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

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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**.**
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Institution for further action to award suitable punishment.	

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

ELECTRONICS & COMMUNICATION 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 Electronics & Communication Engineering					
I Year 1st Semester 1(Theory-5,Lab-4)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Mathematics- I	BS	3-1-0	4
2.		Applied Physics	BS	2-1-0	3
3.		Problem Solving & Programming	ES	3-1-0	4
4.		Communicative English 1	HS	2-0-0	2
5.		Electronics & Communication Engineering Workshop	LC	0-0-2	1
6.		Applied Physics 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.		Constitution of India	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 Electronics & Communication Engineering					
I Year 2nd Semester (Theory-6,Lab-4)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Mathematics-II	BS	3-1-0	4
2		Engineering Chemistry	BS	2-1-0	3
3		Data Structures	ES	2-1-0	3
4		Network Theory	ES	3-0-0	3
5		Engineering Graphics	ES	1-0-4	3
6		Engineering Workshop	LC	0-0-2	1
7		Network Theory Lab	ES	0-0-3	1.5
8		Engineering Chemistry Lab	BS	0-0-3	1.5
9		Data Structures Lab	ES	0-0-4	2
10		Environmental Sciences	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 Electronics & Communication Engineering					
II Year 1st Semester (Theory-6,Lab-3)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Mathematics-III (ECE & EEE)	BS	3-0-0	3
2.		Life Science for Engineers	HS	3-0-0	3
3.		Signals and Systems	PC	3-0-0	3
4.		Electronic Devices and Circuits	PC	3-0-0	3
5.		Digital Logic Design	PC	3-0-0	3
6.		Python Programming	ES	3-0-0	3
7.		Basic Simulation Lab	PC	0-0-2	1
8.		Electronic Devices and Circuits Lab	PC	0-0-3	1.5
		Python Programming Lab	ES	0-0-2	1
9.		Essence of Indian Traditional Knowledge	MC	3-0-0	0
				Total	**21.5**

Category	**CREDITS**
Basic Science course	6
Professional core Courses	11.5
Engineering Science Courses	4
TOTAL CREDITS	**21.5**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electronics & Communication Engineering					
II Year 2nd Semester (Theory-6,Lab-2)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Probability Theory and Stochastic Processes	PC	3-0-0	3
2		Electromagnetic Waves and Transmission lines	PC	3-0-0	3
3		Electronic Circuits Analysis	PC	3-0-0	3
4		Analog Communications	PC	3-0-0	3
5		Computer Architecture and Organization	PC	3-0-0	3
6		Managerial Economics and Financial Analysis	HS	3-0-0	3
7		Electronic Circuits Analysis Lab	PC	0-0-3	1.5
8		Analog Communications Lab	PC	0-0-3	1.5
				Total	**21**

Category	**CREDITS**
Professional core Courses	18
Humanities and Social Sciences	3
TOTAL CREDITS	**21**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electronics & Communication Engineering					
III Year 1st Semester 1					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Control Systems	PC	3-0-0	3
2.		Antennas and Wave Propagation	PC	3-0-0	3
3.		Microprocessors & Microcontrollers	PC	3-0-0	3
4.		Analog IC Applications	PC	3-0-0	3
5.		Professional Elective –I 1)Digital IC Applications 2) Mathematical Modeling & Simulation 3) Information Theory &Coding	PE-I	3-0-0	3
6.		Open Elective- I	OE-I	3-0-0	3
7.		Integrated Circuits and Applications Lab	PC	0-0-3	1.5
8.		Microprocessors and Microcontrollers Lab	PC	0-0-3	1.5
9.		Social Relevant Project	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 Electronics & Communication Engineering					
III Year 2nd Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Electronic Measurements and Instrumentation	PC	3-0-0	3
2		Digital Communications	PC	3-0-0	3
3		Digital Signal Processing	PC	3-0-0	3
4		Computer Networks	PC	3-0-0	3
5		Professional Elective courses-II 1) Embedded Systems 2) Cellular & Mobile Communication 3) Robotics and Automation	PE-II	3-0-0	3
6		Open Elective courses-II	OE-II	3-0-0	3
7		Digital Communications Lab	PC	0-0-3	1.5
8		Digital Signal Processing Lab	PC	0-0-3	1.5
9		Socially Relevant Project(15hrs/Sem)	PR	0-0-3	1.5
10		Industrial Training/ Internship/ Research Projects in National Laboratories/Academic Institutions	- - -	- - -	- - -
				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 Electronics & Communication Engineering					
IV Year 1st Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		VLSI Design	PC	3-0-0	3
2.		Microwave and Engineering & Optical Communications	PC	3-0-0	3
3.		Management Science	HS	3-0-0	3
4.		Professional Elective courses-III 1)Satellite Communication 2) Pattern Recognition 3) Advanced Digital Signal Processing	PE-III	3-0-0	3
5.		Professional Elective courses-IV 1) Image Processing 2) Fuzzy sets, logic and systems and Applications 3) Micro Electro Mechanical Systems	PE-IV	3-0-0	3
6.		Microwave and Engineering & Optical Communications Lab	PC	3-0-0	1
7.		VLSI Lab	PC	0-0-2	1
8.		Project I	PR	- - -	2
		Socially Relevant Project(15hrs/Sem)	PR	- - -	0.5
9.		Industrial Training/ Internship/ Research Projects in National Laboratories/Academic Institutions	PR	- - -	2
				Total	**21.5**

Category	**CREDITS**
Professional core courses	8
Professional Elective courses	6
Humanities and Social Science	3
Project I	2
Socially Relevant Project(15hrs/Sem)	0.5
Industrial/Research Internship	2
TOTAL CREDITS	**21.5**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electronics & Communication Engineering					
IV Year 2nd Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Professional Elective courses 1) Advanced 3G and 4G Wireless Mobile Communications 2) Radar Engineering 3) Introduction to Internet Of Things	PE-V	3-0-0	3
2		Open Elective-III	OE-III	3-0-0	3
3		Project II			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 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 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 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

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

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electronics & Communication Engineering					
I Year 1st Semester 1(Theory-5,Lab-4)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Mathematics- I	BS	3-1-0	4
2.		Applied Physics	BS	2-1-0	3
3.		Problem Solving & Programming	ES	3-1-0	4
4.		Communicative English 1	HS	2-0-0	2
5.		Electronics & Communication Engineering Workshop	LC	0-0-2	1
6.		Applied Physics 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.		Constitution of India	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 1st Sem	**(Electronics & Communication 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 1st Sem (Electronics & Communication Engineering)

L	T	P	C
2	1	0	3

Applied Physics
(ECE, CSE & EEE Branches)

Course Objectives:

- 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 electromagnetic theory and its propagation this leads topotential applications.
- To impart knowledge in basic concepts of lasers and optical fiber and its propagation along with its Engineering applications.
- To identify the importance of semiconductors in the functioning of electronic devices.
- To teach the concepts related to magnetic materials and superconductivity which lead to their fascinatingapplications.

Unit-I: Wave Optics

Interference-Principle of Superposition-Interference of light-Conditions for sustained Interference -Interference in thin films (reflected light)-Newton's Rings-Determination of Wavelength- Engineering applications of Interference.

Diffraction-Fraunhofer Diffraction-Single and Double slits - Diffraction Grating- Engineering applications of diffraction

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

Learning Outcomes:

The students will be able to

- explain the need of coherent sources and the conditions for sustained interference
- identify engineering applications of interference including homodyne and heterodyne detection
- analyzethe 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-II: Dielectric & Electromagnetic waves

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

Gauss' theorem for divergence and Stokes' theorem for curl- Fundamental laws of Electric and Magnetic Fields-Derivation of Maxwell's Equations (Integral form and Differential form) - Electromagnetic wavepropagation (conducting and non-conducting media)-Propagation of Electromagnetic waves in dielectric medium.

Learning Outcomes:

The students will be able to

- explain the concept of dielectric constant and polarization in dielectric materials
- summarize various types of polarization of dielectrics
- interpret Lorentz field and Clausius- Mossotti relation in dielectrics
- apply the Gauss' theorem for divergence and Stokes' theorem for curl
- valuate the Maxwell's equations, Maxwell's displacement current and correction in Ampere's law
- asses the electromagnetic wave propagation and its power in non-conducting medium, conducting and dielectric medium

Unit – III: Lasers & Fiber Optics

Introduction-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.

Learning 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
- Apply the fiber optic concepts in various fields .

Unit – IV: Quantum Mechanics & Semiconductors
Dual nature of matter- Schrodinger's time independent wave equation- Schrodinger's time dependent wave equation-Significance of wave function-Particle in one dimensional infinite potential well.

Intrinsic semiconductors - density of charge carriers-Fermi energy – Electrical conductivity – extrinsic semiconductors - P-type & N-type - Density of charge carriers Dependence of Fermi energy on carrier concentration and temperature-Hall effect-Hall coefficient - Applications of Hall effect - Drift and Diffusion currents- Einstien's relation - Applications of Semiconductors.

Learning Outcomes:
The students will be able to

- classify the energy bands of semiconductors
- outline the properties of n-type and p-type semiconductors and charge carriers
- interpret the direct and indirect band gap semiconductors
- identify the type of semiconductor using Hall effect
- identify applications of semiconductors in electronic devices

Unit – V: Magnetic Materials & Superconductors
Introduction-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Classification of Magnetic Materials-Hysteresis-soft and hard magnetic materials.

Superconductors-Properties-Critical magnetic field-Meissnereffect-Josephson Effect (AC & DC)-Types of Superconductors-SQUID- Applications of superconductors.

Learning Outcomes:
The students will be able to

- classify the magnetic materials based on susceptibility
- explain the applications of dielectric and magnetic materials
- Apply the concept of magnetism to magnetic devices
- explain how electrical resistivity of solids changes with temperature
- classify superconductors based on Meissner's effect
- explain Meissner's effect & Josephson effect in superconductors

Text Books:

1. M. N. Avadhanulu, P.G. Kshirsagar& TVS Arun Murthy" AText book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.
2. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2012.

Reference Books:

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

2. David J.Griffiths, “Introduction to Electrodynamics”- 4/e, Pearson Education,2014
3. D.K Battacharya and Poonam Tandon “Engineering Physics”, Oxford University Press.
4. Applied Physics – P.K.Palanisamy SciTech Publications Pvt. Ltd.,
5. Engineering Physics- K. Vijay Kumar, S. Chand Publications

Course Outcomes:

The students will be able to

- identify the wave properties of light and the interaction of energy with the matter
- apply electromagnetic wave propagation in different guided media
- asses the electromagnetic wave propagation and its power in different media
- calculate conductivity of semiconductors
- interpret the difference between normal conductor and superconductor
- demonstrate the application of nanomaterials

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I year 1st Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	Problem Solving and Programming	**3**	**1**	**0**	**4**
	(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 1st Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	Communicative English I	**2**	**0**	**0**	**2**
	(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.

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- 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

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I year 1st Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	Electronics & Communication Engineering Workshop	**0**	**0**	**2**	**1**

Course Objectives:

- To introduce electronic components, measuring instruments and tools used in electronic workshop.
- To equip with the knowledge of understanding data sheets of electronic components
- To give practical experience on soldering the electronic components on a PCB
- To introduce EDA tools
- To know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
- To provide training on Productivity tools like word processors, spreadsheets, presentations
- To provide knowledge in understanding working of various communication systems

List of Exercises / Experiments

1. Familiarization of commonly used Electronic Workshop Tools : Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that electronics hardware tools and instruments are learned to be used by the students
2. Familiarization of Electronic Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that electronic measuring instruments are learned to be used by the students
3. Electronic Components: Familiarization/Identification of electronic components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, color coding, package, symbol, cost etc.
4. Testing of electronic components like Resistor, Capacitor, Diode, Transistor, ICs etc.
   - Compare values of components like resistors, inductors, capacitors etc with the measured values by using electronic instruments
5. Study of Cathode Ray Oscilloscope (CRO)
   - Find the Amplitude and Frequency of a signal
   - Measure the Unknown Frequency & Phase difference of signals using Lissajous figures
6. Interpret data sheets of discrete components and IC's.
   - Write important specifications/ratings of components & ICs and submit it in the form of a report
7. Introduction to EDA Tools: MULTISIM/PSPICE/TINA schematic capture tool, Learning of basic functions of creating a new project, getting and placing parts, connecting placed parts, simulating the schematic, plotting and analyzing the results.
   - Provide some exercises so that students are familiarized in using EDA tools
8. Assembling and Testing of simple electronic circuits on breadboards; identifying the components and its location on the PCB, soldering of the components, testing the assembled circuit for correct functionality.
9. Familiarization with Computer Hardware & Operating System:
   - Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.
   - Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.
   - Install Operating system on the computer. Students should record the entire installation process.
10. Familiarization with Office Tools

- Word Processor: Able to create documents using the word processor tool. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied.
- Spreadsheet: Able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells.
- Presentations: creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyper-linking, running the slide show, setting the timing for slide show.

