERING

Common for All Branches of Engineering				
S.No	**Course No**	**Course Name**	**Category**	**L-T-P-C**
1		Physical Activities – Sports, Yoga and Meditation, Plantation	MC	0-0-12-0
2		Career Counseling	MC	4-0-4-0
3		Orientation to all branches – career options, tools, etc.	MC	6-0-0-0
4		Orientation on admitted Branch – corresponding labs, tools and platforms	EC	4-0-6-0
5		Proficiency Modules & Productivity Tools	ES	4-2-4-0
6		Assessment on basic aptitude and mathematical skills	MC	4-0-6-0
7		Remedial Training in Foundation Courses	MC	4-2-4-0
8		Human Values & Professional Ethics	MC	6-0-0-0
9		Communication Skills – focus on Listening, Speaking, Reading, Writing skills	BS	4-2-4-0
10		Concepts of Programming	ES	4-0-4-0
Total				40-6-44-0

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
I Year 1st Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Mathematics- I	BS	3-1-0	4
2.		Engineering Chemistry	BS	2-1-0	3
3.		Problem Solving & Programming	ES	3-1-0	4
4.		Communicative English 1	HS	2-0-0	2
5.		Basic Engineering Workshop	LC	0-0-2	1
6.		Engineering Chemistry Lab	BS	0-0-3	1.5
7.		Problem Solving & Programming Lab	ES	0-0-3	1.5
8.		Communicative English Lab-1	HS	0-0-2	1
9.		Environmental Sciences	MC	3-0-0	0
				Total	**18**

Category	**CREDITS**
Basic Science course	8.5
Engineering Science Courses(Including LC)	6.5
Humanities and Social science	3
TOTAL CREDITS	**18**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
I Year 2nd Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Mathematics- II	BS	3-1-0	4
2		Engineering Physics	BS	2-1-0	3
3		Basic Electrical & Electronics Engineering	ES	3-0-0	3
4		Data Structures	ES	3-0-0	3
5		Civil Engineering Workshop	LC	0-0-2	1
6		Engineering Graphics	ES	1-0-4	3
7		Basic Electrical & Electronics Engineering Lab	ES	0-0-3	1.5
8		Engineering Physics Lab	BS	0-0-3	1.5
9		Data Structures Lab	ES	0-0-4	2
10		Constitution of India	MC	3-0-0	0
				Total	**22**

Category	**CREDITS**
Basic Science course	8.5
Engineering Science Courses(Including LC)	13.5
TOTAL CREDITS	**22**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
II Year 1st Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Mathematics- III	BS	3-0-0	3
2.		Manufacturing Processes	PC	3-0-0	3
3.		Engineering Mechanics	PC	3-0-0	3
4.		Thermodynamics	PC	3-0-0	3
5.		Fluid Mechanics & Hydraulic Machinery	PC	3-0-0	3
6.		Managerial Economics & Financial Analysis	HS	3-0-0	3
7.		Machine Drawing	PC	0-0-3	1.5
8.		Manufacturing Processes Lab	PC	0-0-2	1
9.		Fluid Mechanics & Hydraulic Machinery Lab	PC	0-0-2	1
				Total	**21.5**

Category	**CREDITS**
Basic Science course	3
Professional core Courses	15.5
Humanities and Social science	3
TOTAL CREDITS	**21.5**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
II Year 2nd Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Mathematics- IV	BS	3-0-0	3
2		Life science for Engineers	HS	3-0-0	3
3		Mechanics of Materials	PC	3-0-0	3
4		Material Science and Engineering	PC	3-0-0	3
5		Thermal Engineering-I	PC	3-0-0	3
6		Python Programming	ES	3-0-0	3
7		Material Science and Engineering Lab	PC	0-0-3	1.5
8		Mechanics of Materials Lab	PC	0-0-3	1.5
				Total	**21**

Category	**CREDITS**
Professional core Courses	15
Humanities and Social Sciences	3
Basic Science Courses	3
Engineering Science Course	3
TOTAL CREDITS	**21**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
III Year 1st Semester 1					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Thermal Engineering-II	PC	3-0-0	3
2.		Metrology and Measurements	PC	3-0-0	3
3.		Heat Transfer	PC	3-0-0	3
4.		Design of Machine Elements - I	PC	3-0-0	3
5.		**Professional Elective - I** 1. Manufacturing Technology 2. Mechanical Behavior of Materials 3. Industrial Engineering and Management	PE-I	3-0-0	3
6.		Open Elective - I	OE-I	3-0-0	3
7.		Metrology & Measurements Lab	PC	0-0-3	1.5
8.		Thermal Engineering-I Lab	PC	0-0-3	1.5
9.		Socially Relevant Project(15hrs/Sem)	PR	- - -	0.5
				Total Credits	**21.5**

Category	**CREDITS**
Professional core courses	15
Professional Elective courses	03
Open Elective Course/Job oriented elective	03
Socially Relevant Project(15hrs/Sem)	0.5
TOTAL	21.5

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
III Year 2nd Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Kinematics and Dynamics of Machinery	PC	3-0-0	3
2		Design of Machine Elements - II	PC	3-0-0	3
3		CAD/CAM	PC	3-0-0	3
4		Internal Combustion Engines	PC	3-0-0	3
5		**Professional Elective - II** 1. Refrigeration and Air Conditioning 2. Design of Transmission of systems. 3. Composite Materials	PE-II	3-0-0	3
6		Open Elective -II	OE-II	3-0-0	3
7		Thermal Engineering-II Lab	PC	0-0-3	1.5
8		CAD/CAM Lab	PC	0-0-3	1.5
9		Socially Relevant Project(15hrs/Sem)	PR	- - -	0.5
10		Industrial Training/ Internship/ Research Projects in National Laboratories/Academic Institutions	PR	- - -	- - -
				Total credits	**21.5**

Category	**CREDITS**
Professional Core Courses	15
Professional Elective Courses	03
Open Elective Course/Job oriented elective	03
Socially Relevant Project(15hrs/Sem)	0.5
TOTAL	21.5

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
IV Year 1st Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Tool Design	PC	3-0-0	3
2.		Operations Research	PC	3-0-0	3
3.		Non Conventional Sources of Energy	PC	3-0-0	3
4.		Non Destructive Testing	PC	3-0-0	3
5.		**Professional Elective - III** 1. Automobile Engineering 2. Organisational Behaviour 3. Solar Energy Systems	PE-III	3-0-0	3
6.		**Professional Elective - IV** 1. Robotics 2. Power Plant Engineering 3. Optimization Techniques through MATLAB	PE-IV	3-0-0	3
7.		Project I	PR	---	2
8.		Socially Relevant Project(15hrs/Sem)	PR	- - -	0.5
		Industrial Training/ Internship/ Research Projects in National Laboratories/Academic Institutions	PR	- - -	1
9.		Tool Design	PR	- - -	1
				Total	**21.5**

Category	**CREDITS**
Professional Core Courses	12
Professional Elective Courses	6
Project I	2
Socially Relevant Project(15hrs/Sem)	0.5
Industrial/Research Internship	1
TOTAL CREDITS	**21.5**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
IV Year 2nd Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		**Professional Elective - V** 1.Finite Element Analysis 2.Energy Conservation and Management 3.Total Quality Management	PE-V	3-0-0	3
2		**Professional Elective -VI** 1.Computational Fluid Dynamics 2.Entrepreneurship 3.Cryogenics	PE-VI	3-0-0	3
3		Project II	PR	- - -	7
				Total	**13**

Category	**CREDITS**
Professional Elective courses	3
Open Elective Course/Job oriented elective	3
Project II	7
TOTAL CREDITS	**13**

Open Electives offered by Dept. of Mech. Engineering

1. Manufacturing Process
2. Entrepreneurship
3. IC Engines
4. Automobile Engineering
5. Non Conventional Sources of Energy
6. Non Destructive Evaluation

Open Electives offered by Dept. of E.E.E

1. Introduction to Hybrid Electric Vehicles
2. Electrical Engineering Materials
3. Generation of Electric Power
4. Control Systems
5. Renewable Energy Sources
6. Fundamentals of Power Electronics

Open Electives offered by Dept. of E.C.E

1. Fundamentals of Digital Electronics
2. Fundamentals of Communication Systems
3. Signals and Systems
4. Microprocessors and Microcontrollers
5. Electronic Measurements and Instrumentation
6. Embedded Systems
7. Basics of VLSI
8. Principles of Digital Signal Processing
9. Introduction to Image Processing

Open Electives offered by Dept. of C.S.E

1. Database Management Systems
2. Unix Programming
3. Object Oriented Programming through Java
4. Cyber Security
5. Computer Networks
6. Software Engineering
7. Cloud Computing
8. Introduction to Operations Management
9. Block Chain Technology

Open Electives offered by Dept. of Civil Engineering

1. Environmental Impact Assessment
2. Noise and Air Pollution
3. Disaster Mitigation And Management
4. Ground Improvement Techniques
5. Environmental Pollution Control
6. Remote Sensing and GIS

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
I Year 1st Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Mathematics- I	BS	3-1-0	4
2.		Engineering Chemistry	BS	2-1-0	3
3.		Problem Solving & Programming	ES	3-1-0	4
4.		Communicative English 1	HS	2-0-0	2
5.		Basic Engineering Workshop	LC	0-0-2	1
6.		Engineering Chemistry Lab	BS	0-0-3	1.5
7.		Problem Solving & Programming Lab	ES	0-0-3	1.5
8.		Communicative English Lab-1	HS	0-0-2	1
9.		Environmental Sciences	MC	3-0-0	0
				Total	**18**

Category	**CREDITS**
Basic Science course	8.5
Engineering Science Courses(Including LC)	6.5
Humanities and Social science	3
TOTAL CREDITS	**18**

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – I Year 1 Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
	Mathematics-I	**3**	**1**	**0**	**4**
	(Calculus & Algebra)				

(Common to all branches of Engineering)

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Bridge Course: Limits, continuity, Types of matrices

Unit I: Matrix Operations and Solving Systems of Linear Equations

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

Learning Outcomes:

At the end of this unit, the student will be able to

- solving systems of linear equations, using technology to facilitate row reduction determine the rank, eigenvalues and eigenvectors, diagonal form and different factorizations of a matrix;
- identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics;

Unit II:Mean Value Theorems

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof);

Learning Outcomes:

At the end of this unit, the student will be able to

- Translate the given function as series of Taylor's and Maclaurin's with remainders
- analyze the behaviour of functions by using mean value theorems

Unit III: Multivariable calculus

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies.
- Acquire the Knowledge maxima and minima of functions of several variable
- Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables

Unit IV: Double Integrals

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

Learning Outcomes:

At the end of this unit, the student will be able to

- Evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates
- Apply double integration techniques in evaluating areas bounded by region

Unit V: Multiple Integrals and Special Functions

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

Learning Outcomes:

At the end of this unit, the student will be able to

- Conclude the use of special function in multiple integrals
- evaluate multiple integrals in Cartesian, cylindrical and spherical geometries

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, 201.

Course Outcomes:

At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications
- Utilize mean value theorems to real life problems
- familiarize with functions of several variables which is useful in optimization
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
- Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – I Year 1 Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		2	**1**	**0**	**3**

Engineering Chemistry
(Common to Civil & Mech. Branches)

Course Objectives

- To familiarize engineering chemistry and its applications
- To impart the concept of source and hard waters, softening methods of hard water
- To train the students on the principle and applications of electrochemistry, polymers chemistry, cement and surface chemistry

Unit 1 : Water technology

Water: Source of water**,** impurities in water, hardness of water by using EDTA method, temporary and permanent hardness and its units. **Water for industrial purpose**: steam generation, boiler troubles–carry over (priming & foaming) boiler corrosion–scales and sludge. **Water internal and external treatment:** Permutit or zeolite process. deminera- lization of brackish water, reverse-osmosis and electro dialysis.

Learning Outcomes:

- List: The differences between temporary and permanent hardness of water
- Explain: The principles of reverse osmosis and electro dialysis
- Compare: Quality of drinking water specifications
- Illustrate: Problems associated with hard water-scale and sludge
- Explain: The working principles of different industrial water treatment processes

Unit 2 : Polymer Chemistry and Fuel Chemistry

Polymers: Basic concepts of polymerization, types of polymerization addition and condensation polymerization. **Plastomers:** thermosetting and theromoplastics composition properties and engineering applications of PVC, teflon, bakelite and nylons. **Rubber:** rubber-processing of natural rubber and compound elastomers-buna **S**, buna **N** preparation, properties and its applications. **Fuel cells:** Hydrogen-oxygen and methane-oxygen fuel cells advantages, disadvantages and its applications

Learning Out comes:

- Explain: Different types of polymers and their applications
- Compare: Elastomers Buna-S and Buna-N
- Explain: Hydrogen-oxygen fuel cell
- Compare: Difference between plastomers and elastomers
- Demonstrate: Engineering applications of PVC and Bakelite

Unit 3: Electrochemistry and Corrosion and its Control

Electrochemical cells: galvanic cells, types of electrodes (standard hydrogen, calomel and quinhydrone), EMF of cells. **Batteries:** Nickel-cadmium, lithium ion batteries advantages, disadvantages and its applications. **Corrosion and its Control:** Theories (dry-wet, chemical and electrochemical corrosion) of corrosion and mechanism. Factors affecting the corrosion. Types of corrosions and control methods-cathode protection sacrificial anodic, impressed current method.

Learning Outcomes:

- Apply: Nernst equation for calculating electrode and cell potentials
- Apply: Corrosion and its corrosion prevention or control
- Demonstrate: The corrosion prevention methods and factors affecting corrosion
- Compare: Different batteries and their applications
- Explain: Primary batteries and secondary batteries

Unit 4: Advanced Engineering Materials

Building materials: Portland cement composition, classification, preparation (dry and wet processes).Constituents, phases and reactivity of clinker, Setting and hardening of cement. **Refractories:**Criteries of refracteries,Classification,properties,Factors affecting the refractory materials and applications.Failures of refractories

Learning Outcomes:

- Identify: The factory affecting the refractory material
- Identify: The constituents of Portland cement
- Enumerate: The reactions at setting and hardening of the cement
- Compare: Dry and wet processes of Portland cement

Unit 5: Surface Chemistry and Applications

Introduction to surface chemistry, colloids, micelle formation, synthesis of colloids any two methods with examples. Chemicals and electrochemicals methods(not more than two methods) of preparation of nanometals and metal oxides.

Learning Outcomes:

- Explain: The synthesis of collids with examples
- Outline: The preparation of nanomaterials and metal oxides
- Explain: Synthesis of colloids any two methods

Text books:

1.A text book of engineering chemistry., Jain and Jain, Dhanpat Rai Publishing Company., 15th edition, New Delhi,**2008**.

2. Chemistry of engineering., Prof. K.N. Jayaveera, Dr. G.V. Subba Reddy and Dr. C. Ramachandraiah. McGraw hill higher education. Hyderabad, **2009.**

3. Peter Atkins, Julio de Paula and James Keeler, Atkin's Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference books:

1.D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth- Heineman,1992.

2.H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.

3.Engineering chemistry K.B Chandra Sekhar et.al, SciTech Publications.

Course Out comes

- Demonstrate: The corrosion prevention methods and factores affecting corrosion
- Explain: The preparation, properties, and applications of thermosetting and thermoplastics
- Discuss: Hydrogen-Oxygen fuel cell
- Explain: The setting and hardening of cement and concrete phase

Useful Links

Subjects	Web Sites
Organic Chemistry Help	http://www.chemhelper.com
Model ChemLab	http://modelscience.com/products.html?source=google
Virtual Library	http://www.liv.ac.uk/Chemistry/Links/links.html
The World Wide Club for the chemical community	http://www.chemweb.com/
International Chemistry Departments	http://www.liv.ac.uk/Chemistry/Links/international.html
Chemistry Software for Chemists	http://www.chemistry-software.com/
Guide to academic and research jobs in Europe	http://www.academicjobseu.com/
Guide to PhD studentships and chemical sciences	http://www.findaphd.com/firstmain.asp
Guide to postdoctoral positions	http://www.findapostdoc.com/firstmain.asp
Wiley InterScience	http://www.interscience.wiley.com/cgi-bin/home
Bath University Library Catalogue	http://www.bath.ac.uk/library/webcat

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – I Year 1 Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

Problem Solving and Programming
(Common to all Branches Of Engineering)

Course Objectives:
1. Introduce the internal parts of a computer, and peripherals.
2. Introduce the Concept of Algorithm and use it to solve computational problems
3. Identify the computational and non-computational problems
4. Teach the syntax and semantics of a C Programming language
5. Demonstrate the use of Control structures of C Programming language
6. Illustrate the methodology for solving Computational problems

Unit 1:

Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited, Introduction to Operating systems, Operational overview of a CPU.

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Fourth generation languages, Fifth generation languages, Classification of Programming languages, Structured programming concept, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

Unit Outcomes:

Student should be able to
1. Identify the different peripherals, ports and connecting cables in a PC
2. Illustrate the working of a Computer
3. Select the components of a Computer in the market and assemble a computer
4. Solve complex problems using language independent notations

Unit 2:

Introduction to computer problem solving: Introduction, the problem-solving aspect, top down design, implementation of algorithms, the efficiency of algorithms, the analysis of algorithms.

Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.

Learning Outcomes: Student should be able to
1. Solve Computational problems
2. Apply Algorithmic approach to solving problems
3. Analyze the algorithms

Unit 3:

Types, Operators, and Expressions: Variable names, data types and sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

Input and output: standard input and output, formatted output-Printf, formatted input-Scanf.

Control Flow: Statements and blocks, if-else, else-if, switch, Loops-while and for, Loops-Dowhile, break and continue, Goto and labels.

Functions and Program Structure: Basics of functions, functions returning non-integers, external variables, scope variables, header variables, register variables, block structure, initialization, recursion, the C processor.

Learning Outcomes: Student should be able to
1. Recognize the programming elements of C Programming language
2. Select the control structure for solving the problem
3. Apply modular approach for solving the problem

Unit 4:

Factoring methods: Finding the square root of a number, the smallest divisor of a number, the greatest common divisor of two integers, generating prime numbers.

Pointers and arrays: Pointers and addresses, pointers and function arguments, pointers and arrays, address arithmetic, character pointers and functions, pointer array; pointers to pointers, Multi-dimensional arrays, initialization of arrays, pointer vs. multi-dimensional arrays, command line arguments, pointers to functions, complicated declarations.

Array Techniques: Array order reversal, finding the maximum number in a set, removal of duplicates from an order array, finding the kth smallest element

Learning Outcomes: Student should be able to
1. Solve mathematical problems using C Programming language
2. Structure the individual data elements to simplify the solutions
3. Facilitate efficient memory utilization

Unit 5:

Sorting and Searching: Sorting by selection, sorting by exchange, sorting by insertion, sorting by partitioning, binary search.

Structures: Basics of structures, structures and functions, arrays of structures, pointers to structures, self-referential structures, table lookup, typedef, unions, bit-fields.

Learning Outcomes: Student should be able to
1. Select sorting algorithm based on the type of the data
2. Organize heterogeneous data
3. Design a sorting algorithm

Text Books:

1. Pradip Dey, and Manas Ghosh, “Programming in C”, 2018, Oxford University Press.
2. R.G. Dromey, “How to Solve it by Computer”. 2014, Pearson.
3. Brian W. Kernighan, and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, Pearson.

Reference Books:

1. RS Bichkar “Programming with C”, 2012, Universities Press.
2. Pelin Aksoy, and Laura Denardis, “Information Technology in Theory”, 2017, Cengage Learning.
3. Byron Gottfried and Jitender Kumar Chhabra, “Programming with C”, 4th Edition, 2019, McGraw Hill Education.

Course Outcomes:
1. Construct his own computer using parts .
2. Recognize the importance of programming language independent constructs
3. Solve computational problems
4. Select the features of C language appropriate for solving a problem
5. Design computer programs for real world problems
6. Organize the data which is more appropriated for solving a problem

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – I Year 1 Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**2**

Communicative English I
(Common to All Branches of Engineering)

Introduction

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

Course Objectives

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

Unit 1

Lesson : Exploration – A Proposal to Girdle – Explored Avenues

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.**Speaking:**Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. **Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Reading for Writing:** Beginnings and endings of paragraphs -
introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. **Grammar and Vocabulary:** Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Learning Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

Unit 2

Lesson : On Campus – The District School as It was by One Who Went to It – Strategies to organise ideas

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/ small groups on specific topics followed by short structured talks.**Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters. **Grammar and**
Vocabulary: Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.

Learning Outcomes

At the end of the module, the learners will be able to

- comprehend short talks on general topics
- participate in informal discussions and speak clearly on a specific topic using suitable discourse markers
- understand the use of cohesive devices for better reading comprehension
- write well structured paragraphs on specific topics
- identify basic errors of grammar/ usage and make necessary corrections in short texts

Unit 3

Lesson : Working Together – The future of work – Successful Great Partnership

Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.**Writing:** Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. **Grammar and Vocabulary:** Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Learning Outcomes

At the end of the module, the learners will be able to

- comprehend short talks and summarize the content with clarity and precision
- participate in informal discussions and report what is discussed
- infer meanings of unfamiliar words using contextual clues
- write summaries based on global comprehension of reading/listening texts
- use correct tense forms, appropriate structures and a range of reporting verbs in speech and writing

Unit4

Lesson : Fabric of Change – H.G.Wells and the Uncertainties of Progress – Diversity in Work Place

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading:**Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.**Writing:** Information transfer; describe, compare, contrast, identify significance/trendsbased on information provided in figures/charts/graphs/tables.**Grammar and Vocabulary:**Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Learning Outcomes

At the end of the module, the learners will be able to

- infer and predict about content of spoken discourse
- understand verbal and non-verbal features of communication and hold formal/informal conversations
- interpret graphic elements used in academic texts
- produce a coherent paragraph interpreting a figure/graph/chart/table
- use language appropriate for description and interpretation of graphical elements

Unit 5

Lesson : Tool For Life – Leaves from the Mental Portfolio of a Eurasian – Learning by Doing

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides. **Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences **Grammar and Vocabulary:** Editing short texts –identifying and correcting common errors in grammar and
usage (articles, prepositions, tenses, subject verb agreement)

Learning Outcomes

At the end of the module, the learners will be able to

- take notes while listening to a talk/lecture and make use of them to answer questions
- make formal oral presentations using effective strategies
- comprehend, discuss and respond to academic texts orally and in writing
- produce a well-organized essay with adequate support and detail
- edit short texts by correcting common errors

***Course Materials would be compiled and provided to learners and teachers**

Text Books

- English All Round - Communication Skills for Undergraduate Learners , Prabavathi Y M Lalitha Sridevi, Orient Black Swan Publishers

Reference Books

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

Course Outcomes:

At the end of the course, the learners will be able to

- Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
- Apply grammatical structures to formulate sentences and correct word forms
- Analyze discourse markers to speak clearly on a specific topic in informal discussions
- Evaluate reading/listening texts and to write summaries based on global comprehension of these texts. Create a coherent paragraph interpreting a figure/graph/chart/table
- produce a well-organized essay with adequate support and detail
- edit short texts by correcting common errors

Text Books

- Bailey, Stephen. Academic writing: A handbook for international students.Routledge, 2014.
- Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.

Reference Books

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Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – I Year 1 Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Basic Engineering Workshop
(Common to all branches)

Course Objective:
To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Wood Working:
Familiarity with different types of woods and tools used in wood working and make following joints

a) Half – Lap joint
b) Mortise and Tenon joint
c) Corner Dovetail joint or Bridle joint

Sheet Metal Working:
Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets

a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing

Fitting:
Familiarity with different types of tools used in fitting and do the following fitting exercises

a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two wheeler tyre

Electrical Wiring:
Familiarities with different types of basic electrical circuits and make the following connections

a) Parallel and series b) Two way switch c) Godown lighting d) Tube light e) Three phase motor f) Soldering of wires

Course Outcomes:
After completion of this lab the student will be able to

1. apply wood working skills in real world applications.
2. build different parts with metal sheets in real world applications.
3. apply fitting operations in various applications.
4. apply different types of basic electric circuit connections.
5. demonstrate soldering and brazing.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – I Year 1 Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

Engineering Chemistry Lab
(Common to Civil & Mech. Branches)

Course Objectives

- Verify the fundamental concepts with experiments

List of Experiments:

Chemical methods: Volumetric analysis

1. Estimation of Ferrous (Fe^{2+}) Ion using Standard Potassium Dichromate

Iodometry Titrations:

2.Estimation of Copper (Cu^{2+}) Ion using Standard Potassium Dichromate

(i) Part-I : Standardization of sodium thiosulphate ($Na_2S_2O_3$) solution with standard $K_2Cr_2O_7$

(ii) Part-II: Estimation of Copper

Complexometry Titrations:

3.Estimation of Calcium hardness of water using Standard EDTA solution

4.Estimation of Copper by using Standard EDTA solution

5.Dissolved Oxygen: To test the amount of dissolved oxygen present in the given water sample.

Physical methods: Instrumental Analysis

6. pH metric titration of (i) strong acid vs strong base, (ii) weak acid vs strong base

7. Determination of cell constant and conductance of solutions

8. Determination of colorimetric titration with $KMnO_4$ solution

9. Identification of simple organic compounds by UV, IR and NMR

10. Viscosity determination of Kerosin and Petrol by Red-wood viscometer

Course Out comes

At the end of the course, the students will be able to

- **Determination:** Hardness of water by using EDTA
- **Estimation:** Amount of dissolved oxygen given water sample
- **Analysis:** Difference between the UV-Visible and IR spectroscopy
- **Explain:** Identification of the UV-Visible and IR spectrum
- **Identify:** Acid -base buffer solution pH meter

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – I Year 1 Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

Problem Solving And Programming Lab
(Common To All Branches Of Engineering)

Laboratory Experiments

1. Assemble and disassemble parts of a Computer
2. Design a C program which reverses the number
3. Design a C program which finds the second maximum number among the given list of numbers.
4. Construct a program which finds the kth smallest number among the given list of numbers.
5. Design an algorithm and implement using C language the following exchanges
   a ⟵ b ⟵ c ⟵ d
6. Develop a C Program which counts the number of positive and negative numbers separately and also compute the sum of them.
7. Implement the C program which computes the sum of the first n terms of the series
   Sum = 1 – 3 + 5 -7 + 9
8. Design a C program which determines the numbers whose factorial values are between 5000 and 32565.
9. Design an algorithm and implement using a C program which finds the sum of the infinite series $1 - x^2/2! + x^4/4! - x^6/6! + \ldots.$
10. Design a C program to print the sequence of numbers in which each number is the sum of the three most recent predecessors. Assume first three numbers as 0, 1, and 1.
11. Implement a C program which converts a hexadecimal, octal and binary number to decimal number and vice versa.
12. Develop an algorithm which computes the all the factors between 1 to 100 for a given number and implement it using C.
13. Construct an algorithm which computes the sum of the factorials of numbers between m and n.
14. Design a C program which reverses the elements of the array.
15. Given a list of n numbers, Design an algorithm which prints the number of stars equivalent to the value of the number. The starts for each number should be printed horizontally.
16. Implement the sorting algorithms
    a. Insertion sort b. Exchange sort c. Selection sort d. Partitioning sort.
17. Illustrate the use of auto, static, register and external variables.
18. Design algorithm and implement the operations creation, insertion, deletion, traversing on a singly linked list.
19. Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers.
20. Design a C program which sorts the strings using array of pointers.

Course outcomes: Student should be able to

1. Construct a Computer given its parts
2. Select the right control structure for solving the problem
3. Analyze different sorting algorithms
4. Design solutions for computational problems
5. Develop C programs which utilize the memory efficiently using programming constructslike pointers.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – I Year 1 Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Communicative English I Lab
(Common to All Branches of Engineering)

Course Objectives

➢ Students will be exposed to a variety of self instructional, learner friendly modes of language learning

➢ Students will cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc.

➢ Students will learn better pronunciation through stress, intonation and rhythm

➢ Students will be trained to use language effectively to face interviews, group discussions, public speaking

➢ Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc

Unit 1

1. Phonetics for listening comprehension of various accents
2. Reading comprehension
3. Describing objects/places/persons

Learning Outcomes

At the end of the module, the learners will be able to

- understand different accents spoken by native speakers of English
- employ suitable strategies for skimming and scanning on monitor to get the general idea of a text and locate specific information
- learn different professional registers and specific vocabulary to describe different persons, places and objects

Unit 2

1. JAM
2. Small talks on general topics
3. Debates

Learning Outcomes

At the end of the module, the learners will be able to

- produce a structured talk extemporarily
- comprehend and produce short talks on general topics
- participate in debates and speak clearly on a specific topic using suitable discourse markers

Unit 3

1. Situational dialogues – Greeting and Introduction
2. Summarizing and Note making
3. Vocabulary Building

Learning Outcomes

At the end of the module, the learners will be able to

- Learn different ways of greeting and introducing oneself/others
- summarize the content with clarity and precision and take notes while listening to a talk/lecture and make use of them to answer questions
- replenish vocabulary with one word substitutes, homonyms, homophones, homographs to reduce errors in speech and writing

Unit4

1. Asking for Information and Giving Directions
2. Information Transfer
3. Non-verbal Communication – Dumb Charade

Learning Outcomes

At the end of the module, the learners will be able to

- Learn different ways of asking information and giving directions
- Able to transfer information effectively
- understand non-verbal features of communication

Unit 5

1. Oral Presentations
2. Précis Writing and Paraphrasing
3. Reading Comprehension and spotting errors

Learning Outcomes

At the end of the module, the learners will be able to

- make formal oral presentations using effective strategies
- learn different techniques of précis writing and paraphrasing strategies
- comprehend while reading different texts and edit short texts by correcting common errors

Course Outcomes

- CO1: Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
- CO2: Apply communication skills through various language learning activities
- CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- CO4: Evaluate and exhibit acceptable etiquette essential in social and professional settings
- CO5: Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – I Year 1 Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**0**

Environmental Science

OBJECTIVE:

To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

UNIT – I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

LEARNING OUTCOMES
Students will be able to

1. articulate the basic structure, functions, and processes of key social systems affecting the environment.
2. explain how water resources should be used.
3. articulate basic understanding of effects of modern agriculture on environment.
4. explain how various paradigms or world views and their implicit and explicit assumptions and values shape the viewer's perception of environmental problems and solutions.

UNIT – II: Ecosystems, Biodiversity, and its Conservation

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION : Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

LEARNING OUTCOMES

Students will be able to

1. get a clear picture of structure and functions of ecosystems.
2. explain why renewable and non-renewable energy resources are important.
3. get awareness about land degradation, soil erosion & desertification.
4. gain a rigorous foundation in various scientific disciplines as they apply to environmental science, such as ecology, evolutionary biology, hydrology, and human behavior.

UNIT – III: Environmental Pollution and Solid Waste Management

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT : Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

LEARNING OUTCOMES

Students will be able to

1. demonstrate knowledge and understanding of theories in the field of Biodiversity and Systematics in the broad sense.
2. conduct basic conservation biology research.
3. explain endangered and endemic species of India.
4. identify the threats to biodiversity.

UNIT – IV: Social Issues and the Environment

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

LEARNING OUTCOMES:

Students will be able to

1. understand Cause, effects and control measures of air pollution.
2. understand soil, noise & water pollution.
3. explain the enforcement of Environmental legislation
4. understand solid waste management.

UNIT – V: Human Population and the Environment

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights –

Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK : Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

LEARNING OUTCOMES

Students will have

1. knowledge about watershed management and environmental ethics.
2. explain the reasons for global warming
3. explain principles and impact of disasters on environment.
4. explain disaster management cycle in India.