11. Familiarization of PA system with different microphones, loud speakers, mixer etc. epresent the same in the form of diagrams, write specifications and submit it in the form of a report.
12. Understand working of various Communication Systems like Television, Satellite Transmitter & Receiver, Radio Receiver, Mobile Phone Prepare demo boards/charts of various communication systems.

Course Outcomes:

- Identify discrete components and ICs
- Assemble simple electronic circuits over a PCB
- Testing of various components
- Interpret specifications (ratings) of the component
- Demonstrate disassembling and assembling a Personal Computer and make the computer ready to
- use
- Make use of Office tools for preparing documents, spread sheets and presentations
- Demonstrate working of various communication systems

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B.Tech –I year 1st Sem (Electronics & Communication Engineering)	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Applied Physics Lab
(Common to ECE, CSE & EEE Branches)

Course Objectives:

- Understands the concepts of interference and diffraction and their applications.
- Understand the role of optical fiber parameters in communication.
- Recognize the importance of energy gap in the study of conductivity and hall effect in a semiconductor.
- Apply the principles of semiconductors in various electronic devices.
- 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.

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. Resolving power of a grating
   Experimental outcomes:
   operates optical instrument like spectrometer.
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 T_2
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. To determine the energy gap of a semiconductor
    Experimental outcomes:
    operates various instruments and connect them as per the circuit.
    estimate the energy gap of a semiconductor.
    Illustrates the engineering applications of energy gap .
    plots **1/T** with log R
11. 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
12. 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.
13. 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
14. Determination of pressure variation using Strain Guage sensor.
    Experimental outcomes:
    Operates various instruments.
    estimate the pressure variation using strain guage sensor.
    Illustrates the applications of strain gauge sensors.
15. To determine the self inductance of the coil (L) using Anderson's bridge.
    Experimental outcomes:
    operates various instruments and connect them as per the circuit.
    estimate the self inductance of the coil using Anderson's bridge.
    Identifies the significance of self inductance of the coil in electric devices.

Course Outcomes:

The students will be able to

- **operate** optical instruments like microscope and spectrometer
- **determine** thickness of a hair/paper with the concept of interference
- **estimate** the wavelength of different colours using diffraction grating and resolving power
- **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
- **determine** the resistivity of the given semiconductor using four probe method
- **identify** the type of semiconductor i.e., n-type or p-type using hall effect
- **calculate** the band gap of a given semiconductor

References Books:

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

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I year 1st Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	Problem Solving And Programming Lab	**0**	**0**	**3**	**1.5**
	(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 constructs like pointers.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I year 1st Sem (Electronics & Communication Engineering)	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

Communicative English Lab - I
(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 1st Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	Constitution of India	**3**	**0**	**0**	**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 Electronics & Communication Engineering					
I Year 2nd Semester (Theory-6,Lab-4)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Mathematics-II	BS	3-1-0	4
2		Engineering Chemistry	BS	2-1-0	3
3		Data Structures	ES	2-1-0	3
4		Network Theory	ES	3-0-0	3
5		Engineering Graphics	ES	1-0-4	3
6		Engineering Workshop	LC	0-0-2	1
7		Network Theory Lab	ES	0-0-3	1.5
8		Engineering Chemistry Lab	BS	0-0-3	1.5
9		Data Structures Lab	ES	0-0-4	2
10		Environmental Sciences	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	**(Electronics & Communication 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	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	Engineering Chemistry	**2**	**1**	**0**	**3**
	(**Common CSE,ECE and EEE Branches**)				

Course Objectives

- To familiarize engineering chemistry and its applications
- To train the students on the principle and applications of electrochemistry, polymers chemistry
- To introduce instrumental methods and advanced engineering materials

Unit 1 : Structure and Bonding Models:

Schrodinger wave equation (Eigen-value and Eigen-function). **Crystal field theory:** Crystal field theory and the energy level diagrams for transition metal ions,Salient features –splitting in octahedral and tetrahedral geometry**,** magnetic properties and colours.

Learning Outcomes:

- Apply : Schrodinger wave equation Eigen values and Eigen function
- Illustrate: Crystal field theory and energy level diagrams
- Discuss: The magnetic behavior and colour of complexes
- Explain: The Splitting of octahedral and tetrahedral geometry

Unit 2 : Polymer 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 Vulcanisation of rubber, compounds of rubber, elastomers-buna **S**, buna **N** preparation, properties and its applications. **Conducting polymers:** Polyacetylene, polythiphene, polyphenylene and poly aniline, classifications of conducting polymers.Synthesis mechanism of conducting polymers and its applications

Learning Out comes:

- Explain: Different types of polymers and their applications
- Compare: Elastomers Buna-S and Buna-N
- Explain: Conducting polymers polyacetylene, polyaniline and polythiophene
- Discuss: Synthesis mechanism of conducting polymers.

Unit 3: Electrochemistry and Applications

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. **Fuel cells:** Hydrogen-oxygen and methane-oxygen fuel cells advantages, disadvantages and its applications

Learning Outcomes:

- Apply: Nernst equation for calculating electrode and cell potentials
- Apply: Pilling Bed worth rule for corrosion and corrosion prevention
- Demonstrate: The corrosion prevention methods and factors affecting corrosion
- Compare: Different batteries and their applications

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:** Definition,criteries of refractories, 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: Instrumental methods and Applications

Electromagnetic spectrum and absorption of radiations. The absorption laws: Beer-Lambert's law. Ultraviolet and Visible Spectroscopy, Infrared Spectroscopy. Principle, instrumentation and applications of pH metry.

Learning Outcomes:

- Explain: The different types of spectral series in electromagnetic spectrum
- Outline: The different applications of analytical instruments
- Discuss: Difference between the UV-Visible and IR spectroscopy
- Understanding: To identify acid-base buffer pH meter

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.J.D Lee, Concise Inorganic Chemistry,5/e, OxfordUniversity Press,2008.

2.Skoog and West, Principles of instrumental Ananlysis, 6/e, Thomson,2007.

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

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

Course Out comes

- Demonstrate: The materials of construction for battery and electrochemical series
- Explain: The preparation, properties, and applications of thermosetting and thermoplastics
- Explain: The constituents of Portland cement and factory affecting the refractory material
- Explain: Difference between the UV-Visible and IR spectroscopy
- Discuss: 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 2nd Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	Data Structures	**2**	**1**	**0**	**3**

(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	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	Network Theory	**2**	**0**	**0**	**2**

Course Objectives:

- To introduce basic laws, mesh & nodal analysis techniques for solving electrical circuits
- To impart knowledge on applying appropriate theorem for electrical circuit analysis
- To explain transient behavior of circuits in time and frequency domains
- To teach concepts of resonance
- To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship.

UNIT 1 Introduction to Electrical Circuits

Passive components and their V-I relations, Energy sources - Ideal, Non-ideal, Independent and dependent sources, Source transformation Kirchoff's laws, Star–to-Delta or Delta-to-Star Transformations, Mesh analysis and Nodal analysis problem solving, Super node and Super mesh for DC Excitations.

Learning Outcomes:

- Gain knowledge on basic network elements, voltage and current laws
- Apply Kirchoff's laws, network reduction techniques on simple electrical circuits with dependent & independent sources
- Solve complex circuits using mesh and nodal analysis techniques

UNIT 2 Network Theorems

Superposition theorem, Thevenin & Norton theorems, Maximum power transfer theorem, Reciprocity theorem, Millman theorem, Miller Theorem, Tellegan's Theorem, Compensation theorem - problem solving using dependent sources also, Duality and dual networks.

Learning Outcomes:

- Understand significance of duality and dual networks
- Select appropriate theorem for network simplification
- Determine maximum power transfer to the load

UNIT 3 Transients

First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC (sinusoidal) excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method.

Learning Outcomes:

- Understand behavior of circuit elements under switching conditions
- Analyze response of RL, RC & RLC circuits in time & frequency domains
- Evaluate initial conditions in RL, RC & RLC circuits

UNIT 4 Resonance and Coupled Circuits

Self inductance, Mutual inductance, dot rule, coefficient of coupling, Analysis of multi-winding coupled circuits, series & parallel connection of coupled inductors.

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, general case resistance present in both branches, anti resonance at all frequencies.

Learning Outcomes:

- Understand magnetically coupled circuits
- Determine resonant frequency and bandwidth of a simple series or parallel RLC circuit

- Determine voltages and currents in a resonant circuit

UNIT 5 Two Port Networks & Network Functions

Two Port Networks, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters, hybrid and inverse hybrid parameters, relationship between parameters, interconnection of two port networks.

Concept of complex frequency, driving point and transfer functions for one port and two port network, poles & zeros of network functions, Restriction on Pole and Zero locations of network function

Learning Outcomes:

- Determine network parameters for given two port network
- Relate different two port network parameters
- Represent transfer function for the given network

Text Books:

1. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
2. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.

References Books:

1. D. Roy Choudhury, "Networks and Systems", New Age International Publications,1998.
2. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
3. Bhise, Chadda, Kulshreshtha, "Engineering network analysis and filter design" Umesh Publication, 2000.
4. Joseph Edminister and Mahmood Nahvi, "Electric Circuits", Schaum's Outline Series, Fourth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2003.

Course Outcomes:

- Solve network problems using mesh and nodal analysis techniques
- Analyze networks using Thevenin, Norton, Maximum power transfer, Superposition,Miller and Millman theorems
- Compute responses of first order and second order networks using time & frequency domain analysis
- Design resonant circuits for given bandwidth
- Utilize z, y, ABCD and h parameters for analyzing two port circuit behavior

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I year 2nd Sem	**(Electronics & Communication 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. (L2)
- show projections of solids and sections graphically. (L2)
- draw the development of surfaces of solids. (L3)
- use computers as a drafting tool. (L2)
- draw isometric and orthographic drawings using CAD packages. (L3)

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	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	Engineering Workshop	**0**	**0**	**2**	**1**

C**ourse 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 2nd Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	Network Theory Lab	**0**	**0**	**3**	**1.5**

Course Objectives:

- To gain hands on experience in verifying Kirchoff's laws and network theorems
- To analyze transient behavior of circuits
- To study resonance characteristics
- To determine 2-port network parameters

List of Experiments:

Any 10 of the following experiments are to be conducted in Hardware & Simulation (Multisim/Open source software):

1. Verification of Kirchoff's Laws
2. Apply Mesh & Nodal Analysis techniques for solving electrical circuits (problems with dependent sources also)
3. Verification of Superposition & Reciprocity Theorem
4. Verification of Thevenin's and Norton's Theorem
5. Verification of Maximum Power Transfer Theorem
6. Verification of Millman and Miller Theorm
7. Measure and calculate RC time constant for a given RC circuit
8. Measure and calculate RL time constant for a given RL circuit
9. Measure and analyze (settling time, overshoot, undershoot, etc.) step response of for a given series RLC circuit for following cases:
   (i) $\zeta = 1$ (critically damped system) (ii) $\zeta > 1$(over damped system)
   (iii) $\zeta < 1$ (under damped system)
   Choose appropriate values of R, L, and C to obtain each of above cases one at a time.
10. Design a series RLC resonance circuit. Plot frequency response and find resonance frequency , Bandwidth , Q – factor.
11. Design a parallel RLC resonance circuit. Plot frequency response and find resonance frequency , Bandwidth , Q – factor.
12. Measure and calculate Z, Y parameters of two-port network.
13. Measure and calculate ABCD & h parameters of two-port network.

Course Outcomes:

- Verify Kirchoff's laws and network theorems
- Measure time constants of RL & RC circuits
- Analyze behavior of RLC circuit for different cases
- Design resonant circuit for given specifications
  Characterize and model the network in terms of all network parameters

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech –I year 2nd Sem (Electronics & Communication Engineering)	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Engineering Chemistry Lab
(**Common CSE,ECE and EEE 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 2nd Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	Data Structures Lab	**0**	**0**	**4**	**2**

(Common to All Branches of Engineering)

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	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	Environmental Science	**3**	**0**	**0**	**0**

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 UNIT-3

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.

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electronics & Communication Engineering					
II Year 1st Semester (Theory-6,Lab-3)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Mathematics-III (ECE & EEE)	BS	3-0-0	3
2.		Life Science for Engineers	HS	3-0-0	3
3.		Signals and Systems	PC	3-0-0	3
4.		Electronic Devices and Circuits	PC	3-0-0	3
5.		Digital Logic Design	PC	3-0-0	3
6.		Python Programming	ES	3-0-0	3
7.		Basic Simulation Lab	PC	0-0-2	1
8.		Electronic Devices and Circuits Lab	PC	0-0-3	1.5
		Python Programming Lab	ES	0-0-2	1
9.		Essence of Indian Traditional Knowledge	MC	3-0-0	0
				Total	**21.5**

Category	**CREDITS**
Basic Science course	6
Professional core Courses	11.5
Engineering Science Courses	4
TOTAL CREDITS	**21.5**

Sri Krishnadevaraya University College of Engineering & Technology

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

(Complex Variables and Transforms**)**
(Common to ECE & EEE)

Course Objective:
This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables. The student develops the idea of using continuous/discrete transforms.

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, ez, cos z, z2) 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: Fourier transforms & Z Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem

Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

Unit Outcomes:

Students will be able to

- Find Fourier Sine and cosine integrals.
- Understand Fourier transforms.
- Apply properties of Fourier transform.
- Understand Z transforms.
- Apply properties of Z transform.
- Apply Z transforms to solve difference 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, Fourier Transforms and Z transforms.
- Evaluate the Fourier series expansion of periodic functions.

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.

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

Signals & Systems

Course Objectives:

- To introduce students to the basic idea of signal and system analysis and its characterization in time and frequency domains.
- To present Fourier tools through the analogy between vectors and signals.
- To teach concept of sampling and reconstruction of signals.
- To analyze characteristics of linear systems in time and frequency domains.
- To understand Laplace and z-transforms as mathematical tool to analyze continuous and discrete-time signals and systems.

Unit I

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, Fourier series: Trigonometric & Exponential, Properties of Fourier series, concept of discrete spectrum, Illustrative Problems.

Unit Outcomes:

- Understand different types of signals and systems.
- State principles of vector spaces and concept of Orthogonality.
- Describe continuous time signal and discrete time signal.
- Analyze the periodic signals by applying Fourier series.

Unit II

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 Outcomes:

- Identify system properties based on impulse response and Fourier analysis.
- Analyze the spectral characteristics of signals.
- Illustrate signal sampling and its reconstruction.
- Apply Fourier transform to solve problems.

Unit III

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 Outcomes:

- Understand the impulse response, transfer characteristics of LTI system and various filters.
- Analyse filter characteristics and physical realisation of LTI system.
- Apply the relation between bandwidth and rise time & energy and power spectral densities in various applications.

UNIT-IV

CONVOLUTION AND CORRELATION OF SIGNALS: Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of Fourier transforms. Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum,Parseval's theorem, Power density spectrum, Properties of convolution, Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

Unit Outcomes:

- Understand Concept of Convolution and Correlation of signals in time and frequency Domain
- Apply Parsvels theorem and understand the properties of convolution
- Understand Relation between convolution and correlation

Unit V

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.

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.

Unit Outcomes:

- Understand the limitations of Fourier transform and need for Laplace transform and develop.
- Apply transform techniques to analyse discrete-time signals and systems.
- Evaluate response of linear systems to known inputs by using Laplace transforms.
- Analyze the continuous-time and discrete-time signals and systems using Laplace and Z- transforms.

Course Outcomes:

After completion of the course, student will be able to

CO1: Understand the mathematical description and representation of continuous-time and discrete-time signals and systems. Also understand the concepts of various transform techniques.

CO2: Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems.

CO3: Analyze the frequency spectra of various continuous-time and discrete-time signals using different transform methods.

CO4: Classify the systems based on their properties and determine the response of them.

Text Books:

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.

References:

1. BP Lathi, "Principles of Linear Systems and Signals", 2nd Edition, Oxford University Press, 2015.
2. Matthew Sadiku and Warsame H. Ali, "Signals and Systems A primer with MATLAB", CRC Press, 2016.
3. Hwei Hsu, "Schaum's Outline of Signals and Systems", 4th Edition, TMH, 2019.

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B.Tech – II-I Sem	**(Electronics & Communication Engineering)**	**3**	**0**	**0**	**3**

ELECTRONIC DEVICES AND CIRCUITS

Course Objectives:

- To acquire fundamental knowledge and expose to the field of semiconductor theory and devices and their applications.
- To introduce different types of semiconductor devices, viz., diodes and special diodes.
- To explain application of diodes as rectifiers, clippers, clampers and regulators.
- To describe operation and characteristics of Bipolar Junction Transistor& Field Effect Transistor.
- To analyze the various biasing circuits using BJTs & FETs.

Unit I:

Semiconductor Diode: Open circuited PN junction, PN junction as a rectifier, Current components in a PN diode, Diode Equation and its mathematical derivation, Volt-Ampere Characteristics, Energy band diagram of PN diode, Temperature dependence of Volt-Ampere Characteristics, Diode resistance (Static and Dynamic resistance), Transition capacitance, Diffusion capacitance, Step graded junction.

Unit Outcomes:

- Study the characteristics and operation of p-n junction diode.
- Explain the energy band diagram & effect of temperature on the characteristics of diode.
- Derive the expression for transition capacitance and diffusion capacitance.

Unit II:

Special Devices: Avalanche breakdown, V-I Characteristics of Zener diode, Zener breakdown, Principle of operation and characteristics of Tunnel diode with the help of Energy band diagram, Photo diode, LED, PIN diode and Varactor diode, Silicon Controlled Rectifier (SCR) and its V-I characteristics, DIAC, TRIAC, Schottky Barrier diode, solar cell, Uni-Junction Transistor (UJT) and its V-I Characteristics, Problem solving.

Unit Outcomes:

- Study the characteristics operation and applications of Zener diode .
- Explain V-I Characteristics of Tunnel diode, Photo diode, SCR, UJT and other special diodes.
- Apply concepts of semiconductor devices and solve problems. .

Unit III:

Diode Applications: Diode as switch, Rectifier – Half wave and Full wave rectifier, Bridge rectifier, Ripple factor, PIV, Filters – Inductor and Capacitor Filter, L-section filter, pi-Filter, Zener as voltage regulator, Clipping and Clamping circuits, Detector, Voltage doubler, Problem solving related to diode applications.

Unit Outcomes:

- Understand the circuit operation involving p-n junction and Zener diodes.

- Analyze the performance of rectifiers with and without filters.
- Design half wave and full wave rectifier circuits, clippers, clampers and voltage regulator.
- Compare the various rectifier circuits in terms of their parameter metrics.

Unit IV:

Bipolar Junction Transistor (BJT):
Transistor – Structure, current components and their relationship, PNP and NPN transistors- Active mode of operation, symbols and conventions, Transistor equations, Transistor as an amplifier, input and output characteristics of Common Base, Common Emitter and Common collector configurations. DC analyses of Common Base, Common Emitter and Common collector circuits.
BJT Biasing: Load line and modes of operations, operating point, Bias stability, fixed bias, self bias, stabilization against variations in I_{co}, V_{BE}, β, Bias compensation, Thermal runaway, condition for Thermal stability, Problem solving.
Applications: As a switch, as an amplifier.

Unit Outcomes:

- Understand the current components and their relationships in BJT.
- Explain principle, operation and applications of Bipolar Junction Transistor.
- Describe input and output Characteristics of Bipolar Junction Transistor.
- Derive the expression for stability factor of various biasing circuits.
- Analyse the different configurations (CB,CC,CE).

Unit V:

Field-Effect Transistors (FET) : Metal Oxide Semiconductor Field-effect Transistor (MOSFET) - structures and V-I characteristics of n-channel Enhancement mode MOSFET, p- channel Enhancement mode MOSFET, n-channel depletion mode MOSFET, p-channel depletion mode MOSFET, symbols and conventions, Complementary MOSFETs (CMOSFETs) - structure, V-I characteristics, symbols and conventions, structure and V-I characteristics of n- channel and p-channel Junction Field Effect Transistors (JFET), Problem solving.
Biasing Circuits Using MOSFETS and JFETS: Different configurations using MOSFETs and JFET, load line and modes of operation, different biasing circuits (self-bias, voltage divider bias) using MOSFETs and JFETs, DC Analysis of n-channel and p-channel MOSFETs (both Enhancement and Depletion modes),DC analysis of n-channel and p-channel JFETs, Problem solving.
Applications: MOSFETs, JFET as switch and small signal amplifier, CMOS as a switch.

Unit Outcomes:

- Understand the current components and their relationships in Field effect transistors (JFET, MOSFETs).
- Explain principle, operation and applications of Field effect transistors.
- Describe input and output Characteristics of Field effect transistors.
- Analyse the different configurations (CS,CG,CD) and biasing circuits.

Course Outcomes:

After the completion of the course students will able to
CO1: Understand principle, operation, characteristics and applications of Bipolar Junction Transistor and Field Effect Transistor

CO2: Describe basic operation and characteristics of various semiconductor devices.

CO3: Analyze diode circuits for different applications such as rectifiers, clippers and clampers also analyze low frequency and high frequency models of BJT and FET.

CO4: Design various biasing circuits for BJT and FET.

CO5: Compare the performance of various semiconductor devices.

TEXT BOOKS:

1. Donald A Neamen, "Electronic Circuits – analysis and design", 3rd Edition, McGraw Hill (India), 2019.
2. J. Milliman and C Halkias, "Integrated electronics", 2nd Edition, Tata McGraw Hill, 1991.

REFERENCES:

1. Behzad Razavi, "Microelectronics", 2nd edition, Wiley, 2013.
2. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits," 9th Edition, Pearson, 2006.
3. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd
4. edition, McGraw-Hill (India), 2010.

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B.Tech – II-I Sem	**(Electronics & Communication Engineering)**	**3**	**0**	**0**	**3**

DIGITAL LOGIC DESIGN

Course Objectives:

- To teach significance of number systems, conversions, binary codes and functionality of logic gates.
- To discuss different simplification methods for minimizing Boolean functions.
- To impart knowledge on operation, characteristics and various configurations of TTL logic families.
- To outline procedures for the analysis and design of combinational and sequential logic circuits.
- To introduce programmable logic devices.

Unit I

Number Systems and Codes: Decimal, Binary, Octal, and Hexa-decimal number systems and their conversions, ASCII code, Excess -3 codes, Gray code.

Binary codes Classification, Error detection and correction – Parity generators and checkers

Boolean Algebra& Logic Gates: Boolean operations, Boolean functions, Algebraic manipulations, Min-terms and Maxterms, Sum-of-products and Product-of-sum representations, Two-input logic gates, NAND /NOR implementations.

Minimization of Boolean Functions: Karnaughmap, Don't-care conditions, Prime implicants, Minimization of functions using Quine-McClusky method.

Unit Outcomes:

- Summarize advantages of using different number systems.
- Explain usefulness of different coding schemes and functionality of logic gates.
- Apply basic laws and De Morgan's theorems to simplify Boolean expressions.
- Compare K- Map and Q-M methods of minimizing logic functions.

Unit II

Combinational Circuits: Introduction, Analysis of combinational circuits, Design Procedure– Binary Adder-Subtractor, Decimal Adder, Multiplier, Comparator, Code Converters, Encoders, Decoders, Multiplexers, Demultiplexers, Illustrative examples.

Sequential Circuits-1: Introduction, Latches –RS latch and JK latch, Flip-flops-RS, JK, T and D flip flops, Master-slave flip flops, Edge-triggered flip-flops, Flip-flop conversions.

Unit Outcomes:

- Apply Boolean algebra for describing combinational digital circuits.
- Analyze standard combinational circuits such as adders, subtractors, multipliers, comparators etc.
- Design various Combinational logic circuits.
- Implement logic functions with decoders and multiplexers.

Unit III

Sequential Circuits-2: Analysis and Design of Synchronous Sequential Circuits: Moore and Mealy machine models, State Equations, State Table, State diagram, State reduction & assignment, Synthesis using flip flops

Registers and Counters: Registers, shift registers, Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter.

Unit Outcomes:

- Describe behaviour of Flip-Flops and Latches.
- Compare Moore and Mealy machine models.
- Design synchronous sequential circuits using flip flops and construct digital systems using components such as registers and counters
- Utilize concepts of state and state transition for analysis and design of sequential circuits

Unit IV

Memory and Programmable Logic: RAM, Types of Memories, Memory decoding, ROM, Types of ROM, Programmable Logic Devices (PLDs): Basic concepts, PROM as PLD, Programmable Array Logic (PAL) and Programmable Logic Array (PLA), Design of combinational and sequential circuits using PLDs.

Unit Outcomes:

- Define RAM, ROM, PROM, EPROM and PLDs.
- Describe functional differences between different types of RAM & ROM.

Unit V

Digital Logic Families: Unipolar and Bipolar Logic Families, Transistor-Transistor Logic (TTL): Operation of TTL, Current sink logic, TTL with active pull up, TTL with open collector output, Shockley TTL, TTL characteristics, I^2L, ECL logic Families.

Unit Outcomes:

- Summarize significance of various TTL , I^2L, ECL and CMOS subfamilies.
- Examine Interface aspects of TTL logic familly.
- Explain characteristics of digital ICs such as speed, power dissipation, figure of merit, fan-out, noise immunity etc.
- Compare bipolar and MOS logic families.