TEXT BOOKS :

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company

REFERENCES :

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
I Year 2nd Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Mathematics- II	BS	3-1-0	4
2		Engineering Physics	BS	2-1-0	3
3		Basic Electrical & Electronics Engineering	ES	3-0-0	3
4		Data Structures	ES	3-0-0	3
5		Civil Engineering Workshop	LC	0-0-2	1
6		Engineering Graphics	ES	1-0-4	3
7		Basic Electrical & Electronics Engineering Lab	ES	0-0-3	1.5
8		Engineering Physics Lab	BS	0-0-3	1.5
9		Data Structures Lab	ES	0-0-4	2
10		Constitution of India	MC	3-0-0	0
				Total	**22**

Category	**CREDITS**
Basic Science course	8.5
Engineering Science Courses(Including LC)	13.5
TOTAL CREDITS	**22**

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I Year 2nd Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
	Mathematics-II	**3**	**1**	**0**	**4**

(Differential Equations and Vector Calculus)

(Common to ECE,EEE,Civil & Mechanical Branches)

Course Objectives:

1) To enlighten the learners in the concept of differential equations and multivariable calculus.
2) To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

UNIT I: Linear Differential Equations of Higher Order

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

Learning Outcomes:

At the end of this unit, the student will be able to

- identify the essential characteristics of linear differential equations with constant coefficients
- solve the linear differential equations with constant coefficients by appropriate method

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.

Learning Outcomes:

At the end of this unit, the student will be able to

- classify and interpret the solutions of linear differential equations
- formulate and solve the higher order differential equation by analyzing physical situations

UNIT III: Partial Differential Equations – First order

First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential equations.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply a range of techniques to find solutions of standard PDEs
- outline the basic properties of standard PDEs

UNIT IV: Multivariable Calculus (Vector differentiation)

Scalar and vector point functions, vector operator del, del applies to scalar point functions- Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply del to Scalar and vector point functions
- illustrate the physical interpretation of Gradient, Divergence and Curl

UNIT V: Multivariable Calculus (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).

Learning Outcomes:

At the end of this unit, the student will be able to

- find the work done in moving a particle along the path over a force field
- evaluate the rates of fluid flow along and across curves
- apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

References:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

Course Outcomes:

At the end of the course, the student will be able to

- solve the differential equations related to various engineering fields
- Identify solution methods for partial differential equations that model physical processes
- interpret the physical meaning of different operators such as gradient, curl and divergence
- estimate the work done against a field, circulation and flux using vector calculus

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I Year 2nd Sem (Mechanical Engineering)

L	T	P	C
2	1	0	3

Engineering Physics
(Common to Civil and Mech. Branches)

Course Objectives:

- To familiarize the basic concepts of Mechanics and oscillations.
- To familiarize the basic concepts of acoustics and ultrasonics with their Engineering applications.
- To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications.
- To explain the significant concepts of dielectric and magnetic materials this leads to potential applications in the emerging micro devices.
- To impart knowledge in basic concepts of optical fibers and LASERs along with its Engineering applications.

UNIT-1: MECHANICS & OSCILLATION

Newton's Laws of Motion - Central Forces-Conservative of central force-F = – grad V- Centripetal acceleration (polar coordinates) – Equation of Motion under central force – Kepler's laws of motion (Qualitative).Simple Harmonic Motion-Equation of motion of a simple oscillator-Characteristics of Simple Harmonic Motion-Kinetic, Potential and Total Energy of Simple Harmonic Motion-Torsional Pendulum-Damped Oscillation-Forced oscillation.

Learning Outcomes:

- identify forces and moments in mechanical systems using scalar and vector techniques
- interpret the equation of motion under central force
- explain Kepler's laws of motion
- explain the concepts of simple harmonic motion and its characteristics.
- Recognize the concepts of torsional pendulum and damped oscillation.

UNIT-2 ACOUSTICS & ULTRASONICS8HRS

Introduction of Acoustics, decibel, Weber–Fechner law- Reverberation – Reverberation time – Sabine's formula-derivation using growth and decay method – Absorption coefficient and its determination –factors affecting acoustics of buildings and their remedies. Introduction to ultrasonic-Production of ultrasonic by magnetostriction and piezoelectric methods- Detection of ultrasonic-Applications of ultrasonic.

Learning Outcomes:

- explain how sound is propagated in buildings
- analyze acoustic properties of typically used materials in buildings
- recognize sound level disruptors and their use in architectural acoustics
- identify the use of ultrasonics in different fields

UNIT-3: WAVE OPTICS

Principle of Superposition–Interference of light – Interference in thin films by reflection– Newton's Rings– Determination of the wavelength- Applications.

Diffraction–Fresnel and Fraunhofer Diffraction–Single and Double-slit – Diffraction Grating-Applications.

Polarization–Polarization by reflection and double refraction–Nicol's Prism–Half wave and Quarter wave plate– Applications of Polarization.

Learning Outcomes:

- Explain about coherent sources and the conditions for sustained interference
- Identify engineering applications of interference and diffraction
- Analyze the differences between interference and diffraction with applications

- Illustrate the concept of polarization of light and its applications
- Classify ordinary polarized light and extraordinary polarized light

UNIT-4: DIELECTRIC & MAGNETIC MATERIALS

Introduction-Dielectric Polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations: Electronic, Ionic, Orientation Polarizations (Qualitative)-Lorentz (internal)field-Clausius - Mossotti equation-Applications of Dielectrics.

Introduction-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability Classification of Magnetic materials-Hysteresis-soft and hard magnetic materials.

Learning Outcomes:

The students will be able to

- **explain** the concept of dielectric constant and polarization in dielectric materials
- **summarize** Gauss's law in the presence of dielectrics
- **interpret** dielectric loss, Lorentz field and Clausius- Mossotti relation
- **classify** the magnetic materials based on susceptibility and their temperature dependence
- **explain** the applications of dielectric and magnetic materials

UNIT-5: LASERS & FIBER OPTICS

Introduction - Characteristics of Laser - Spontaneous and Stimulated emission of radiation-Einstein's coefficients - Population inversion - Pumping Mechanisms - He-Ne laser- Semiconductor laser - Applications of laser.

Introduction to Optical Fibers-Total Internal Reflection-Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile-Propagation of electromagnetic wave through optical fiber–modes-Block Diagram of Fiber optic Communication -Medical Applications.

Unit Outcomes:

The students will be able to

- **Understand** the basic concepts of LASER light Sources
- **Apply** the concepts to learn the types of lasers
- **Identifies** the Engineering applications of lasers
- **explain** the working principle of optical fibers
- **classify** optical fibers based on refractive index profile and mode of propagation
- **identify** the applications of optical fibers in medical, communication and other fields

Text Books

1. D.Kleppner and Robert Kolenkow"An introduction to Mechanics"-II -Cambridge University Press,2015
2. Gaur R.K. and Gupta S.L., "Engineering Physics"-Dhanpat Rai publishers, 2012
3. M.N.Avadhanulu&P.G.Kshirsagar"A Text book of Engineering Physics"-S.Chand Publications,2017
4. Ian R Sinclair, Sensor and Transducers 3rd eds, 2001, Elsevier (Newnes)

Reference text books:

1. M K Varma "Introduction to Mechanics"-Universities Press-2015.
2. D.K. Bhattacharya and A. Bhaskaran, "Engineering Physics"- Oxford Publications-2015

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I Year 2nd Sem (Mechanical Engineering)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Basic Electrical & Electronics Engineering

Course Objectives:

1. To introduce basics of electric circuits.
2. To teach DC and AC electrical circuit analysis.
3. To explain working principles of transformers and electrical machines.
4. To impart knowledge on low voltage electrical installations
5. To provide comprehensive idea about working principle, operation and applications of PN junction & zener diodes, BJT, FET, MOSFET and operational amplifier
6. To introduce fundamentals of digital electronics
7. To educate on principles of various communication systems
8. To teach efficacy of electronic principles which are pervasive in engineering applications

Unit 1 DC & AC Circuits:

Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Superposition Theorem - Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits.

Unit Outcomes: Able to

- Recall Kirchoff laws
- Analyze simple electric circuits with DC excitation
- Apply network theorems to simple circuits
- Analyze single phase AC circuits consisting of series RL - RC - RLC combinations

Unit 2 DC & AC Machines:

Principle and operation of DC Generator - EMF equations - OCC characteristics of DC generator – principle and operation of DC Motor – Performance Characteristics of DC Motor - Speed control of DC Motor – Principle and operation of Single Phase Transformer - OC and SC test on transformer - principle and operation of Induction Motor [Elementary treatment only]

Unit Outcomes: Able to

- Explain principle and operation of DC Generator & Motor.
- Perform speed control of DC Motor
- Explain operation of transformer and induction motor.
- Explain construction & working of induction motor - DC motor

Unit 3 Basics of Power Systems:

Layout & operation of Hydro, Thermal, Nuclear Stations - Solar & wind generating stations – Typical AC Power Supply scheme – Elements of Transmission line – Types of Distribution systems: Primary & Secondary distribution systems.

Unit Outcomes: Able to

- Understand working operation of various generating stations
- Explain the types of Distribution systems

Unit 4 Analog Electronics

Overview of Semiconductors, PN junction diode, Zener diode, Applications of diode as switch and rectifier, Zener diode as regulator, special purpose diodes: schottky diode, tunnel diode, varactor diode, photodiode, phototransistor and LED.

BJT construction, operation, configuration and characteristics, JFET and MOSFET construction, operation, characteristics (CS configuration), applications

Operational Amplifiers: Introduction, block diagram, basic op-amp circuits: Inverting, Non Inverting, summer, subtractor, voltage follower.

Unit Outcomes:

- Describe operation and characteristics of diodes and transistors
- Make use of diodes and transistors in simple, typical circuit applications
- Understand operation of basic op-amp circuits

Unit 5 Digital Electronics

Introduction, Switching and Logic Levels, Digital Waveform, characteristics of digital ICs, logic gates, number systems, combinational circuits - adders, multiplexers, decoders; introduction to sequential circuits, flip flops, shift register, binary counter.

Unit Outcomes:

- Explain different logic gates using truth table
- Distinguish combinational and sequential circuits
- Analyze various combinational circuits such as adders, multiplexers and decoders
- Understand functionality of flip-flops, shift registers and counters

Course Outcomes:

- Apply concepts of KVL/KCL in solving DC circuits
- Choose correct rating of a transformer for a specific application
- Illustrate working principles of induction motor - DC Motor
- Identify type of electrical machine based on their operation.
- Describe working principles of protection devices used in electrical circuits.
- Describe operation and characteristics of diodes and transistors and basic opamps
- Analyze various combinational circuits and sequential circuits.

Text Books:

1. D. P. Kothari and I. J. Nagrath - "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. V.K. Mehta & Rohit Mehta, "Principles of Power System" – S.Chand – 2018
3. D.P. Kothari, I.J.Nagrath, Basic Electronics, 2nd edition, McGraw Hill Education(India)Private Limited
4. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, 2nd edition, Pearson India Private Limited.

Reference Books:

1. R. Muthusubramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
2. David Bell, Electronic Devices and Circuits: Oxford University Press, 5th EDn., 2008.
3. L. S. Bobrow - "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
4. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.
5. C.L. Wadhwa – "Generation Distribution and Utilization of Electrical Energy", 3rd Edition, New Age International Publications.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I Year 2nd Sem (Mechanical Engineering)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Data Structures
(Common to All Branches of Engineering)

Course Objectives:

1. To teach the representation of solution to the problem using algorithm
2. To explain the approach to algorithm analysis
3. To introduce different data structures for solving the problems
4. To demonstrate modelling of the given problem as a graph
5. To elucidate the existing hashing techniques

Unit – I: Introduction Algorithm Specification, Performance analysis, Performance Measurement. Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions. Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort

Learning Outcomes:

1. Analyze the given algorithm to find the time and space complexities.
2. Select appropriate sorting algorithm
3. Design a sorting algorithm

Unit – II: Stack, Queue and Linked lists Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.

Learning Outcomes:

1. Evaluate expressions
2. Develop the applications using stacks and queues
3. Construct the linked lists for various applications

Unit – III:Trees Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, Optimal Binary search Trees, AVL Trees. B-Trees: BTrees, B + Trees

Learning Outcomes:

1. Explain the concept of a tree
2. Compare different tree structures
3. Apply trees for indexing

Unit – IV : Graphs and Hashing The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.

Learning Outcomes:

1. Recognize the importance of Graphs in solving real world problems
2. Apply various graph traversal methods to applications
3. Design a minimum cost solution for a problem using spanning trees
4. Select the appropriate hashing technique for a given application
5. Design a hashing technique

Unit – V: Files and Advanced sorting File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization. Advanced sorting: Sorting on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.

Learning Outcomes:

1. Organize data in the form of Files
2. Apply sorting on large amount of data

Text Books:

1. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures in C”, 2nd Edition, Galgotia Book Source, Pvt. Ltd., 2004.
2. Alan L. Tharp, “File Organization and Processing”, Wiley and Sons, 1988.

Reference Books:

1. D. Samanta, “Classic Data Structures”, 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012. 3. Peter Bras, “Advanced Data Structures”, Cambridge University Press, 2016
2. Richard F.Gilberg, Behrouz A.Forouzan, “Data Structures A Pseudo code Approach with C”, Second Edition, Cengage Learning 2005.

Course Outcomes:

Students should be able to

1. Select Appropriate Data Structure for solving a real world problem
2. Select appropriate file organization technique depending on the processing to be done
3. Construct Indexes for Databases
4. Analyse the Algorithms
5. Develop Algorithm for Sorting large files of data

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I Year 2nd Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Mechanical Engineering Workshop

Course Objectives:

1. Familiarize moulding and casting skills.
2. Train on different types welding joints.
3. Develop assemble or disassembly skills.
4. Make plastic components.
5. Familiarize with use power tools.
6. Demonstrate assembly of computer and installation of software

Foundry Practice: (2 Sessions)

i. a) Determination of average grain size for sand sample using sieve shaker b) Preparation of a green sand mould using single piece pattern

ii. Preparation of a green sand mould using split piece pattern with core and demonstration of casting.

Welding Practice: (2 Sessions)

i. Lap joint, butt joint and T joint using arc welding.

ii. a) Lap joint using resistance spot welding b) Lap and butt joints using gas welding

Assembling/Disassembling Practice: (3 Sessions)

i. Bicycle
ii. Clutch and carburetor
iii. Two wheeler engine parts
iv. Desktop Computer and installation of Operating system Software

Manufacture of a Plastic Component (2 Sessions)

i. Use of injection moulding machine
ii. FRP composite using hand layup method
iii. Joining of plastic components

Manufacturing any two domestic utility products with any material by above methods (2 Sessions)

Use of Power Tools (2 Sessions)

Drilling, Cutting, Planing, Finishing, Etc,. on wood or metals

Text Books:

1. K. Venkata Reddy Workshop Mannual 6th Ed., B.S. Publishers, 2013.
2. B.L. Juneja Workshop practice 1st Ed., Cengage, 2015.

Course Outcomes:

After completion of this lab student will be able to

- make moulds for sand casting.
- develop different weld joints.
- assemble or disassemble of machine components.
- make plastic components.
- use power tools for different applications.
- Assemble computer and installation of software

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I Year 2nd Sem (Mechanical Engineering)	**L**	**T**	**P**	**C**
	1	**0**	**4**	**3**

Engineering Graphics
(Common to All Branches of Engineering)

Course Objectives:

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

UNIT-1

Introduction to Engineering graphics: Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions.a) Conic sections including the rectangular hyperbola-general method only, b) Cycloid, epicycloids and hypocycloid - Normal and Tangent. c) Involutes –Normal and Tangent.

UNIT-II

Projection of points, lines: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by lines.

UNIT-III

Projections of regular planes: inclined to one plane and both planes by rotational method.

Projections of solids: Projections of regular solids inclined to one plane by rotational or Auxiliary views method. – Prism, Cylinder, Pyramid, Cone.

UNIT-IV

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, Pyramid and cone. True shapes of the sections.

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, Pyramid, cone and their sectional parts.

Computer Aided Drafting:

Introduction to AutoCAD: Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, Templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions.

UNIT-V

Orthographic Projections: Systems of projections, conventions and application to orthographic projections.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, simple solids.

Text Books:

1. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000

Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.
3. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009

4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Course Outcomes:

After completing the course, the student will be able to

- draw various curves applied in engineering.
- show projections of solids and sections graphically.
- draw the development of surfaces of solids.
- use computers as a drafting tool.
- draw isometric and orthographic drawings using CAD packages.

Note:

1. Manual (part A) and Computer Aided Drafting (part B) classes can be held in alternative weeks for optimal utilization of computer facilities.
2. External examinations to be conducted both manual and computer mode with equal weight of marks.

Additional Sources

1. Youtube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I Year 2nd Sem (Mechanical Engineering)	**L**	**T**	**P**	**C**
Basic Electrical & Electronics Engineering Lab	**0**	**0**	**3**	**1.5**

Electrical Engineering Lab

Course Objectives:

1. To Verify Kirchoff's laws
2. To verify Superposition theorem.
3. To learn performance characteristics of DC Machines.
4. To perform open circuit & Short Circuit test on 1- Phase Transformer.
5. To Study the I – V Characteristics of Solar PV Cell

List of experiments: -

1. Verification of Kirchhoff laws.
2. Verification of Superposition Theorem.
3. Open circuit characteristics of a DC Shunt Generator.
4. Speed control of DC Shunt Motor.
5. OC & SC test of 1 – Phase Transformer.
6. Brake test on 3 - Phase Induction Motor.
7. I – V Characteristics of Solar PV cell
8. Brake test on DC Shunt Motor.

Course Outcomes: Able to

1. Verify Kirchoff's Laws & Superposition theorem.
2. Perform testing on AC and DC Machines.
3. Study I – V Characteristics of PV Cell

Electronics Engineering Lab

Course outcomes:

- Describe construction, working and characteristics of diodes, transistors and operational amplifiers
- Demonstrate how electronic devices are used for applications such as rectification, switching and amplification
- Build different building blocks in digital electronics using logic gates
- Explain functionality of flip-flops, shift registers and counters for data processing applications

List of Experiments:

1. Draw and study the characteristics of Semi-conductor diode and Zener Diode
2. Draw and study the input and output characteristics of Transistor in Common Emitter configuration
3. Draw and study the static and transfer characteristics of FET in Common Source Configuration
4. Construct half wave and full wave rectifier circuits. Find ripple factor and plot their output waveforms with and without filters
5. Study the application of Op-amp as an Inverting amplifier, Non-inverting amplifier, Voltage follower, Summer and Subtractor
6. Realization of logic gates, AND, OR, NOT, NAND, NOR, XOR

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I Year 2nd Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
	Engineering Physics Lab	**0**	**0**	**3**	**1.5**
	(Civil and Mechanical Branches)				

Course Objectives:

- Understand the role of Optical fiber parameters in engineering applications.
- Recognize the significance of laser by studying its characteristics and its application
- in finding the particle size.
- Illustrates the magnetic and dielectric materials applications.
- Identifies the various sensor applications.

Note: - In the following list of experiments, out of 15 experiments any 12 experiments must be performed in a semester.

List of Physics Experiments:

1. Determination of wavelength of LASER light using diffraction grating.

Experimental outcomes:
operates various instrument
estimate the wavelength of laser source
Identifies the formation of grating spectrum due diffraction.

2. Determination of particle size using LASER.

Experimental outcomes:
operates various instrument
estimate the Particles size using laser
Identifies the application of laser

3. Determine the thickness of the wire using wedge shape method

   Experimental outcomes:
   operates optical instrument like travelling microscope.
   estimate the thickness of the wire using wedge shape method
   Identifies the formation of interference fringes due to reflected light

4. Determination of the radius of curvature of the lens by Newton's ring method

   Experimental outcomes:
   operates optical instrument like travelling microscope.
   estimate the radius of curvature of the lens
   Identifies the formation of interference fringes due to reflected light
   plots the square of the diameter of a ring with no. of rings

5. Dispersive power of a diffraction grating

   Experimental outcomes:
   operates optical instrument like spectrometer.
   estimate the wavelength of the given source
   Identifies the formation of grating spectrum due diffraction.

6. Determination of spring constant of springs using Coupled Oscillator

Experimental outcomes:
Operates various instrument.
estimate the spring constant
Identifies the principle of coupled oscillations.

7. Magnetic field along the axis of a circular coil carrying current.

   Experimental outcomes:

Operates various instruments and connect them as per the circuit.
estimate the magnetic field along the axis of a circular coil carrying current.
plots the intensity of the magnetic field of circular coil carrying current with distance

8. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum)

Experimental outcomes:

Operates various instruments.
estimate the rigidity modules of a given wire
plots length of the pendulum (l) with time period T2

9. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle

Experimental outcomes:
Operates various instruments and connect them as per the circuit.
estimate the numerical aperture and acceptance angle of a given optical fiber.
Identifies the significance of numerical aperture and acceptance angle of a optical fiber in various engineering applications.

10. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.

Operates various instruments and connect them as per the circuit.
estimate the charge carrier concentration and mobility in a semiconductor.
Illustrates the applications of hall effect.
Plots the voltage with current and voltage with magnetic field

11. Determination of Dielectric constant of dielectric material using charging and discharging of capacitor.

Experimental outcomes:
Operates various instruments and connect them as per the circuit.
estimate the dielectric constant of the given substance.
Identifies the significance of dielectric constant in various devices.

12. Determination of hysteresis loss by tracing B-H Curve of ferromagnetic material.

Experimental outcomes:
Operates various instruments and connect them as per the circuit.
estimate the hysteresis loss, coercivity and retentivity of the ferromagnetic material
classifies the soft and hard magnetic material based on B-H curve.
plots the magnetic field H and flux density B

13. Measurement of magnetic susceptibility by Gouy's method

Experimental outcomes:
Operatesvarious instruments and connect them as per the circuit.
estimate themagnetic susceptibility of the given material.
Identifies the significance of magnetic susceptibilityin various engineeringapplications.

14. Determination of pressure variation using Strain Guage sensor.

Experimental outcomes:
Operatesvarious instruments.
Estimatethe pressure variation using strain guage sensor.
Illustrates the applications of strain gauge sensors.

15. Determination of temperature change using Strain Guage sensor.

Experimental outcomes:
Operatesvarious instruments.
Estimatethe temperature variation using strain guage sensor.

Course Outcomes:

- Operate various optical instruments
- Estimate wavelength of laser and particles size using laser
- estimate the susceptibility and related magnetic parameters of magnetic materials
- plot the intensity of the magnetic field of circular coil carrying current with distance
- evaluate the acceptance angle of an optical fiber and numerical aperture
- determine magnetic susceptibility of the material and its losses by B-H curve
- identify the type of semiconductor i.e., n-type or p-type using hall effect
- Apply the concepts of sensors for various applications

Reference Books:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 20172.
http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I Year 2nd Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
	Data Structures Lab	**0**	**0**	**4**	**2**

Course Objectives:

1. To introduce to the different data structures
2. To elucidate how the data structure selection influences the algorithm complexity
3. To explain the different operations that can be performed on different data structures
4. To introduce to the different search and sorting algorithms.

Laboratory Experiments

1. String operations using array of pointers
2. Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.
3. Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time.
4. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List
5. Stack implementation using arrays
6. Stack implementation using linked lists
7. Queue implementation using arrays. Implement different forms of queue. While implementing you should be able to store elements equal to the size of the queue. No positions should be left blank.
8. Queue implementation using linked lists
9. Creation of binary search tree, performing operations insertion, deletion, and traversal.
10. Breadth first search
11. Depth first search
12. Travelling sales man problem
13. File operations
14. Indexing of a file
15. Reversing the links (not just displaying) of a linked list.
16. Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using 'Ladies first' principle. You may create new linked lists if necessary.
17. An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form.
18. A table can be defined as a collection of rows and columns. Each row and column may have a label. Different values are stored in the cells of the table. The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table. User may like to remove row/column. Create table datatype and support different operations on it.

Course Outcomes:

At the end of the course students should be able to

1. Select the data structure appropriate for solving the problem
2. Implement searching and sorting algorithms
3. Design new data types
4. Illustrate the working of stack and queue
5. Organize the data in the form of files

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I Year 2nd Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
	Constitution of India	**0**	**0**	**3**	**0**

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of india and election commission of india.
- To understand the central and state relation financial and administrative.

UNIT-I

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

LEARNING OUTCOMES:

After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secrateriate

UNIT-IV

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

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zilla panchayat block level organisation

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

LEARNING OUTCOMES:- After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-RESOURCES:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Course Outcomes: At the end of the semester/course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
II Year 1st Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Mathematics- III	BS	3-0-0	3
2.		Manufacturing Processes	PC	3-0-0	3
3.		Engineering Mechanics	PC	3-0-0	3
4.		Thermodynamics	PC	3-0-0	3
5.		Fluid Mechanics & Hydraulic Machinery	PC	3-0-0	3
6.		Managerial Economics & Financial Analysis	HS	3-0-0	3
7.		Machine Drawing	PC	0-0-3	1.5
8.		Manufacturing Processes Lab	PC	0-0-2	1
9.		Fluid Mechanics & Hydraulic Machinery Lab	PC	0-0-2	1
				Total	**21.5**

Category	**CREDITS**
Basic Science course	3
Professional core Courses	15.5
Humanities and Social science	3
TOTAL CREDITS	**21.5**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
II Year 2nd Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Mathematics- IV	BS	3-0-0	3
2		Life science for Engineers	HS	3-0-0	3
3		Mechanics of Materials	PC	3-0-0	3
4		Material Science and Engineering	PC	3-0-0	3
5		Thermal Engineering-I	PC	3-0-0	3
6		Python Programming	ES	3-0-0	3
7		Material Science and Engineering Lab	PC	0-0-3	1.5
8		Mechanics of Materials Lab	PC	0-0-3	1.5
				Total	**21**

Category	**CREDITS**
Professional core Courses	15
Humanities and Social Sciences	3
Engineering Science Courses	3
Basic Science Course	3
TOTAL CREDITS	**21**

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-I Sem	(Mechanical Engineering)	L	T	P	C
	Mathematics-III	**3**	**0**	**0**	**3**

Complex Variables, Transforms & Partial Differential Equations

(Common to MECH & CIVIL)

Course Objective:

This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables. The aim is to analyze the solutions of partial differential equations.

Unit-I: Complex Variable – Differentiation:

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions (exponential, trigonometric, logarithm), harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method-Conformal mappings-standard and special transformations (sin z, e^z, cos z, z^2) Mobius transformations (bilinear) and their properties.

Unit Outcomes:

Students will be able to

- Understand functions of Complex variable and its properties.
- Find derivatives of complex functions.
- Understand the analyticity of complex functions .
- Understand the conformal mappings of complex functions.

Unit-II: Complex Variable – Integration:

Line integral-Contour integration, Cauchy's integral theorem, Cauchy Integral formula, Liouville's theorem (without proof) and Maximum-Modulus theorem (without proof); power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (around unit circle, semi circle with f(z) not having poles on real axis).

Unit Outcomes:

Students will be able to

- Understand the integration of complex functions.
- Apply Cauchy's integral theorem and Cauchy's integral formula.
- Understand singularities of complex functions.
- Evaluate improper integrals of complex functions using Residue theorem.

Unit-III: Laplace Transforms

Definition-Laplace transform of standard functions-existence of Laplace Transform – 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 – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

Unit Outcomes:

Students will be able to

- Understand the concept of Laplace transforms and find the Laplace transforms of elementary functions.
- Find the Laplace transforms of general functions using its properties.
- Understand Laplace transforms of special functions(Unit step function, Unit Impulse & Periodic).
- Apply Laplace transforms to solve Differential Equations.

Unit-IV: Fourier series

Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions- typical wave forms - Parseval's formula-Complex form of Fourier series.

Unit Outcomes:

Students will be able to

- Understand finding Fourier series expression of the given function.
- Determine Fourier coefficients (Euler's) and identify existence of fourier series of the given function.
- Expand the given function in Fourier series given in Half range interval.
- Apply Fourier series to establish Identities among Euler coefficients.
- Find Fourier series of wave forms.

Unit-V: Partial Differential Equations & Applications

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of first order PDEs by Lagrange's method- Solution of non linear PDEs (Standard forms)- Solution of second order PDEs by Method of separation of variables – Solutions of one dimensional wave equation, one dimensional heat equation under initial and boundary conditions.

Unit Outcomes:

At the end of this unit, the students will be able to

- Form Partial Differential Equations.
- Solve Partial Differential Equations of first order.
- Understand the method of separation of variables.
- Solve applications of Partial Differential Equations.
-

Course Outcomes:

After the completion of course, students will be able to

- Understand the analyticity of complex functions and conformal mappings.
- Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.
- Understand the usage of Laplace Transforms.
- Evaluate the Fourier series expansion of periodic functions.
- Formulate/solve/classify the solutions of Partial differential equations and also find the solution of one dimensional wave equation and heat equation.

Text Books:

1. B.S.Grewal , "Higher Engineering Mathematics", Khanna publishers.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India

Reference Books:

1. B.V.Ramana, "Higher Engineering Mathematics", Mc Graw Hill publishers.
2. Alan Jeffrey, "Advanced Engineering Mathematics", Elsevier.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-I Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Manufacturing Processes

Course Objectives:

- Working principle of different metal casting processes and gating system.
- Nature of plastic deformation, cold and hot working process, working of a rolling mill and types, extrusion processes.
- Principles of forging, tools and dies, working of forging processes.
- Classification of the welding processes, working of different types of welding processes and welding defects
- Classification, applications and manufacturing methods of plastics, ceramics and powder metallurgy.
- Learning Characteristics of Unconventional Machining Processes

UNIT I

Introduction : Importance and selection of manufacturing processes.

Casting Processes: Introduction to casting process, process steps; pattern: types, materials and allowance; Cores: Types of cores, core prints, principles and design of gating system; Solidification of casting: Concept, solidification of pure metal and alloy; Special casting processes: Shell casting, investment casting, die casting, centrifugal casting, casting defects and remedies.

Unit Outcomes:

At the end of this unit, the student will be able to

- Selection of suitable manufacturing process for a given product.
- Understand the steps involved in metal casting, pattern making.
- Apply the knowledge of designing gating systems, risers.
- Compare the working of various metal casting processes.
- Identify the various casting defects.

UNIT II

Metal Forming: Introduction, nature of plastic deformation, hot and cold working of metals, mechanics of metal forming; Rolling: Principle, types of rolling mill and products, roll passes, forces in rolling and power requirements; Extrusion: Basic extrusion process and its characteristics, hot extrusion and cold extrusion, wire drawing, tube drawing.

Forging: Principles of forging, tools and dies. Types: Smith forging, drop forging, forging hammers, rotary forging and forging defects. Sheet metal forming: Mechanics of sheet metal working, blanking, piercing, bending, stamping.

Unit Outcomes:

At the end of this unit, the student will be able to

- Compare cold working and hot working processes.
- Explain the working of rolling mills.
- Evaluate the forces and power in rolling and extrusion processes.
- Summarize the working of various extrusion processes.
- Identify the principles of forging, tools and dies.
- Summarize the various operations of Sheet metal forming.

UNIT III

Metal Joining Processes: Classification of welding processes, types of welds and welded joints and V-I characteristics, arc welding, weld bead geometry, submerged arc welding, gas tungsten arc welding, gas

metal arc welding. applications, advantages and disadvantages of the above processes, other fabrication processes. Heat affected zones in welding; soldering and brazing: Types and their applications, Welding defects: causes and remedies.

Unit Outcomes:

At the end of this unit, the student will be able to

- Classify the working of various welding processes.
- Compare V-I characteristics of different welding processes.
- Summarize the applications, advantages of various welding processes.
- Identify the defects in welding.

UNIT IV : Plastic Processing, Ceramics and Powder Metallurgy:

Plastics: Types, properties and their applications, processing of plastics, extrusion of plastics, transfer molding and compression molding, injection molding, thermoforming, rotational molding and blow molding

Ceramics: Classification of ceramic materials, properties and their application, ceramic powder preparation; Processing of ceramic parts: Pressing, casting, sintering; secondary processing of ceramics: Coatings, finishing.

Powder Metallurgy: Principle, manufacture of powders, steps involved.

Unit Outcomes:

At the end of this unit, the student will be able to

- Learn the methods of manufacturing plastics parts.
- Explain the steps in making ceramics parts.
- Explain the steps in manufacturing of powder metallurgy parts.
- Demonstrate the application of plastic, ceramics and power metallurgy.

UNIT V

Unconventional Machining Processes: Electrical discharge machining (EDM), principle and processes parameters, electro-chemical machining (ECM) Laser beam machining (LBM), plasma arc machining (PAM) and electron beam machining

Principles and process parameters of Abrasive jet machining (AJM), water jet machining, ultrasonic machining

Unit Outcomes:

At the end of this unit, the student will be able to

- Identify different unconventional machining processes.
- Evaluate process parameters of EDM, ECM, LBM, PAM and AJM.
- Apply various unconventional machining processes.

Course Outcomes:

At the end of the course, the student will be able to

- Demonstrate different metal casting processes and gating systems.
- Classify working of various welding processes.
- Evaluate the forces and power requirements in rolling process.
- Apply the principles of various forging operations.
- Outline the manufacturing methods of plastics, ceramics and powder metallurgy.
- Identify different unconventional processes and their applications.

Text Books:

1. Rao P.N., "Manufacturing Technology – Volume I", 5th edition, McGraw-Hill Education, 2018.
2. Kalpakjain S and Schmid S.R., "Manufacturing Engineering and Technology", 7th edition, Pearson, 2018.

Reference Books:

1. Millek P. Groover, "Fundamentals of Modern Manufacturing": "Materials, Processes and Systems", 4th edition, John Wiley and Sons Inc, 2010.

Sharma P.C., "A Text book of Production Technology", 8th edition, S Chand

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-I Sem (Mechanical Engineering)

L	T	P	C
3	0	0	3

Engineering Mechanics

Course Objectives:

- Explain the effect of force and moment in different engineering applications.
- Teach centre of gravity and moment of inertia of solids and surfaces.
- Familiarize frictional forces in mechanical applications.
- Analysis of rigid bodies under dynamic conditions.

UNIT I

Introduction to Engineering Mechanics: Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.

Friction: Laws of friction, types of friction, equilibrium of force systems involving frictional forces, wedge friction. Free body diagrams involving frictional forces.

Unit Outcomes:

At the end of this unit, the student will be able to

- Resolve the forces in mechanical systems
- Identify the moments and forces
- Draw free body diagram

UNIT II

Analysis of Structures**:** Introduction to plane trusses, analysis of plane trusses by method of joints and method of sections.

Virtual Work: Equilibrium of ideal systems, work done by a force, work done by a couple, principle of virtual work.

Unit Outcomes:

At the end of this unit, the student will be able to

- Identify different types of trusses.
- Analyze the plane trusses by method of joints and the method of sections.
- Demonstrate equilibrium of ideal system.
- Estimate the work done by a force and work done by a couple.

UNIT III

Properties of Surfaces and Volumes: Centroid and center of gravity, derivation of centroids from first moment of area, centroids of composite sections, center of gravity of common volumes - cylinder, cone, sphere, theorem of Pappus-guidinus.

Moment of Inertia: Area moment of inertia of plane and composite shapes, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, mass moment of inertia of common volumes -thin plates, thin rod, cylinder, cone, sphere, rectangular prism, radius of gyration.

Unit Outcomes:

At the end of this unit, the student will be able to

- Identify the centre of gravity of composite sections.
- Determine the centre of gravity of common solids.
- Determine moment of inertia for composite volumes.

UNIT IV

Kinematics**:** Equations of motion for rigid bodies, constant and variable acceleration, rectilinear and curvilinear motion, motion under gravity -projectile motion, use of rectangular coordinates,

tangential and normal coordinates, radius of curvature, rotation of a rigid body about a fixed axis, introduction to plane motion.

Unit Outcomes:

At the end of this unit, the student will be able to

- Write equations of motion for rigid bodies.
- Find velocity and acceleration in rectilinear and curvilinear motions
- Trace the path of projectile.

UNIT V

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

Ideal Systems: Principle of conservation of energy, concept of power, conservation of linear and angular momentum, principle of momentum and impulse, impact - types of impact.

Unit Outcomes:

At the end of this unit, the student will be able to

- Apply D'Alembert's principle in rectilinear translation.
- Relate principle of work and energy in dynamic systems.
- Make use of principle of momentum and impulse to dynamic bodies.

Course Outcomes:

Upon successful completion of the course, the students will be able to

- Resolve forces and couples in mechanical systems.
- Identify the frictional forces and its influence on equilibrium.
- Find the centre of gravity and moment of inertia for various geometric shapes
- Develop equations for different motions.
- Determine the displacement, velocity and acceleration relations in dynamic systems
- Relate the impulse and momentum

Text books:

1. S S Bhavikatti, “Engineering Mechanics”, 4th edition, New Age International, 2008.
2. S Timoshenko, DH Young, JV Rao, Sukumar Pati, “Engineering Mechanics (in SI units)”, 5th edition, McGraw Hill, 2013.

Reference Books:

1. Basudeb Bhattacharya., “Engineering Mechanics”, 2nd edition, Oxford University Press (India), 2015.
2. Irving Shames, G K M Rao, “Engineering Mechanics: Statics and Dynam-ics”, 4th edition, Pearson, 2009.
3. K L Kumar, Veenu Kumar, “Engineering Mechanics”, 4th edition, Tata McGraw Hill, 2010.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-I Sem	(Mechanical Engineering) Thermodynamics	L	T	P	C
		3	0	0	3

Course Objectives

- Familiarize concepts of heat, work, energy and governing rules for conversion of one form to other.
- Explain relationships between properties of matter and basic laws of thermodynamics.
- Teach the concept of entropy for identifying the disorder and feasibility of a thermodynamic process.
- Introduce the concept of available energy for maximum work conversion.
- Familiarize steam properties to understand working of steam power plants.
- Provide fundamental concepts of air standard cycles used in steam power plants, IC engines and gas turbines

UNIT I

Introduction: Basic Concepts: Macroscopic and microscopic viewpoints, definitions of thermodynamic terms, quasi – static process, point and path function, forms of energy, ideal gas and real gas, Zeroth law of thermodynamics.

First law of Thermodynamics: Joule's experiment - first law of thermodynamics, corollaries-perpetual motion machines of first kind, first law applied to non-flow and flow process-limitations of first law of thermodynamics**.**

Unit Outcomes

At the end of this Unit, the student will be able to

- Understand thermodynamic systems, properties and their importance in solving engineering problems.
- Make energy balance for closed systems and open systems.
- Solve simple thermodynamics problems.

UNIT II

Second Law of Thermodynamics: Kelvin - Planck statement and Clausius statement and their equivalence, corollaries - perpetual motion machines of second kind - reversibility and irreversibility, cause of irreversibility - Carnot cycle, heat engine, heat pump and refrigerator, Carnot theorem, Carnot efficiency.

Unit Outcomes

At the end of this Unit, the student will be able to

- Apply second law of thermodynamics in design of heat engine, refrigerator and heat pump.
- Explain the efficiency of thermodynamic systems.
- Enumerate the causes for poor performance of thermodynamic systems.

UNIT III

Entropy: Clausius inequality - Concept of Entropy- entropy equation for different processes and systems

Availability and Irreversibility: Definition of exergy and anergy, expressions for availability and irreversibility. Availability in steady flow, non-flow processes and irreversibility.

Unit outcomes

At the end of this Unit, the student will be able to

- Apply entropy concepts to estimate the performance of systems.
- Evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process.

UNIT IV

Properties of Steam and use of Steam Tables: Pure Substances, P-V-T surfaces, T-s and h-s diagram, Mollier chart, dryness fraction, property tables, analysis of steam undergoing various thermodynamic processes using Mollier chart– steam calorimetry.

Unit Outcomes

At the end of this Unit, the student will be able to

- Apply properties of steam to design steam systems.
- Examine steam systems using conservation equations.
- Evaluate the dryness fraction and performance of steam systems.

UNIT V

Thermodynamic Relations: Maxwell relations, TdS equations, difference in heat capacities, ratio of heat capacities, Energy equation, Joule Thompson coefficient, Clausius-Clapeyron equation.

Air Standard Cycles: Otto, Diesel and dual cycles, P-V and T -S diagrams - description and efficiencies, mean effective pressures. Comparison of Otto, Diesel and dual cycles

Unit Outcomes

At the end of this Unit, the student will be able to

- Explain the importance of T-ds equations.
- Relate specific heats, internal energy, enthalpy and Joule-Thomson coefficient in standard form.
- Examine the importance of compression ratio.
- Explain the cycles on which internal combustion engines work.

Course Outcomes

After completing the course, the student will be able to

- Explain the importance of thermodynamic properties related to conversion of heat energy into work.
- Apply the laws of thermodynamics to boilers, heat pumps, refrigerators, heat engines, compressors and nozzles.
- Utilize steam properties to design steam based components.
- Compare thermodynamic relations and air standard cycles.

Text Book(s)

1. P.K.Nag, "Engineering Thermodynamics:, 5th edition, Tata McGraw Hill, 2013.
2. Yunus A. Cengel, Michaela A. Boles, "Thermodynamics", 7th edition, Tata McGraw Hill, 2011.

References

1. J.B.Jones and G.A.Hawkins, "Introduction to Thermodynamics", 2nd edition, John Wiley & Sons, 2012.
2. Moran, Michael J. and Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics", 3rd edition, Wiley, 2015
3. R.K. Rajput, S.Chand& Co., "Thermal Engineering", 6th edition, Laxmi publications, 2010.

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B.Tech – II-I Sem	(Mechanical Engineering)	L	T	P	C
	Fluid Mechanics and Hydraulic Machinery	**3**	**0**	**0**	**3**

Course Objectives:

- To Introduce concepts of fluid statics and kinematics
- To impart the knowledge on minor losses in pipes
- To impart knowledge on power developed by hydraulic energy and hydro electric installations.
- To impart the knowledge on design of turbines
- To impart the knowledge on design of centrifugal pumps.

UNIT - I

FLUID STATICS : Dimensions and units: physical properties of fluids – specific gravity, porosity surface tension – vapor pressure and their influence on fluid motion – atmospheric gauge and vacuum pressure – measurement of pressure – Piezometer, U-tube differential manometers.

FLUID KINEMATICS : stream line, path line and streak lines and steam tube, classification of flows-steady & unsteady, uniform, non uniform, laminar, turbulent, rotational, and irrotational flows-equation of continuity for one dimensional flow.

Fluid dynamics: surface and body forces – Euler's and Bernoulli's equations for flowing stream line, momentum equation and its application on force on pipe bend.

Unit Outcomes:

- To introduce the concepts stream line, path line, streak line etc.,
- To familiarize the concepts of rotational and irrotational flows

UNIT – II

CONDUIT FLOW: Reynold's experiment – Darcy Weisbach equation – Minor losses in pipes – pipes in series and pipes in parallel – total energy line-hydraulic gradient line. Measurement of flow: pitot tube, venturimeter, and orifice meter, Flow nozzle, Turbine current meter.

Unit Outcomes:

- To introduce the concepts of pipes in series and parallel
- To familiarize the discharge measurements by using pitot tube, venturimeter etc.,

UNIT – III

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 efficiency, flow over radial vanes.

HYDROELECTRIC POWER STATIONS: Elements of hydro electric power station-types- concept of pumped storage plants-storage requirements.

Unit Outcomes:

- To impart the knowledge on effect of impact of jets on different types of vanes.
- To familiarize with the elements of hydroelectric installations.

UNIT – IV

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.

PERFORMANCE OF HYDRAULIC TURBINES : Unit and specific quantities, characteristics governing of turbines, selection of type of turbine, cavitation, surge tank, hammer.**,**

Unit Outcomes:

- To impart the knowledge on working principles of hydraulic turbines along with their efficiencies
- To evaluate the performance of different types of turbines.

UNIT – V

CENTRIFUGAL PUMPS : Classification, working, work done – manomertic head – loss efficiencies – specific speed – pumps in series and parallel – performance characteristic curves, NPSH.

Unit Outcomes:

- To impart the knowledge on working principles of different pumps.
- To evaluate the performance of different types of pumps

Course Outcomes:

At the end of the course, the student will be able to

- Understand characteristics of laminar and turbulent flows.
- Understand the energy losses in different types of pipes.

- Identify the performance of different types of turbines
- Identify the performance of centrifugal pumps.

TEXT BOOKS :

1. "Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH". Standard book house
2. Dr.R.K.Bansal, "Fluid Mechanics" Lakshmi Publications Pvt.Ltd.
3. D.Rama Durgaiah, "Fluid Mechanics and Machinery" New Age International.

REFERENCE BOOKS :

1. D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering", Kotaria &Sons
2. Banga & Sharma, "Hydraulic Machines", Khanna Publishers.
3. James W.Dally, "Instrumentation for Engineering Measurements", Wiley Riley, John Wiley & Sons Inc. 2004

Sri Krishnadevaraya University College of Engineering & Technology

		L	T	P	C
B.Tech – II-I Sem	**(Mechanical Engineering)**	**3**	**0**	**0**	**3**

Managerial Economics & Financial Analysis

Course Objectives:

- The objective of this course is to inculcate the basic knowledge to the students with the concepts of Economics & Demand to make them effective business decision makers.
- To understand fundamentals of Production & Cost Concepts which is an important subject helps to the Technocrats to take certain business decisions in the processes of optimum utilization of resources.
- To know the various types of Market Structures & pricing methods and its strategies & Trade Blocks.
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills about accounting and to explain the process of preparing accounting statements & analysis for effective business decisions

Unit I: INTRODUCTION TO MANAGERIAL ECONOMICS

Managerial Economics – Definition- Nature- Scope - Contemporary importance of Managerial Economics - Demand Analysis: Concept of Demand-Demand Function - Law of Demand - Elasticity of Demand- Significance - Types of Elasticity - Measurement of elasticity of demand - Demand Forecasting- factors governing demand forecasting- methods of demand forecasting -Relationship of Managerial Economics with Financial Accounting and Management.

UNIT II: THEORY OF PRODUCTION AND COST ANALYSIS

Production Function- Least cost combination- Short-run and Long- run production function- Isoquants and Isocosts, MRTS - Cobb-Douglas production function - Laws of returns - Internal and External economies of scale - **Cost Analysis**: Cost concepts and cost behavior- Break-Even Analysis (BEA) - Determination of Break Even Point (Simple Problems)-Managerial significance and limitations of Break- Even Point.

UNIT III: INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT

Market structures: Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition-Monopoly-Monopolistic Competition-Oligopoly-Price-Output Determination - Pricing Methods and Strategies-Forms of Business Organizations- Sole Proprietorship- Partnership – Joint Stock Companies - Public Sector Enterprises – New Economic Environment- Economic Liberalization – Privatization - Globalization.

UNIT IV: CAPITAL AND CAPITAL BUDGETING

Concept of Capital - Over and Undercapitalization – Remedial Measures - Sources of Shot term and Long term Capital - Estimating Working Capital Requirements – Capital Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

UNIT V: INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS

Financial Accounting – Concept - Emerging need and Importance - Double-Entry Book Keeping-Journal - Ledger – Trial Balance - Financial Statements - Trading Account – Profit & Loss Account – Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

Course outcomes:

CO1: Capable of analyzing fundamentals of Economics such as Demand, Elasticity & Forecasting methods

CO2: To apply production, pricing & supply concepts for effective business administration

CO3: Students can able to identify the influence of various markets, the forms of business organization and its International Economic Environment.

CO4: Analyze how to invest adequate amount of capital in order to get maximum return from selected business activity.

CO5: Prepare and analyze accounting statements like income & expenditure statement, balance sheet apart from the fundamental knowledge, to understand financial performance of the business and to initiate the appropriate decisions to run the business profitably.

TEXT BOOKS:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Ahuja H.L Managerial economics. S.Chand, 3/e, 2013

REFERENCES

1. Aryasri: Managerial Economics and Financial Analysis, 4/e, TMH, 2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International,. 2013
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-I Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
	Manufacturing Processes Lab	**0**	**0**	**2**	**1**

Course Objectives:

- Acquire practical knowledge on Metal Casting, Welding, Press Working and unconventional machining Processes.

1. **METAL CASTING**
   - Gating Design and pouring time and solidification time calculations.
   - Sand Properties Testing – Exercise for Strength and Permeability.
   - Molding, Melting and Casting for ferrous/ non ferrous materials.

2. **WELDING**
   - TIG Welding.
   - MIG Welding.
   - Friction stir welding
   - Any other Special Welding Processes.

3. **MECHANICAL PRESS WORKING**
   - Press Tool: Blanking and Piercing operation with Simple, Compound and Combination dies.
   - Closed die forging, Deep Drawing and Extrusion operations.

4. **UN CONVENTIONAL MANUFACTUNRING PROCESSES**
   - Electro Discharge Machining(EDM)/ Wire cut EDM
   - Plasma arc cutting / Abrasive jet machining (AJM)
   - Additive manufacturing with reverse engineering

Course Outcomes:

At the end of the lab, the student will be able to

- Fabricate different types of components using various manufacturing techniques.
- Adapt unconventional manufacturing methods.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-I Sem (Mechanical Engineering)	**L**	**T**	**P**	**C**
Fluid Mechanics and Hydraulic Machines Lab	**0**	**0**	**2**	**1**

Course Objectives:

- To understand the basic principles of fluid mechanics.
- To identify various types of flows.
- To understand boundary layer concepts and flow through pipes.
- To evaluate the performance of hydraulic turbines.
- To understand the functioning and characteristic curves of pumps.

List of Experiments:

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Verification of Bernoulli's Theorems

Course Outcomes:

- Able to explain the effect of fluid properties on a flow system.
- Able to identify type of fluid flow patterns and describe continuity equation.
- To analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design.
- To select and analyze an appropriate turbine with reference to given situation in power plants.
- To estimate performance parameters of a given Centrifugal and Reciprocating pump.
- Able to demonstrate boundary layer concepts

Sri Krishnadevaraya University College of Engineering & Technology

		L	T	P	C
B.Tech – II-I Sem	**(Mechanical Engineering)**				
	Machine Drawing	**0**	**0**	**3**	**1.5**

Course objectives: To familiarize with the standard conventions for different materials and machine parts in working drawings. To make part drawings including sectional views for various machine elements. To prepare assembly drawings given the details of part drawings.

Drawing of Machine Elements and simple parts

Selection of Views, additional views for the following machine elements and parts with every drawing proportion.

1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, cottered joints and knuckle joint.
3. Rivetted joints for plates
4. Shaft coupling, spigot and socket pipe joint.
5. Journal, pivot and collar and foot step bearings.

Assembly Drawings:

Drawings of assembled views for the part drawings of the following usingconventions and easy drawing proportions.

1. Steam engine parts – stuffing boxes, cross heads, Eccentrics.
2. Machine tool parts: Tail stock, Tool Post, Machine Vices.
3. Other machine parts - Screws jacks, Petrol engine connecting rod, Plummer block, Fuel Injector
4. Valves - Steam stop valve, spring loaded safety valve, feed check valve and air cock.

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

TEXT BOOKS:

1. Machine Drawing / N.D. Bhatt / Charotar
2. Machine Drawing with Auto CAD / Goutham Pohit, Goutam Ghosh /Pearson

REFERENCE BOOKS:

1. Machine Drawing by / Bhattacharyya / Oxford
2. Machine Drawing / Ajeet Singh / Mc Graw Hill

Course Outcomes:

- Preparation of engineering and working drawings with dimensions and bill of material during design and development. Developing assembly drawings using part drawings of machine components.
- Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. 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 and their liberal usage
- Types of Drawings – working drawings for machine parts.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-I Sem **(Mechanical Engineering)**

L	T	P	C
3	0	0	0

Essence of Indian Traditional Knowledge

Objectives:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

- The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledge system
- To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act 2003.
- The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection.
- To know the student traditional knowledge in different sector.

Unit-I:

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

Learning Outcomes:

At the end of the unit the student will able to:

- understand the traditional knowledge.
- contrast and compare characteristics importance kinds of traditional knowledge.
- analyze physical and social contexts of traditional knowledge.
- evaluate social change on traditional knowledge.

Unit-II:

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Learning Outcomes:

At the end of the unit the student will able to:

- know the need of protecting traditional knowledge.
- apply significance of TK protection.
- analyze the value of TK in global economy.
- evaluate role of government

Unit-III:

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act);B:The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

Learning Outcomes:

At the end of the unit the student will able to:

- Understand legal framework of TK.
- Contrast and compare the ST and other traditional forest dwellers
- Analyze plant variant protections
- Evaluate farmers right act

Unit-IV:

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

Learning Outcomes:

At the end of the unit the student will able to:

- Understand TK and IPR

- Apply systems of TK protection.
- Analyze legal concepts for the protection of TK.
- Evaluate strategies to increase the protection of TK.

Unit-V:
Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Learning Outcomes:
At the end of the unit the student will able to:
- know TK in different sectors.
- apply TK in engineering.
- analyze TK in various sectors.
- evaluate food security and protection of TK in the country.

Reference Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
4. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

E-Resources:
1. https://www.youtube.com/watch?v=LZP1StpYEPM 2.http://nptel.ac.in/courses/121106003/

Course Outcomes: After completion of the course, students will be able to:
1. understand the concept of Traditional knowledge and its importance
2. know the need and importance of protecting traditional knowledge
3. know the various enactments related to the protection of traditional knowledge.
4. understand the concepts of Intellectual property to protect the traditional knowledge

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
II Year 2nd Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Mathematics- IV	BS	3-0-0	3
2		Life science for Engineers	HS	3-0-0	3
3		Mechanics of Materials	PC	3-0-0	3
4		Material Science and Engineering	PC	3-0-0	3
5		Thermal Engineering-I	PC	3-0-0	3
6		Python Programming	ES	3-0-0	3
7		Material Science and Engineering Lab	PC	0-0-3	1.5
8		Mechanics of Materials Lab	PC	0-0-3	1.5
				Total	**21**

Category	**CREDITS**
Professional core Courses	15
Humanities and Social Sciences	3
Engineering Science Courses	3
Basic Science Course	3
TOTAL CREDITS	**21**

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-II Sem **(Mechanical Engineering)**

L	T	P	C
3	0	0	3

Mathematics-IV

Numerical Methods and Probability Theory

(Common to MECH & CIVIL)

Course Objective:

This course aims at providing the student with the knowledge on

- Various numerical methods for solving equations, interpolating the polynomials, evaluation of integral equations and solution of differential equations.
- The theory of Probability and random variables.

Unit-I: Solution of Algebraic & Transcendental Equations:

Introduction-Bisection method-Iterative method-Regula falsi method-Newton Raphson method System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.

Unit Outcomes:

Students will be able to

- Calculate the roots of equation using Bisection method and Iterative method.
- Calculate the roots of equation using Regula falsi method and Newton Raphson method.
- Solve the system of algebraic equations using Gauss Jordan method and Gauss Siedal method.

Unit-II: Interpolation

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

Unit Outcomes:

Students will be able to

- Understand the concept of interpolation.
- Derive interpolating polynomial using Newton's forward and backward formulae.
- Derive interpolating polynomial using Lagrange's formulae.
- Derive interpolating polynomial using Gauss forward and backward formulae.

Unit-III: Numerical Integration & Solution of Initial value problems to Ordinary differential equations

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

Unit Outcomes:

Students will be able to

- Solve integral equations using Simson's 1/3 and Simson's 3/8 rule.
- Solve integral equations using Trapezoidal rule.
- Solve initial value problems to ordinary differential equations using Taylor's method.
- Solve initial value problems to ordinary differential equations using Euler's method and Runge Kutta methods.

Unit-IV: Probability theory:

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 Outcomes:

Students will be able to

- Understand the concept of Probability.
- Solve problems on probability using addition law and multiplication law.
- Understand Random variables and probability mass and density functions.

- Understand stastical constants of random variables.

Unit-V: Random variables & Distributions:

Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties-Uniform distribution-exponential distribution

Unit Outcomes:

Students will be able to

- Understand Probability distribution function.
- Solve problems on Binomial distribution.
- Solve problems on Poisson distribution.
- Solve problems on Normal distribution.

Course Outcomes:

After the completion of course, students will be able to

- Apply numerical methods to solve algebraic and transcendental equations
- Derive interpolating polynomials using interpolation formulae
- Solve differential and integral equations numerically
- Apply Probability theory to find the chances of happening of events.
- Understand various probability distributions and calculate their statistical constants.

Text Books:

1. B.S.Grewal, "Higher Engineering Mathematics", Khanna publishers.
2. Ronald E. Walpole "Probability and Statistics for Engineers and Scientists", ,PNIE.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India

Reference Books:

1. B.V.Ramana, "Higher Engineering Mathematics", Mc Graw Hill publishers.
2. Alan Jeffrey, "Advanced Engineering Mathematics", Elsevier.

Sri Krishnadevaraya University College of Engineering & Technology

		L	T	P	C
B.Tech – II-II Sem	**(Mechanical Engineering)**	**3**	**0**	**0**	**3**

Life Science for Engineers

(Common to all branches)

Course Objectives: To provide basic understanding about life and life Process. Animal and plant systems. To understand what bimolecules, are, their structures are functions. Application of certain bimolecules in Industry.

- Brief introduction about human physiology and bioengineering.
- To understand hereditary units, i.e. DNA (genes) and RNA and their synthesis in living organism.
- How biology Principles can be applied in our daily life using different technologies.
- Brief introduction to the production of transgenic microbes, Plants and animals.

Unit I: Introduction to Basic Biology

Cell as Basic unit of life, cell theory, Cell structure, Chromosomes. Prokaryotic and eukaryotic Cell. Plant Cell, Animal Cell, Cell cycle, Mitosis & meiosis, Brief introduction to five kingdoms of classification.

Unit Outcomes:

After completing this unit, the student will be able to

- Summarize the basis of life.
- Understand the difference between lower organisms (prokaryotes) from higher organisms (eukaryotes).
- Understand how organisms are classified.

Unit II: Introduction to Biomolecules

Definition, Classification, structure & functions of Carbohydrates, lipids, proteins, Nucleic acids (DNA and RNA) and their types. Enzymes-action, classification and Enzyme application in Industry.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what are biomolecules? Their role in living cells, their structure, function and how they are produced.
- Interpret the relationship between the structure and function of nucleic acids.
- Summarize the applications of enzymes in industry.
- Understand what is fermentation and its applications of fermentation in industry.

Unit III: Human Physiology

Nutrition: Nutrients or food substances. Digestive system, Respiratory system,(aerobic and anaerobic Respiration).Respiratory organs, respiratory cycle. Excretory system.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what nutrients are
- Understand the mechanism and process of important human functions

Unit IV: Introduction to Molecular Biology and recombinant DNA Technology

Prokaryotic gene and Eukaryotic gene structure & chromosomal organization, Genetic code , DNA replication, Transcription and Translation. rDNA technology. Introduction to gene cloning.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand and explain about gene structure and replication in prokaryotes and Eukaryotes
- How genetic material is replicated and also understands how RNA and proteins are synthesized.
- Understand about recombinant DNA technology and its application in different fields.
- Explain what is cloning.

Unit V: Application of Biology

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, biochips, Bio fuels. Basics of Production of Transgenic plants and animals.

Unit Outcomes:

After completing this unit, the student will be able to Understand.

- How biology is applied for production of useful products for mankind.
- What are biosensors, biochips etc.
- Understand transgenic plants and animals and their production

Course Outcomes:

After studying the course, the student will be able to:

- Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
- Explain about biomolecules, their structure and function and their role in the living organisms. How biomolecules are useful in Industry.
- Briefly about human physiology.
- Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
- Know about application of biological Principles in different technologies for the production of medicines and Pharmaceutical molecules through transgenic microbes,plants and animals.
-

Text books:

1. P.K.Gupta, Cell and Molecular Biology, 5th Edition, Rastogi Publications -
2. U. Satyanarayana. Biotechnology, Books & Allied Ltd 2017

Reference Books:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A Global Approach", Pearson Education Ltd, 2018.
2. T Johnson, Biology for Engineers, CRC press, 2011
3. J.M. Walker and E.B. Gingold, Molecular Biology and Biotechnology 2nd ed.. Panima Publications. PP 434.
4. David Hames, Instant Notes in Biochemistry –2016
5. Phil Tunner, A. Mctennan, A. Bates & M. White, Instant Notes – Molecular Biology

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B.Tech – II-II Sem	(Mechanical Engineering)	L	T	P	C
		3	0	0	3

Mechanics of Materials

Course Objectives:

- Familiarize concepts of stress, strain, shear force, bending moment, torsion, thin cylinders ,bending stresses, shear stresses and deflections.
- Derivation for bending stress, shear stress, deflection, and torsion, equations.
- To understand the double integration method, macaulays method and moment area method.
- Applications of strength of materials to the engineering work
- To understand the properties
- Provide fundamental concepts of temperature stresses.

UNIT I

Simple Stresses and Strains: Elasticity and plasticity – Types of stresses and strains – Hook'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.

Unit Outcomes

At the end of this Unit, the student will be able to

- To gain knowledge about simple stresses and strains.
- Know the relationships in terms of poisons ratios.
- Solve the simple problems.

UNIT II

Shear Force and Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

Unit Outcomes At the end of this Unit, the student will be able to

- To learn the drawing of SF and BM moment diagram.
- To learn the basic concepts.
- Solve the simple problems.

UNIT III

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: M/I = F/Y =E/R, Neutral axis – Determination 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 angle sections**.**

Unit Outcomes

At the end of this Unit, the student will be able to

- Learn the derivation of equations for flexural and shear stresses
- Know the drawing of shear stress distribution curves
- Solve the simple problems
-

UNIT IV

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, -U.D.L. Uniformly varying load.- Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

Unit Outcomes

At the end of this Unit, the student will be able to

- Learn the definitions for slope , deflection and radius of curvature.
- To understand d the different methods
- Solve the simple problems

UNIT V

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations: T/J = q/r = N_/L – Assumptions made in the theory of pure torsion – Torsion moment of resistance – Polar section modulus –Power transmitted by shafts.

Thin Cylinders: Stresses and Strains in thin cylinders, Thin Spherical Shells.

Unit Outcomes

At the end of this Unit, the student will be able to

- To understand the concept of torsion.
- Learn the derivation of equation of torsion
- Solve the simple problems

Course Outcomes:

After successful completion of this course student will be able to

- Apply the concepts of stress and strain to machine numbers.
- Determine, shear forces, and bending moments in beams.
- Find the slope and deflection in beams.
- Estimate the stresses in thin cylinders due to internal pressure.

TEXT BOOKS:

1. Strength of Materials by S. Ramamrutham
2. Strength of Materials by B.C. Punmia
3. Mechanics of Materials by Gere &Thimoshenko

REFERENCES:

1. Strength of Materials by Schaum'sout line series – Mc. Graw hill International Editions.
2. Strength of Materials by S. Ramakrishna and R.Narayan – DhanpatRai publications

Sri Krishnadevaraya University College of Engineering & Technology

		L	T	P	C
B.Tech – II-II Sem	**(Mechanical Engineering)**	**3**	**0**	**0**	**3**
	Material Science and Engineering				

Course Objectives

- To teach the principles of physical metallurgy, i.e. crystallography of metals, constitution of alloys, phase diagrams.
- Expose commercially important metals and alloys (both ferrous and non ferrous) with engineering constraints.
- Explain the methods to change the properties of materials through heat treatment processes
- Familiarize properties and applications of ceramics, polymers and composite materials.
- Demonstrate the fundamental properties of nano-materials and their applications.

UNIT I

Structure of Metals: Crystal Structures: Unit cells, Metallic crystal structures, Imperfection in solids: Point, Line, interstitial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

Constitution of Alloys: Necessity of Alloying, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron-Iron-carbide diagram and microstructural aspects of ferrite, cementite, austenite, ledeburite, and cast iron.

Unit Outcomes:

At the end of this unit the student will be able to

- Explain the importance of material science in engineering.
- Recall the definitions and terminology of crystallography.
- Distinguish metals and alloys.
- Make use of the principles of construction of binary phase diagrams.
- Identify various invariant reactions in binary phase diagrams.
- Explain the concept of metallography in studying the microstructures of metals and alloys.

UNIT II

Steels:

Plain carbon steels, use and limitations of plain carbon steels. AISI& BIS classification of steels. Classification of alloys steels. Micro structure, properties and applications of alloy steels- stainless steels and tool steels.

Cast irons:

Micro structure, properties and applications of white cast iron, malleable cast iron, grey cast iron, nodular cast iron and alloy cast irons.