Course Outcomes:

After completion of the course, student will be able to

CO1: Understand various number systems, error detecting, correcting binary codes, logic families, combinational and sequential circuits.

CO2: Apply Boolean laws, k-map and Q-M methods to minimize switching functions. Also describe the various performance metrics for logic families.

CO3: Design combinational and sequential logic circuits.

CO4: Compare different types of Programmable logic devices and logic families.

TEXTBOOKS:

1. M. Morris Mano and Michael D. Ciletti, “Digital Design", 4th Edition, Pearson Education, 2013.
2. Z. Kohavi and N. K. Jha, “Switching and Finite Automata Theory”, 3rd Edition, Tata McGraw Hill, 2010.
3. R. P. Jain, "Modern Digital Electronics", 4th edition, McGraw Hill Education (India Private Limited), 2012.

REFERENCES:

1. Wakerly J.F., “Digital Design: Principles and Practices”, 4th Edition, Pearson India, 2008.

2. Charles H Roth (Jr), Larry L. Kinney, “Fundamentals of Logic Design”, 5th Edition, Cengage Learning India Edition, 2010.
3. John.M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2006.

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B.Tech – II-I Sem	**(Electronics & Communication 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-ISem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

BASIC SIMULATION LAB

Course Objectives:

- To provide practical exposure with generation and simulation of basic signals using standardized tools.
- To teach analysing signals and sequences using Fourier, Laplace and Z-transforms.
- To enable to write programs for signal processing applications.

List of Experiments:

1. Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc function.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightages- Plot the discrete spectrum of the signal.
4. Write a program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.
5. Write a program to convolve two discrete time sequences. Plot all the sequences.
6. Write a program to find autocorrelation and cross correlation of given sequences.
7. Write a program to verify Linearity and Time Invariance properties of a given Continuous/Discrete System.
8. Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
9. Write a program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
10. Write a program to find response of a low pass filter and high pass filter, when a speech signal is passed through these filters.
11. Write a program to generate Complex Gaussian noise and find its mean, variance, Probability Density Function (PDF) and Power Spectral Density (PSD).
12. Generate a Random data (with bipolar) for a given data rate (say 10kbps). Plot the same for a time period of 0.2 sec.
13. To plot pole-zero diagram in S-plane/Z-plane of given signal/sequence and verify its stability.

Note: All the experiments are to be simulated using MATLAB or equivalent software.

Course Outcomes:

CO1: Understand the basic concepts of programming in MATLAB and explain use of built-in functions to perform assigned task.
CO2: Generate signals and sequences, Input signals to the systems to perform various operations
CO3: Analyze signals using Fourier, Laplace and Z-transforms.
CO4: Compute Fourier transform of a given signal and plot its magnitude and phase spectrum.
CO5:Verify Sampling theorem, Determine Convolution and Correlation between signals and sequences.

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B.Tech – II-I Sem (Electronics & Communication Engineering)	**0**	**0**	**2**	**1**

ELECTRONIC DEVICES AND CIRCUITS LAB

Course Objectives:

- To verify the theoretical concepts practically from all the experiments.
- To analyze the characteristics of diodes, UJT, BJT, FET, SCR.
- To Model the electronic circuits using tools such as PSPICE/Multisim.

LIST OF EXPERIMENTS:

1. Verification of Volt- Ampere characteristics of a PN junction diode and find static, dynamic and reverse resistances of the diode from the graphs obtained.
2. Design a full wave rectifier for the given specifications with and without filters, and verify the given specifications experimentally. Vary the load and find ripple factor. Draw suitable graphs.
3. Verify various clipping and clamper circuits using PN junction diode and draw the suitable graphs.
4. Design a Zener diode based voltage regulator against variations of supply and load. Verify the same from the experiment.
5. Study and draw the output and transfer characteristics of MOSFET (Enhance mode) in Common Source Configuration experimentally. Find Threshold voltage (V_T), g_m, & K from the graphs.
6. Study and draw the output and transfer characteristics of MOSFET (Depletion mode) or JFET in Common Source Configuration experimentally. FindI_{DSS}, g_m, & V_P from the graphs.
7. Verification of the input and output characteristics of BJT in Common Emitter configuration experimentally and find required h – parameters from the graphs.
8. Study and draw the input and output characteristics of BJT in Common Base configuration experimentally, and determine required h – parameters from the graphs.
9. Verify the Volt Ampere characteristics of SCR experimentally and determine holding current and break over voltage from the graph.
10. Study and draw the Volt Ampere characteristics of UJT and determine η, I_P, I_v,V_P, &Vv from the experiment.
11. Design and analysis of voltage- divider bias/self bias circuit using BJT.
12. Design and analysis of voltage- divider bias/self bias circuit using JFET.
13. Design and analysis of self bias circuit using MOSFET.
14. Design a suitable circuit for switch using CMOSFET/JFET/BJT.

Tools / Equipment Required: Software Tool like Multisim/ Pspice or Equivalent,
DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices

Note: All the experiments shall be implemented using both Hardware and Software. Student has to perform minimum of any 12 experiments

Course Outcomes:

CO1: Understand the basic characteristics and applications of basic electronic devices. CO2: Observe the characteristics of electronic devices by plotting graphs
CO3: Analyze the Characteristics of UJT, BJT, FET, and SCR .
CO3: Design FET based amplifier circuits/BJT based amplifiers for the given specifications.
CO4: Simulate all circuits in PSPICE /Multisim.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech II– I Sem (Electronics & Communication Engineering)

L	T	P	C
0	0	2	1

PYTHON PROGRAMMING LABORATORY

Course Objectives:

- To train the students in solving computational problems
- To elucidate solving mathematical problems using Python programming language
- To understand the fundamentals of Python programming concepts and its applications.
- To understand the object-oriented concepts using Python in problem solving.

Laboratory Experiments

1. Install Python Interpreter and use it to perform different Mathematical Computations. Try to do all the operations present in a Scientific Calculator
2. Write a function that draws a grid like the following:

```
+ - - - - + - - - +
|         |       |
|         |       |
|         |       |
|         |       |
+ - - - - + - - - +
|         |       |
|         |       |
|         |       |
|         |       |
+ - - - - + - - - - +
```

3. Write a function that draws a Pyramid with # symbols

```
          #
        # # #
      # # # # #
    # # # # # # #
  # # # # # # # # #
.
```

Up to 15 hashes at the bottom

4. Using turtles concept draw a wheel of your choice
5. Write a program that draws Archimedean Spiral
6. The letters of the alphabet can be constructed from a moderate number of basic elements, like vertical and horizontal lines and a few curves. Design an alphabet that can be drawn with a minimal number of basic elements and then write functions that draw the letters. The alphabet can belong to any Natural language excluding English. You should consider at least Ten letters of the alphabet.
7. The time module provides a function, also named time that returns the current Greenwich Mean Time in “the epoch”, which is an arbitrary time used as a reference point. On UNIX systems, the epoch is 1 January 1970.

```
>>> import time
>>>        time.time()
1437746094.573595
8
```

Write a script that reads the current time and converts it to a time of day in hours, minutes, and seconds, plus the number of days since the epoch.

8. Given $n+r+1 <= 2^r$. n is the input and r is to be determined. Write a program which computes minimum value of r that satisfies the above.
9. Write a program that evaluates Ackermann function
10. The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a numerical approximation of $1/\pi$:
    Write a function called estimate_pi that uses this formula to compute and return an estimate of π.

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

    It should use a while loop to compute terms of the summation until the last term is smaller than 1e-15 (which is Python notation for 10^{-15}). You can check the result by comparing it to math.pi.
11. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-in functions.
12. Given a text of characters, Write a program which counts number of vowels, consonants and special characters.
13. Given a word which is a string of characters. Given an integer say 'n', Rotate each character by 'n' positions and print it. Note that 'n' can be positive or negative.
14. Given rows of text, write it in the form of columns.
15. Given a page of text. Count the number of occurrences of each latter (Assume case insensitivity and don't consider special characters). Draw a histogram to represent the same
16. Write program which performs the following operations on list's. Don't use built-in functions
    a) Updating elements of a list
    b) Concatenation of list's
    c) Check for member in the list
    d) Insert into the list
    e) Sum the elements of the list
    f) Push and pop element of list
    g) Sorting of list
    h) Finding biggest and smallest elements in the list
    i) Finding common elements in the list

1. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.

2. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of-copyright book in plain text format. Read the book you downloaded, skip over the header information at the beginning of the file, and process the rest of the words as before. Then modify the program to count the total number of words in the book, and the number of times each word is used. Print the number of different words used in the book. Compare different books by different authors, written in different eras.

3. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of-copyright book in plain text format. Write a program that allows you to replace words, insert words and delete words from the file.

4. Consider all the files on your PC. Write a program which checks for duplicate files in your PC and displays their location. Hint: If two files have the same checksum, they probably have the same

contents.

5. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.
6. Write a program illustrating the object oriented features supported by Python.
7. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorising them into distinction, first class, second class, third class and failed.
8. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.
9. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)

Unit Outcomes:

Student should be able to

- Design solutions to mathematical problems.
- Organize the data for solving the problem.
- Develop Python programs for numerical and text based problems.
- Select appropriate programming construct for solving the problem.
- Illustrate object oriented concepts.

Reference Books:

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python 3", 3rd edition, Available at http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
2. Paul Barry, "Head First Python a Brain Friendly Guide" 2nd Edition, O'Reilly, 2016
3. Dainel Y.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-I Sem (Electronics & Communication 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 Electronics & Communication Engineering					
II Year 2nd Semester (Theory-6,Lab-2)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Probability Theory and Stochastic Processes	PC	3-0-0	3
2		Electromagnetic Waves and Transmission lines	PC	3-0-0	3
3		Electronic Circuits Analysis	PC	3-0-0	3
4		Analog Communications	PC	3-0-0	3
5		Computer Architecture and Organization	PC	3-0-0	3
6		Managerial Economics and Financial Analysis	HS	3-0-0	3
7		Electronic Circuits Analysis Lab	PC	0-0-3	1.5
8		Analog Communications Lab	PC	0-0-3	1.5
				Total	**21**

Category	**CREDITS**
Professional core Courses	18
Humanities and Social Sciences	3
TOTAL CREDITS	**21**

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-II Sem (Electronics & Communication Engineering)	L	T	P	C
PROBABILITY THEORY AND STOCHASTIC PROCESSES	**3**	**0**	**0**	**3**

Course Objectives:

- To gain the knowledge of the basic probability concepts and acquire skills in handling situations involving more than one random variable and functions of random variables.
- To understand the principles of random signals and random processes.
- To be acquainted with systems involving random signals.
- To gain knowledge of standard distributions that can describe real life phenomena.

Unit I

Probability Introduced Through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events, Problem Solving.
Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties, Problem Solving.

Unit Outcomes:

- Understand the fundamental concepts of probability theory, random variables, and conditional probability.
- Evaluate the different probability distribution and density functions.

Unit II

Operations on Single Random Variable: Introduction, Expectation of a random variable, moments-moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, moment generating function, characteristic function, transformations of random variable.
Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected), Unequal Distribution, Equal Distributions.

Unit Outcomes:

- Apply the knowledge to the sum of random variables, central limit theorem in communication system .
- Evaluate the single and multiple random variable concepts to expectation, variance and moments .

Unit III

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties of Gaussian random variables, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

Unit Outcomes:

- Apply the different operations to multiple random variables .
- Understand the concepts of linear transformation of Gaussian random variables .

Unit IV

Random Processes-Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept

of Stationarity and Statistical Independence, First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, N-Order and Strict-Sense Stationarity. Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

Random Processes-Spectral Characteristics: The Power Density Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum and its Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

Unit Outcomes:

- Understand and analyze continuous and discrete-time random processes .
- Analyze the concepts and its properties of auto correlation, cross correlation functions and power spectral density .

Unit V

Random Signal Response Of Linear Systems: System Response – Convolution, Mean and Mean squared Value of System Response, autocorrelation Function of Response, Cross- Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band Limited and Narrowband Processes, Properties.

Noise Definitions: White Noise, colored noise and their statistical characteristics, Ideal low pass filtered white noise, RC filtered white noise.

Unit Outcomes:

- Describe the theory of stochastic processes to analyze linear systems .
- Apply the knowledge to linear systems; low pass and band pass noise models for random processes .

Course Outcomes:

After completion of the course, student will be able to

CO1: Understanding the concepts of Probability, Random Variables, Random Processes and their characteristics learn how to deal with multiple random variables, conditional probability, joint distribution and statistical independence.

CO2: Formulate and solve the engineering problems involving random variables and random processes.

CO3: Analyze various probability density functions of random variables.

CO4: Derive the response of linear system for Gaussian noise and random signals as inputs.

TEXT BOOKS:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2002.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002.