Unit Outcomes:

At the end of this unit the student will be able to

- Classify various types of steels, their properties and applications.
- Identify various types of cast irons, their properties and applications.
- Compare steels and cast irons and their limitations in applications.

UNIT III

Heat Treatment of Steels: Annealing, tempering, normalizing and spheroidizing, isothermal transformation diagrams for Fe-Fe_3C alloys and microstructure development. Continious cooling curves and interpretation of final microstructures and properties- austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, and vacuum and plasma hardening

Unit Outcomes:

At the end of this unit the student will be able to

- Understand the importance of steel and iron - iron carbide phase diagram.
- Explain the influence of heat treatment in modification of properties of steels.
- Develop a heat treatment cycle based on properties required.

- Explain the principles of surface hardening methods.

UNIT IV

Non-ferrous Metals and Alloys: Micro structure, properties and applications of copper and its alloys, aluminium and its alloys. Study of Al-Cu phase diagram, precipitation hardening. Micro structure, properties and applications of titanium and its alloys.

Unit Outcomes:

At the end of this unit the student will be able to

- Explain the importance of non-ferrous metals and alloys in engineering applications.
- Demonstrate various properties and applications of non-ferrous alloys.
- Differentiate between hardening of ferrous and non-ferrous alloys.

UNIT V

Ceramics, Polymers and Composites: Structure, properties and applications of ceramics, polymers and composites. Introduction to super alloys and nanomaterials.

Unit Outcomes:

At the end of this unit the student will be able to

- Explain the properties of ceramics and their applications.
- Summarize the properties of polymers and composites and their use.
- Interpret the properties of nano materials and their applications.
- Identify the difference between the micro and nano scale materials and their uses.

Course Outcomes:

After completing the course, the student will be able to

- Explain the principles of binary phases.
- Select steels and cast irons for a given application.
- Apply heat treatment to different applications.
- Utilize nonferrous metals and alloys in engineering.
- Choose composites for various applications.
- Assess the properties of nano-scale materials and their applications.

Text Book(s)

1. V.Raghavan, "Material Science and Engineering", 5th edition, Prentice Hall of India, 2004.
2. R.Balasubramaniam, Callister's "Material Science and Engineering:, 2nd edition, Wiley India, 2014.

References

1. Y. Lakhtin, "Engineering Physical Metallurgy", University Press of the Pacific, 2000.
2. S.H.Avner, "Introduction to Physical Metallurgy", 2nd edition, Tata McGraw- Hill, 1997.
3. L.H.Van Vlack, "Elements of Material Science and Engineering", 6th edition, Pearson Education, 2008.
4. George E.Dieter, "Mechanical Metallurgy", 3rd edition, McGraw-Hill, 2013.

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B.Tech – II-II Sem	(Mechanical Engineering)	L	T	P	C
	Thermal Engineering - I	**3**	**0**	**0**	**3**

Course Objectives:

The Objectives of this course are to

- Familiarize concepts of properties of steam, use of molier charts, how to use steam tables, steam properties.
- Explains how steam boilers, condensers, nozzles and steam engines works and it's principles.
- Teach the concept of usage of cooling towers used for cooling of steam.
- Explains how mechanical work is generated using steam boilers, condensers and engines.
- Provide fundamental concepts steam engines and types of boilers and condensers used.

UNIT I

Thermodynamic vapour processes and cycles: constant volume process- constant pressure process- constant temperature process- hyperbolic process- adiabatic process, polytrophic process.

Cycles: Carnot cycle with steam as working substances-Rankine and Modified Rankine cycles, its efficiency and performance.

Unit Outcomes:

At the end of this unit, the student will be able to

- Students should Learn the drawing of P-V and H-S charts for processes and cycles.
- Understand the how to derive the various equations for various process.
- Solution for simple problems.

UNIT II

Steam Boilers : Classification based on Working principles –Mountings and Accessories – Boiler horse power, equivalent evaporation, efficiency and heat balance performance of steam boilers – boiler.

Draught: classification – Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced draught.

Unit Outcomes:

At the end of this unit, the student will be able to

- Finding the difference between various types of boilers.
- Understand the difference between mountings and accessories
- Should learn the meaning for draught.

UNIT III

Steam Condensers: Classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency–air leakage, sources and its effects, air pump- cooling water requirement, cooling towers and types of cooling towers

Unit Outcomes:

At the end of this unit, the student will be able to

- Understand the classification and working principles steam condensers
- Should learn the different types cooling towers
- Work on simple problems

UNIT IV

Steam Nozzles: Function of nozzle – applications - types, Flow through nozzles, thermodynamic analysis –assumptions –velocity of nozzle at exit-Ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio. Criteria for design of nozzle shape: Supersaturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line – Shock at the exit.

Unit Outcomes:

At the end of this unit, the student will be able to

- Students should gain knowledge about function , classification and applications of nozzle.
- Should know the problem solution.
- Solve simple problems

UNIT V

Steam engines- simple and compound steam engines- classification of steam engines, work done and power developed by steam engines.

Performance of steam engines-efficiencies of steam engine-governing of steam engines-missing quantity and steam consumption

Unit Outcomes:

At the end of this unit, the student will be able to

- Gain knowledge about working and performance of steam engines
- Understand the governing of steam engines
- Problem solution.

Course outcomes:

After completing this unit, the student will be able to

- Explain the importance of Thermodynamic vapour processes and cycles.
- How steam boilers, condensers, nozzles and steam engines works
- Utilize steam properties to design steam based components.

TEXT BOOKS:

1. Thermal Engineering – R.S. Khurmi&J.K.Gupta –S.Chand
2. Thermal Engineering / Rajput / Lakshmi Publications.

REFERENCES:

1. Thermal Engineering, Rudramoorthy - TMH
2. Thermodynamics & Heat Engines, B. Yadav, Central Book Depot., Allahabad
3. Thermal engineering data book-B.Srinivasulu Reddy, JK International Pub

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-II Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Python Programming

Course Objectives:

- To learn the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To get training in the development of solutions using modular concepts
- To introduce the programming constructs of python

Unit – I

Introduction: What is a program, Running python, Arithmetic operators, Value and Types.

Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.

Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

Unit Outcomes:

Student should be able to

- List the basic constructs of Python.
- Solve the problems by applying modularity principle.

Unit – II

Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.

Conditionals and Recursion: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.

Fruitful Functions: Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types

Unit Outcomes:

Student should be able to

- Apply the conditional execution of the program.
- Apply the principle of recursion to solve the problems.

Unit - III

Iteration: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.

Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.

Case Study: Reading word lists, Search, Looping with indices.

Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

Unit Outcomes:

Student should be able to

- Use the data structure list.
- Design programs for manipulating strings.

Unit – IV

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse

Lookup, Dictionaries and lists, Memos, Global Variables.
Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.
Files: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.
Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying.Classes and Functions

Unit Outcomes:
Student should be able to
- Apply object orientation concepts.
- Use data structure dictionaries.
- Organize data in the form of files.

Unit – V
Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning
Classes and Methods: Object oriented features, Printing objects, The init method, The __str__method, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation
Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.
The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args,
Unit Outcomes:
Student should be able to
- Plan programs using object orientation approach.
- Illustrate the principle of inheritance.

Course Outcomes:
Student should be able to
- Apply the features of Python language in various real applications.
- Select appropriate data structure of Python for solving a problem.
- Design object oriented programs using Python for solving real-world problems.
- Apply modularity to programs.

TEXT BOOKS:
1. Allen B. Downey, “Think Python”, 2nd edition, SPD/O’Reilly, 2016.

REFERENCE BOOKS:
1. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, “Fundamentals of Python”, CENGAGE, 2015.
3. R. Nageswara Rao, “Core Python Programming”, 2nd edition, Dreamtech Press, 2019

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B.Tech – II-II Sem	(Mechanical Engineering)	L	T	P	C
	Material Science & Engineering Lab	**0**	**0**	**3**	**1.5**

Course Objectives:

- To understand microstructure and hardness of engineering materials.
- To explain grain boundaries and grain sizes of different engineering materials.

List of Experiments:

1. Study of microstructure of pure metals – Iron, copper and aluminum.
2. Study of microstructure of low carbon steel, mild steel and high carbon steel.
3. Study of microstructure of cast irons.
4. Study of microstructure of non-ferrous alloys – aluminum, copper, titanium, nickel and their alloys.
5. Study hardenability of steels by Jominy End Quench Test.
6. Study of microstructure of heat treated steels.
7. Find hardness of various untreated and treated steels.
8. Study of microstructure of ceramics, polymeric materials.
9. Study of microstructure of super alloy and nano-materials.
10. Find the hardness of ceramics, super alloys, nano-materials and polymeric materials (one sample on each)

Course Outcomes:

The student is able to

- Identify various microstructures of ferrous and non-ferrous metals and alloys.
- Visualize grains and grain boundaries.
- Importance of hardening of steels.
- Evaluate hardness of treated and untreated steels.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-II Sem	(Mechanical Engineering)	L	T	P	C
	Mechanics of Materials Laboratory	**0**	**0**	**3**	**1.5**

Course Objectives:

- To conduct uni-axial tension test on Steel, Aluminium, Copper and Brass.
- To perform compression test on spring and wood.
- To determine elastic constants of materials using flexural and torsion tests.
- To find hardness of given metals.

List of Experiments:

1. Study the stress – strain relations of (a) Mild Steel b) Cast iron and (c) Tor Steel by conducting tension/compression test on U.T.M.
2. Study the stress – strain relation of (a) Copper and (b) Aluminium (c) other materials by conducting tension /compression test.
3. Find the compressive and shear strength of wood and shear strength of GI sheet by conducting relevant tests.
4. Find the Brinnell's and Vicker's hardness numbers of (a) Steel (b) Brass (c) Aluminium (d) Copper.
5. Determine the Modulus of rigidity (a) Solid shaft (b) Hollow shaft made of steel and aluminium.
6. Find the spring index and modulus of rigidity of the material of a spring by conducting compression and tensile tests.
7. Determine the Young's modulus of the material by conducting deflection test on a simply supported, propped cantilever and continuous beams.
8. Find impact strength of a given material by conducting a) Charpy test and b) Izod test
9. Determine buckling load in a compressive member made with steel and aluminium.
10. Determine the deflection in leaf spring with a single leaf and multiple leafs.

Course Outcomes:

On completion of this lab student will be able to

- Understand the stress-strain behaviour of different materials.
- Identify the difference between compression and tension testing.
- Evaluate the hardness of different materials.
- Correlate the elastic constants of the materials.
- Explain the relation between elastic constants and hardness of materials.

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
III Year 1st Semester 1					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Thermal Engineering-II	PC	3-0-0	3
2.		Metrology and Measurements	PC	3-0-0	3
3.		Heat Transfer	PC	3-0-0	3
4.		Design of Machine Elements - I	PC	3-0-0	3
5.		**Professional Elective - I** 1. Manufacturing Technology 2. Mechanical Behavior of Materials 3. Industrial Engineering and Management	PE-I	3-0-0	3
6.		Open Elective - I	OE-I	3-0-0	3
7.		Metrology & Measurements Lab	PC	0-0-3	1.5
8.		Thermal Engineering-I Lab	PC	0-0-3	1.5
9.		Socially Relevant Project(15hrs/Sem)	PR	- - -	0.5
				Total Credits	**21.5**

Category	**CREDITS**
Professional core courses	15
Professional Elective courses	03
Open Elective Course/Job oriented elective	03
Socially Relevant Project(15hrs/Sem)	0.5
TOTAL	21.5

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech III – I Sem (Mechanical Engineering)

L	T	P	C
3	0	0	3

Thermal Engineering-II

Course Objectives:

- Familiarize concepts of turbo machines.
- Explains how compressors work and types of compressors used.
- Explains how gas turbines and jet propulsion engines works.

UNIT I:

Basic Concepts of Turbo Machines: Definition, components and classification of Turbo machines
Reciprocating Compressors: Basic constructional features- working principle-work done calculation with and without clearance-single and multistage-intercooling.

UNIT – II:

Centrifugal Compressors and Fans: Components and description-Euler's pump and turbine equations-velocity diagrams-slip factor-energy transfer- power input factor-stage pressure rise and loading coefficient, pressure coefficient- degree of reaction- Centrifugal compressor characteristic,-surging- rotating Stall and Choking

UNIT – III

Axial Flow Compressors and Fans: Basic constructional features-Advantages of axial flow compressors-working principle-velocity triangle- elementary theory-stage work-work done factor- stage loading- degree of reaction-vortex theory- simple design calculations.

UNIT – IV

Gas Turbines: Simple gas turbine cycle- constant volume cycles – open and closed cycle – constant pressure cycle – efficiency and work output – cycle with inter coolers – reheat and regeneration practical cycles losses in a turbine-problems.

UNIT – V

Jet Propulsion : Principle of Operation –Classification of jet propulsive engines – Working Principles with schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency – Turbo jet engines –Turbo jet, Turbo prop, Pulse jet – Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – Methods.

TEXT BOOKS

1. Gas turbines, V. Ganesan, Tata McGraw-Hill
2. Subramanya, K., Hydraulic Machine, Tata McGraw Hill 2013
3. Thermal Engineering, A.S.Rao
4. Thermal Engineering, R.S.Khurmi, J.K.Gupta, S.CHAND Publications

REFERENCES:

1. Gas Turbines – V.Ganesan /TMH
2. Gas Turbines and Propulsive Systems – P.Khajuria&S.P.Dubey - /Dhanpatrai
3. Thermal Engineering-M.L.Mathur& Mehta/Jain bros

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B.Tech III – I Sem (Mechanical Engineering)

L	T	P	C
3	0	0	3

Metrology and Measurements

Course Objectives:

- Introduce the basic concepts of metrology and measurement methods.
- Demonstrate the importance of metrology in manufacturing
- Explain the concepts of transducers and its practical applications.
- Expose with various measuring instruments
- Familiarize calibration methods of various measuring instruments.

Course Outcomes:

- List various measuring instruments used in metrology.
- Examine geometry of screw threads and gear profiles.
- Measure force, torque, temperature, pressure and sound.
- Calibrate various measuring instruments.

UNIT I

Concept of Measurement: General concept-generalized measurement system, units and standards, measuring instruments, sensitivity, readability, range of accuracy, precision, static and dynamic response, repeatability, systematic and random errors, correction, calibration, terminology and limits fits and tolerances, hole basis and shaft basis system, interchangeability.

Linear and Angular Measurement: Linear measuring instruments: Vernier instruments, micrometers, slip gauges, tool makers microscope. Comparators: Mechanical, pneumatic and electrical. Angular measurements: Sine bar, bevel protractor and angle dekkor, rollers and spheres used to determine the tapers.

UNIT II

Flatness Measurement: Measurement of flatness – straight edges – surface plates, optical flat and autocollimators, interferometers and their applications.

Surface Roughness Measurement: Terminology systems, differences between surface roughness and surface waviness- Numerical assessment of surface finish - CLA, R,M,S Values-Ra , Rz values, Methods of measurement of surface finish-profilograph, talysurf, BIS symbols for indication of surface roughness, classification of automatic inspections systems, co-ordinate- measuring machines, non-contact inspection techniques-machine vision, laser scanning systems.

UNIT III

Metrology of Screw Threads:

Screw thread measurements: Elements of threads, errors in screw threads, various methods for measuring external and internal screw threads, screw thread gauges.

Gear Measurement: Gear tooth terminology, measurement of gear elements-runout, lead, pitch backlash, profile, pressure angle, tooth thickness, diameter of gear, constant chord and base tangent method.

UNIT IV

Measurement of Displacement: Theory and construction of various transducers to measure displacement - Piezo electric, inductive, capacitance, resistance, ionization and photoelectric transducers, calibration procedures.

Measurement of Speed: Mechanical tachometers - Electrical tachometers - Stroboscope, Noncontact type of tachometer.

Measurements of Strain: Various types of electrical strain gauges, gauge factor, method of usage of resistance strain gauge for bending, compressive and tensile strains, usage for measuring torque, strain gauge rosettes.

UNIT V

Measurement of Force: Direct method - analytical balance, platform balance; elastic members – load cells, cantilever beams and proving rings.
Measurement of Torque: Torsion bar dynomometer, servo controlled dynamometer and absorption dynamometer.
Measurement of Temperature: Standards and calibration, thermal expansion methods, thermo electric sensors (thermocouples), Electrical Resistance sensors, Junction semiconductor sensors, Digital thermometers, Radiation methods.
Measurement of Pressure and Sound: Standards and calibration, basic methods of pressure measurement, dead weight gauges and manometers, Elastic transducers, vibrating cylinder, resonant transducers, High and low pressure measurement.

Textbooks:

1. Thomas G.Beckwith, Marangoni, Linehard, "Mechanical Measurements", 6th edition, 257 Page PHI, 2013.
2. R.K. Jain, "Engineering Metrology", 20th edition, Khanna Publishers, 2013.

Reference Books:

1. Mahajan, "Engineering Metrology", 2nd edition, Dhanpat Rai, 2013.
2. S.Bhaskar, Basic Principles - Measurments and Control Systems, Anuradha Publications, 2014.
3. Anand K Bewoor & Vinay A Kulkarni, "Metrology & Measurement", 15th edition, McGrawHill, 2015

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech III – I Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Heat Transfer

Course Objectives:

- To impart the basic laws of conduction, convection and radiation heat transfer and their applications
- To familiarize the convective heat transfer concepts
- To explain basics of radiation heat transfer
- To make conversant with the heat transfer analysis related to thermal systems like heat exchangers, evaporator, and condenser.

Unit I

Introduction: Basic modes of heat transfer- rate equations- generalized heat conduction equation for plane walls, cylindrical surfaces and spherical surfaces, 1-D steady state heat conduction solution for plain and composite slabs - cylinders –spheres--problems- critical thickness of insulation.

Unit II

Heat conduction through extended surfaces- fins of uniform cross section- fin effectiveness and efficiency.
Unsteady State Heat Transfer Conduction- Transient heat conduction- lumped system analysis and use of Heisler charts.
Boiling and Condensation: Different regimes of boiling- nucleate, transition and film boiling – condensation - filmwise and dropwise condensation.

Unit III

Convection: Basic concepts of convection–heat transfer coefficients - types of convection –forced convection and free convection.
Forced convection in external flow–concepts of hydrodynamic and thermal boundary layer- use of empirical correlations for flow over plates and cylinders. Internal flow – Use of empirical relations for convective heat transfer in horizontal pipe flow.
Free Convection -development of hydrodynamic and thermal boundary layer along a vertical plate – use of empirical relations for convective heat transfer on plates and cylinders in horizontal and vertical orientation

Unit IV

Radiation: Radiation heat transfer – thermal radiation – laws of radiation - Black and Gray bodies – shape factor-radiation exchange between surfaces - Radiation shields - Greenhouse effect.

Unit V

Heat Exchangers: Types of heat exchangers- parallel flow- counter flow- cross flow heat exchangers- overall heat transfer coefficient- LMTD and NTU methods for parallel and counter flow heat exchangers.

Text Book(s)

1. P.K. Nag, Heat Transfer, 3/e, Tata McGraw-Hill, 2011.
2. F. P. Incropera and D.P. Dewitt, Fundamentals of Heat and Mass Transfer, 6/e, John Wiley, 2007.

References:

1. J.P.Holman, Heat Transfer, 9/e, Tata McGraw-Hill,2008.
2. Cengel. A.Yunus, Heat Transfer- A Practical Approach, 4/e, Tata McGraw-Hill, 2007.
3. S.P. Sukhatme, A Textbook of Heat Transfer, Universities Press, 2005
4. Lienhard and Lienhard, A Heat and Mass Transfer, Cambridge Press, 2011.
5. C.P. Kothandaraman and S. Subramanyan, Heat and Mass Transfer databook, New Age Publications, 2014

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B.Tech III – I Sem (Mechanical Engineering)

L	T	P	C
3	0	0	3

Design of Machine Elements- I

Course Objectives:

- To impart the general procedure to design the machine elements
- To familiarize the selection of engineering materials to design based on mechanical properties
- To explain basics various types of joints, couplings, & loads
- To familiarize various testing methods from theories of failures

UNIT-I

Introduction: The art and science of machine design- Types of design methods - stages in machine design selection of engineering materials based on mechanical properties-Types of loads, Factor of safety. Introduction of various theories of failure.

UNIT-II

Strength of Machine Elements: Stress concentration–notch sensitivity, Fatigue stress concentration factor – Design for fluctuating stresses – Endurance limit, S-N Curve – Estimation of Endurance strength –Gerber, Goodman's & Soderberg's methods, and simple problems.

UNIT-III

Riveted Joints: Types of riveted joints - modes of failure-strength and efficiency of riveted joints, pitch of the rivets, design stresses - boiler joints, - Riveted joints under eccentric loading.

Welded Joints: Types of welded joints, strength of welds, Design of simple welded joints.

UNIT-IV

Bolted Joints : Forms of Screw threads. Stresses in Screw fasteners. Design of bolts with pre-stresses – Design of joints under eccentric loading– Bolts of uniform strength.

Keys, Cotters and Knuckle Joints: Types of Keys, stresses in Keys, design of rectangular and square Keys. Design of Cotter joints: spigot and socket, sleeve and cotter, jib and cotter joints- Knuckle joints.

UNIT-V

Design of Shafts and Couplings- Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads. Design of Rigid couplings: Muff, Split muff and Flange couplings.

TEXT BOOKS:

1. Machine design, R.S Khurmi and JK Gupta.S.Chand& Chand
2. V.B.Bhandari, Design ofMachineElements,TMHPublishers,NewDelhi.
3. Machine Design, Kannaiah, Scietech.
4. Machine Design by S.Md. Jalaluddin, Anardha Publishers, Chennai.

REFERENCES:

1. Machine design, J.E. Shigley.
2. Design of Machine Elements, M.F. Spotts, PHI

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		3	**0**	**0**	**3**

Manufacturing Technology

(Professional Elective – I)

Course Objectives:

- Explain parameters in the metal cutting operation.
- Relate tool wear and tool life and the variables that control them.
- Calculate machining times for different machining processes.
- Teach various metal cutting processes. (lathe, drilling, boring shaping, slotting, milling and grinding

Course Outcomes:

At the end of the course, the student will be able to

- Choose cutting processes and variables.
- Relate tool wear and tool life.
- Calculate the machining parameters for different machining processes.
- Identify methods to generate different types of surfaces.
- Explain work-holding requirements.

UNIT I:

Geometry of single point cutting tools and angles-Mechanism of chip formation in machining ductile and brittle materials- and types of chips –Built-up-Edge (BUE) formation and its effects, Use of Chip breaker in machining-principles and methods of chip breaking. Mechanics of Orthogonal cutting –Merchant's Force diagram, cutting forces – cutting speeds, feed, depth of cut, tool life and wear, economics of machining-coolants-methods of applications of cutting fluids, mach inability –Tool materials.

.

UNIT II:

Engine lathe – Principle of working, specification of lathe – types of lathes – work holders, tool holders – Box Tools, 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.

UNIT III:

Shaping, Slotting and planning machines – their Principles of working – Principal parts – specification, classification, Operations performed-Machining time calculations. Shaper size, shaper mechanism, Crank and slotted link mechanism, Whit worth quick return mechanism, Hydraulic shaper mechanism,

UNIT IV:

Drilling and Boring Machines – Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring machines – Fine boring machines – Jig Boring machine-deep hole drilling machine.

UNIT V

Milling machine – Principles of working – specifications – classifications and principle features of milling machines – machining operations, Types and geometry of milling cutters– methods of indexing –Direct Rapid indexing, Plain or simple indexing, Compound indexing, Differential indexing and angular indexing.

Introduction to grinding, lapping, honing and broaching machines-classification- comparison of grinding, lapping and honing- Lapping, Honing and Broaching machines- Grinding wheel: Different types of abrasives – bonds, specification and selection of a grinding wheel.

Text books:

1. Elements of Workshop Technology: Vol: II machine tools; By Choudhury, S. K. Hajara, Choudhury, A. K. Hajara & Roy, Nirjhar.
2. Workshop Technology – Vol II, B.S. Raghuvamshi.
3. Metal cutting by Bhattacharya

4. P.N. Rao, Manufacturing Technology: Metal Cutting and Machine Tools, (Volume 2), 3/e, Tata McGraw-Hill Education, 2013
5. R.K. Jain and S.C. Gupta, Production Technology, 17/e, Khanna Publishers, 2012.

Reference books:

1. Kalpakzian S and Schmid SR, Manufacturing Engineering and Technology, 7/e, Pearson, 2018.
2. Milton C.Shaw , Metal Cutting Principles, 2/e, Oxford, 2012
3. Hindustan Machine Tools, Production Technology, TMH, 2001
4. V.K.Jain, Advanced Machining Process,12/e, Allied Publications, 2010
5. AB. Chattopadhyay, Machining and Machine Tools, 2/e, Wiley, 2017
6. Halmi A Yousuf & Hassan, , Machine Technology: Machine Tools and Operations, CRC Press Taylor and Francis Group, 2008
7. Manufacturing science by Amitab Ghosh and Ashok Kumr Mallik, Tata-McGraw-Hill Publications
8. Production Technology by Pakkirappa - Durga Publications.

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B.Tech III – I Sem (Mechanical Engineering)

L	T	P	C
3	0	0	3

Mechanical Behaviour of Materials

(Professional Elective – I)

Course Objectives:

The objectives of the course are to

- Explain the structure of material over the effects of mechanical properties.
- Familiarize the defects inside the structure and their effects on the mechanical properties.
- Train the methods for characterization of the mechanical behavior of materials.
- Impart knowledge about strengthening mechanisms of materials.
- Teach mechanisms of failures of materials (fracture, fatigue and creep) and their relationship with the different types of stress.

Course outcomes:

- After successful completion of this course, the student will be able to
- Apply materials based on their structure and failure modes.
- Characterize materials using different machines.
- Summarize the various strengthening mechanisms with suitable examples.
- Identify the creep in different materials and its influence in selection of materials.

UNIT – I

Elastic and plastic behaviour: Elastic behaviour of materials – Hooke's law, plastic behavior: dislocation theory – Burger's vectors and dislocation loops, dislocations in FCC, HCP and BCC lattice, stress fields and energies of dislocations, forces on and between dislocations, slip and twinning.

UNIT – II

Strengthening mechanisms: Cold Working, Grain Size Strengthening, Solid Solution Strengthening, Martensitic Strengthening, Precipitation Strengthening, Dispersion Strengthening, Fibre Strengthening, Examples. Yield Point Phenomenon, Strain aging and dynamic strain aging.

UNIT – III

Fracture and fracture mechanics: Types of Fracture, Basic Mechanism of Ductile and Brittle Fracture, Griffith's Theory Of Brittle Fracture, Ductile to Brittle Transition Temperature (DBTT), Factors Affecting DBTT, Determination of DBTT. Fracture Mechanics-Introduction, Modes of Fracture, Stress Intensity Factor, Strain Energy Release Rate, Fracture Toughness and Determination of K_{IC}.

UNIT - IV

Fatigue behaviour and testing: Stress Cycles, S-N Curves, Effect of Mean Stress, Factors Affecting Fatigue, Structural Changes Accompanying Fatigue, Cumulative Damage, HCF / LCF, Thermo-mechanical Fatigue, Application of Fracture Mechanics to Fatigue Crack Propagation, Fatigue Testing Machines.

UNIT - V

Creep behaviour and testing: Creep Curve, Stages In Creep Curve And Explanation, Structural Changes During Creep, Creep Mechanisms, Metallurgical Factors Affecting Creep, High Temperature Alloys, Stress Rupture Testing, Creep Testing Machines.

Text books:

1. Dieter, G.E., "Mechanical Metallurgy", McGraw-Hill, SI Edition, 1995.
2. Davis. H. E., Troxell G.E., Hauck.G. E. W., "The Testing Of Engineering Materials", McGraw-Hill, 1982.

References:

1. Wulff, The Structure and Properties of Materials, Vol. III "Mechanical Behavior of Materials", John Wiley and Sons, 1983.
2. Honey Combe R. W. K., "Plastic Deformation of Materials", Edward Arnold Publishers, 1984.
3. Suryanarayana, A. V. K., "Testing of Metallic Materials", Prentice Hall India, 1979.

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		3	**0**	**0**	**3**

Industrial Engineering and Management

(Professional Elective – I)

Course Objectives:

- To create awareness to learn principles, concepts, functions of management and also to design organizational structures.
- To train with materials and marketing management concepts in organizational context.
- To familiarize the students regarding HR, Strategy and Project Management

Course Outcomes:

After completing this course, the student should be able to

- Discuss the principles and functions of management.
- Apply the knowledge of inventory management and marketing strategies in work setting.
- Discuss the importance of various sub systems of HRM.
- Decide the competitive strategy that works best for the organization.
- Develop effective project management techniques

UNIT I

Introduction To Management: Concepts of Management - nature, importance and Functions of Management, Management Skills, Henry Mintzberg's managerial roles, Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Leadership Styles, Social responsibilities of Management.

Designing Organizational Structures: Types of mechanistic and organic structures of organization (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, team structure) their merits, demerits and suitability.

UNIT II

Materials Management: EOQ, ABC Analysis, Purchase Procedure and Stores Management. Inventory — functions. Types, inventory classification techniques.

Marketing: Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle, Channels of distribution.

UNIT III

Human Resources Management (HRM): Concepts of HRM ,Personnel Management and Industrial Relations (PMIR), Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Compensation Management, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation, Merit Rating and methods.

UNIT IV

Strategic Management: Vision, Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation.

UNIT V

Project Management (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing.

TEXT BOOKS:

1. Harold Koontz, Cyril O'Donnell, Heinz Weihrich, Essentials of Management, ISE Edition, McGraw-Hill publications,1990.
2. A.R.Aryasri, Management Science, 4/e, Tata McGraw-Hill company Ltd., 2012.
3. Harold T.Amrine, Jhon A. Ritchey, Colin L. Moodie, Manufacturing Organization and management, 6/e, Pearson Education India, 2009.
4. Samuel Eilon, Elements of production planning and control, 1/e, Macmillan, New York, 1962.

REFERENCES:

1. James Arthur Finch Stoner, R. Edward Freeman, Daniel R. Gilbert, Management , 6/e, Prentice Hall, 2010.
2. R.Panneerselvam, Production and Operations Management, 3/e, PHI , 2012.
3. Stoner. Freeman. Gilbert. Management. 6/e, Pearson Education, 2005.
4. Richard B. Chase, F. Robert Jacobs, Nicholas J. Aquilano, Operations Management for Competitive Advantage. 11/e. McGraw-Hill-, 2006.

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		0	**0**	**3**	**1.5**

Metrology & Measurements Lab

List of Experiments:

1. Strain measurement trainer
2. Temperature measurement trainer R.T.D
3. Temperature measurement trainer Thermocouple
4. Temperature measurement trainer Thermister
5. LVDT measurement trainer
6. Rota meter test Rig
7. Pressure measurement trainer
8. Speed measurement trainer
9. Angular type capacitance measurement trainer
10. McLeod Gauge
11. Vibration measurement trainer
12. Tool maker's microscope
13. Measurement of length, height, and diameter by verniercallipers, vernier height gauge and micrometer.
14. Measurement of bores using dial bore indicator.
15. Angle and tapper measurement using Bevel protractor and SINEBAR
16. Measurement of thickness of gare teeth by vernier tooth caliper
17. surface roughness measurement by Talysurf
18. Flatness of surface plate by using sprit level.
19. Alignment tests

Note: Any 12 of the above equipments

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		0	**0**	**3**	**1.5**

Thermal Engineering-I Lab

List of Experiments:

1. Composite wall apparatus
2. Heat transfer in natural convection
3. Lagged pipe
4. Stefan Boltzmann apparatus
5. Heat transfer in force convection
6. Heat transfer in pin fin
7. Heat pipe demonstrator
8. Emmisitivity measurement
9. Drop wise and film vise apparatus
10. Counter flow and parallel flow heat exchangers apparatus.