REFERENCES:

1. Simon Haykin, "Communication Systems", 3rd Edition, Wiley, 2010.
2. Henry Stark and John W.Woods, "Probability and Random Processes with Application to Signal Processing," 3rd Edition, Pearson Education, 2002.
3. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis," 3rd Edition, Oxford, 1999.

Sri Krishnadevaraya University College of Engineering & Technology

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

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

Course Objectives:

- To introduce fundamentals of static and time varying electromagnetic fields.
- To teach problem solving in Electromagnetic fields using vector calculus.
- To demonstrate wave concept with the help of Maxwell's equations.
- To introduce concepts of polarization and fundamental theory of electromagnetic waves in transmission lines and their practical applications.
- To analyze reflection and refraction of electromagnetic waves propagated in normal and oblique incidences.

Unit I

Vector Analysis: Coordinate systems and transformation-Cartesian, Cylindrical and Spherical coordinates

Vector Calculus: Differential length area and volume, line surface and volume integrals, del operator, gradient, divergent and curl operations.

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Divergence Theorem, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

Unit Outcomes:

- Understand basic laws of static electric field.
- Derive the Maxwell's equations for electrostatic fields.
- Solve problems applying laws of electrostatics.

Unit II

Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Magnetic dipole, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems.

Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's equations for time varying fields, Maxwell's Equations in Different Final Forms and Word Statements, Illustrative Problems

Unit Outcomes:

- Understand basic laws of static magnetic field.
- Derive the Maxwell's equations for magnetic fields.
- Solve problems applying laws of magneto statics.
- Derive the Maxwell's equations for electromagnetic fields.
- Apply the boundary conditions of electromagnetic fields at the interface of different media.

Unit III

Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves

– Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

Unit Outcomes:

- Understand concept of wave propagation through the Maxwell's equations .
- Derive wave equations for different media.

- Explain concept of polarization of electromagnetic wave.

Unit IV

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

Unit Outcomes:

- Understand principles of reflections and refraction for different incidences.
- State concept of power flow using Poynting vector.
- Calculate Brewster angle, power flow and surface impedance.

Unit V

Transmission Lines: Introduction, Transmission line parameters, Transmission line equivalent circuit, Transmission line equations and their solutions in their phasor form, input impedance, standing wave ratio, Transmission of finite length- half wave, quarter wave transmission line, Smith chart, graphical analysis of transmission lines using Smith chart, stub matching- single and double stub matching, Illustrative Problems.

Unit Outcomes:

- Understand the principles of transmission lines and concept of smith chart.
- Derive the input impedance of transmission line.
- Finding the line parameters through problem solving.
- Study the applications of different lengths of transmission lines.

Course Outcomes:

After completion of the course, student will be able to

CO1: Explain basic laws of electromagnetic fields and know the wave concept.
CO2: Solve problems related to electromagnetic fields.
CO3: Analyze electric and magnetic fields at the interface of different media.
CO4: Derive Maxwell's equations for static and time varying fields.
CO5: Analogy between electric and magnetic fields.
CO6: Describes the transmission lines with equivalent circuit and explain their characteristic with various lengths.

TEXT BOOKS:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics", 4th edition. Oxford Univ. Press, 2008.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", 7th edition., TMH, 2006.

REFERENCES:

1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2000.
2. John D. Krauss, "Electromagnetics", 4th Edition,McGraw- Hill publication1999.

Sri Krishnadevaraya University College of Engineering & Technology

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

ELECTRONIC CIRCUITS-ANALYSIS

Course Objectives:

- To design and analyze single and multi stage amplifiers using BJT & FET at low and high frequencies.
- To discuss cascading of single stage amplifiers.
- To explain effect of negative feedback on amplifier characteristics.
- To teach basic principles for analysing RC & LC oscillator circuits.
- To introduce different types of large signal amplifiers and tuned amplifiers.

Unit I

Small Signal Amplifiers Using MOSFETS: Graphical analysis, Load line and small signal parameters, Small signal equivalent circuit, Small signal analysis of Common source, Common drain, Common gate amplifiers, Comparison of the three basic amplifier configurations, Problem solving.

JFET Small Signal Amplifiers: Small signal analysis of common source, common drain, common gate amplifiers, JFET as voltage variable resistor, Problem solving.

BJT Small Signal Models: Bipolar linear amplifier, Graphical and ac equivalent circuit, Small signal hybrid-∏equivalent circuit, Hybrid-∏equivalent circuit including the early effect, other small signal parameters and equivalent circuits-h-parameters.

Small Signal Analysis: Basic CE amplifier circuit, Circuit with Emitter resistance, ac load line analysis, maximum symmetrical swing, Small signal analysis-input and output impedances, Voltage gain, Current gain of CB, CC amplifiers, Problem solving.

Unit Outcomes:

- Understand the concepts and equivalent circuit models of small signal amplifiers.
- Analyze low frequency and high frequency models of BJT and FET.
- Design BJT and FET amplifier circuits.
- Determine performance parameters of BJT and FET amplifiers.

Unit II

Frequency Response: Amplifier frequency response-different ranges, short circuit and open circuit time constants, time response, transistor amplifiers with circuit capacitors-coupling capacitor effects, load capacitor effects, Bypass capacitor effects, Problem solving, combined effects of coupling and bypass capacitor, high-frequency response model for BJT and MOSFETs, short circuit current gain, Miller effect and its applications, unity-gain bandwidth in BJT and FET amplifiers, CE and CS circuits, CB and CG circuits, Cascode amplifier analysis, emitter and source follower circuits, high frequency response-design application.

Unit Outcomes:

- Analyze the frequency response of single stage amplifiers using BJT & FET at high and low frequencies.
- Design of single stage amplifiers using BJT and FET with and without coupling capacitors.
- Explore the various effects of load , bypass and coupling capacitor on the performance of amplifier circuits.

Unit III

Differential and Multistage Amplifiers: Differential amplifier, basic BJT differential pair and its qualitative description, DC transfer characteristics, small signal equivalent circuit analysis, CMRR, differential and common mode gains, differential and common mode input impedances. Basic differential FET pair, small signal equivalent circuit analysis, JFET differential amplifier, differential amplifier with active load, MOSFET differential amplifier with active load, two stage RC coupled amplifier, Darlington pair and simple emitter follower output, voltage gain, input and output impedances, simplified BJT operational amplifier circuit, design applications- CMOS differential amplifier.

Unit Outcomes:

- Understand basic concepts and need of Differential and multistage amplifiers. Also various inter-stage coupling in multi-stage amplifiers.
- Analyze and examine few common two stage transistor amplifier circuits viz., Cascade amplifiers, Cascode amplifiers, Darlington pairs.
- Design multiple stage amplifier circuits.

Unit IV

Feedback Amplifiers: General Considerations, Properties of Negative Feedback, Types of Amplifiers, Sense and Return Techniques, Polarity of Feedback , Feedback Topologies, Effect of Nonideal I/O Impedances, Stability in Feedback Systems , Analysis of a feedback Amplifiers

- Voltage – Series, Current Series, Current-shunt and Voltage-shunt , Illustrative problems. **Oscillators:** General Considerations, LC Oscillators, Phase Shift Oscillator, Wien-Bridge Oscillator, Crystal Oscillators, Illustrative Problems.

Unit Outcomes:

- Understand concept of different feedback topologies.
- Determine the effect of feedback on amplifier characteristics .
- Analyse characteristics of various types of feedback configurations
- Explore working principle of oscillator. Also examine different types of oscillators, RC & LC, with detailed mathematical analysis and illustrations.

Unit V

Power Amplifiers:

Classes of amplifiers-Operations of Class A, B, AB, C, class-A: Inductively coupled amplifier, transformer-coupled common emitter amplifier, transformer-coupled emitter-follower amplifier, Class-AB Push-pull complementary output stages-class-AB output stage with diode biasing, class-AB biasing using the V_{BE} multiplier, class-AB output stage with input buffer transistors, class –AB output stage utilizing the Darlington configuration, Illustrative Problems.

Tuned Amplifiers: Introduction to tuned amplifiers, Role of Q-Factor, Single-tuned, Double- tuned and Stagger-tuned amplifiers.

Unit Outcomes:

- Know most common classes of power amplifier and their basic characteristics.
- Understand various distortions of amplifiers and the concept of heat sink.
- Analyse complementary symmetry topologies.
- Evaluate conversion efficiency of various topologies.
- Analyse different types of distortions in power amplifiers.
- Evaluate the resonant frequency for tuned amplifiers. Analyse characteristics of tuned amplifiers

Course Outcomes:

CO1: Understand the working principle of multistage amplifiers, Feedback amplifiers, power amplifiers, tuned amplifiers, Multivibrator and Time base generators

CO2: Analyse multistage amplifiers, multistage amplifiers, feedback amplifiers, power amplifiers, tuned amplifier and Multivibrators.

CO3: Design multistage amplifiers, feedback amplifiers, oscillators, Multivibrator, power amplifiers and tuned amplifiers for given specification.

CO5: Evaluate efficiency of large signal (power) amplifiers and voltage regulators

TEXT BOOKS:

1. Donald A Neamen, "Electronic Circuits – Analysis and Design," 3rdEdition, McGraw Hill (India), 2019.
2. J. Millman, C Chalkias, "Integrated Electronics", 4th Edition, McGraw Hill Education (India) Private Ltd., 2015.
3. K.Lal Kishore, "Electronic Circuit Analysis", 2nd Edition, B S Publications, 2008.

REFERENCE BOOKS:

1. Behzad Razavi, “Fundamentals of Micro Electronics”, Wiley, 2010.
2. Millman and Taub, Pulse, “Digital and Switching Waveforms”, 3rd Edition, Tata McGraw-Hill Education, 2011
3. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory”, 9th Edition, Pearson/Prentice Hall, 2006.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-II Sem (Electronics & Communication Engineering)

L	T	P	C
3	0	3	3

ANALOG COMMUNICATIONS

Course Objectives

- To introduce various modulation and demodulation techniques of analog communication system.
- To analyze different parameters of analog communication techniques.
- Know Noise Figure in AM & FM receiver systems.
- Understand Function of various stages of AM, FM transmitters and Know Characteristics of AM & FMreceivers.
- Understand the concepts of information theory.

Unit – I

Introduction: Elements of communication systems, Information, Messages and Signals, Modulation, Modulation Methods, Modulation Benefits and Applications.

Amplitude Modulation & Demodulation: Baseband and carrier communication, Amplitude Modulation (AM), Rectifier detector, Envelope detector, Double sideband suppressed carrier (DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Frequency mixer, sideband and carrier power of AM, Generation of AM signals, Single sideband (SSB) transmission, Time domain representation of SSB signals & their demodulation schemes (with carrier, and suppressed carrier), Generation of SSB signals, Vestigial sideband (VSB) modulator & demodulator, Frequency division multiplexing (FDM), Illustrative Problems.

Unit Outcomes:

- Understand the concepts of Amplitude Modulation and demodulation techniques.
- Apply the concepts to solve problems in Amplitude modulation Schemes.
- Analyse frequency spectra of modulated signals used in various amplitude modulation
- Compare the Performance of different amplitude modulation techniques.

Unit – II

Angle Modulation & Demodulation: Concept of instantaneous frequency, Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation (NBFM) and Wide band FM (WBFM), Phase modulation, Verification of Frequency modulation bandwidth relationship, Features of angle modulation, Generation of FM waves-Indirect method, Direct generation; Demodulation of FM, Band pass limiter, Practical frequency demodulators, Small error analysis, Pre-emphasis, & De-emphasis filters, FM Capture Effect, Illustrative Problems.

Unit Outcomes:

- Understand the concepts of Angle modulation and demodulation techniques.
- Understand importance Pre-emphasis & de-emphasis circuit in FM modulation.
- Apply the concepts to solve problems in Angle modulation Schemes.
- Analyse frequency spectra of modulated signals used in various angle modulation

Unit – III

Noise in Communication Systems: Thermal noise, Time domain representation of narrowband noise, filtered white noise, Quadrature representation of narrowband noise, Envelope of narrowband noise plus sine wave, Signal to noise ratio & probability of error, Noise equivalent bandwidth, Effective noise temperature, and Noise figure, Baseband systems with channel noise, Performance analysis (i.e. finding SNR expression) of AM, DSB-SC, SSB-SC, FM, PM in the presence of noise, Illustrative Problems.

Unit Outcomes:

- Understand different types of noise and sources that effect the performance of the communication system. [L1]
- Analyse performance of analog communication system in the presence of noise. [L3]

Unit – IV

Analog Pulse Modulation Schemes: Pulse amplitude modulation – Natural sampling, flat top sampling and Pulse amplitude modulation (PAM) & demodulation, Pulse-Time Modulation – Pulse Duration and Pulse Position modulations, and demodulation schemes, PPM spectral analysis, Illustrative Problems.

Radio Receiver: Working principle of Super heterodyne AM and FM Receivers along with suitable block

diagrams, Sensitivity, Selectivity and fidelity.

Unit Outcomes:

- Understand the concepts of Analog Pulse Modulation and Demodulation techniques. [L1]
- Understand the concepts of AM and FM receivers. [L1]
- Apply the concepts to solve problems in Analog pulse modulation schemes. [L2]
- Analyse the performance of AM and FM receivers.[L3]
- Compare the Performance of different Analog Pulse Modulation techniques.[L4]

Unit – V

Information Theory: Introduction, Information and Entropy, and its properties, source coding Theorem, Data Compaction – Prefix coding, Huffman coding, Discrete Memoryless channels, Mutual Information, and its properties, Channel capacity, Channel coding Theorem, Application to binary symmetric channels, differential entropy and mutual information, Information capacity theorem, implication of information capacity theorem, Rate Distortion, Illustrative problems.

Unit Outcomes:

- Understand the concepts of information theory and different coding techniques.[L1]
- Analyse Binary symmetric channel. [L3]
- Design the channel performance using information theory. [L4]
- Derive equation for Entropy, Mutual information and channel capacity for all types of channels. [L2]

Course Outcomes

After completion of the course, student will be able to

CO1: Understand the concepts of various Amplitude, Angle and Pulse Modulation schemes. Understand the concepts of information theory with random processes.

CO2: Apply the concepts to solve problems in analog and pulse modulation schemes.

CO3: Analysis of analog communication system in the presence of noise.

CO4: Compare and contrast design issues, advantages, disadvantages and limitations of various modulation schemes in analog communication systems.

CO5: Solve basic communication problems & calculate information rate and channel capacity of a discrete communication channel

TEXT BOOKS:

1. B. P. Lathi, "Modern Digital and Analog Communication Systems," 3rd Edition, Oxford Univ. press, 2006.
2. John Wiley & Sons Simon Haykin, "Communication Systems,",3 Edition, 2010.
3. Sham Shanmugam, "Digital and Analog Communication Systems", Wiley-India edition, 2006.(edition)

REFERENCES:

1. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", 5th Edition, McGraw-Hill International Edition, 2010.
2. Herbert Taub & Donald L Schilling, "Principles of Communication Systems", 3rd Edition, Tata McGraw- Hill, 2009.
3. R.E. Ziemer & W.H. Tranter, "Principles of Communication-Systems Modulation & Noise", 5th edition, Jaico Publishing House2001.
4. George Kennedy and Bernard Davis, "Electronics & Communication System", TMH,2004.(edition)

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II –II Sem (Electronics & Communication Engineering)

L	T	P	C
3	0	0	3

COMPUTER ARCHITECTURE AND ORGANIZATION

Course Objectives:

- To discuss organization and design of a digital computer.
- To explain how to use RTL to represent memory and Arithmetic/ Logic/ Shift operations
- To introduce computer languages, machine, symbolic and assembly levels
- To present organization of central processing unit and concepts of micro-programmed control
- To explain how input-output devices communicate with the other components and methods of data transfer
- To teach different types of addressing modes and memory organization.

Unit I

Data Representation: Data Types, Complements, Fixed-Point Representation, Conversion of Fractions, Floating-Point Representation, Other Binary Codes

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

Unit Outcomes:

- Represent various data types found in digital computers in binary form
- Emphasize representation of numbers employed in arithmetic operations and on binary coding of symbols used in data processing
- Express micro-operations in symbolic form by using register transfer language
- Develop composite arithmetic logic shift unit to show hardware design of micro- operations

Unit II

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input- Output and Interrupt, Complete Computer Description, Design and Accumulator Logic.

Programming the Basic Computer: Machine Language, Assembly Language, the Assembler, Program Loops, programming arithmetic and logic operations

Unit Outcomes:

- Describe organization and design of a basic digital computer
- Illustrate techniques used in assembly language programming
- Show translation from symbolic code to an equivalent binary program using basic operations of an assembler

Unit III

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

Unit Outcomes:

- Develop execution unit to show general register organization of a typical CPU
- Explain operation of a memory stack
- Illustrate various instruction formats together with a variety of addressing modes
- Discuss characteristics and advantages of reduced instruction set computer(RISC)

Unit IV

Micro-programmed Control: Control Memory, Address Sequencing, Micro-program example, Design of Control Unit.

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

Unit Outcomes:

- Develop specific micro-programmed control unit to show how to write microcode for a typical set of

instructions

- Design control unit including the hardware for the micro-program sequencer
- Show procedures for implementing arithmetic algorithms for addition, subtraction, multiplication and division with digital hardware
- Discuss algorithms to specify the sequence of micro-operations and control decisions required for implementation

UNIT V

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

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

Unit Outcomes:

- Explain how processor interacts with external peripherals through Interface units
- Compare different modes of data transfer
- Illustrate procedures for serial data transmission
- Describe concept of memory hierarchy composed of cache memory, main memory, and auxiliary memory
- Explain organization and operation of associative memories

Course Outcomes:

CO1: Conceptualize basics of organizational and architectural issues of a digital computer
CO2: Emphasize representation of data types, numbers employed in arithmetic operations and binary coding of symbols used in data processing
CO3: Develop low-level programs to perform different basic instructions **CO4**: Evaluate various modes of data transfer between CPU and I/O devices **CO5**: Analyze various issues related to memory hierarchy
CO6: Design basic computer system using the major components

TEXT BOOKS:

1. M. Morris Mano, "Computer System Architecture", 3rd edition, Pearson Education,2017.

REFERENCES:

1. Carl Hamacher, ZvonkoVranesic and SafwatZaky, "Computer Organization", 5th Edition McGraw Hill,
2. John D. Carpinelli, "Computer Systems Organization and Architecture", 15th reprint Pearson Education, 2018,
3. William Stallings, "Computer Organization and Architecture: Designing for Performance", 8th Edition, Pearson

Sri Krishnadevaraya University College of Engineering & Technology

		L	T	P	C
B.Tech – II-II Sem	**(Electronics & Communication 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 it's 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-II Sem (Electronics & Communication Engineering)	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB

Course Objectives:

- To provide a practical exposure for design& analysis of electronic circuits for generation and amplification input signal.
- To learn the frequency response and finding gain, input &output impedance of multistage amplifiers
- To Design negative feedback amplifier circuits and verify the effect of negative feedback on amplifier parameters.
- To understand the application of positive feedback circuits& generation of signals.
- To understand the concept of design and analysis of Power amplifiers and tuned amplifiers
- To construct and analyse voltage regulator circuits.

LIST OF EXPERIMENTS:

1. MOSFET Amplifier
   a. Design and simulate MOSFET (Depletion mode) amplifier using PSPICE /Multisim and study the Gain and Bandwidth of amplifier
   b. Design common source MOSFET (Enhance mode) amplifier with discrete components and calculate the bandwidth of amplifier from its frequency response
2. JFET Amplifier
   a. Design and simulate common source FET amplifier using PSPICE /Multisim and study the Gain and Bandwidth of amplifier
   b. Design common source FET amplifier with discrete components and calculate the bandwidth of amplifier from its frequency response
3. Common Emitter Amplifier (Self bias Amplifier)
   a. Design and simulate a self- bias (Emitter bias)Common Emitter amplifier using PSPICE /Multisim and study the Gain and Bandwidth of amplifier
   b. Design voltage divider based Common Emitter amplifier with discrete components and calculate the bandwidth of amplifier from its frequency response.
4. Design and simulate two stage RC coupled amplifier for given specifications. Determine Gain and Bandwidth from its frequency response curve.
5. Design and simulate Darlington amplifier. Determine Gain and Bandwidth from its frequency response curve.
6. Design and Simulate CE – CB Cascode amplifier. Determine Gain and Bandwidth from its frequency response curve.
7. Design and simulate voltage series feedback amplifier for the given specifications. Determine the effect of feedback on the frequency response of a voltage series feedback amplifier.
8. Design and simulate current shunt feedback for the given specifications. Determine the effect of feedback on the frequency response of a current shunt feedback amplifier.
9. Design and simulate RC Phase shift oscillator and Wien bridge oscillator for the given specification. Determine the frequency of oscillation.

10. Design and simulate Hartley and Colpitts oscillators for the given specifications. Determine the frequency of oscillation.
11. Design and simulate class A power amplifier and find out the efficiency. Plot the output waveforms.
12. Design and simulate class B push-pull amplifier and find out the efficiency. Plot the output waveforms.
13. Design and simulate single tuned amplifier. Determine the resonant frequency and bandwidth of a tuned amplifier.
14. Design and simulate double tuned amplifier. Determine the resonant frequency and bandwidth of a tuned amplifier.

Note: Design & simulate any 12 experiments with Multisim / PSPICE or equivalent software and verify the results in hardware lab with discrete components.

Course Outcomes

After completion of the course, student will be able to

CO1: Understand Characteristics and frequency response of various amplifiers

CO2: Analyze negative feedback amplifier circuits, oscillators, Power amplifiers, Tuned amplifiers.

CO3: Determine the efficiencies of power amplifiers

CO4: Design RC and LC oscillators, Feedback amplifier for specified gain and multistage amplifiers for Low, Mid and high frequencies

CO3: Simulate all the circuits and compare the performance.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – II-II Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
	ANALOG COMMUNICATIONS LAB	**0**	**0**	**3**	**1.5**

Course Objectives

- To familiarize the students with basic analog communication systems. Integrate theory with experiments so that the students appreciate the knowledge gained from the theory course.
- Understand all types of analog modulation / demodulation principles.
- Substantiate pulse modulation techniques.
- To design and implement different modulation and demodulation techniques.
- To write and execute programs in MATLAB to implement various modulation techniques.

LIST OF EXPERIMENTS

1. (a) Develop an Amplitude modulation circuit to get modulated signal for various modulation indices. Verify the Spectrum of the modulated signal experimentally and find its Bandwidth.
   (b) Design a suitable demodulated circuit to recover original information signal.
2. Generate a DSB - SC signal using suitable circuit diagram. Extract information bearing signal from DSB-SC signal. Calculate the power of the DSB-SC signal.
3. (a) Develop a Frequency modulation circuit to get modulated signal for various modulation depths. Verify the Spectrum of the modulated signal experimentally and find its Bandwidth.
   (b) Design a suitable demodulated circuit to recover original information signal.
4. (a)Design a Mixer circuit to verify the principle of operation of Mixer experimentally.
   (b)Design a Pre-emphasis & de-emphasis circuit and verify its importance experimentally and plot necessary graph.
5. Construct Pulse Amplitude Modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
6. Construct Pulse Width Modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
7. Construct Pulse Position modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
8. Radio receiver measurements – Sensitivity Selectivity and Fidelity.
9. Simulate AM and FM signals and find power spectrum of each signal. Plot the graphs.
10. Simulate PAM and PWM signals and find power spectrum of each signal. Plot the graphs.
11. Generate a complex Gaussian noise (with zero mean unit variance). And pass through an LTI system. Find the power spectrum density of the noise signal available at the output of LTI system.
12. Make use of AM signal from experiment no. 9 add Gaussian noise (with zero mean and unity variance) to the signal. Extract the information bearing signal using suitable system.
13. Simulate Huffman coding.

Equipment & Software Required:

Software:

1. Computer Systems with latest specifications
2. Connected in LAN (Optional)
3. Operating system (Windows XP)
4. Simulations software (MATLAB)

Equipment:

1. Regulated Power Supply (0-30) V
2. CROs (0-20)MHz

3. Function Generators (0-3) MHz
4. RF Signal Generators (0-1000) MHz
5. Multimeters
6. Required Electronic components(active and passive)for the design of experiments from 1 -7
7. Radio Receiver Demo kits or Trainers.
8. RF power meter frequency range 0 – 1000MHz
9. Spectrum Analyzer

Note: Conduct experiments (9-12) using MATLAB software. Student has to perform minimum twelve Experiments

Course Outcomes:

After the completion of the course students able to

CO1: Understand different analog modulation techniques &Radio receiver characteristics.

CO2: Analyze different analog modulation techniques.

CO3: Design and implement different modulation and demodulation techniques.

CO4: Observe the performance of system by plotting graphs & Measure radio receiver characteristics.

CO5: Simulate all digital modulation and demodulation techniques.