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
III Year 2nd Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Kinematics and Dynamics of Machinery	PC	3-0-0	3
2		Design of Machine Elements - II	PC	3-0-0	3
3		CAD/CAM	PC	3-0-0	3
4		Internal Combustion Engines	PC	3-0-0	3
5		**Professional Elective - II** 1. Refrigeration and Air Conditioning 2. Design of Transmission of systems. 3. Composite Materials	PE-II	3-0-0	3
6		Open Elective -II	OE-II	3-0-0	3
7		Thermal Engineering-II Lab	PC	0-0-3	1.5
8		CAD/CAM Lab	PC	0-0-3	1.5
9		Socially Relevant Project(15hrs/Sem)	PR	- - -	0.5
10		Industrial Training/ Internship/ Research Projects in National Laboratories/Academic Institutions	PR	- - -	- - -
				Total credits	**21.5**

Category	**CREDITS**
Professional Core Courses	15
Professional Elective Courses	03
Open Elective Course/Job oriented elective	03
Socially Relevant Project(15hrs/Sem)	0.5
TOTAL	21.5

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B.Tech III – II Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Kinematics and Dynamics of Machinery

Course objectives:

- Introduce various basic mechanisms and their applications
- Explain importance of degree of freedom
- Familiarize velocity and acceleration in mechanisms
- Describe the cams and follower motions
- Explain the importance of gyroscopic couples
- Introduce the equation of motion for single degree of freedom system

Course Outcomes:

At the end of the course the students will be able to

- Understand different mechanisms and their inversions.
- Calculate velocity and acceleration of different links in a mechanism,
- Apply the effects of gyroscopic couple in ships, aero planes and road vehicles.
- Evaluate unbalance mass in rotating machines.
- Analyse free and forced vibrations of single degree freedom systems.

Unit I

Simple Mechanisms:

Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, mobility – Grashof's law, kinematic inversions of four bar chain and slider crank chains- Limit positions – Mechanical advantage- Transmission angle- Description of some common mechanisms- Quick return mechanism, straight line mechanisms- Universal Joint – Rocker mechanisms.

Unit II

Velocity analysis: Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centers, velocity and acceleration analysis using loop closure equations- kinematic analysis of simple mechanisms-slider crank mechanism dynamics-Coincident points-Coriolis component of acceleration-introduction to linkage synthesis-three postion graphical synthesis for motion and path generation.

Unit III

Gyroscope: Principle of gyroscope, gyroscopic effect in an aeroplane, ship, car and two wheeler, simple problems

Gear Profile: Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/undercutting-helical, bevel, worm, rack & pinion gears, epicyclic and regular gear train kinematics.

Unit IV

Balancing of Rotating masses: Need for balancing, balancing of single mass and several masses in different planes, using analytical and graphical methods.

Cams: Classification of cams and followers- Terminology and definitions- Displacement diagrams- Uniform velocity, parabolic, simple harmonic and cycloidal motions- derivatives of follower motions- specified contour cams- circular and tangent cams- pressure angle and undercutting.

Unit V

Vibrations: Introduction, degree of freedom, types of vibrations, free natural vibrations, Newton method and energy method for single degree of freedom. Damped vibrations- under damped, critically damped; and over damped systems, forced vibrations with and without damping in single degree of freedom; Vibration isolation and transmissibility, Vibration measuring instruments: displacement, velocity, acceleration and frequency measurement.

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Text Book(s)

1. S.S.Rattan ,Theory of Machines, 4/e, Tata Mc-Graw Hill, 2014
2. G.K.Groover, Mechanical Vibrations, 8/e, Nemchand Bros, 2009

References

1. F. Haidery, Dynamics of Machines, 5/e, Nirali Prakashan, Pune, 2003
2. J.E.Shigley, Theory of Machines and Mechanisms, 4/e, Oxford, 2014
3. P.L.Ballaney, Theory of Machines & Mechanisms, 25/e, Khanna Publishers, Delhi, 2003.
4. Norton, R.L., , Design of Machinery - An introduction to Synthesis and Analysis of Mechanisms and Machines, 2/e, McGraw Hill, New York, 2000.
5. William T. Thomson, Theory of vibration with applications, 4/e, Englewood Cliffs, N.J. : Prentice Hall, 1993.

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L	T	P	C
3	0	0	3

Design of Machine Elements - II

Course objectives:

The Objectives of this course are to

- Importance of design
- How to design the various components and design procedures
- Usage of design data hand book.

UNIT – I

Bearings: Types of Journal bearings – Lubrication – Bearing Modulus–bearing materials – journal bearing design – Ball and roller bearings – Static loading of ball & roller bearings, bearing life.

UNIT – II **Design of**

I.C.Engine Parts: Design of connecting rod-stress due to whipping action on Connecting rod –design of trunk type piston for I.C. engine, design of crank and crankshafts.

UNIT – III

DESIGN OF PRESSURE VESSELS AND PIPES: Introduction- classification of pressure vessels-stresses in thin cylinder, circumferential& hoop stresses, longitudinal stresses-thin and thick cylinders-Pipe joints-design of circular, oval & flanged pipe joints- standard pipe flanges for steam-hydraulic pipe joints for high pressures

.

UNIT – IV

Power Transmission Systems: Design of Flat belt drives, V-belt drives & rope drives. Selection of wire ropes, design procedure for chain drives.

UNIT-V

Spur & Helical Gears: Classification of gears, design of spur gears, Lewis equation –bending strength, dynamic load and fatigue of gear tooth- Design of Helical gears.

Power Screws : Design of screw, Square ACME, Buttress screws, design of nut, compound screw, differential screw, ball screw- possible failures.

TEXT BOOKS

1. V.B.Bhandari, Design ofMachineElements,TMHPublishers,NewDelhi.
2. Machine Design, Kannaiah/ Scietech
3. Machine Design, S MD Jalaludin, Anuradha Publishers
4.

REFERENCES:

1. SadhuSingh[2000],Machine Design,KhannaPublishers, NewDelhi.
2. M.F.Spotts, DesignofMachineElements,PHIPublishers, NewDelhi.

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		3	**0**	**0**	**3**

CAD/CAM

Course objectives:

- Understand the basics of CAD/CAM, geometric representation, transformations.
- Explain geometric modeling methods in CAD.
- Familiarize numerical control (NC), computer numerical control (CNC) and direct numerical control (DNC) machines.
- Impart knowledge on manual part programming and computer aided part programming.

Course Outcomes:

At the end of the course, the student will be able to

- Apply the basics of geometric representation and transformations in CAD/CAM.
- Choose geometric modeling methods for building CAD models.
- Compare NC, CNC and DNC.
- Develop manual and computer aided part programming for turning and milling operations

UNIT I

Product cycle, steps involved in Designing a CAD, CAD tools, CAM tools, CPU, input devices, output devices, Memory types, Application of computers for design, benefits of CAD, storage devices.

UNIT II:

Computer Graphics & Drafting: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, Geometric commands, layers, display control commands, editing, dimensioning.

UNIT III

Geometric modeling: Wire frame models, Wire frame entities, curve representation, parametric representation of synthetic curves, curve manipulations.

UNIT IV

Numerical control: Basic components of an NC, Classifications- CNC, DNC, classification of several output devices used in NC systems, feedback devices, NC coordinate systems, NC motion control systems, application of NC, Machining center, turning center, NC Part Programming, A.P.T- language.

UNIT V

Group Tech: Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

Computer Aided Quality Control: Terminology in quality control, the computer in QC, contact inspection methods, non-contact inspection methods-optical non-contact inspection methods-non-optical computer aided testing, integration of CAQC with CAD/CAM.

Text books:

1. CAD/CAM, A Zimmers & P.Groover, PE, PHI.
2. CAD/CAM-Principles and applications, P.N. Rao, TMH.
3. P. N. Rao, CAD/CAM: Principles and applications, 3/e, Tata McGraw-Hill, Delhi, 2017
4. Ibrahim Zeid, R.Siva Subramanian, CAD/CAM: Theory and Practice, 2/e, Tata McGraw-Hill, Delhi, 2009

Reference books:

1. Automation, Production systems & Computer integrated Manufacturing, Groover, P.E.
2. CAD/CAM/CIM, Radhakrishnan and Subramaniah, New Age
3. Mikell P. Groover, Emory W. Zimmers , CAD/CAM, 5/e, Pearson Prentice Hall of India, Delhi, 2008
4. P. Radhakrishnan, S. Subramanyan & V. Raju, CAD/CAM/CIM, 3/e, New Age International Publishers, 2008
5. Computer Aided Manufacturing, 3/e, Tien Chien Chang, Pearson, 2008

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech III – II Sem (Mechanical Engineering)

L	T	P	C
3	0	0	3

Internal Combustion Engines

Course objectives:

- Impart the knowledge of IC engines and its components.
- Demonstrate the working of petrol engines and diesel engines.
- Trains about how combustion takes place in the IC engines.
- Explains how the fuels are rated and how to assess the performance of the engines.

UNIT – I

I.C.Engines: Energy conversion– basic engine components - Working principle of two stroke and four stroke engines - comparison of two stroke and four stroke, SI and CI engines – Classification of I.C. Engines, Valve and port timing diagrams, application of I.C Engines.

UNIT-II

Power Cycles: Carnot cycle, Air standard cycles -Description and representation of Otto cycle, Diesel cycle & Dual cycles on P–V and T-S diagram -Thermal Efficiency – Comparison of Otto, Diesel and Dual cycles. Simple problems on Otto, Diesel and Dual cycles

.

UNIT – III

Testing and Performance: Engine Performance Parameters - Determination of, Brake power, friction power and indicated power – Performance test – Heat balance sheet- problems.

UNIT – IV

Engine Systems: Working principle of Magneto & Battery Ignition System - Simple Carburetor – fuel Injection System - Air & Thermostat cooling system -Lubrication system.

Super Charging: Introduction, types of superchargers, methods of supercharging, advantages and limitations of supercharging.

UNIT – V

Combustion in S.I. Engines: Homogeneous Mixture - Stages of combustion –Abnormal Combustion - Phenomenon of Knocking, Combustion Chambers- types, Rating of S.I Engine fuels.

Combustion in C.I. Engines: Heterogeneous Mixture - Stages of combustion - Combustion chambers –types, Rating of C.I Engine fuels.

TEXT BOOKS:

1. I.C. Engines / V. GANESAN- TMH
2. Thermal Engineering / R.K Rajput / Lakshmi Publications.
3.

REFERENCES:

1. I.C Engines – Mathur & Sharma – Dhanpath Rai & Sons.
2. Engineering fundamentals of I.C Engines – Pulkrabek / Pearson /PHI

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech III – II Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Refrigeration and Air Conditioning

(Professional Elective – II)

Unit I

Introduction to Refrigeration : Refrigerants– Desirable properties of idle refrigerant – classification of refrigerants – Nomenclature – secondary refrigerants. Unit of refrigeration – COP - Air refrigerator working on reversed Carnot cycle & Bell Coleman cycle - Simple Problems.

Unit II

Vapour Compression Refrigeration : Introduction – advantages and limitations - Basic cycle (p-h chart) – working principle and essential components of the system – types of vapour compression cycles – effect of subcooling and super heating – Actual cycle - effect of suction pressure and discharge pressure.

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Unit III

Vapour Absorption Refrigeration System : Simple vapour absorption system- practical vapour absorption system - advantages and disadvantages of VAR over VCR - COP of idle VAR system.Working Principle and operation of Domestic Electrolux system.

Steam Jet Refrigeration system: Working Principle and operation of Steam Jet Refrigeration system and Thermo-Electric Refrigerator.

Unit IV

Introduction to Air Conditioning : Introduction to Psychrometry – psychometric terms – psychometric chart -Daltons Law of partial pressures - psychometric Processes- Need for Ventilation – Infiltrated air – Heat Load concepts - RSHF, GSHF - Problems.

Air Conditioning equipment: Fans and blowers- types.

Unit V

Comfort Air Conditioning : Requirements of human comfort and concept of Effective Temperature- Comfort chart –Comfort Air Conditioning – summer, winter & year round air conditioning.

Heat Pump – Heat sources – different heat pump circuits.

Text Book(s)

1. A text book of Refrigeration and Air Conditioning, R.S.Khurmi&J.K.Gupta, S.Chand& Co.
2. Refrigeration and Air Conditioning, CP Arora, 3/e, TMH, 2008
3. A Course in Refrigeration and Air conditioning, SC Arora&Domkundwar, Dhanpatrai

References:

1. Refrigeration and Air Conditioning, Manohar Prasad, 2/e, New Age.
2. Principles of Refrigeration, Dossat, 4/e, Pearson Edu

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech III – II Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Design of Transmission Systems

(Professional Elective – II)

Course Objectives:

- Explain the various elements involved in a transmission system.
- Focus on the various forces acting on the elements of a transmission system.
- Design the system based on the input and the output parameters.
- Produce working drawings of the system involving pulleys, gears, clutches and brakes.
- Demonstrate the energy considerations in the design of motion control elements.

Course Outcomes:

At the end of this Unit the student will be able to

- Design pulleys, chain drives, rope drives and belt drives.
- Determine performance requirements in the selection of commercially available transmission drives.
- Design Brakes and Clutches
- Design various types of gear boxes.
- Select materials for various applications in the transmission elements.

UNIT I

Design of bearing: Design of sliding contact bearing using Sommerfield number – Design using Mckee's equation – Selection of rolling contact bearings.

Flexible power transmission systems: Design of Belts – Flat Belts and Pulleys – V Belts and Pulleys – Design of chain drives – Wire ropes.

UNIT II

Spur gear: Gear geometry – Kinematics – Forces on gear tooth – Stresses in Gear tooth – Selection of gear material based on bending stress and contact stress – Design of Spur gear – Power transmitting capacity.

UNIT III

Helical, bevel and worm gears: Parallel Helical Gears – Kinematics – Tooth proportions – Force analysis – Stresses in Helical gear – Design of helical gear – Crossed Helical gears – Straight Bevel gears – Kinematics – Force analysis – Stresses in straight bevel gear tooth – Design of bevel gear – Worm gearing – Kinematics – Forces - Friction and Efficiencies – Stresses in worm gear tooth.

UNIT IV

Design of gear boxes: Design of Speed reducers – Design of multi speed gear boxes for machine tools – Structural and ray diagrams.

UNIT V

Elements of motion control: Internal – Expanding Rim clutches and Brakes – External – Contracting Rim clutches and Brakes – Band type Clutches – Cone clutches and Brakes – Energy considerations – Temperature rise – Friction materials.

Text books:

1. Joseph Edward Shigley and Charles, R. Mischke, Mechanical Engineering Design, McGraw –Hill International Editions, 2000.
2. Machine Design- an integrated approach, (5th Edition) by Robert L. Norton, Pearson publisher, 2000

References:

1. Design Data, PSG College of Technology, DPV Printers, Coimbatore, 2005.
2. Malisa, Hand Book of Gear Design, Tata Mc Graw Hill, International Edition, 2000.
3. V.B. Bhandari , Design of Machine elements, Tata Mc Graw Hill, 2001.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech III – II Sem **(Mechanical Engineering)**

L	T	P	C
3	0	0	3

Composite Materials

(Professional Elective – II)

Course Objectives:

- Introduce composite materials and their applications.
- Build proper background for stress analysis in the design of composite structures.
- Familiarize various properties of composite materials.
- Focus on biodegradable composites.

Course Outcomes:

At the end of this course, the student will be able to

- Identify the practical applications of composites.
- Identify the polymer matrix composites.
- Classify of bio- degradable composites.
- Outline the various types of ceramic matrix materials.

UNIT - I

Introduction to composites: Fundamentals of composites – Definition – classification– based on Matrix – based on structure – Advantages and applications of composites - Reinforcement – whiskers – glass fiber – carbon fiber - Aramid fiber – ceramic fiber – Properties and applications

UNIT - II

Polymer matrix composites: Polymers - Polymer matrix materials – PMC processes - hand layup processes – spray up processes – resin transfer moulding – Pultrusion – Filament winding – Auto clave based methods - Injection moulding – sheet moulding compound – properties and applications of PMCs.

UNIT - III

Metal matrix composites: Metals - types of metal matrix composites – Metallic Matrices. Processing of MMC – Liquid state processes – solid state processes – Insitu processes. Properties and applications of MMCs.

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UNIT - IV

Ceramic matrix composites: Ceramic matrix materials – properties – processing of CMCs –Sintering - Hot pressing – Infiltration – Lanxide process – Insitu chemical reaction techniques – solgel polymer pyrolsis – SHS - Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). Properties and Applications of CCMs.

UNIT - V

Advances in composites: Advantages of carbon matrix – limitations of carbon matrix carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Properties and applications of Carbon-carbon composites. Composites for aerospace applications. Biodegradability, introduction of biocomposites, classification, processing of biocomposites, applications of biocomposites - Mechanical, Biomedical, automobile Engineering.

Text books

1. Chawla K.K, Composite materials, 2/e, Springer – Verlag, 1998.
2. Mathews F.L. and Rawlings R.D., Chapman and Hall, Composite Materials: Engineering and Science, 1/e, England, 1994.

References

1. H K Shivanand, B V Babu Kiran, Composite Materials, ASIAN BOOKS, 2011.
2. A.B. Strong , Fundamentals of Composite Manufacturing, SME, 1989.
3. S.C. Sharma, Composite materials, Narosa Publications, 2000.
4. Maureen Mitton, Hand Book of Bioplastics & Biocomposites for Engineering applications, John Wiley publications.

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B.Tech III – II Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

Thermal Engineering-II Lab

List of Experiments:

1. Refrigeration test rig
2. Vapour absorption test rig
3. Window type AC
4. Air washer test rig
5. Water cooler
6. Mechanical heat pump
7. Thermo electric apparatus
8. Gas charging unit
9. Cooling tower test rig
10. Performance test on 4 stroke diesel engine
11. Performance test on 2 stroke petrol engine
12. Air compressor test rig.
13. Flash and fire point apparatus
14. Redwood and say bolt viscometer apparatus.
15. VTD and PTD of 2 and 4 stoke engine.
16. Study of boilers, SI and CI Engines, Assemble and disassemble of Engines, Carburetor and fuel injector.

Note: Any 12 of the above equipments

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B.Tech III – II Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

CAD/CAM Lab

List of Experiments:

1. Introduction and initiating the graphics package, setting the paper size, space, setting the limits, units, use of snap, ortho and grid commands.
2. Practicing Autocad commands: Line, Circle, Arc, Array, Offset, Trim, Extend, Mirror, Move, Copy, Rotate, Erase, Zoom, Pan, Etc.
3. Dimensioning the drawing and adding text.
4. Create a 2-D view of the given diagram using Autocad
5. Create a 2-D view of the given diagram using Autocad
6. Create a iso metric from the given orthographic views using Autocad.
7. Create a iso metric from the given orthographic views using Autocad CA
8. To creating 3-D modeling from the given orth graphic views using Autocad 3-D commands.
9. To creating 3-D modeling from the given orth graphic views using Autocad 3-D commands.

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
IV Year 1st Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Tool Design	PC	3-0-0	3
2.		Operations Research	PC	3-0-0	3
3.		Non Conventional Sources of Energy	PC	3-0-0	3
4.		Non Destructive Testing	PC	3-0-0	3
5.		**Professional Elective - III** 1. Automobile Engineering 2. Organisational Behaviour 3. Solar Energy Systems	PE-III	3-0-0	3
6.		**Professional Elective - IV** 1. Robotics 2. Power Plant Engineering 3. Optimization Techniques through MATLAB	PE-IV	3-0-0	3
7.		Project I	PR	---	2
8.		Socially Relevant Project(15hrs/Sem)	PR	- - -	0.5
		Industrial Training/ Internship/ Research Projects in National Laboratories/Academic Institutions	PR	- - -	1
9.		Tool Design	PR	- - -	1
				Total	**21.5**

Category	**CREDITS**
Professional Core Courses	12
Professional Elective Courses	6
Project I	2
Socially Relevant Project(15hrs/Sem)	0.5
Industrial/Research Internship	1
TOTAL CREDITS	**21.5**

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech IV – I Sem (Mechanical Engineering)

L	T	P	C
3	0	0	3

Tool Design

Course Objectives:

- To learn basic concepts, functions and design principles of Jigs, Fixtures and Dies
- Implement the tool design process when designing tooling for the manufacturing of a product.
- Evaluate and select appropriate materials for tooling applications.
- Design, develop and evaluate cutting tools and work holders for a manufactured product.
- Apply Geometric Tolerancing principles in the designs of tooling.

Course outcomes:

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

- Design mechanical components with economical consideration .
- Select materials and machining processes.
- Identify the necessity for redesigning components out of manufacturing considerations.
- Consider the manufacturing considerations while designing cast, forged weld and sheet metal components.
- Design plastic parts with manufacturing considerations.

UNIT - I

Design of single point cutting tools: Single point, cutting tools-various systems of specifications, geometry and their inter relation, theories of formation of chip and their effect, design of broach.

UNIT - II

Design of multipoint cutting tools: Drill geometry, Design of Drills, Rake & Relief angles of twist drill, speed, feed and depth of cut, machining time, forces, milling cutters, cutting speeds and feed-machining times-design-form cutters, combination tools, reamers etc.

UNIT - III

Design of jigs and fixtures: Basic principles of location and clamping, locating, methods and devices, jigs, definitions, types, general consideration in the design of jigs, drills bushing, methods of construction, fixtures-vice fixtures milling, boring, and lathe grinding fixtures.

UNIT – IV

Design of sheet metal blanking and piercing: Fundamentals of die cutting operating, power press types, General press information, Material handling equipment, cutting action in punch and die operation. Die clearance, and types of Die construction. Die design fundamentals-blanking and piercing die construction, pilots, striper and pressure pads presswork material, strip layout, short run tooling for piercing.

UNIT- V

Design of sheet metal bending, forming and drawings die: Bending dies, drawing dies, forming dies, drawing operations, variables that effect metal flow during drawing. Determination of blank size, drawing force, single and double action draw dies.

Tool life and tool wear: theories of tool wear-adhesion, abrasive and diffusion wear mechanisms forms of wear, tool life criteria and Mach inability index, tool wear criterion, measurement of tool wear. Introduction to Plastic tooling-commonly used plastic tooling materials.

TEXT BOOKS:

1. Tool Design, Donaldson, Lecain and Goold, TMH.
2. Principles of Metal cutting, A Bhattacharya, New Central Book Agency, Calcutta

REFERENCES:

1. Production Engineering Design (Tool Design), Surendra Kenav and Umesh Chandra, Satyaprakashan, New Delhi 1994.
2. Design of Cutting Tools. Use of Metal Cutting Theory, Amitabh Bhattacharya and Inyong Ham, ASTME publication Michigan USA, 1969.
3. Fundamentals of Machining and Machine Tools, RK Singal and Others, I.K. International, 2008.
4. Metal Cutting Principles, Shaw, Oxford Univ. Press

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech IV – I Sem (Mechanical Engineering)

L	T	P	C
3	0	0	3

Operations Research

Course Objectives:

- To impart knowledge in concepts and tools of Operations Research
- To understand mathematical models used in Operations Research
- To apply these techniques constructively to make effective business decisions

Course Outcomes:

At the end of the course, the student will be able to

- Solve Linear Programming Problems
- Solve Transportation and Assignment Problems
- Understand the usage of game theory and Simulation for Solving Business Problems

UNIT I

Linear Programming: Introduction-structure of linear programming model- Formulation–Graphical solution – Simplex method, Big-M method, two phase method (maximization case and minimization case), Special cases-Duality, dual simplex method.

UNIT II

Transportation: Introduction-methods of finding initial solution-optimal solution-variations in transportation problem-maximization.

Assignment problems: Hungarian method of Assignment problem- variations of the assignment problem-Travelling sales man problem.

UNIT III

Replacement and maintenance models: Introduction-types of failure-replacement of items whose efficiency deteriorates with time- replacement of items that fail completely-staffing problem.

UNIT IV

Queuing theory: introduction-characteristics of queuing system-probability distributions in queuing system-single server queuing models-multi server queuing models.

Job sequencing: n jobs - two machines, n jobs - three machines, two jobs - n machines.

UNIT V

Inventory: introduction-functional role of inventory-reasons for carrying inventory-inventory control models without shortages and with shortages-EOQ models with quantity discounts-instantaneous probabilistic demand without set-up cost, P-system and Q-system.

Introduction to PERT / CPM : Project management, network modeling-probabilistic model, various types of activity times estimation - programme evaluation review techniques- Critical Path-probability of completing the project, deterministic model, critical path method (CPM)-critical path calculation-crashing of simple of networks.

Network Flow Models: maximal flow, minimal flow.

Text books:

1. Operations Research- theory and applications, second edition, J.K. Sharma/MacMillian publications.
2. Introduction to operations research, Hamdy A. Taha/PHI publications.
3. Production & operation management , Panner selvam
4. Sharma S.D., Operations Research: Theory, Methods and Applications, 15th Edition, Kedar Nath Ram Nath, 2010
5. Taha H.A., Operations Research, 9th Edition, Prentice Hall of India, New Delhi, 2010.

Reference books:

1. Hiller F.S., and Liberman G.J., Introduction to Operations Research, 7th Edition, Tata McGraw Hill, 2010.
2. Sharma J.K., Operations Research: Theory and Applications, 4th Edition, Laxmi Publications, 2009.
3. Prem kumar Gupta and Hira, Operations Research, 3rd Edition, S Chand Company Ltd., New Delhi, 2003.
4. Pannerselvam R., Operations Research, 2nd Edition, Pentice Hall of India, New Delhi, 2006.
5. Sundaresan.V, and Ganapathy Subramanian.K.S, Resource Management Techniques: Operations Research, A.R Publications, 2015.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech IV – I Sem (Mechanical Engineering)

L	T	P	C
3	0	0	3

Non Conventional Sources of Energy

Course Objectives:

The main objectives of this course are to make the student

- Familiarize with basics of solar radiation, available solar energy and its measurement.
- Familiarize with solar collectors, construction and operation of solar collectors.
- Understand solar energy conversion systems, applications and power generation.

Course Outcomes:

- At the end of this course, the student will be able to
- Gain Knowledge on basic concepts of solar radiation and solar collectors
- Design of a community Biogas plant
- Know solar heating/cooling technique, solar distillation and drying.

UNIT – I:

Principles of Solar Radiation : Introduction - solar constant - Role and potential of new and renewable source, Environmental impact of solar power, physics of the sun, instruments for measuring solar radiation .

UNIT – II:

Solar Energy Collectors : Introduction – type - Flat plate and concentrating (Parabolic) collectors - Merits & Demerits of Flat plate and Concentrating (Parabolic) Collectors.

UNIT – III:

Solar Energy Storage and Applications : Introduction - Different methods - Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion- photovoltaic Cells

UNIT – IV:

Wind Energy : Introduction – Basic Principle of wind energy conversion - Basic components **–** classification – Horizontal & Vertical Axis wind mill **–** Merit & demerits. Wind energy collectors advantages, disadvantages.

UNIT – V:

Geothermal Energy: Introduction – nature of geothermal fields – geothermal sources – hybrid systems – merits and demerits- applications.

Ocean Energy: Introduction – OTEC (open, closed & hybrid cycle) – Energy from Tides – components – Operating methods – Ocean waves – wave energy conversion devices.

Biomass: Principles of Bio-Conversion - Anaerobic/Aerobic Digestion – Design of a community Biogas plant for a village-classification of biomass gasifiers- up draught, down draught & cross draught gasifiers.

Text Books:

1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Renewable Energy Sources /Twidell & Weir.
3. Non-Conventional Energy Sources /G.D. Rai.

REFERENCE BOOKS:

1. Solar Energy /Sukhatme.
2. Solar Power Engineering / B.S Magal Frank Kreith & J.F Kreith

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech IV – I Sem (Mechanical Engineering)

L	T	P	C
3	0	0	3

Non Destructive Testing

Course Objectives:

- Introduce basic concepts of non destructive testing.
- Familiarize with characteristics of ultrasonic test.
- Describe concept of liquid Penetrant, eddy current and magnetic particle tests, its applications and limitations.
- Explain the principles of Radiographic Inspection.
- Impart NDE and its applications in pressure vessels, casting and welded constructions.

Course Outcomes

At the end of the course, student will be able to

- Explain various methods of non-destructive testing.
- Apply relevant non-destructive testing method for different applications.
- Outline the limitations and disadvantages of NDE. (L2)

UNIT I

Introduction: An Overview, Factors influencing the Reliability of NDE, Defects in materials, Defects in composites. NDT methods used for evaluation of materials and composites.
Visual Inspection: Basic principle and applications.

UNIT II

Liquid Penetrant Testing: Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrant and developers. Illustrative examples – Heavy castings of large size, frame of jet engine, porosity testing of nickel alloys, leak testing. Zyglo test.

UNIT III

Radiographic Inspection: Principles of X – ray radiography, equipment, Absorption, Scattering, X-ray film processing, General radiographic procedures, Reading and Interpretation of Radiographs, Industrial radiographic practice, Limitations and Applications, Welding defects detection. Gamma ray radiography.

UNIT IV

Ultrasonic Testing: Principle of wave propagation, Ultrasonic equipment, Variables affecting an ultrasound test, Basic methods: Pulse Echo and Through Transmission, Types of scanning.
Applications of UT: Testing of products, Welding Inspection, Tube Inspection, Thickness Measurement, Elastic Constant Determination, Ultrasonic testing of composites.

UNIT V

Magnetic Particle Inspection: Methods of generating magnetic field, Demagnetization of materials, Magnetic particle test: Principle, Test Equipment and Procedure, Interpretation and evaluation.
Introduction to Accostic Emission Testing and Thermography.
Eddy Current Testing: Principle of eddy current, Factors affecting eddy currents, Test system and test arrangement, Standardization and calibration, Application and effectiveness. Comparison and Selection of NDT Methods, Codes and Standards.

TEXT BOOKS:

1. Non-Destructive Testing by Baldev Raj et. al., Narosa Publishing House.
2. J Prasad, GCK Nair , Non destructive test and evaluation of Materials, Tata mcgraw-Hill Education Publishers, 2008.
3. Josef Krautkrämer, Herbert Krautkrämer, Ultrasonic testing of materials, 3/e, Springer-Verlag, 1983.
4. X. P. V. Maldague, Non destructive evaluation of materials by infrared thermography, 1/e, Springer-Verlag, 1993.

REFERENCES:

1. Non-Destructive Testing by P. Halmshaw
2. Metals Handbook Vol.II, Nondestructive inspection and quality control
3. Non-Destructive Testing by Warren J.Mcgomnagle, Mc Grawhill
4. Gary L. Workman, Patrick O. Moore, Doron Kishoni, Non-destructive, Hand Book, Ultrasonic Testing, 3/e, Amer Society for Nondestructive, 2007.
5. ASTM Standards, Vol 3.01, Metals and alloys

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B.Tech IV – I Sem (Mechanical Engineering)

L	T	P	C
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Automobile Engineering

(Professional Elective – III)

Course Objectives:

- Impart the knowledge of vehicle structure and its components.
- Demonstrate various components of petrol engines and diesel engines.
- Trains about the various electrical system, circuits, and testing of automobiles.
- Explain the concepts of steering, suspension and braking system in automobile.

UNIT - I

Introduction to vehicle structure and engine components: Vehicle construction - Chassis and body - Specifications - Engine - Types - Construction - Location of engine - Cylinder arrangement - Construction details - Cylinder block - Cylinder head - Cylinder liners - Piston – piston rings - Piston pin - Connecting rod - Crankshaft - Valves. Lubrication system - Types - Oil pumps - Filters - Cooling system - Types - Water pumps - Radiators - Thermostats - Anti-freezing compounds.

UNIT - II

Ignition system: Ignition system - Coil and Magneto - Spark plug - Distributor – Electronic ignition system

Fuel system - Carburettor - Fuel pumps - Fuel injection systems - Mono point and Multi point injector - Electronic Fuel Injection system (EFI) – GDI, MPFI, DTSI

Automobile Emissions - Source of formation – Effects on human health and environment - Control techniques - Exhaust Gas Recirculation (EGR) - Catalytic converter - Emission tests and standards (Indian and Europe)

UNIT - III

Transmission system: Clutches - Function - Types - Single plate, multiple plate, Centrifugal clutch

Gearbox - Manual - Sliding - Constant - Synchromesh - Overdrive – Automatic transmission – Torque converter - Universal joint - Propeller shaft - Differential - Need - Construction

UNIT - IV

Steering, suspension and braking system: Principle of steering - Steering Geometry and wheel alignment - Steering linkages

Suspension system - Independent and Solid axle - torsion bar - shock absorbers

Brakes - Needs – Classification –Drum and Disc brakes- types of brakes– Anti-lock Braking System (ABS)

UNIT - V

Automobile electrical systems, instrumentation and advances in automobile engineering: Battery-General electrical circuits-Dash board instrumentation - Passenger comfort – Safety and security - HVAC - Seat belts - Air bags - Automotive Electronics - Electronic Control Unit (ECU) - Variable Valve Timing (VVT) - Active Suspension System (ASS) - Electronic Brake Distribution (EBD) – Electronic Stability Program(ESP) Traction Control System (TCS) - Global Positioning System (GPS) - Electric - Hybrid vehicle.

TEXTBOOKS:

1. William.H.Crouse, Automotive Mechanics, 10/e Edition, McGraw-Hill, (2006).
2. David A. Corolla, Automotive Engineering: Powertrain, Chassis System and Vehicle Body, Butterworth-Heinemann Publishing Ltd, (2009).
3. Richard Stone, Jeffrey K. Ball, Automotive Engineering Fundamentals" SAE International (2004).

REFERENCES:

1. Bosch, Automotive Hand Book, (2007), 6/e SAE Publications year.
2. K. Newton and W. Steeds, The motor vehicle, 13/e Butterworth-Heinemann Publishing Ltd. (year).
3. Kirpal Singh, Automobile Engineering, Vol.1&2, Standard Publications year.

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B.Tech IV – I Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Organizational Behaviour

(Professional Elective – III)

Course Objectives:

- To familiarize the students with fundamental knowledge on organisational behaviour
- To apply human psychology in organizational settings.
- To instruct the students regarding individual, group and organizational behaviour.

Course Outcomes:

After completing this course, the student should be able to

- Explain the influence of human behavioural patterns in the context of an organization.
- Apply the knowledge of perception and motivation and its influence in the work setting.
- Outline comprehensive idea on leadership and group dynamics.
- Discuss the relevance of organizational structures in the organization.
- Relate organizational culture and change in the corporate world.

UNIT I

Introduction,organizational behaviour, nature, management functions, management roles, management skills, systematic study; foundations of individual behaviour, attitudes, types of attitudes.

UNIT II

Perception and motivation, perception, factors, motivation, nature; theories of motivation, hierarchy needs theory, two - factor theory, expectancy theory; applications of motivation. Effects of motivation on work behaviour and employees in an organization

UNIT III

Foundations of group behaviour, groups, nature, classification; stages of group development, group structure, group dynamics, group cohesiveness, group decision, making, groups and teams; leadership, nature, theories, trait theories, behavioural theories, contingency theories.

UNIT IV

Organizational structure, nature, work specialization, departmentalization, chain of command, span of control, centralization and decentralization; organizational designs, the simple structure, the bureaucracy, the matrix structure, the team structure, the virtual organization, the boundary less organization.

UNIT V

Organizational culture and change management, organizational culture, nature, cultures functions, approaches to managing organizational change, Lewin's model, Kotter's plan for implementing change, organizational development techniques. Organizational Behaviour in the global context.

Text Book(s):

1. Robbins, Stephen & S. Sanghi, Organizational Behaviour, Pearson Education. 2010.
2. Parikh, M. & Gupta, R, Organisational Behaviour, Tata McGraw-Hill, 2010

Reference Books

1. McShane, S.L., Glinow, M.A.V & Sharma, R.R, Organizational Behaviour- Emerging knowledge and practice for the real world. 5/e, 2011.
2. Mullins, J. Laurie, Management and Organizational Behaviour, Oxford Publishers, 2007.
3. Robbins, S.P. & Judge, T.A, Organizational behaviour, Pearson Education. 16/e, 2015.
4. Griffin, R.W & Moorhead, G., Organizational Behavior: Managing People and Organizations,11/e Cengage Learning, 2013.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech IV – I Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Solar Energy Systems

(Professional Elective – III)

Course Objectives:

The main objectives of this course are to make the student

- Familiarize with basics of solar radiation, available solar energy and its measurement.
- Familiarize with solar collectors, construction and operation of solar collectors.
- Understand solar energy conversion systems, applications and power generation.
- Learn the principles PV technology and techniques of various solar cells/ materials for energy conversion
- Know the advance current technology of the solar energy systems for making the process economical, environmentally safe and sustainable.

Course Outcomes:

At the end of this course, the student will be able to

- Gain Knowledge on basic concepts of solar radiation and solar collectors
- Illustrate design and operation of solar heating and cooling systems
- Discuss the principles of solar thermo photovoltaics
- Analyze the performance of a solar cell array system
- Explain Passive heating concepts and passive cooling concepts

UNIT – I:

Solar radiation and collectors: Solar angles – Sun path diagrams – Radiation - extra terrestrial characteristics - measurement and estimation on horizontal and tilted surfaces - flat plate collector thermal analysis - testing methods-evacuated tubular collectors - concentrator collectors – classification - design and performance parameters - tracking systems - compound parabolic concentrators - parabolic trough concentrators - concentrators with point focus - Heliostats – performance of the collectors.

UNIT – II:

Solar thermal technologies: Principle of working, types, design and operation of - Solar heating and cooling systems - Thermal Energy storage systems – Solar Desalination – Solar cooker : domestic, community – Solar pond – Solar drying.

UNIT – III:

Solar PV fundamentals: Semiconductor – properties - energy levels - basic equations of semiconductor devices physics. Solar cells - p-n junction: homo and hetro junctions - metal-semiconductor interface - dark and illumination characteristics - figure of merits of solar cell - efficiency limits - variation of efficiency with band-gap and temperature - efficiency measurements - high efficiency cells – Solar thermo-photovoltaics.

UNIT – IV:

SPV system design and applications: Solar cell array system analysis and performance prediction- Shadow analysis: reliability - solar cell array design concepts - PV system design - design process and optimization - detailed array design - storage autonomy - voltage regulation - maximum tracking - centralized and decentralized SPV systems - stand alone - hybrid and grid connected system - System installation - operation and maintenances - field experience - PV market analysis and economics of SPV systems.

UNIT – V:

Solar passive architecture: Thermal comfort - bioclimatic classification – passive heating concepts: direct heat gain - indirect heat gain - isolated gain and sunspaces - passive cooling concepts: evaporative cooling - Radiative cooling - application of wind, water and earth for cooling; shading - paints and cavity walls for cooling - roof radiation traps - earth air-tunnel. – Energy efficient landscape design - thermal comfort.

Text Books:

1. Goswami D.Y., Kreider, J. F. and Francis., “Principles of Solar Engineering’, Taylor and Francis, 2000.

2. Chetan Singh Solanki, “Solar Photovoltatics – Fundamentals, Technologies and Applications”, PHI Learning Private limited, 2011.
3. Sukhatme S.P.,. Nayak.J.P, ‘Solar Energy – Principle of Thermal Storage and collection”, Tata McGraw Hill, 2008.
4. Solar Energy International, “Photovoltaic – Design and Installation Manual” – New Society Publishers, 2006.
5. Roger Messenger and Jerry Vnetre, “Photovoltaic Systems Engineering”, CRC Press, 2010.

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B.Tech IV – I Sem **(Mechanical Engineering)**

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Robotics

(Professional Elective – IV)

Course Objectives:

- The goal of the course is to familiarize the students with the concepts and techniques in robotic engineering, manipulator kinematics, dynamics and control, chose, and incorporate robotic technology in engineering systems.
- Make the students acquainted with the theoretical aspects of Robotics
- Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
- Make the students to understand the importance of robots in various fields of engineering.
- Expose the students to various robots and their operational details.

Course Outcomes:

After completing the course, the student will be able to,

- To understand the basic components of robots.
- Differentiate types of robots and robot grippers.
- Model forward and inverse kinematics of robot manipulators.
- Analyze forces in links and joints of a robot.
- Programme a robot to perform tasks in industrial applications

UNIT – I

Introduction: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system.

UNIT – II

Components of the Industrial Robotics: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT – III

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric &stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors. Robot Applications in Manufacturing, welding, Assembly and Inspection.

UNIT – IV

Motion Analysis: Homogeneous transformations as applicable to rotation and translation – problems.

Manipulator Kinematics: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

UNIT – V

Differential transformation and manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

Trajectory planning and avoidance of obstacles, path planning, skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages.

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TEXT BOOKS

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Robotics and Control / Mittal R K & Nagrath I J / TMH.
3. Mikell P. Groover and Mitchell Weiss, Roger N. Nagel,Nicholas G.Odrey , Industrial Robotics — Mc Graw Hill, 1986.

4. R K Mittal and I J Nagrath, Robotics and control, Illustrated Edition, Tata McGraw Hill India 2003.

REFERENCES

1. Robotics / Fu K S/ McGraw Hill.
2. An Introduction to Robot Technology, / P. Coiffet and M. Chaironze / Kogam Page Ltd. 1983 London.
3. Saeed B. Niku, Introduction to Robotics – Analysis, System, Applications, 2nd Edition, John Wiley & Sons, 2010.
4. H. Asada and J.J.E. Slotine, Robot Analysis and Control, 1st Edition Wiley- Interscience, 1986.
5. Robert J. Schillin, Fundamentals of Robotics: Analysis and control, Prentice-Hall Of India Pvt. Limited, 1996.
6. Mohsen shahinpoor, A robot Engineering text book, Harper & Row Publishers,1987.
7. John.J.Craig Addison, Introduction to Robotics: Mechanics and Control, Wesley, 1999.
8. K.S. FU, R.C. Gonzalez and C.S.G Lee, Robotics: Control, sensing, vision, and intelligence . Mc Graw Hill, 1987.
9. Richard D. Klafter, Thomas Robotic Engineering an integrated approach, PHI publications 1988.

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B.Tech IV – I Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
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Optimization Techniques through MATLAB

(Professional Elective – IV)

Course Objectives:

- Introduce basics of MATLAB
- Familiarize the fundamentals of optimization
- Explain single variable optimization using various methods
- Implement multi variable optimization using various methods
- Train various evolutionary algorithms.

Course Outcomes:

After completion of this course the student can be able to

- Use optimization terminology and concepts, and understand how to classify an optimization problem.
- Apply optimization methods to engineering problems.
- Implement optimization algorithms.
- Compare different genetic algorithms.
- Solve multivariable optimization problems

UNIT I

Introduction to MAT LAB: Overview, MATLAB Preliminaries, Basics of MATLAB, Beyond the Basics of MATLAB, Popular Functions and Commands, Plotting using MATLAB, Optimization with MATLAB.

UNIT II

Introduction to Optimization: Statement of an optimization problem, Classifications of optimization Problems: Single variable optimization, Multi variable optimization with no constraints, Multi variable optimization with equality constraints, Multi variable optimization with inequality constraints, Convex and Concave programming.

UNIT III

Single Variable Optimization: Finite difference method, Central difference method, Runge-Kutta method, interval halving method, golden section method with MATLAB code.

UNIT IV

Multi Variable Optimization: Conjugate gradient method, Newton's method, Powell's method, Flectcher-Reeves method, Hook and Jeeves method, interior penalty function with MATLAB code.

UNIT V

Evolutionary Algorithms: Overview, Genetic Algorithms: Basics of Genetic Algorithms, Options in MATLAB, Multi Objective Optimization using Genetic Algorithms, Ant Colony Optimization, Simulated Annealing, Particle Swarm Optimization.

Text books:

1. Rao V.Dukkipati, MATLAB: An Introduction with Applications, Anshan, 2010.
2. Achille Messac, Optimization in practice with MATLAB, Cambridge University Press, 2015.
3. Jasbir S Arora, Introduction to optimum design, 2/e. Elsevier, 2004.

References:

1. Cesar Perez Lopez, MATLAB Optimization Techniques, Academic press, Springer publications, 2014.
2. Steven C.Chapra, Applied Numerical Methods with MATLAB for Engineers and scientists, 4/e, McGraw-Hill Education, 2018.

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Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Mechanical Engineering					
IV Year 2nd Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		**Professional Elective - V** 1.Finite Element Analysis 2.Energy Conservation and Management 3.Total Quality Management	PE-V	3-0-0	3
2		**Professional Elective -VI** 1.Computational Fluid Dynamics 2.Entrepreneurship 3.Cryogenics	PE-VI	3-0-0	3
3		Project II	PR	- - -	7
				Total	**13**

Category	**CREDITS**
Professional Elective courses	3
Open Elective Course/Job oriented elective	3
Project II	7
TOTAL CREDITS	**13**

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B.Tech IV – II Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Finite Element Analysis

(Professional Elective – V)

Course Objectives:

- To learn basic principles of finite element analysis procedure..
- To learn the theory and characteristics of finite elements that represent engineering structures.
- To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.
- Learn to model complex geometry problems and solution techniques.

Course Outcomes:

Upon successful completion of this course you should be able to

- Understand the concepts behind variational methods and weighted residual methods in FEM.
- Identify the application and characteristics of FEA elements such as bars, beams, plane and Isoparametric elements, and 3-D element.
- Develop element characteristic equation procedure and generation of global stiffness equation will be applied.
- Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.
- Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer, and fluid flow.

UNIT - I

Fundamental concepts in finite element methods, advantages and applications of FEM, steps followed in FEM- Stress and Equilibrium. Strain - Displacement relations. Stress - strain relations. Plane stress, plane strain conditions.

UNIT - II

Finite element technique: Finite element modeling coordinates and shapes functions- Principle of minimum Potential Energy- Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT - III

Analysis of Bar And Truss Structures: One-dimensional Bar element- derivation of element stiffness matrix, simple problems on bar element, Thermal stresses in 1-D bar element- Two-dimensional truss element, stiffness matrix for two-dimensional truss, simple problems on two-dimensional truss structures.

UNIT - IV

Analysis of Beam Structures: Beam elements, stiffness matrix for beam element, simple problems on beam structures – stresses and deflection of beams – cantilever and simply supported beams**.**

UNIT V

Two Dimensional Stress Analyses: Finite element modeling for two-dimensional stress analysis, element stiffness matrix for constant strain triangle (CST) and treatment of boundary conditions.

Steady State Heat Transfer Analysis: Derivation of basic differential equation, One-dimensional heat transfer through a fin and composite wall.

.TEXT BOOKS

1. Tirupati Chandrapatla and Bellagundu Introduction to Finite Element in Engineering, Pearson Education, New Delhi.
2. S.Md. Jalaluddin Introduction of finite element Analysis, Anuradha Publishers, Chennai.
3. David V. Hutton Fundamentals of Finite Element Analysis, TMH Publishers, New Delhi.
4. Chandraputla, Ashok &Belegundu,Introduction to Finite Element in Engineering, Prentice Hall.
5. S.S.Rao, The Finite Element Methods in Engineering,Elsevier Butterworth -Heinemann 2nd Edition, 2011.

REFERENCE BOOKS

1. C.S. Krishna Moorthy, Finite Element Analysis, TMH Publishers, New Delhi.
2. S.S.Rao Finite Element Methods, Pergamom Press, New York.
3. J N Reddy, An introduction to the Finite Element Method, McGraw – Hill, New York, 1993.
4. R D Cook, D S Malkus and M E Plesha, Concepts and Applications of Finite Element Analysis, 3rd Edition, John Wiley, New York, 1989.
5. K J Bathe, Finite Element Procedures in Engineering Analysis, Prentice-Hall, Englewood Cliffs,1982.
6. T J R Hughes, the Finite Element Method, Prentice-Hall, Englewood Cliffs, NJ, 1986.
7. C Zienkiewicz and R L Taylor, the Finite Element Method, 3rd Edition. McGraw-Hill, 1989.

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B.Tech IV – II Sem **(Mechanical Engineering)**

L	T	P	C
3	0	0	3

Energy Conservation and Management

(Professional Elective – V)

Course Objectives:

- Familiarize present energy scenario, and energy auditing methods.
- Explain components of electrical systems, lighting systems and improvements in performance.
- Demonstrate different thermal systems, efficiency analysis, and energy conservation methods.
- Train on energy conservation in major utilities.
- Instruct principles of energy management and energy pricing.

Course Outcomes:

At the end of this course, the student will be able to:

- Explain energy utilization and energy auditing methods.
- Analyze electrical systems performance of electric motors and lighting systems.
- Examine energy conservation methods in thermal systems.
- Estimate efficiency of major utilities such as fans, pumps, compressed air systems, hvac and d.g. sets.
- Elaborate principles of energy management, programs, energy demand and energy pricing.

UNIT I

Introduction: Energy – Power – Past & Present Scenario Of World; National Energy Consumption Data – Environmental Aspects Associated With Energy Utilization –Energy Auditing: Need, Types, Methodology And Barriers. Role Of Energy Managers. Instruments For Energy Auditing.

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UNIT II

Electrical Systems: Components Of EB Billing – HT And LT Supply, Transformers, Cable Sizing, Concept Of Capacitors, Power Factor Improvement, Harmonics, Electric Motors – Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types Of Lighting, Efficacy, LED Lighting And Scope Of Economy In Illumination.

UNIT III

Thermal Systems: Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency Computation and Encon Measures. Steam: Distribution & Usage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories.

.

UNIT IV

Energy Conservation In Major Utilities: Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration And Air Conditioning Systems – Cooling Towers – D.G. Sets.

UNIT V

Energy Management: Principles of Energy Management, Energy demand estimation, Organising and Managing Energy Management Programs, Energy pricing.

TEXT BOOKS:

1. Energy Manager Training Manual (4 Volumes) Available At www.energymanagertraining.com, A Website Administered By Bureau Of Energy Efficiency (BEE), A Statutory Body Under Ministry Of Power, Government Of India, 2004.

REFERENCES:

1. Witte. L.C., P.S. Schmidt, D.R. Brown, “Industrial Energy Management and Utilisation” Hemisphere Publ, Washington, 1988.
2. Callaghn, P.W. “Design And Management For Energy Conservation”, Pergamon Press, Oxford, 1981.

3. Dryden. I.G.C., “The Efficient Use Of Energy” Butterworths, London, 1982
4. Murphy. W.R. And G. Mc KAY, “Energy Management”, Butterworths, London 1987.
5. Turner, W. C., Doty, S. and Truner, W. C., Energy Management Hand book, 7th edition, Fairmont Press, 2009.
6. De, B. K., Energy Management audit & Conservation, 2nd Edition, Vrinda Publication, 2010.
7. Smith, C. B., Energy Management Principles, Pergamon Press, 2007.

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B.Tech IV – II Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Total Quality Management

(Professional Elective – V)

Course Objectives:

The Objectives of this course are to

- Introduce the students, the basic concepts of Total Quality Management.
- Expose with various quality issues in Inspection.
- Gain Knowledge on quality control and its applications to real time.
- Know the extent of customer satisfaction by the application of various quality concepts.
- Understand the importance of Quality standards in Production.

Course Outcomes:

At the end of this course, the student will be able to

- Develop an understanding on quality Management philosophies and frameworks
- Adopt TQM methodologies for continuous improvement of quality
- Measure the cost of poor quality, process effectiveness and efficiency to identify areas for improvement
- Apply benchmarking and business process reengineering to improve management processes.
- Determine the set of indications to evaluate performance excellence of an organization.

UNIT I

Introduction: Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management.

UNIT II

Historical Review: Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies.

UNIT III

TQM Principles: Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure Case studies

UNIT IV

TQM Tools: Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.

UNIT V

Quality Systems: Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits, Case Studies.

Textbooks:

1. Dale H Besterfield, Total Quality Management, Fourth Edition, Pearson Education, 2015
2. Subburaj Ramaswamy, Total Quality Management, Tata Mcgraw Hill Publishing Company Ltd., 2005
3. Joel E.Ross , Total Quality Management, Third Eition, CRC Press, 2017

Reference books:

1. Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, NewAge International, 1996
2. Robert L.Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993
3. Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata Mcgraw Hill, 2015
4. Samuel Ho , TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995.

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B.Tech IV – II Sem **(Mechanical Engineering)**

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Computational Fluid Dynamics

(Professional Elective – VI)

Course Objectives:

- The concepts of grid generation techniques for simple and complex domains to model fluid flow problems.
- The aspects of numerical discretization techniques such as finite volume and finite difference methods.
- The mathematical modeling of different classes of partial differential equations to show their impact on computational fluid dynamics.
- The characteristics of different turbulence models and numerical schemes for estimating the criteria of stability, convergence, and error of fluid flow problem.

Course Outcomes:

Upon successful completion of this course you should be able to

- Demonstrate the methods of finite control volume and infinitesimal fluid element in both forms such as moving with the fluid and fixed in space solves governing equations.
- Develop the fundamental aspects of numerical discretization of the governing equations and differentiate the integral and differential forms of the governing flow equations suitable for computational fluid dynamics.
- Illustrate the CFD aspects of the hyperbolic, parabolic, and elliptic equations in aerodynamic and other physical problems for understanding mathematical behavior.
- Make use of range of influence and domain of dependence for low-subsonic, subsonic, supersonic, and hypersonic flows.
- Demonstrate the finite volume discretization and its general formulation of a numerical scheme in the finite volume method

UNIT - I

Introduction to Computational Fluid Dynamics and Principles of Conservation: Conservation of mass, linear momentum: Navier-Stokes equation, Conservation of Energy, General scalar transport equation, Reynolds transport theorem, Classification of Partial Differential Equations and Physical Behaviour: Elliptic, parabolic and hyperbolic partial differential equations

Approximate Solutions of Differential Equations: Error Minimization Principles, Approximate solutions of differential equations, variational approach, Weighted residual approach: trial function and weighting function, Essential and natural boundary conditions, Least square method, Galerkin's method, Rayleigh-Ritz method

UNIT - II

Fundamentals of Discretization: Pre-processing, Solution, Post processing, Finite Element Method, Finite difference method, Well posed boundary value problem, Conservativeness, Boundedness, Transportiveness, Finite volume method (FVM), 1-D steady state heat conduction without and with constant source term.

Finite Volume Method: FV Discretization of a 1-D steady state diffusion type problem, Composite material with position dependent thermal conductivity, Source term linearization, Implementation of boundary conditions, 1-D unsteady state diffusion problems: implicit, fully explicit and Crank-Nicholson scheme

UNIT - III

Solution techniques for systems of linear algebraic equations: Elimination, Iteration and Gradient Search method, L-U decomposition technique, Tridiagonal matrix algorithm (TDMA):

Thomas algorithm Iteration methods: Generalized analysis of the iterative methods, Sufficient condition for convergence, Scarborough criteria of for convergence Relaxation methods, Preferential characteristics of iterative methods, Multigrid method, Line by line TDMA, Alternating direction implicit method, Gradient search methods: Steepest descent method, Conjugate gradient method.

UNIT - IV

Discretization of Convection-Diffusion Equations: A Finite Volume Approach: Central difference scheme, Upwind scheme, Exponential scheme and Hybrid scheme, Power law scheme, Generalized convection-diffusion formulation, The concept of false diffusion, QUICK scheme.

Discretization of Navier Stokes Equations: Discretization of the Momentum Equation: Stream Function-Vorticity approach and Primitive variable approach, Staggered grid and Collocated grid, SIMPLE Algorithm, SIMPLER Algorithm .

UNIT V

Introduction to Turbulence Modeling: Vorticity transport equation, Homogeneous turbulence and isotropic turbulence, Reynolds average Navier stokes (RANS) equation, Necessity of turbulence modeling, Turbulence model: Eddy viscosity, Mixing length, The κ-ε model, RNG κ-ε model, κ-ω model, Reynolds stress model (RSM),Large eddy Simulation (LES),Direct numerical simulation (DNS)

The basic structure of a CFD code: Pre-processor, Solver and Postprocessor, User-defined-subroutines, Solution to some basic problems in heat transfer and fluid flow.

TEXT BOOKS:

1. Computational Fluid Dynamics, John Anderson, McGraw Hill Publication.

REFERENCE BOOKS

1. Computational Fluid Dynamics, Jiynan Tu, Butter Worth Henman. 1998
2. Computational Fluid and Heat Transfer, Anderson & Tannehill, Taylor & Francis Publication. 1997
3. Computational Methods for Fluid Dynamics, Joel H. Ferziger, Springer Publication. 2009
4. Computational Heat Transfer, Jaluria Y., Taylor and Francis Publication. 1996

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Entrepreneurship

(Professional Elective – VI)

UNIT I

Introduction to Entrepreneurship, Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur.

UNIT II

Creating and Starting the Venture, Sources of new Ideas, Methods of generating ideas, creating problem solving, product planning and development process, channels of distribution, marketing functions.

UNIT III

Financing and managing the new venture, Sources of capital, venture capital, Record keeping, recruitment, motivating and leading teams, and financial controls. Marketing and sales controls. E-commerce and Entrepreneurship, Internet advertising.

UNIT IV

Small scale enterprises. Characteristics of small scale industry, role and importance of small business, problems of small business enterprises, sickness in small scale enterprises, Institutional support to entrepreneurship

UNIT V

Choosing location and layout, Issues related to Selection of layout.

Labour legislation, Salient Provision under Indian Factories Act, Industrial Disputes Act, Employees State Insurance Act, Workmen's Compensation Act and payment of Bonus Act.

This course replaces the course offered in earlier years as 'Entrepreneurship& Management'

TEXTBOOKS:

1. Entrepreneurship, Robert Hisrich, & Michael Peters, 5/e TMH.
2. Entrepreneurship, Dollinger, Pearson, 4/e, 2004.
3. REFERENCES:
4. Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publ. House, 2004.
5. Entrepreneurship management Bolanath dutta

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B.Tech IV – II Sem	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Cryogenics

(Professional Elective – VI)

Course Objectives:

- To impart the basic knowledge of cryogenics and its applications.
- To familiarize the cryogenic vessels construction.
- To explain how gases can be liquefied and transported.

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.

UNIT II

Applications of Cryogenics: Applications in space, Food Processing, super Conductivity, Electrical Power, Biology, Medicine, Electronics and Cutting Tool Industry.

UNIT III

Cryogenic Refrigeration systems: Ideal Refrigeration systems- Refrigeration using liquids and gases as refrigerant- Refrigerators using solids as working media.

Liquefaction systems: ideal system, Joule Thomson expansion, Adiabatic expansion, Linde Hampson Cycle, Claude & Cascaded System, Magnetic Cooling, Stirling Cycle Cryo Coolers.

UNIT IV

Gas liquefaction systems: Introduction - Production of low temperatures- General Liquefaction systems- Liquefaction systems for Neon. Hydrogen and Helium – Critical components of Liquefaction systems.

UNIT V

Cryogenic Storage vessels and Transportation: Thermal insulation and their performance at cryogenic temperatures, Super Insulations, Vacuum insulation, Powder insulation, Cryogenic fluid transfer systems, Pressure flow-level and temperature measurements – Types of heat exchangers used in cryogenic systems. Cryo-pumping Applications.

TEXT BOOKS

1. Klaus D.Timmerhaus, Thomas M. Flynn, Cryogenic Process Engineering, Plenum Press,

REFERENCE BOOKS

1. Randal F.Barron, Cryogenic systems, McGraw Hill, 1986
2. R. B. Scott, Cryogenic Engineering
3. J. H. Boll Jr., Cryogenic Engineering

SYLLABUS FOR
OPEN ELECTIVES OFFERED BY
DEPARTMENT OF E.C.E

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech	(Electronics & Communication Engineering)	L	T	P	C
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Fundamentals of Digital Electronics

(Open Elective for non ECE Students)

UNIT-I- Binary Systems

Binary Systems Introduction of Digital Computers and Digital Systems Binary umbers Base Conversion Complements R's Complement (R-1)'s Complement Binary Codes Decimal Codes Error Detection codes Reflected Code

UNIT-II -Binary Logic And Boolean Algebra

Binary logic Logic Gates Postulates of Boolean algebra

Two value Boolean algebra Basic theorems of Boolean algebra De-Morgan's Theorems Boolean functions Boolean forms

UNIT-III -Boolean Function Implementation

Need for simplification K – Map method 2 – Variable K – map 3 – Variable K – map 4 – variable K – map K – Map using Don't care condition Universal Gates NAND Gate NOR Gate NAND Implementation NOR Implementation

UNIT-IV-Basic Combinational Logic

Design procedure of combinational logic Adder ,Half Adder ,Full Adder ,Subtractor ,Half Subtractor ,Full Subtractor Code Conversion BCD – Excess-3 conversion .

UNIT-VCombinational Logic Using MSI And LSI

Binary Parallel Adder ,Magnitude Comparator ,2 Input Comparator ,Decoder ,Encoder ,Multiplexer ,Demultiplexers

UNIT-VI-SEQUENTIAL CIRCUITS: Classification of sequential circuits, Basic Flip-Flops, Excitation andCharacteristic Tables.

TEXTBOOKS:

1. Switching & Finite Automata theory- ZviKohavi, TMH,2nd Edition.
2. Digital Design-Morris Mano, PHI, 3rd Edition,2006.
3. Switching Theory and Logic design-A. Anand Kumar,2008.

REFERENCES:

1. An Engineering Approach to Digital Design-Fletcher, PHI.
2. Fundamentals of Logic Design-Charles H.Roth.5th Edition, 2004, Thomson publications.

Digital Logic Applications and Design-John M.Yarbrough, 2006, Thomson Publications

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech	(Electronics & Communication Engineering)	L	T	P	C
		3	0	0	3

Fundamentals of Communication Systems
(Open Elective for non ECE Students)

UNIT I INTRODUCTION TO COMMNICATION SYSTEMS: Communication process, Elements of Communication Systems; Modulation: Need for Modulation, Forms of Modulation: AM, FM, PM, Advantages,Disadvantages and Applications.

UNIT II AMPLITUDE MODULATION AND DEMODULATION: Introduction, Mathematical Representation of AM, Modulation Factors, Percentage of Modulation, Power Relationships, Virtues and imitations of AM.DSB AM: Analog Message Conventions, AM Signals and Spectra, DSB signals and spectra.SSB AM: SSB Signals and Spectra, SSB generation, VSB Generation, Demodulation of AM, Square law detector.

UNIT III FREQUENCY, PHASE MODULATION AND DEMODULATION: FM: Introduction,Mathematical Representation of FM, Modulation Index, Deviation Sensitivity, Deviation Ratio, Bandwidth of FM (Carson's rule), Narrow band FM, Wide band FM, Voltage and Power for FM, Pre-emphasis and Deemphasis,Illustrative Problems.PM: Introduction, Narrow Band PM, Phase Modulation and Indirect FM; FMdemodulators, Slope detector, Balanced slope discriminators, Phase difference discriminators, Ratio detector,PLL Detectors, Distortion and Transmission estimates.

UNIT IV TRANSMITTERS AND RECEIVERS: AM Transmitters: Balanced Modulator, Square Law Modulator, and Product Modulator.

Receivers: Super Heterodyne Receiver, Double Conversion Receiver and Independent Sideband Receiver.FM Transmitters: Direct FM and VCO's, Mixer, Divider, Multiplier. Receivers: Local Oscillator, Slope Detector,Phase Locked Loop, Introduction to IC 565 applications, FM demodulator.

UNIT V PULSE MODULATION TECHNIQUES: Definition, Types: PAM, PWM, PPM,

Sampling,Nyquist rate, Flat top sampling, Generation and Detection of PAM, PWM, PPM.

TEXT BOOKS:

1. A.Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5th Edition, 2010.
2. "Electronic Communications systems" Modulation and Transmission-Robert Schoenbeck, UBS Publications, New Delhi.

REFERENCES:

1. Simon Haykin, "Communication Systems", Wiley-India edition, 3rd edition, 2010
2. Sham Shanmugam, "Digital and Analog Communication Systems", Wiley-India edition, 2006.
3. B.P. Lathi, &Zhi Ding, "Modern Digital & Analog Communication Systems", Oxford University Press, International 4th edition, 2010.
4. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition

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B.Tech	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Signals and Systems
(Open Elective for non ECE Students)

UNIT - I Signals and Systems

Signals & Systems: Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Concepts of Convolution and Correlation of signals, Analogy between vectors and signals-Orthogonality, mean square error..