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electronics & Communication Engineering					
III Year 1st Semester 1					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Control Systems	PC	3-0-0	3
2.		Antennas and Wave Propagation	PC	3-0-0	3
3.		Microprocessors & Microcontrollers	PC	3-0-0	3
4.		Analog IC Applications	PC	3-0-0	3
5.		Professional Elective –I 1)Digital IC Applications 2) Mathematical Modeling & Simulation 3) Information Theory &Coding	PE-I	3-0-0	3
6.		Open Elective- I	OE-I	3-0-0	3
7.		Integrated Circuits and Applications Lab	PC	0-0-3	1.5
8.		Microprocessors and Microcontrollers Lab	PC	0-0-3	1.5
9.		Social Relevant Project	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 (Electronics & Communication Engineering)

L	T	P	C
3	0	0	3

Control Systems

Course Objectives

- Merits and demerits of open loop and closed loop systems; the effect of feedback
- The use of block diagram algebra and Mason's gain formula to find the overall transfer function
- Transient and steady state response, time domain specifications and the concept of Root loci
- Frequency domain specifications, Bode diagrams and Nyquist plots

Course Outcomes

After completing the course, the student should be able to:

CO1:Understand the concepts of control systems classification, feedback effect, mathematical modelling, time response and frequency response characteristics, state space analysis

CO2:Apply the concepts of Block diagram reduction, Signal flow graph method and state space formulation for obtaining mathematical and Root locus, Bode, Nyquist, Polar plots for stability calculations, controllability and observability and demonstrate the use of these techniques.

CO3:Analyse time response analysis, error constants, and stability characteristics of a given mathematical model using different methods.

CO4:Design and develop different compensators, controllers and their performance evaluation for various conditions. Implement them in solving various engineering applications

UNIT I:

I**NTRODUCTION**: Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Examples-Types of feedback control systems. Mathematical modelling of Electrical & Mechanical (Translational & rotational) systems – Differential equations, Electrical analogous (F-V, F-I) of mechanical system-Use of Laplace transforms in control systems- Transfer function: Concepts, features-Transfer functions of above systems.

UNIT II:

BLOCK DIAGRAM & SIGNAL FLOW GRAPH REPRESENTATION: Block diagram representation of electrical systems and reduction techniques-Signal flow graphs and reduction using mason's gain formula-Transfer function of DC servomotor, AC servomotor.

UNIT-III:

TIME RESPONSE ANALYSIS: Definition & classification of time response-Standard test signals- Type & order of a system-Transient response of first order and second order systems for step input-Transient response specifications-Steady state response-Steady sate errors and error constants-Effects of PD, PI & PID controllers.

FREQUENCY RESPONSE ANALYSIS: Introduction – Steady state response to sinusoidal input (frequency response) – Bode diagrams – Phase margin and gain margin – Stability analysis from bode plots – Determination of transfer function from Bode diagram

UNIT IV:

STABILITY ANALYSIS IN S-DOMAIN: The concept of stability – Routh's stability criterion,special, special cases, advantages and limitations. Root locus technique: The root locus concept, construction of root loci-Effects of adding poles and zero's to G(s) H(s) on the root loci.

UNIT V:
POLAR AND NYQUIST PLOTS: Polar plots – Nyquist plots – Stability analysis.

TEXT BOOKS:
1) Control systems – U.A. Bakshi&V.U.Bakshi, Technical publications, Pune.
2) Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, 2nd edition.

REFERENCES:
1) Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., edition 1998.
2) Automatic Control Systems by B. C. Kuo, John wiley and sons, 2003.
3) Control Systems Engg. by NISE 3rd Edition – John wiley

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B.Tech –III - I Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Antennas and Wave Propagation

Course Objectives:

- To introduce radiation mechanisms and basic characteristics of antennas.
- To derive mathematical expressions and their application for complete design ofantennas.
- To demonstrate various modes of EM wave propagation.
- To explain measurement of antenna parameters
- To introduce design concepts of various types of antennas including micro stripantenna.

Course Outcomes:

- Understand various antenna parameters, principle of operation of various antennas viz.wired, aperture, micro strip antennas.
- Discuss various EM wave propagation methods in ionosphere and troposphere
- Analyze mathematical aspects of wave propagation, Derive expressions related to radiation mechanisms for antennas
- Design various antennas namely array, micro strip, horn, lens and aperture antennas, etc.,for a given application.
- Compare performance of various antennas.

UNIT I ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – single wire, Two-wire, Current Distribution on a thin wire antenna of different lengths. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beam width, Beam Area, Radiation Intensity, Radiation Resistance, Beam Efficiency, Directivity, Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height. Near-field and Far-field regions.

UNIT II BASIC ANTENNA ELEMENTS: Retarded Potentials (Vector and Scalar Descriptions), Hertzian Dipole, Half-wave Dipole, Quarter-wave Monopole; Current Distribution, Evaluation of Field Components, Expression for Radiated Power and antenna parameters for Alternating Current-carrying Element, Half-wave Dipole and Quarter-wave Monopole; Small Loop Antenna, Comparison between Loop Antenna and Dipole, Illustrative problems.

Antenna Arrays: Introduction to Antenna Arrays, Purpose of antenna arrays; N-element Uniform Linear Arrays – Broadside Arrays (BSA), End-fire Arrays (EFA), Derivation of their characteristics, EFA with Increased Directivity, Comparison of BSA and EFA.Related Problems.

UNIT III HF, VHF ANTENNAS: Classification of antennas based on different characteristics. HF,VHF Antennas: V-antennas, Rhombic Antennas and Design Relations, Helical Antennas– Significance, Geometry,basic properties; Design considerations, Modes of Helical antennas- Axial Mode and Normal Mode. Yagi–Uda Antenna Arrays, Folded Dipoles & their characteristics, Principle of Pattern Multiplication, Binomial Arrays; Effects of Uniform and Non-Uniform Amplitude Distributions.

UNIT IV UHF AND MICRO-WAVE FREQUENCY ANTENNAS: Reflector Antennas: Flat Sheet and Corner Reflectors; Paraboloidal Reflectors– Geometry, Characteristics, Types of feeds. Cassegrain feed system.Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; Lens Antennas –Geometry, Features, Types- Non-metallic & Metallic lens and Zoning, Patch and slot Antennas. Applications of

all antennas, Antenna Measurements - Introduction, Co-Ordinate System, Patterns to be measured, Pattern Measurement arrangement, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna

Methods).

UNIT V WAVE PROPAGATION: Introduction-Frequency ranges and modes of propagations. Ground Wave Propagation– Characteristics, Parameters, Wave Tilt, Flat and Spherical Earth Considerations and Roughness Calculations. Sky Wave Propagation – Formation of Ionosphere Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF & Skip Distance –Optimum Frequency, LUHF, Virtual Height, Ionospheric Abnormalities, Ionospheric Absorption. Space wave propagation - Introduction, field strength variation with distance and height, effect of earth's curvature, M-curves and Duct propagation, scattering phenomena, fading path loss calculations.

TEXT BOOKS

1. Antennas and Wave Propagation- John D. Krauss and Ronald J. Marhefka and Ahmad S. Khan, 3rd Edition,
TMH, New Delhi.
2. Antenna Theory - C.A. Balanis, John Wiley & Sons, 2nd ed., 2001.

REFERENCES

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.
2. Antennas and Wave Propagation - GSN Raju, Pearson Education India, 2009.
3. Antennas and Wave Propagation – K.D. Prasad, SatyaPrakashan, Tech India Publications, New Delhi, 2001.

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech – III-I Sem (Electronics & Communication Engineering)

L	T	P	C
3	0	0	3

Microprocessors and Microcontrollers

Course Objectives:

- To introduce fundamental architectural concepts of microprocessors
  And microcontrollers.
- To impart knowledge on addressing modes and instruction set of 8086 and 8051.
- To introduce assembly language programming concepts.
- To explain Interfacing with 8086 and 8051.

Course Outcomes:

- Understand instruction set of 8086 microprocessor
- Explain addressing modes of 8086, develop assembly language programs for various problems, describe interfacing of 8086 with peripheral devices.
- Distinguish between microprocessor and microcontroller, 8085& 8086 microprocessors,design applications using microcontrollers.

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.

TE**XT 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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B.Tech III– I Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Analog IC Applications

Course Objectives:

- To introduce basic building blocks of Op-Amps & specialized ICs.
- To explain DC and AC performance characteristics of Op-Amps.
- To impart knowledge on linear and non-linear applications of Op-Amps.
- To describe operation & characteristics of data converters.
- To design various circuits using Op-Amps and 555 timer.
- To familiarise specialised ICs such as VCO, PLL, voltage regulators.

Course Outcomes:

- Understand DC and AC characteristics of operational amplifiers & Op amp parameters and functionality of specialized ICs such as 555 TIMER, VCO, PLL & Voltage regulators.
- Make use of Op-Amps and specialized ICs to design circuits for various applications.
- Analyze Op-Amp based Comparators, Waveform generators, Active filters, Converters.
- Design of Op amp based Comparators, Waveform Generators, Active filters, Converters,design various multi-vibrator circuits using IC 555 timer
- Compare different types of A/D and D/A Converter circuits.

UNIT-I

INTRODUCTION TO OP-AMPS: Integrated circuits-types, classification, package types and temperature ranges, power supplies, OP-Amp Block diagram, Differential amplifier circuit configurations, Characteristics of OP-Amps, ideal and practical OP-Amp specifications, DC and AC characteristics, 741 OP-Amp and its features, OP-Amp parameters, input and output offset voltages and currents, slew rate, CMRR, PSRR.

UNIT-II

LINEAR AND NON LINEAR APPLICATIONS OF OP-AMPS: Inverting and non-inverting amplifier, integrator and differentiator, difference amplifier, instrumentation amplifier, AC amplifier, Voltage to Current, Current to Voltage converters, Buffers. Non-linear function generation, comparators, Multivibrators, Triangular and square wave generators, Log and antilog amplifiers, precision rectifiers, IC 723 voltage regulators.

UNIT-III

ANALOG FILTERS: Introduction, Butterworth filters-first order, second order LPF, HPF filters. Band pass,Band reject and all pass filters.

UNIT-IV

TIMERS AND PHASE LOCKED LOOPS: Introduction to 555 Timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger, PLL-Introduction, Block schematic, principles and description of individual blocks, Introduction to IC 566, VCO applications and details.

UNIT–V

D/A AND A/D CONVERTERS: Introduction, Basic DAC techniques, weighted resistor DAC, R-2R Ladder DAC, Inverted R-2R DAC and different types of ADCs-parallel comparator type ADC, counter type ADC ,successive approximation ADC and Dual slope ADC.DAC and ADC specifications

TEXT BOOKS:

1. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, 4th edition, PHI, 1987.
2. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition, 2003.

REFERENCES:

1. Operational Amplifiers & Linear ICs by David A. Bell, 2nd edition, Oxford University Press, 2010.
2. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, McGraw Hill, 1988.

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

Digital IC Applications
(Professional Elective-I)

Course Objectives:

- Learn and understand the CMOS Logic
- Translate a software application into hardware logic.
- Design synthesizable systems based on industry-standard coding methods.
- Build test benches and create data models to verify bit-true accurate designs.

Course Outcomes:

- Understand the architecture of FPGAs, tools used in modelling of digital design andmodelling styles in VHDL.
- Learn the IEEE Standard 1076 Hardware Description Language (VHDL).
- Analyze and design basic digital circuits with combinatorial and sequential logic circuitsusing VHDL.
- Model complex digital systems at several levels of abstractions, behavioural, structural.

UNIT I

CMOS LOGIC: Introduction to logic families, CMOS logic, CMOS steady state electrical behavior, CMOS dynamic electrical behavior, CMOS logic families.

UNIT II

BIPOLAR LOGIC AND INTERFACING: Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families,Familiarity with standard 74XX and CMOS 40XX series-ICs – Specifications.

UNIT III

THE VHDL HARDWARE DESCRIPTION LANGUAGE: Design flow, program structure, types and constants, functions and procedures, libraries and packages.THE VHDL DESIGN ELEMENTS: Structuraldesign elements, data flow design elements, behavioral design elements, and time dimension and simulationsynthesis.

UNIT IV

COMBINATIONAL LOGIC DESIGN: Decoders, encoders, three state devices, multiplexers and demultiplexers, EX-OR gates and parity circuits, comparators, adders &subtractors, ALUs, VHDL modes for the above ICs

SEQUENTIAL LOGIC DESIGN: Latches and flip-flops, counters, shift register, and their VHDL models.

UNIT V

DESIGN EXAMPLES (USING VHDL): Barrel shifter, comparators, floating-point encoder, dual parity encoder, designing with ROM.

TEXT BOOKS:

1. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.
2. Fundamentals of Digital Logic with VHDL Design – Stephen Brown and ZvonkoVramesic, McGraw Hill, 2nd Edition., 2005.

REFERENCES:

1. Digital System Design Using VHDL – Charles H. Roth Jr., PWS Publications, 2nd edition, 2008.
2. A VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.

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		3	0	0	3

Mathematical Modeling & Simulation
(Professional Elective-I)

Course Objective:

This course focuses on what is needed to build simulation software environments, andnot just building simulations using preexisting packages.