UNIT - II Fourier Series and Fourier Transform

Fourier series: Trigonometric & Exponential, Properties of Fourier series, concept of discrete spectrum, Illustrative Problems.

Continuous Time Fourier Transform: Definition, Computation and properties of Fourier transform for different types of signals and systems, Inverse Fourier transform. Statement and proof of sampling theorem of low pass signals, Illustrative Problems.

UNIT - III Laplace Transform

Laplace Transform: Definition, ROC, Properties, Inverse Laplace transforms, the S-plane and BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions.

UNIT - IV Signal Transmission through LTI systems

Signal Transmission through Linear Systems: Linear system, impulse response, Response of a linear system for different input signals, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time, Energy and Power spectral densities, Illustrative Problems.

UNIT - V DTFT & Z-Transform

Discrete Time Fourier Transform: Definition, Computation and properties of Discrete Time Fourier transform for different types of signals and systems.

Z–Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, The inverse Z-Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions. Illustrative Problems.

Textbooks:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, “Signals and Systems”, 2nd Edition, PHI, 2009.
2. Simon Haykin and Van Veen, “Signals & Systems”, 2nd Edition, Wiley, 2005.
3. BP Lathi, “Principles of Linear Systems and Signals”, 2nd Edition, Oxford University Press, 015.
4. Matthew Sadiku and Warsame H. Ali, “Signals and Systems A primer with MATLAB”, CRC Press, 2016.
5. Hwei Hsu, “Schaum's Outline of Signals and Systems”, 4thEdition, TMH, 2019.

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B.Tech	(Electronics & Communication Engineering)	L	T	P	C
		3	0	0	3

Microprocessors and Microcontrollers
(Open Elective for non ECE Students)

UNIT-I

8086 MICROPROCESSOR: Evaluation of microprocessors. Overview of 8085. Register organization of 8086,architecture, signal description of 8086, physical memory organization, general bus operations, I/O addressing capability, special processor activities, 8086-Minimum mode and maximum mode of operation, Timing diagram.

UNIT-II

8086 INSTRUCTION SET AND ASSEMBLER DIRECTIVES: Addressing modes of 8086, Instruction set of 8086, Assembler Directives and operators.8086 Assembly language programs involving logical,branch and call instructions, sorting, evaluation of arithmetic expressions, string manipulation.

UNIT-III

PROGRAMMABLE PERIPHERAL DEVICES AND THEIR INTERFACING: Memory interfacing to 8086 (static RAM and EPROM). 8255 PPI-various modes of operation and interfacing to 8086. D/A and A/D converter interfacing, Stepper motor interfacing. Interrupt structure of 8086, Vector interrupt table. Interrupt service routines.8259 PIC architecture and interfacing cascading of interrupt controller and its importance

.

UNIT-IV

8051 MICROCONTROLLER: Architecture of 8051 microcontroller. Pin Diagram of 8051, and external memories, counters and timers, serial communication, interrupts.

UNIT-V

8051 ASSEMBLY LANGUAGE PROGRAMMING: Instruction set of 8051, Addressing modes of 8051,Assembly Language Programming examples using 8051.Interfacing to LCD,Keyboard,ADC& DAC.

TEXT BOOKS:

1. Microprocessor Architecture, Programming and Applications with8085 By Ramesh S Gaonkar.
2. Advanced microprocessor and peripherals-A.K. Ray and K.M.Bhurchandi, 2nd edition, TMH, 2000.
3. 8051 microcontroller and embedded systems by mazidi and mazidi ,pearson education 2000.

REFERENCES:

1. Microprocessors Interfacing-Douglas V.Hall, Revised 2nd edition, 2007.
2. The 8088 and 8086 Microprocessors- Walter A. Triebel, Avtar Singh, PHI, 4th Edition, 2003.
3. 8051 Microcontroller-Internals, Instructions, Programming and Interfacing by SubrataGhoshal,

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Electronic Measurements & Instrumentation
(Open Elective for non ECE Students)

UNIT I: ELECRICAL MEASUREMENTS: Electrical standards: ampere, voltage, resistance, capacitance & inductance standards-Suspension Galvanometer-Torque & deflection of the galvanometer-PMMC mechanism - DC Ammeters-DC voltmeters-Voltmeter sensitivity-Series and Shunt type ohm meters-Multimeters-Alternating current indicating instruments: electrodynamometer, rectifier type-Thermo instruments-Electrodynamometers in power measurements-Watt hour meter-Power factor meter.

UNIT II: BRIDGE MEASUREMENTS: Resistance Measurement: Wheat stone bridge, Kelvin bridge-AC bridges: Condition for bridge balance- Inductance measurement: Maxwell Bridge, Hay Bridge-Capacitance measurement: Schering Bridge- Frequency measurement: Wein Bridge- Problems of shielding and grounding.

UNIT III: ELECTRONIC MEASUREMENTS: FET input electronic volt-ohm-ammeters- AC voltmeters: rectifier type, true RMS type- Digital voltmeters: Ramp, Dual slope integration & SAR types

UNIT IV: OSCILLOSCOPES: Oscilloscope block diagram- Vertical deflection system-Delay line-Horizontal deflection system-Vertical I/p and sweep generator signal synchronization-Oscilloscope probes: 1:1 probes,attenuator probes, active probes, current probes- Oscilloscope controls-Measurement of voltage, frequency, phase .

UNIT V: SIGNAL GENERATORS AND ANALYZERS: Low-frequency signal generators- Function generators- Pulse generators- RF signal generators.

UNIT VI: FREQUENCY & TIME MEASUREMENT: Time & frequency standards – Frequency measurement - time base - Period measurement - Measurement errors.

TEXT BOOKS:

1. Modern Electronic Instrumentation and Measurement Techniques- Albert D. Helfrick, Willium D. Cooper-PHI-2002
2. Electronic Instrumentation and Measurements- David A. Bell-PHI-2nd edition-2003.

REFERENCES:

1. A course in Electrical and Electronic Mesurements and Instrumentation- A.K. Sawhney- DhanpatiRai&CO-7th edition-2005
2. Electronic Instrumentation- H Kalsi- TMH-3rd edition
3. Electronic Measurements and Instrumentation- Oliver and Cage- TMH

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Embedded Systems
(Open Elective for non ECE Students)

Unit - I

Embedded Computing: Introduction, Complex Systems and Microprocessor, The Embedded System Design Process, Formalisms for System Design, Design Examples.

Unit - II

The 8051 Architecture : Introduction, 8051 Micro controller Hardware, Input / Output Ports and Circuits, External Memory, Counter and Timers, Serial data Input /Output, Interrupts.

Unit - III

Basic Assembly Language Programming Concepts: The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051. Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions, Further Details on Interrupts. Applications: Interfacing with Keyboards, Displays, D/A and A/D Conversions

Unit IV

Introduction to Real – Time Operating Systems: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment.

Unit , V

Basic Design Using a Real,Time Operating System: Principles, Semaphores and Queues, HardReal,Time Scheduling Considerations, Saving Memory and Power,

TEXT BOOKS :

1. Computers and Components, Wayne Wolf, Elseveir.
2. The 8051 Microcontroller , Kenneth J.Ayala, Thomson.

REFERENCES :

1. Embedding system building blocks, Labrosse, via CMP publishers.
2. Embedded Systems, Raj Kamal, TMH.
3. Micro Controllers, Ajay V Deshmukhi, TMH.
4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley.
5. Microcontrollers, Raj kamal, Pearson Education.
6. An Embedded Software Primer, David E. Simon, Pearson Education

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B.Tech	(Electronics & Communication Engineering)	L	T	P	C
	Basics of VLSI	**3**	**0**	**0**	**3**

(Open Elective for non ECE Students)

UNIT – I

Introduction: Introduction to MOS Technology – MOS, PMOS, NMOS, CMOS and BiCMOStechnologies, fabrication fundamentals: Oxidation, Lithography, Diffusion, Ionimplantation, Metallization and Encapsulation.

Basic Electrical Properties: Basic Electrical Properties of MOS,CMOS and BiCMOS Circuits, IDS-VDSrelationships, MOS transistor threshold Voltage, gm, gds, figure of merit ωo, Passtransistor, NMOS inverter, Various pull - ups, Determination of pull-up to pulldown ratio (Zpu / Zpd) , CMOS Inverter analysis and design, BiCMOS inverters,Latch-up in CMOS circuits.

UNIT – II

VLSI Circuit Design Processes:VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layouts,Lambda based design rules, Contact cuts , CMOS Lambda based design rules,Layout Diagrams for logic gates, Transistor structures, wires and vias, Scaling ofMOS circuits- Scaling models, scaling factors, scaling factors for device parameters, Limitations of Scaling.

UNIT – III

Gate Level Design and Layout: Architectural issues, Switch logic networks: Gate logic, Alternate gate circuit:Pseudo-NMOS Dynamic CMOS logic. Basic circuit concepts, Sheet ResistanceRS and its concept to MOS, Area Capacitance Units, Calculations, The delay unitT, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-inand fan-out, Choice of layers

UNIT – IV

Subsystem Design: Subsystem Design, Shifters, Adders, ALUs, Multipliers: Array multiplier, SerialParallel multiplier, Parity generator, Comparators, Zero/One Detectors, Up/DownCounter, Memory elements: SRAM, DRAM, ROM, Serial Access Memories.

UNIT – V

Semiconductor Integrated Circuit Design:PLDs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic,Programmable Logic Array Design Approach.

TEXT BOOKS:

1.Kamran Eshraghian, “Essentials of VLSI circuits and systems”, EshraghianDouglesand A. Pucknell, PHI, 2005 Edition

2.Wayne Wolf, “Modern VLSI Design”, 3rd Edition, Pearson Education, 1997.

REFERENCE BOOKS:

1. John .P. Uyemura, “CMOS logic circuit Design”, Springer, 2007.
2. Neil H. E Weste, “CMOS VLSI Design – A Circuits and Systems Perspective”, 3rd edition, DavidHarris, Ayan Banerjee, Pearson, 2009.

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B.Tech	(Electronics & Communication Engineering)	L	T	P	C
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Principles of Digital Signal Processing
(Open Elective for non ECE Students)

UNIT- I:

INTRODUCTION TO SIGNALS

Classification of Signals: Analog, Discrete, Digital, Deterministic & Random, Periodic & Aperiodic, Even & Odd, Energy & Power signals. Basic operations on signals: Time shifting, Time scaling, Time reversal, Amplitude scaling and Signal addition. Elementary Signals: Unit step, Unit ramp, Unit parabolic, Impulse, Sinusoidal function, Exponential function, Gate function, Triangular function, Sinc function and Signum function.

UNIT – II:

DISCRETE TIME SIGNALS AND SYSTEMS

Discrete Time Signals: Elementary discrete time signals, Classification of discrete time signals: power and energy signals, even and odd signals. Simple manipulations of discrete time signals: Shifting and scaling of discrete-time signals.

Discrete Time Systems: Input-Output description of systems, Block diagram representation of discrete time systems, Linear Constant Coefficient Difference Equations, Classification of discrete time systems: linear and nonlinear, time-invariant and variant systems, causal and non causal, stable and unstable systems.

UNIT- III:

LAPLACE TRANSFORMS AND Z- TRANSFORMS

Laplace Transforms: Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of Region of Convergence (ROC), Constraints on ROC for various classes of signals, Properties of Laplace transforms.

Z-Transforms: Concept of Z-transform of a discrete sequence, Region of convergence in Z- Transform, constraints on ROC for various classes of signals, inverse Z-transform, properties of Z-Transforms.

UNIT – IV:

FAST FOURIER TRANSFORMS

Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Radix-2 Fast Fourier Transforms (FFT), Decimation in Time and Decimation in Frequency FFT Algorithms: radix-2 DIT-FFT, DIF-FFT, and Inverse FFT: IDFT-FFT.

UNIT – V:

IIR AND FIR DIGITAL FILTERS

IIR DIGITAL FILTERS: Analog filters approximations: Butterworth and Chebyshev, Design of IIR digital filters from analog filters. Realization of IIR filters: Direct form-I, Direct form-II, cascade form and parallel form.

FIR DIGITAL FILTERS: Characteristics of FIR digital filters, frequency response. Design of FIR digital filters using window techniques: Rectangular window, Triangular or Bartlett window, Hamming window, Hanning window, Blackman window. Realization of FIR filters: Linear phase and Lattice structures.

TEXT BOOKS:

1. B. P. Lathi, “Signals, Systems and Communications”, BS Publications, 2008.
2. John G. Proakis, Dimitris G. Manolakis, “Digital signal processing, principles, Algorithms and applications” , 4th edition , Pearson Education/PHI, 2007.
3. A.V. Oppenheim and R.W. Schaffer, “Discrete Time Signal Processing”, 2nd edition., PHI.

REFERENCES:

1. A.V. Oppenheim, A.S. Will sky and S.H. Nawab, “Signals and Systems”, PHI, 2nd Edition, 2013.
2. A. Anand Kumar, “Signals and Systems”, PHI Publications, Third Edition, 2013
3. P. Ramesh Babu. “Digital Signal Processing”.
4. Andreas Antoniou, “Digital signal processing”, Tata McGraw Hill, 2006.
5. R S Kaler, M Kulkarni,, Umesh Gupta, “A Text book on Digital Signal processing” –I K International Publishing House Pvt. Ltd.

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B.Tech	(Electronics & Communication Engineering)	L	T	P	C
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Introduction to Image Processing
(Open Elective for non ECE Students)

UNIT-I:

INTRODUCTION TO DIGITAL IMAGE PROCESSING

Introduction: Digital image representation, Fundamental steps in image processing, Elements of digital image processing, Elements of visual perception, Simple image model, Sampling and Quantization, Basic relationships between pixels, Image transformations.

Applications: Medical imaging, Robot vision, Character recognition, Remote sensing.

UNIT–II:

IMAGE ENHANCEMENT

Need for image enhancement, Point processing, Histogram processing, Spatial filtering- Smoothing and Sharpening.

UNIT-III:

COLOR IMAGE PROCESSING

Colour fundamentals, Colour models, Color transformations, Pseudo colour image processing, Full colour image processing.

UNIT–IV:

IMAGE COMPRESSION

Redundancies, Fidelity criteria, Image compression model, Lossless compression: Huffman coding, Arithmetic coding. Lossy compression: Lossy Predictive Coding, JPEG Compression Standard.

UNIT–V:

IMAGE SEGMENTATION

Detection of discontinuities: point, line and edge detection, Edge linking and Boundary detections: Local Processing, Global processing via Hough transform, Thresholding, Region oriented segmentation: Region growing, Region splitting and merging.

TEXT BOOKS:

1.Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, 3rd Edition, Pearson Education, 2011.

REFERENCE BOOKS:

1. S Jayaraman, S Esakkirajan and T Veerakumar, “Digital Image Processing”, TMH, 2011.

S. Sridhar, “Digital Image Processing”, 2nd Edition, Oxford Pu

SYLLABUS FOR
OPEN ELECTIVES OFFERED BY
DEPARTMENT OF E.E.E

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech **(Electrical and Electronics Engineering)**

L	T	P	C
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Introduction to Hybrid Electric Vehicles

(Open Elective offered for non EEE Students)

UNIT I: Electric Vehicle Propulsion and Energy Sources

Introduction to electric vehicles, vehicle mechanics - kinetics and dynamics, roadway fundamentals propulsion system design - force velocity characteristics, calculation of tractive power and energy required, electric vehicle power source - battery capacity, state of charge and discharge, specific energy, specific power, Ragone plot. battery modeling - run time battery model, first principle model, battery management system-soc measurement, battery cell balancing. Traction batteries - nickel metal hydride battery, Li-Ion, Lipolymer battery.

UNIT II: Electric Vehicle Power Plant And Drives

Introduction electric vehicle power plants. Induction machines, permanent magnet machines, switch reluctance machines. Power electronic converters-DC/DC converters - buck boost converter, isolated DC/DC converter. Two quadrant chopper and switching modes. AC drives- PWM, current control method. Switch reluctance machine drives - voltage control, current control.

UNIT III: Hybrid And Electric Drive Trains

Introduction hybrid electric vehicles, history and social importance, impact of modern drive trains in energy supplies. Hybrid traction and electric traction. Hybrid and electric drive train topologies. Power flow control and energy efficiency analysis, configuration and control of DC motor drives and induction motor drives, permanent magnet motor drives, switch reluctance motor drives, drive system efficiency.

UNIT IV: Electric and Hybrid Vehicles - Case Studies

Parallel hybrid, series hybrid -charge sustaining, charge depleting. Hybrid vehicle case study – Toyota Prius, Honda Insight, Chevrolet Volt. 42 V system for traction applications. Lightly hybridized vehicles and low voltage systems. Electric vehicle case study - GM EV1, Nissan Leaf, Mitsubishi Miev. Hybrid electric heavy duty vehicles, fuel cell heavy duty vehicles.

UNIT V: Electric And Hybrid Vehicle Design :

Introduction to hybrid vehicle design. Matching the electric machine and the internal combustion engine. Sizing of propulsion motor, power electronics, drive system. Selection of energy storage technology, communications, supporting subsystem. Energy management strategies in hybrid and electric vehicles - energy management strategies- classification, comparison, implementation.

Text Books :

1. Iqbal Hussein, “Electric and Hybrid Vehicles: Design Fundamentals”, 2nd edition, CRC Press, 2003.
2. Amir Khajepour, M. Saber Fallah, Avesta Goodarzi, “Electric and Hybrid Vehicles: Technologies, Modeling and Control - A Mechatronic Approach”, illustrated edition, John Wiley & Sons, 2014.
3. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, “Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design”, CRC Press, 2004.

References:

1. James Larminie, John Lowry, “Electric Vehicle Technology”, Explained, Wiley, 2003.

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B.Tech	**(Electrical and Electronics Engineering)**	**3**	**0**	**0**	**3**

Electrical Engineering Materials

(Open Elective offered for non EEE Students)

UNIT-I Conducting Materials

Introduction – classification of materials – Metals and Non metals, physical, thermal, mechanical and electrical properties of materials – classification of electrical materials – concept of atom – electron configuration of atom, conductors, general properties of conductors, factors effecting resistivity of electrical materials –electrical/mechanical/thermal properties of copper, aluminium, iron, steel, lead, tin and their alloys – applications.

UNIT-II Dielectric and High Resistivity Materials

Introduction – solid, liquid and gaseous dielectrics, leakage current, permittivity, dielectric constant, dielectric loss – loss angle – loss constant, Breakdown voltage and dielectric strength of-solid, liquid and gaseous dielectrics, effect of break down– electrical and thermal effects, Polarization – electric, ionic and dipolar polarization. Effect of temperature and Frequency on dielectric constant of polar dielectrics. High Resistivity materials – electrical / thermal / mechanical properties of Manganin, Constantan, Nichrome, Tungsten, Carbon and Graphite and their applications in electrical equipment.

UNIT-III Solid Insulating Materials

Introduction – characteristics of a good electrical insulating materials – classification of insulating materials – electrical, thermal, chemical and mechanical properties of solid insulating materials - Asbestos, Bakelite, rubber, plastics, thermo plastics. Resins, polystyrene, PVC, porcelain, glass, cotton and paper.

UNIT-IV Liquid & Gas Insulating Materials

Liquid insulating materials – Mineral oils, synthetic liquids, fluorinated liquids – Electrical, thermal and chemical properties – transformer oil – properties – effect of moisture on insulation properties Gaseous insulators – classification based on dielectric strength – dielectric loss, chemical stability properties and their applications.

UNIT-V Domestic Wiring

Wiring materials and accessories – Types of wiring – Types of Switches - Specification of Wiring – Stair case wiring - Fluorescent lamp wiring- Godown wiring – Basics of Earthing – single phase wiring layout for a residential building.

Text Books:

1. G.K. Mithal, “Electrical Engineering Materials”, Khanna publishers, 2nd edition, 1991.
2. R.K. Rajput, A course in “Electrical Engineering Materials”, Laxmi publications, 2009.

Reference Books:

1. C.S. Indulkar and S. Thiruvengadam,“An Introduction to Electrical Engineering Materials” S Chand & Company, 2008.
2. Technical Teachers Training Institute, “Electrical engineering Materials”, 1st Edition, Madras, McGraw Hill Education, 2004.
3. by S.P. Seth, “A course in Electrical Engineering Materials Physics Properties & Applications”, Dhanapat Rai & Sons Publications, 2018.

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B.Tech	(Electrical and Electronics Engineering)	L	T	P	C
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Generation of Electric Power

(Open Elective offered for non EEE Students)

UNIT-I: THERMAL POWER GENERATING SYSTEMS

Block Diagram of Thermal Power Station (TPS) showing paths of Coal, Steam, Water, Air, Ash and Flue Gasses - Brief Description of TPS Components: Economizers, Boilers, Super Heaters, Turbines, Condensers, Chimney and Cooling Towers.

UNIT-II: NUCLEAR POWER GENERATING SYSTEMS

Nuclear Power: Nuclear Fission and Chain Reaction.- Nuclear Fuels.- Principle of Operation of Nuclear Reactor.-Reactor Components: Moderators, Control Rods, Reflectors and Coolants.- Radiation Hazards: Shielding and Safety Precautions.- Types of Nuclear Reactors and Brief Description of PWR, BWR and FBR.

UNIT –III: HYDRO POWER GENERATING STATIONS

Hydro Power: Selection of Site, Classification, Layout, Description of Main Components.

UNIT-IV: SOLAR & WIND POWER GENERATING SYSTEMS

Solar Power Generation: Role and Potential of Solar Energy Options, Principles of Solar Radiation,Flat Plate and Concentrating Solar Energy Collectors, Different Methods of Energy Storage – PV Cell-V-I Characteristics.

Wind Power Generation: Role and potential of Wind Energy Option, Horizontal and Vertical AxisWind Mills- Performance Characteristics- Power- Speed & Torque- Speed Characteristics-Pitch & Yaw Controls – Power Electronics Application – Economic Aspects.

UNIT-V: ECONOMIC ASPECTS OF POWER GENERATION

Load Curve, Load Duration and Integrated Load Duration Curves-Load Demand, Diversity, Capacity, Utilization and Plant Use Factors- Numerical Problems. Costs Of Generation and their Division Into Fixed, Semi-Fixed and Running Costs. Tariff Methods: Desirable Characteristics of a Tariff Method.-Flat

TEXT BOOKS:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. Electric Power Generation Distribution and Utilization by C.L Wadhwa, New Age International (P) Ltd., 2005.
3. Non Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2000.

REFERENCE BOOKS:

1.Renewable Energy Resources – John Twidell and Tony Weir, Second Edition, Taylor and Francis Group, 2006.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.

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		3	0	0	3

Control Systems

(Open Elective offered for non EEE Students)

UNIT – I INTRODUCTION AND TRANSFER FUNCTION REPRESENTATION

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems . Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT-II-TIME RESPONSE ANALYSIS

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III -STABILITY ANALYSIS IN S-DOMAIN

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability. Root Locus Technique**:**The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT – IV FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

UNIT – V STABILITY ANALYSIS IN FREQUENCY DOMAIN AND DESIGN TECHNIQUES

Polar Plots-Nyquist Plots-Stability Analysis. Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers. State Space Analysis of Continuous Systems-Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix

TEXT BOOKS:

1. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.,
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.

REFERENCE BOOKS:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
3. Control Systems Engg. by NISE 3rd Edition – John wiley
4. "Modelling & Control Of Dynamic Systems" by Narciso F. Macia George J. Thaler, Thomson Publishers

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B.Tech	**(Electrical and Electronics Engineering)**	**L**	**T**	**P**	**C**
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Renewable Energy Sources

(Open Elective offered for non EEE Students)

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, extraterrestrial 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. 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:

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT-IV 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-V GEOTHERMAL ENERGY:

Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY AND **DIRECT ENERGY CONVERSION** - OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.Need for DEC, Carnot cycle, limitations, principles of DEC.

TEXT BOOKS:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers
2. Renewable Energy Resources – Twidell & Wier, CRC Press(Taylor & Francis)

REFERENCE BOOKS:

1. Renewable energy resources by Tiwari and Ghosal, Narosa.
2. Renewable Energy Technologies by Ramesh & Kumar, Narosa.
3. Non-Conventional Energy Systems by K Mittal, Wheeler
4. Renewable energy sources and emerging technologies by D.P.Kothari,K.C.Singhal, PHI

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech	(Electrical and Electronics Engineering)	L	T	P	C
		3	0	0	3

Fundamentals of Power Electronics

(Open Elective offered for non EEE Students)

UNIT-I: POWER SWITCHING DEVICES

Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET, IGBT and GTO.

UNIT-II: THYRISTOR RECTIFIERS

Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape and power factor-Numerical problems.

UNIT – III CHOPPERS

Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper– Load voltage expression & numerical problems.

UNIT-IV:INVERTERS

Single phase Voltage Source inverters – operating principle -basic series inverter, single phase parallel inverter – basic principle of operation only, Numerical problems.

UNIT-V: AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS:

AC voltage controllers – Principle of phase control – Principle of integral cycle control - Single phase two SCRs in anti parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – RMS load voltage, current and power factor - wave forms – Numerical problems. Cyclo converters - Midpoint and Bridge connections - Single phase to single phase step-up and step-down cyclo converters with Resistive and inductive load, Principle of operation, Waveforms, output voltage equation.

TEXT BOOKS:

1.M. H. Rashid, “Power Electronics: Circuits, Devices and Applications”, 2nd edition, Prentice Hall of India, 1998

2.P.S.Bimbhra,”Power Electronics”, 4th Edition, Khanna Publishers, 2010.

3.M. D. Singh & K. B. Kanchandhani, “Power Electronics”, Tata Mc Graw Hill Publishing Company, 1998.

REFERENCE BOOKS:

4.Ned Moha, “Power Electronics”, Wiley, 2011.

5.. Robert W. Erickson and Dragan Maksimovic, “Fundamentals of Power Electronics” 2nd Edition, Kluwer Academic Publishers, 2004.

6. Vedam Subramanyam, “Power Electronics”, New Age International (P) Limited, 1996.

7. V.R.Murthy, “Power Electronics”, 1st Edition, Oxford University Press, 2005.

8. P.C.Sen, “Power Electronics”, Tata Mc Graw-Hill Education, 1987.

SYLLABUS FOR
OPEN ELECTIVES OFFERED BY
DEPARTMENT OF C.S.E

Sri Krishnadevaraya University College of Engineering & Technology

		L	T	P	C
B.Tech	**(Computer Science and Engineering)**	**3**	**0**	**0**	**3**

Database Management Systems

(Open Elective for non CSE Students)

UNIT-I Database System Applications, database System VS file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Database Languages – DDL – DML. Database System Architecture – Database Users and Administrator – Transaction Management – Storage Manager – the Query Processor.
Data base design and ER diagrams - Entities, Attributes and Entity sets– Relationships and Relationship sets – Additional features of ER Model – Conceptual Design with the ER Model.

UNIT-II Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Logical database Design – Introduction to Views – Destroying /altering Tables and Views .Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Relational calculus : Tuple relational Calculus – Domain relational calculus.
The Form of a Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries, Set – Comparison Operators – Aggregate Operators – NULL values – Logical connectivites – AND, OR and NOT – Outer Joins –
Disallowing NULL values – Triggers and Active Data bases.

UNIT-III Schema refinement – Problems Caused by redundancy – Decompositions – Problems related to decomposition– Functional dependies-reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – MultiValued Dependencies – FORTH Normal Form.

UNIT-IV Overview Of Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of transactions-Lock Based Concurrency Control, Performance of Locking, Transaction Support in SQL, Introduction to crash recovery, Concurrency Control: 2PL, serializability and recoverability, Introduction Lock Management, Lock Conversions, Dealing with Deadlocks, Concurrency control without locking.

UNIT-V Data on External Storage – File Organizations and Indexing – Cluster Indexes, Primary and Secondary Indexes– Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – The Memory Hierarchy, RAID, Disk Space Management, Buffer Manager.

TEXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition.

REFERENCES:

1. Data base Systems design, Implementation, and Management, Peter Rob & CarlosCoronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education.
3. Introduction to Database Systems, C.J.Date Pearson Education
4. Introduction to Database Management, M.L. Gillenson and others, Wiley Student Edition.
5.Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
6. Database Management Systems, G.K. Gupta, TMH

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B.Tech	**(Computer Science and Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Unix Programming

(Open Elective for non CSE Students)

UNIT I

Introduction: Why Unix?, Computer System, The Unix Environment, Unix structure, Accessing Unix, Commoncommands: date, cal, who, passwd, echo, man, lpr. Other useful commands: tty, clear, sty, script, uname, bc, tar,gzip, cpio,finger,arp,ftp,telnet,rlogin. Vi editor: Editor concepts, The vi editor, Modes, Commands.

UNIT II

File Systems: File Names, File Types, Regular Files, Directories, File System Implementation, Operationsunique to regular files, Operations unique to directories, Operations common to both.

Security & File Permissions: users and groups, security levels, changing permissions, user masks, changingownership and group.

UNIT III

Introduction to Shells: Unix Session, Standard Streams, Redirection, Pipes, Tee Command, CommandExecution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, PredefinedVariables, Options, Shell/Environment Customization.

Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting,Translating Characters, Files with Duplicate Lines, Count characters, Words or Lines, Comparing Files.

UNIT IV

Grep : Operation, grep Family, Searching for File Content.

awk: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, StringFunctions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands inawk, Applications, awk and grep.

UNIT V

Interactive Korn Shell: Korn Shell Features, Two Special Files, Variables, Output, Input, Exit Status of aCommand, eval command, Environmental Variables, Options, Startup Scripts, Command History, CommandExecution Process.

Korn Shell Programming: Basic Script concepts, Expressions, Decisions: Making Selections, Repetition,special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts,Script Examples.

TEXT BOOKS:

1. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson
2. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition

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B.Tech	(Computer Science and Engineering)	L	T	P	C
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Object Oriented Programming through Java

(Open Elective for non CSE Students)

UNIT I Java Basics - Introduction, comments, data types, variables, constants, scope andlife time of variables, operators, type conversion and casting, control flowconditionalstatements, break and continue, simple java program, arrays. OOP concepts, parameter passing,static fields and methods, access control, this, overloading methods and constructors, recursion, garbagecollection, Strings, string functions.

UNIT II Inheritance–Inheritance concept, Member access rules, types of Inheritance,super uses, final classes and methods, casting, polymorphism- dynamic binding, method overriding, abstractclasses and methods, the Object class and its methods.
Interfaces – Interfaces vs. Abstract classes, implementing interfaces, accessingimplementations through interface references, extending interface.
Packages- Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

UNIT III Files– streams, text Input/output, binary input/output, random access file operations, Filemanagement using File class, Using java.io. **Networkingin Java**– Introduction, Client/Server Interaction with Stream Socket Connections, Connectionless Client/Server Interaction withDatagrams, Using java.net.Exception handling – benefits of exception handling, exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, built in exceptions, creating own exceptions.

UNIT IV Multithreading - Differences between multiple processes and multiple threads, threadstates, creating threads, interrupting threads, thread priorities, synchronizing threads, interthreadcommunication, thread groups, daemon threads.**Event Handling** - Events, Event sources, Event classes, Event Listeners, Relationship between Eventsources and Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

UNIT V GUI Programming with Java- The AWT class hierarchy, Introduction to Swing, Swing vs.AWT,MVC architecture, Hierarchy for Swing components, Containers – Top-level containers – JFrame,JApplet, JWindow, JDialog, JPanel, A simple swing application, swing components- Jbutton, JToggleButton,JCheckBox, JRadioButton, JLabel, JTextField, JTextArea, JList, JComboBox, JMenu, capabilities –colorcontrol, Font control, Drawing lines, rectangles and ovals, Drawing arcs, Layout management - Layout managertypes – border, grid, flow, box.

TEXT BOOKS

1. Java; the complete reference, 7th editon, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, pearsoneduction.

REFERENCES

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley& sons.
2. An Introduction to OOP, second edition, T. Budd, pearson education.
3. Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education.
4. An introduction to Java programming and object oriented application development,R.A. Johnson-Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, seventhEdition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell,
Seventh Edition, PearsonEducation.

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B.Tech	(Computer Science and Engineering)	L	T	P	C
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Cyber Security

(Open Elective for non CSE Students)

UNIT-I

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Block Ciphers And Data Encryption Standard; Traditional Block Cipher Structure, The Des Algorithm And Example.

UNIT-II

Public Key Cryptography And RSA: Principles Of Public Key Cryptosystem, The RSA Algorithm, Diffe – Hellman Key Exchange. Elliptic Curve Cryptography, Secure Hash Algorithm (SHA) SHA-512 Logic, SHA – 512 Round Function, Message Authentication Requirements, Functions HMAC

UNIT –III

Overview Of Vulnerability Scanning: Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit.

UNIT –IV

Firewalls And Packet Filters : Firewall Basics, Packet Filter Vs Firewall, How A Firewall Protects A Network, Packet Characteristic To Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) And Port Forwarding

UNIT –V

Networks Vulnerability Scanning: Netcat, Socat Understanding Port And Services Tools – Datapipe, Fpipe , Scanning For Web Vulnerabilities Tools: Nikto, W3af, HTTP UtilIties – Curl, OpenSSL And Stunnel, Application Inspection Tools – Zed Attack Proxy, Sqlmap

TEXT BOOKS:

1. Cryptography & Network Security; William Stallings Lie, Pearson Education
2. Anti-Hacker Tool Kit (Indian Edition) By Mike Shema, Publication Mc Graw Hill.
3. Cyber Security Understanding Cyber Crimes, Computer Forensics And Legal Perspectives By Nina Godbole And Sunit Belpure, Publicaiton Wiley

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B.Tech	**(Computer Science and Engineering)**	**3**	**0**	**0**	**3**

Computer Networks

(Open Elective for non CSE Students)

UNIT I: Introduction: Network Hardware, Network Software, References Models. The Physical Layer: GuidedTransmission Media, Communication Satellites, The public Switched Telephone Network- the Local Loop:Modern ADSL, and wireless, Trunks and Multiplexing, Switching

UNIT II: The Data Link Layer: Data link Layer Design Issues, Elementary Data Link Protocols, SlidingWindow Protocols.
The Medium Access Control sub layer: Multiple Access protocols, Ethernet- Ethernet Cabling,Manchester Encoding, The Ethernet MAC Sub layer Protocol.Ethernet Performance, Switched Ethernet, Fast Ethernet. Wireless LANs- The 802.11 Protocol Stack, the802.11 Physical Layer, the 802.11 MAC Sub Layer Protocol, the 802.11 Frame Structure.

UNIT III: The Network Layer: Network Layer Design Issues, Routing Algorithms(Shortest path, Flooding,Distance Vector, Link state and Hierarchical routing, Broad cast routing, Multicast routing), CongestionControl Algorithms,Internetworking.

UNIT IV: The Transport Layer: The Transport Service, Elements of Transport Protocols, The Internet TransportProtocols: UDP, TCP.

UNTI V: The Application Layer: DNS-The Domain Name System, Electronic Mail, The World Wide Web.Network Security: Cryptography, Symmetric-Key Algorithms, Public-Key Algorithms, Digital Signatures.

TEXT BOOKS:

1. Computer Networks, Andrew S. Tanenbaum, Fouth Edition, Pearson Education.

REFERENCES:

1. Computer Communications and Networking Technologies, Michael A. Gallo, William M. Hancock, CengageLearning.
2. Computer Networks: Principles, Technologies and Protocols for Network Design, Natalia Olifer, VictorOlifer, Wiley India.
3. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition, Tata McGraw Hill.
4. Understanding Communications and Networks, Third Edition, W.A.Shay, CengageLearning.
5. Computer and Communication Networks, Nader F. Mir, Pearson Education
6. Computer Networking: A Top-Down Approach Featuring the Internet, James
F.Kurose, K.W.Ross,Third Edition, Pearson Education.
7. Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech	**(Computer Science and Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Software Engineering

(Open Elective for non CSE Students)

UNIT I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Softwaremyths. **A Generic view of process:** Software engineering- A layered technology, a process framework, TheCapability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and teamprocess models.

UNIT II

Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unifiedprocess. **Software Requirements:** Functional and non-functional requirements, User requirements, Systemrequirements, Interface specification, the software requirements document.

UNIT III

Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirementsvalidation, Requirements management. **System models:** Context Models, Behavioural models, Data models,Object models.

UNIT IV

Design Engineering: Design process and Design quality, Design concepts, the design model.

Creating an architectural design: Software architecture, Data design, Architectural styles and patterns.

Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

UNIT V

Testing Strategies: A strategic approach to software testing, teststrategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.

Metrics for Process and Products: Software Quality, Software Measurement, Metrics for software quality.

Quality Management: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, The ISO 9000 quality standards.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition.McGrawHill InternationalEdition.
2. Software Engineering- Sommerville, 7th edition, Pearson education.

REFERENCES:

1. Software Engineering- K.K. Agarwal &Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
3. Systems Analysis and Design- Shely Cashman Rosenblatt,Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech	(Computer Science and Engineering)	L	T	P	C
		3	0	0	3

Cloud Computing

(Open Elective for non CSE Students)

UNIT-I

Introduction: What Is the Cloud? The Emergence of Cloud Computing, The Global Nature of the Cloud, Cloud-Based Service Offerings, Grid Computing or Cloud Computing?,Is the Cloud Model Reliable?, Benefits of Using a Cloud Model, What About Legal Issues When Using Cloud Models?, What Are the Key Characteristics of Cloud Computing?, Challenges for the Cloud.

The Evolution of Cloud Computing: Hardware Evolution, Internet Software Evolution, Server Virtualization.

UNIT-II

Web Services Delivered from the Cloud: Communication-as-a-Service (CaaS), Infrastructure-as-a-Service (IaaS), Monitoring-as-a-Service (MaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS),

Building Cloud Networks: The Evolution from the MSP Model to Cloud.

Computing and Software-as-a-Service, The Cloud Data Center, Collaboration, Service-Oriented Architectures as a Step Toward Cloud Computing, Basic Approach to a Data Center-Based SOA.

UNIT III

Federation, Presence, Identity, and Privacy in the Cloud: Federation in the cloud, Presence in the Cloud, Privacy and Its Relation to Cloud-Based Information Systems, Security in the Cloud: Cloud security challenges - Software- as-a-service security

UNIT IV

Common Standards in Cloud Computing: The open cloud consortium- The distributed management task force - standards for application developers - standards for messaging - standards for security

UNIT V

Cloud Computing case studies: Google App Engine, Google Web Toolkit, Microsoft Azure Services Platform, Windows Live, Exchange Online, SharePoint Services, Microsoft Dynamics CRM, Amazon EC2, Amazon Simple DB, Amazon S3, Amazon Cloud Front, Amazon SQS

TEXTBOOKS:

1) Cloud Computing implementation, management and security by Joh n W.Ruttinghouse, James F. Ransome.CRC Press, Taylor & Franc is group, 2010.

2) Cloud Computing a practical approach by Anthony T.velte, Toby J.velte Robert Elsenpeter. Tata Me Graw Hill edition, 2010

REFERENCES:

1) Cloud Application Architectures by George Reese. Oreilly publishers

2) Cloud computing and SOA convergence in your enterprise, by David S. Linthicum, Addison- Wesley

Sri Krishnadevaraya University College of Engineering & Technology

		L	T	P	C
B.Tech	**(Computer Science and Engineering)**	**3**	**0**	**0**	**3**

Introduction Operations Management

(Open Elective for non CSE Students)

UNIT–I :

Introduction: Role and Scope of production Management – Concepts of productivity production System – production decision levels.

UNIT–II :

Plant Location: Plant Layout – Facilities Management Maintenance Management – Equipment Replacement.

UNIT–III : Design of Work System: Job design –Measurement of Work (Work Study) – Methods study – Time Study) – Value analysis, Value engineering.

UNIT–IV : Production: Planning and control – Job Shop, Flow shop scheduling, line balancing - Line of Balance – PERT – CPM.

UNIT–V : Quality control: Inspection – charts – Acceptance Sampling – Variables and Attributes – Six Sigma.

Materials Management: Concepts – principles – Classification - Inventory Management methods – Stores Management.

***Reference Books*:**

1. Roberta S. Russel And Bermard W. Taylor, Operations Management (Pearson Education).
2. R. Panner Selman: Production And Operation Management (PHI).
3. S.N. Chary: Production And Operation Management, (Tata Mc Graw Hill).
4. K. Aswathappa, K. Sriddhara Bhatt; "Production & Operations Management", 2nd Edition Himalaya Publication.

Adam Ebert: Production And Operation Management (Phi)

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B.Tech	**(Computer Science and Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Block Chain Technology

(Open Elective for non CSE Students

UNIT-I

Blockchain concepts: Blockchain, Blockchain application example: Escrow, Blockchain stack, from web 2.0 to the next generation decentralized web, domain specific Blockchain application, Blockchain benefits and challenges. Blockchain application templates: Blockchain application components, design methodology for Blockchain applications, Blockchain applications templates.

Unit II:

Setting up Ethereum development tools: Ethereum clients,Ethereum languages, TestRPC, Mist Ethereumwalle, meta mask, web3 JavaScript API, truffle. Ethereum Accounts: Ethereum Accounts, keypairs, working with EOA Accounts, working with contract accounts.

Unit III:

Smart contracts: Smart contract, structure of a contract, setting up and interacting with a contract using Geth client, setting up and interacting with a contract using Mist Wallet

Unit IV:

Smart contracts (continued): Smart contract examples, Smart contract patterns. Decentralized Applications: implementing Dapps, case studies,

Unit V:

Mining: Concensus on Blockchain network, mining, Block validation, state storage in Ethereum.

Text book:

1. Arshadeepbahga, Vijay madisetti, “Blockchain Applications A hands-on approach”, VPT 2017.
2. Chandramouli Subramanian, Asha A George, Abhilash K A and MeenaKarthikeyan, “Blockchain Technology”, Universty Press, 2021

Reference Books

1. Imran Bashir, “Mastering Blockchain” Packt Publishing Ltd, March 2017.
2. Melanie swan, “Blokchain blueprint for a new economy”, O’REILLY

SYLLABUS FOR
OPEN ELECTIVES OFFERED BY
DEPARTMENT OF CIVIL ENGINEERING

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech	(Civil Engineering)	L	T	P	C
		3	0	0	3

Environmental Impact Assessment

(Open Elective offered for non Civil Students)

Unit-I:

INTRODUCTION:

Basic concept of EIA, Initial environmental Examination, Elements of EIA, factors affecting EIA. Impact evaluation and analysis, preparation of Environmental Base map. Classification of environmental parameters.

Unit-II:

EIA METHODOLOGIES:

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis**.**

Unit-III:

IMPACT OF DEVELOPMENTAL ACTIVITIES AND LAND USE:

Introduction and Methodology for the assessment of soil and ground water. Delineation of study area, Identification of actives. Procurement of relevant soil quality, Impact prediction, Assessment of Impact and significance. Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, generalized approach for assessment of Air pollution Impact**.**

Unit-IV:

ASSEMENT OF IMPACT ON VEGETATION AND WILDLIFE:

Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation, Causes and effects of deforestation.

ENVIRONEMNTAL AUDIT : Introduction - Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocel, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

Unit-V:

CASE STUDIES:

. Case studies and preparation of Environmental Impact assessment statement for various Industries, namely thermal power plants, steel plants, highway and pharmaceutical industries.

TEXT BOOKS:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

REFERENCES:

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katari & Sons Publication., New Delhi.
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech	(Civil Engineering)	L	T	P	C
		3	0	0	3

Noise And Air Pollution

(Open Elective offered for non Civil Students)

Unit-I:

NOISE POLLUTION: Sources of noise pollution in urban areas, effect of noise pollution on urban environment, status of noise pollution in major cities.

Unit-II:

ACOUSTICAL CONCEPTS: Nature of sound, sound propagation characteristics, Propagation of sound in air absorption of sound in air, Hearing mechanics. Measurement scale, Equal loudness contours. **NOISE CHARACTERISTICS AND SOURCES OF NOISE**: Noise characterization – Sources of noise**.**

Unit-III:

NOISE CONTROL TECHNIQUES: Mechanism of noise generation- Control methodology, Noise control at source – Noise control along the path- Control on the receiver end. NOISE STRATEGY. **FUTURE GUIDELINES**: Current trend, Noise control measures – Environmental noise management – Noise labelling – Diagnostics – Noise strategy, Problems for future investigations**.**

Unit-IV:

AIR POLLUTION SOURCES: Sources and classification of air pollution, natural and manmade, primary, secondary pollutants, and various classifications of air pollutant standards as per Central Pollution Control Board CPCB.

Unit-V:

AIR POLLUTION DUE TO AUTOMOBILES: Exhaust emissions; crank case emission, evaporative emissions, air-fuel ratio. Spark timing, control of exhaust emissions. Air quality and emission standards, air pollution legislations and regulations.

TEXT BOOKS:

1. M.N. Rao and H.V.N. Rao, Air Pollution, Tata McGraw.
2. C.S. Rao, Environmental Pollution Control, 2/e, Wiley Eastern.
3. Air Pollution & Control Kvsg Murali Krishna Published by Kaushal & Co

REFERENCES:

1. A.C. Stern, Air Pollution, Vol, I-Viii, Academic Press, 1984.
2. K.V.G.S. Murali Krishna Air Pollution and control, Kakinada, 1995.
3. An introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications.
4. Air Pollution and Control by K.V.S.G.Murali Krishna, Kousal & Co. Publications, New Delhi.
5. Enivronmental meteorology by S.Padmanabham murthy , I.K.Internationals Pvt Ltd,New Delhi.

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B.Tech	(Civil Engineering)	L	T	P	C
		3	0	0	3

Disaster Mitigation And Management

(Open Elective offered for non Civil Students)

Unit-I:

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

Unit-II

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

Unit-III:

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

Unit-IV:

EXOGENOUS HAZARDS: Exogenous hazards/ disasters, Infrequent events- Cumulative atmospheric hazards/ disasters Infrequent events: Cyclones, Lightning, Hailstorms Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes, distribution human adjustment, perception & mitigation)

Cumulative atmospheric hazards/ disasters: Floods, Droughts, Cold waves, Heat waves, Floods, Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation).Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Palnetary Hazards/ Disasters- Man induced Hazards /Disasters- Physical hazards/ Disasters-Soil Erosion

Unit-V:

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

TEXT BOOKS:

1. Disaster Management by Rajib Shah, Universities Press, India, 2003
2. Disaster Mitigation: Experiences And Reflections by Pardeep Sahni
3. Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning

REFERENCES:

1. Kates,B.I & White, G.F The Environment as Hazards, oxford, New York, 1978.
2. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000.
3. H.K. Gupta (Ed) Disaster Management, Universiters Press, India, 2003.
4. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994.
5. Dr.Satender,Disaster Management t in Hills, Concept Publishing Co., New Delhi, 2003.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech	**(Civil Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Ground Improvement Techniques

(Open Elective offered for non Civil Students)

UNIT- I

In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT -II

Dewatering – sumps and interceptor ditches – single and multi stage well points – vacuum well points – horizontal wells – criteria for choice of filler material around drains – electro osmosis

UNIT- III

Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT- IV

Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing.

UNIT- V

Geo-synthetics, Geo-textiles – types – functions, properties and applications – Geo-grids, Geo-membranes and gabions, properties and applications.

Grouting. objectives of grouting – grouts and their applications – methods of grouting – stage of grouting, hydraulic fracturing in soils and rocks – post grout tests

TEXT BOOKS:

1. Manfred R. Haussmann, Engineering Principles of Ground Modification, McGraw Hill Pub. Co.,NewYork, 1990
2. Purushotham Raj, Ground Improvement Techniques, Laxmi Publications, New Delhi.

REFERENCES:

1. G. L. Siva Kumar Babu, An introduction to Soil Reinforcement and Geosynthetics, Universities Press.
2. M. P. Moseley, Ground Improvement, Blackie Academic and Professional, USA.
3. Nihar Ranjan Patro, Ground Improvement Techniques, Vikas Publishing House (p) Limited, New Delhi.
4. R. M. Koerner, Designing with Geo-synthetics, Prentice Hall.

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B.Tech	**(Civil Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Environmental Pollution Control

(Open Elective offered for non Civil Students)

UNIT- I

Introduction:

Importance and Necessity of Protected Water Supply systems, Objectives of Protected water supply system, Flow chart of public water supply system, Role of Environmental Engineer.

UNIT -II

WATER DEMAND AND QUANTITY STUDIES : Estimation of water demand for a town or city, Types of water demands, Per capita Demand, Factors affecting the Per Capita Demand.

UNIT- III

WASTE WATER TREATMENT: Layout and general outline of various units in a waste water treatment plant – primary treatment: design of screens – grit chambers – skimming tanks – trickling filters – standard and high rate – Construction and design of Oxidation ponds.

UNIT- IV

SOLID WASTE MANAGEMENT: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management.

UNIT- V

AIR POLLUTION: Types of pollutants, their sources and impacts, air pollution control, air quality standards and limits.

NOISE POLLUTION: Impacts of noise, permissible limits of noise pollution, measurement of noise and control of noise pollution.

TEXT BOOKS:

1. Water supply and sanitary Engineering by G.S. Birdi, Dhanpat Rai & Sons Publishers.
2. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi
3. Water supply and sanitary Engineering by S.K.Garg,

REFERENCES:

1. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr
2. Waste water treatment- concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India

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B.Tech	(Civil Engineering)	L	T	P	C
		3	0	0	3

Remote Sensing and GIS

(Open Elective offered for non Civil Students)

UNIT – I

Introduction to photogrammetry:

Principles & types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducially points, parallax measurement using fiducially line.

UNIT – II

Remote sensing:

Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units. Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

UNIT – III

Geographic information system:

Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS. Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

UNIT – IV

GIS spatial analysis:

Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

UNIT – V

Water resources applications:

Land use/Land cover in water resources, Surface water mapping and inventory -Watershed management for sustainable development and Watershed characteristics - Reservoir sedimentation, Fluvial Geomorphology - Ground Water Targeting, Identification of sites for artificial Recharge structures - Inland water quality survey and management, water depth estimation and bathymetry.

TEXT BOOKS:

1. B. Bhatta, Remote Sensing and GIS by Oxford University Press, New Delhi.
2. Satheesh Gopi, Advanced surveying: Total station GIS and remote sensing, Pearson publication.

REFERENCES:

1. George Joseph, Fundamentals of remote sensing, Universities press, Hyderabad.
2. C. P. Lo Albert, K.W. Yonng, Concepts & Techniques of GIS, Prentice Hall (India) Publications.
3. M. Anji Reddy Remote sensing and GIS, B. S. Publications, New Delhi.

L. R. A. Narayana, Remote Sensing and its applica

SYLLABUS FOR
OPEN ELECTIVES OFFERED BY
DEPARTMENT OF MECH. ENGINEERING

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech	(Mechanical Engineering)	L	T	P	C
	Manufacturing Processes	3	0	0	3

(Open Elective offered for non Mech. Students)

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UNIT I

Introduction: Importance and selection of manufacturing processes.

Casting Processes: Introduction to casting process, process steps; pattern: types, materials and allowance; Cores: Types of cores, core prints, principles and design of gating system; Solidification of casting: Concept, solidification of pure metal and alloy; Special casting processes: Shell casting, investment casting, die casting, centrifugal casting, casting defects and remedies. .

UNIT II

Metal Forming: Introduction, nature of plastic deformation, hot and cold working of metals, mechanics of metal forming; Rolling: Principle, types of rolling mill and products, roll passes, forces in rolling and power requirements; Extrusion: Basic extrusion process and its characteristics, hot extrusion and cold extrusion, wire drawing, tube drawing.

Forging: Principles of forging, tools and dies. Types: Smith forging, drop forging, forging hammers, rotary forging and forging defects. Sheet metal forming: Mechanics of sheet metal working, blanking, piercing, bending, stamping.

. **UNIT III**

Metal Joining Processes: Classification of welding processes, types of welds and welded joints and V-I characteristics, arc welding, weld bead geometry, submerged arc welding, gas tungsten arc welding, gas metal arc welding. applications, advantages and disadvantages of the above processes, other fabrication processes. Heat affected zones in welding; soldering and brazing: Types and their applications, Welding defects: causes and remedies.

UNIT IV : Plastic Processing, Ceramics and Powder Metallurgy:

Plastics: Types, properties and their applications, processing of plastics, extrusion of plastics, transfer molding and compression molding, injection molding, thermoforming, rotational molding and blow molding

Ceramics: Classification of ceramic materials, properties and their application, ceramic powder preparation; Processing of ceramic parts: Pressing, casting, sintering; Secondary processing of ceramics: Coatings, finishing.

Powder Metallurgy: Principle, manufacture of powders, steps involved.

UNIT V

Unconventional Machining Processes: Electrical discharge machining (EDM), principle and processes parameters, electro-chemical machining (ECM) Laser beam machining (LBM), plasma arc machining (PAM) and electron beam machining

Principles and process parameters of Abrasive jet machining (AJM), water jet machining, ultrasonic machining

Text Books:

1. Rao P.N., Manufacturing Technology – Volume I, 5/e, McGraw-Hill Education, 2018.
2. Kalpakjain S and Schmid S.R., Manufacturing Engineering and Technology, 7/e, Pearson, 2018.

Reference Books:

1. Millek P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes and Systems, 4/e, John Wiley and Sons Inc, 2010.
2. Sharma P.C., A Text book of Production Technology, 8/e, S Chand Publishing, 2014.
3. Ian Gibson, David W. Rosen, Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 1st Edition, Springer, 2010.

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B.Tech	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Entrepreneurship

(Open Elective offered for non Mech. Students)

UNIT I

Introduction to Entrepreneurship, Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur.

UNIT II

Creating and Starting the Venture, Sources of new Ideas, Methods of generating ideas, creating problem solving, product planning and development process, channels of distribution, marketing functions.

UNIT III

Financing and managing the new venture, Sources of capital, venture capital, Record keeping, recruitment, motivating and leading teams, and financial controls. Marketing and sales controls. E-commerce and Entrepreneurship, Internet advertising.

UNIT IV

small scale enterprises. Characteristics of small scale industry, role and importance of small business, problems of small business enterprises, sickness in small scale enterprises, Institutional support to entrepreneurship

UNIT V

Choosing location and layout, Issues related to Selection of layout.

Labour legislation, Salient Provision under Indian Factories Act, Industrial Disputes Act, Employees State Insurance Act, Workmen's Compensation Act and payment of Bonus Act.

This course replaces the course offered in earlier years as 'Entrepreneurship& Management'

TEXTBOOKS:

1. Entrepreneurship, Robert Hisrich, & Michael Peters, 5/e TMH.
2. Entrepreneurship, Dollinger, Pearson, 4/e, 2004.

REFERENCES:

1. Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publ. House, 2004.
2. Entrepreneurship management Bolanath dutta

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B.Tech	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

IC Engines

(Open Elective offered for non Mech. Students)

UNIT – I

I.C.Engines: Energy conversion– basic engine components - Working principle of two stroke and four stroke engines - comparison of two stroke and four stroke, SI and CI engines – Classification of I.C. Engines, Valve and port timing diagrams, application of I.C Engines.

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UNIT-II

Power Cycles: Carnot cycle, Air standard cycles -Description and representation of Otto cycle, Diesel cycle & Dual cycles on P–V and T-S diagram -Thermal Efficiency – Comparison of Otto, Diesel and Dual cycles. Simple problems on Otto, Diesel and Dual cycles

UNIT – III

Testing and Performance: Engine Performance Parameters - Determination of, Brake power, friction power and indicated power – Performance test – Heat balance sheet- problems.

.

UNIT – IV

Engine Systems: Working principle of Magneto & Battery Ignition System **-** Simple Carburetor – fuel Injection System - Air & Thermostat cooling system -Lubrication system.

Super Charging: Introduction, types of superchargers, methods of supercharging, advantages and limitations of supercharging.

UNIT – V

Combustion in S.I. Engines: Homogeneous Mixture - Stages of combustion –Abnormal Combustion - Phenomenon of Knocking, Combustion Chambers- types, Rating of S.I Engine fuels.

TEXT BOOKS:

1. I.C. Engines / V. GANESAN- TMH
2. Thermal Engineering / R.K Rajput / Lakshmi Publications.

REFERENCES:

1. I.C Engines – Mathur & Sharma – Dhanpath Rai & Sons.
2. Engineering fundamentals of I.C Engines – Pulkrabek / Pearson /PHI

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B.Tech	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Automobile Engineering

(Open Elective offered for non Mech. Students)

UNIT - I

Introduction to vehicle structure and engine components: Vehicle construction - Chassis and body - Specifications - Engine - Types - Construction - Location of engine - Cylinder arrangement - Construction details - Cylinder block - Cylinder head - Cylinder liners - Piston – piston rings - Piston pin - Connecting rod - Crankshaft - Valves. Lubrication system - Types - Oil pumps - Filters - Cooling system - Types - Water pumps - Radiators - Thermostats - Anti-freezing compounds.

UNIT - II

Ignition, fuel supply and emission control system: Ignition system - Coil and Magneto - Spark plug - Distributor – Electronic ignition system - Fuel system - Carburetor - Fuel pumps - Fuel injection systems - Mono point and Multi point – Unit injector – Nozzle types - Electronic Fuel Injection system (EFI) – GDI, MPFI, DTSI-Automobile Emissions - Source of formation – Effects on human health and environment - Control techniques - Exhaust Gas Recirculation (EGR) - Catalytic converter - Emission tests and standards (Indian and Europe)

UNIT - III

Transmission system: Clutches - Function - Types - Single plate, Multiple plate and Diaphragm Clutch – Fluid coupling - Gearbox - Manual - Sliding - Constant - Synchromesh - Overdrive – Automatic transmission - Torque converter - Epicylic and Hydromatic transmission – Continuously variable transmission - Universal joint - Propeller shaft - Hotchkiss drive – Final drive - Rear axle assembly - Types -Differential - Need - Construction – Non-slip differential – Differential locks - Four wheel drive.

UNIT - IV

Steering, suspension and braking system: Principle of steering - Steering Geometry and wheel alignment - Steering linkages – Steering gearboxes - Power steering - front axle - Suspension system - Independent and Solid axle – coil, leaf spring and air suspensions - torsion bar - shock absorbers – Wheels and Tires - Construction - Type and specification - Tire wear and causes - Brakes - Needs – Classification –Drum and Disc Mechanical - Hydraulic and pneumatic - Vacuum assist – Retarders – Anti-lock Braking System(ABS)

UNIT - V

Automobile electrical systems, instrumentation and advances in automobile engineering: Battery-General electrical circuits-Dash board instrumentation - Passenger comfort – Safety and security - HVAC - Seat belts - Air bags - Automotive Electronics - Electronic Control Unit (ECU) - Variable Valve Timing (VVT) - Active Suspension System (ASS) - Electronic Brake Distribution (EBD) – Electronic Stability Program(ESP) Traction Control System (TCS) - Global Positioning System (GPS) - X-by-wire - Electric - Hybrid vehicle.

TEXTBOOKS:

1. William.H.Crouse, Automotive Mechanics, 10/e Edition, McGraw-Hill, (2006).
2. David A. Corolla, Automotive Engineering: Powertrain, Chassis System and Vehicle Body, Butterworth-Heinemann Publishing Ltd, (2009).
3. Richard Stone, Jeffrey K. Ball, Automotive Engineering Fundamentals" SAE International (2004).

REFERENCES:

1. Bosch, Automotive Hand Book, (2007), 6/e SAE Publications year.
2. K. Newton and W. Steeds, The motor vehicle, 13/e Butterworth-Heinemann Publishing Ltd. (year).
3. Kirpal Singh, Automobile Engineering, Vol.1&2, Standard Publications year.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Non Conventional Sources of Energy

(Open Elective offered for non Mech. Students)

UNIT – I:

Principles of Solar Radiation : Introduction - solar constant - Role and potential of new and renewable source, Environmental impact of solar power, physics of the sun, instruments for measuring solar radiation .

UNIT – II:

Solar Energy Collectors : Introduction – type - Flat plate and concentrating (Parabolic) collectors - Merits & Demerits of Flat plate and Concentrating (Parabolic) Collectors.

UNIT – III:

Solar Energy Storage and Applications: Introduction - Different methods - Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion- photovoltaic Cells

UNIT – IV:

Wind Energy: Introduction – Basic Principle of wind energy conversion - Basic components **–** classification – Horizontal & Vertical Axis wind mill **–** Merit & demerits. Wind energy collectors advantages, disadvantages.

UNIT – V:

Geothermal Energy: Introduction – nature of geothermal fields – geothermal sources – hybrid systems –merits and demerits- applications.

Ocean Energy: Introduction – OTEC (open, closed & hybrid cycle) – Energy from Tides – components – Operating methods – Ocean waves – wave energy conversion devices.

Biomass: Principles of Bio-Conversion - Anaerobic/Aerobic Digestion – Design of a community Biogas plant for a village-classification of biomass gasifiers- up draught, down draught & cross draught gasifiers.

Text Books:

1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Renewable Energy Sources /Twidell & Weir.
3. Non-Conventional Energy Sources /G.D. Rai.

REFERENCE BOOKS:

1. Solar Energy /Sukhatme.
2. Solar Power Engineering / B.S Magal Frank Kreith & J.F Kreith

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech	**(Mechanical Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Non Destructive Evaluation

(Open Elective offered for non Mech. Students)

UNIT I

Introduction: An Overview, Factors influencing the Reliability of NDE, Defects in materials, Defects in composites. NDT methods used for evaluation of materials and composites.

Visual Inspection: Basic principle and applications.

UNIT II

Liquid Penetrant Testing: Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrant and developers. Illustrative examples – Heavy castings of large size, frame of jet engine, porosity testing of nickel alloys, leak testing. Zyglo test.

UNIT III

Radiographic Inspection: Principles of X – ray radiography, equipment, Absorption, Scattering, X-ray film processing, General radiographic procedures, Reading and Interpretation of Radiographs, Industrial radiographic practice, Limitations and Applications, Welding defects detection. Gamma ray radiography.

UNIT IV

Ultrasonic Testing: Principle of wave propagation, Ultrasonic equipment, Variables affecting an ultrasound test, Basic methods: Pulse Echo and Through Transmission, Types of scanning.

Applications of UT: Testing of products, Welding Inspection, Tube Inspection, Thickness Measurement, Elastic Constant Determination, Ultrasonic testing of composites.

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UNIT V

Magnetic Particle Inspection: Methods of generating magnetic field, Demagnetization of materials, Magnetic particle test: Principle, Test Equipment and Procedure, Interpretation and evaluation.

Introduction to Accostic Emission Testing and Thermography.

Eddy Current Testing: Principle of eddy current, Factors affecting eddy currents, Test system and test arrangement, Standardization and calibration, Application and effectiveness. Comparison and Selection of NDT Methods, Codes and Standards.

TEXT BOOKS:

1. Non-Destructive Testing by Baldev Raj et. al., Narosa Publishing House.
2. J Prasad, GCK Nair , Non destructive test and evaluation of Materials, Tata mcgraw-Hill Education Publishers, 2008.
3. Josef Krautkrämer, Herbert Krautkrämer, Ultrasonic testing of materials, 3/e, Springer-Verlag, 1983.
4. X. P. V. Maldague, Non destructive evaluation of materials by infrared thermography, 1/e, Springer-Verlag, 1993.

REFERENCES:

1. Non-Destructive Testing by P. Halmshaw
2. Metals Handbook Vol.II, Nondestructive inspection and quality control
3. Non-Destructive Testing by Warren J.Mcgomnagle, Mc Grawhill
4. Gary L. Workman, Patrick O. Moore, Doron Kishoni, Non-destructive, Hand Book, Ultrasonic Testing, 3/e, Amer Society for Nondestructive, 2007.
5. ASTM Standards, Vol 3.01, Metals and alloys