Course Outcomes:

After the completion of course, student will be able to

- Understand basic Model Forms.
- Understand basic Simulation Approaches.
- Evaluate handling Stepped and Event-based Time in Simulations.
- Distinguish Discrete versus Continuous Modeling.
- Apply Numerical Techniques.
- Calculate Sources and Propagation of Error

UNIT-I:

Simulation Basics-Handling Stepped and Event-based Time in Simulations-Discrete versus Continuous Modeling-Numerical Techniques-Sources and Propagation of Error

UNIT-II

Dynamical, Finite State, and Complex Model Simulations-Graph or Network Transitions Based Simulations-Actor Based Simulations-Mesh Based Simulations-Hybrid Simulations

UNIT-III

Converting to Parallel and Distributed Simulations-Partitioning the Data-Partitioning theAlgorithms-Handling Inter-partition Dependencies

UNIT-IV

Probability and Statistics for Simulations and Analysis-Introduction to Queues and RandomNoise-Random Variates Generation-Sensitivity Analysis

UNIT-V

Simulations Results Analysis and Viewing Tools-Display Forms: Tables, Graphs, and Multidimensional Visualization-Terminals, X and MS Windows, and Web Interfaces-Validation of Model Results

TEXT BOOKS:

1. JN Kapur, “Mathematical modelling”, Newage publishers
2. Kai Velten, “Mathematical Modeling and Simulation: Introduction for Scientists and Engineers” Wiley Publishers

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

Information Theory & Coding
(Professional Elective-I)

Course objectives:
The main objectives of this course are given below

- Understand the concept of Entropy and source coding
- Understand the concept of channel and its capacity
- Encoding and Decoding of Digital Data Stream
- Be Aware of Compression and Decompression Techniques
- Learn the Concepts of Multimedia Communication

Course Outcomes:
At the end of this course the student will be able to

- Design an Application with Error-Control Coding
- Use Compression and Decompression Techniques
- Perform source coding and channel coding

UNIT I
INFORMATION THEORY AND SOURCE CODING

Uncertainty, information, entropy and its properties, entropy of binary memory less source and its extension to discrete memory less source, source coding theorem, data compression, prefix coding, Huffman coding, Lempel-Ziv coding, Source with memory and its entropy.

UNIT II
DISCRETE CHANNELS

Binary Symmetric Channel, mutual information & its properties, Channel capacity, channel coding theorem and its application to BSC, Shannon's theorem on channel capacity, capacity of a channel of infinite bandwidth, bandwidth - S/N trade off, practical communication systems in light of Shannon's theorem, Fading channel, channels with memory.

UNIT III
GROUPS, FIELDS AND LINEAR BLOCK CODES

Galois field and its construction in GF(2^m) and its basic properties, vector spaces and matrices in GF(2), Linear block codes, systematic codes and its encoding circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding circuit, probability of undetected error for linear block code in BSC, Hamming code and their applications.

UNIT IV
CYCLIC CODES AND BCH CODES

Basic properties of Cyclic codes, Generator and parity check matrix of cyclic codes, encoding and decoding circuits, syndrome computation and error detection, cyclic Hamming codes, encoding and decoding of BCH codes, error location and correction.

UNIT V CONVOLUTIONAL CODES

Introduction to convolution code, its construction and Viterbi algorithm for maximum likelihood decoding.Automatic repeat request strategies and their throughput efficiency considerations.

Text Books:

1. Sklar, Digital Communication, Pearson Education Asia, 2nd Edition,2001.
2. Shu Lin and Costello, Error Control Coding: Fundamentals and Applications, 2nd Edition, Pearson,2004.

Reference Books:

1. Haykin Simon, Digital Communication, Wiley Publications,2013.
2. Information theory and coding, Muralidhar Kulkarni, KS AShiva prakash,2015.
3. JS Chithode, Information theory and coding, Technical publishers, 1st Edition,2014.

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		0	**0**	**3**	**1.5**

Integrated Circuits and Applications Lab

Course Objectives:

- To familiarize different Analog ICs.
- To implement linear and nonlinear application circuits by Op amp.
- To realize active filters using Op amp.
- To design of various multi-vibrator circuits using 555 timer application
- To design and Understand the working of mixed signal circuits like Analog to DigitalConvertors, Digital to analog Convertors and Phase Locked Loop.
- To understand the working of a few application specific analog ICs and to designcircuits based on these ICs.

Course Outcomes:

- Understand the working of Op amp ICs & Application specific analog ICs.
- Analyze operational amplifier based circuits for linear and non-linear applications.
- Design Operational amplifiers for linear and nonlinear application, Multivibrator circuitsusing 555 & application specific ICs.
- Simulate all linear and nonlinear application based Op amp Circuits and circuits basedon application specific ICs.
- Compare theoretical, practical & simulated results in integrated circuits.

Conduct any 12 experiments from the following list. Out of them any 4 experiments maybe conducted using software tools.

Note: All the Hardware experiments may be performed using ICs 741, TL082, 555,565

Interpretation of data sheets (741, TL082, 555, 565)

1. Applications of Op-amp
   Design and test the performance of the following circuits using Op-amp IC741/TL082
   a. Inverting amplifier
   b. Non-inverting amplifier
   c. Voltage follower
   d. Summer
2. Design and test the performance of practical differentiator and integrator circuits forvarious time constants. Plot the graphs.
3. Comparator circuits
   To study zero crossing detectors, window detector and Schmitt trigger using Op-Amp.
4. Signal converters
   Construct suitable circuits for Voltage to Current and Current to Voltage convertersusing Op-Amp.
5. Active filters using Op-amp
   Design and test the performance of 2^{nd} and 3^{rd} order Butterworth LPF, HPF.
6. Active filters using Op-amp
   Design and test the performance of 2^{nd} and 3^{rd} order Butterworth BPF and BSF.
7. Construct and verify the performance of

a. Logarithmic and antilog amplifiers b. Instrumentation amplifier

8. Precision rectifiers
   Conduct experiments on half wave and full wave precision rectifiers and draw the output waveforms.
9. Design the monostable multivibrator circuit and verify their performance practicallyusing Op-Amp and IC 555.
10. Design the astable multivibrator circuit and verify their performance practically usingOp-Amp and IC 555.
11. Data converters
    Construct and study performance of
    a. DAC circuits – R-2R and ladder type.
    b. Successive approximation type ADC.
12. To study performance of PLL IC565
13. Design a DC power supply using 78XX/79XX andLM723, verify the same practically.

Equipment required forLaboratory Software:

i. Multisim/ Pspice/Equivalent Licensed simulation software tool
ii. Computer Systems with required specifications

Hardware:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Component
10. Bread Boards
11. Connecting Wires
12. CRO Probes

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		0	**0**	**3**	**1.5**

Microprocessors and Microcontrollers Lab

Course Objectives:

- Write ALP for arithmetic and logical operations in 8086
- Familiarize with MASM, Embedded C & Code composer studio
- Write and execute programs in 8086, 8051 .

Course Outcomes:

- Execution of different programs for 8086, 8051 in Assembly Level Language usingMASM Assembler
- Design and implement some specific real time applications.

Conduct all the experiments:

List of Experiments:

Intel 8086 (16 bit Micro Processor)

1. Perform simple arithmetic operations using different addressing modes.
2. Sort an array of binary numbers.
3. Code Conversion (Eg. ASCII to Packed BCD form).
4. Addition of an array of BCD numbers stored in packed form.
5. String transfer and ,String Comparison
6. Identification & displaying the activated key using DOS & BIOS function calls.

Intel 8051 (8 bit Microcontroller)

1. Detection of key closure (connected to a port line) by polling technique.
2. Delay generation using i) Nested loop & ii) Timers.
3. Counting of external event occurrence through port line
4. Sort an array of binary numbers.
5. Code Conversions

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electronics & Communication Engineering					
III Year 2nd Semester (Theory-6,Lab-2)					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Electronic Measurements and Instrumentation	PC	3-0-0	3
2		Digital Communications	PC	3-0-0	3
3		Digital Signal Processing	PC	3-0-0	3
4		Computer Networks	PC	3-0-0	3
5		Professional Elective courses-II 1) Embedded Systems 2) Cellular & Mobile Communication 3) Robotics and Automation	PE-II	3-0-0	3
6		Open Elective courses-II	OE-II	3-0-0	3
7		Digital Communications Lab	PC	0-0-3	1.5
8		Digital Signal Processing Lab	PC	0-0-3	1.5
9		Socially Relevant Project(15hrs/Sem)	PR	0-0-3	1.5
10		Industrial Training/ Internship/ Research Projects in National Laboratories/Academic Institutions	- - -	- - -	- - -
				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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		3	**0**	**0**	**3**

Electronic Measurements & Instrumentation

Course Objectves:

- To remember the basic definitions of some important measurement parameters of electrical and electronic instruments.
- To understand the basic principles of different measuring meters (voltage, current, andother passive parameters), CROs, and transducers.
- To apply the knowledge of DC and AC meters while solving problems related tomeasurement errors.
- To analyze the performance of various electric and electrionc instruments like energymeters, analog & digital meters, CROs, function generators and signal generators.

Course Outcomes:

- CO1: Remember the basic definitions of some important measurement parameters ofelectrical and electronic instruments.
- CO2: Understand the basic principles of different measuring meters (voltage, current,and other passive parameters), CROs, and transducers.
- CO3: Apply the knowledge of DC and AC meters while solving problems related tomeasurement errors.
- CO4: Analyze the performance of various electric and electrionc instruments like energymeters, analog & digital meters, CROs, function generators and signal generators.

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 – Q meter-Vector impedance meter-Vector volt meter- RF power and voltage measurement

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 and pulse- Multi I/p oscilloscopes: dual beam, dual trace- Sampling oscilloscopes- Digital storage oscilloscopes.

UNIT V: SIGNAL GENERATORS AND ANALYZERS: Low-frequency signal generators- Function generators- Pulse generators- RF signal generators- Frequency synthesized signal generator- Heterodyne wave analyzer- Harmonic distortion analyzers- Spectrum analyzer (Basics only)- 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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		3	**0**	**0**	**3**

Digital Communications

Course Objectives:

- To understand the key modules of digital communication systems with emphasis ondigital modulation techniques.
- To get introduced to the concept and basics of information theory and the basics of source and channel coding/decoding.
- To prepare mathematical background for communication signal analysis.
- To study signal flow in a digital communication system.
- To analyze error performance of a digital communication system in presence of noiseand other interferences.

Course Outcomes:

- Understand the elements of digital communication system, baseband pulse transmission, pass band digital modulation, geometric representation of signals, basics of informationtheory and error correcting codes.
- Apply the knowledge of signals and system & statistical theory to evaluate the performance of digital communication systems.
- Analyze the different coding, modulation techniques, Probability of error performance of digital system.
- Compare the performance of different modulation schemes& error correcting codes.

UNIT I: DIGITIZATION TECHNIQUES FOR ANALOG MESSAGES-I: Introduction - Importance of Digitization Techniques, Elements of Pulse Code Modulation (PCM) - Generation and Reconstruction, Quantization and coding, Quantization error, PCM with Noise, Companding in PCM
DIGITIZATION TECHNIQUES FOR ANALOG MESSAGES-II: Delta modulation, Adaptive Delta Modulation, Differential PCM systems (DPCM)

UNIT II: BASE BAND DIGITAL TRANSMISSION: Digital Signals and Systems – Digital PAM Signals, Transmission Limitations, Power Spectra of Digital PAM, Noise and Errors – Binary Error Probabilities, Matched Filtering, Optimum filtering.

UNIT III: DIGITAL MODULATION TECHNIQUES: Introduction, ASK, FSK, PSK, DPSK, QPSK, M–ary PSK Systems calculation of error probability of ASK, BPSK, BFSK, QPSK, Coherent AND Non-Coherent ASK (OOK (on-off keying)

Band Pass Digital Transmission: Introduction, Signal Space, Coherent Binary Systems – Optimum Binary Detection.

UNIT IV: INFORMATION THEORY: Introduction, Information Measure and Encoding, Entropy and Information Rate, Coding for a Discrete Memory Less Channel, Binary Symmetric Channel, Discrete Channel Capacity, Coding for the Binary Symmetric Channels.

UNIT V: CHANNEL CODING: Error Detection & Correction of Linear Block Codes Hamming Codes, Forward Error Correction (FEC) Systems, Automatic Retransmission Query (ARQ) Systems, Matrix Representation of Block Codes, Convolutional Codes, Syndrome calculation, M-ary modulation techniques.

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. Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley, 2005

REFERENCES:

1. Digital communications - Simon Haykin, John Wiley, 2005
2. Herbert Taub& Donald L Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 3rd Edition, 2009.
3. Digital Communications – John Proakis, TMH, 1983. Communication Systems Analog & Digital – Singh & Sapre, TMH, 2004.

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

Digital Signal Processing

Course Objectives:

- To provide background and fundamental material for the analysis and processing ofdigital signals.
- To familiarize the relationships between continuous-time and discrete time signalsand systems.
- To study fundamentals of time, frequency and Z-plane analysis and to discuss theinter-relationships of these analytic method.
- To study the designs and structures of digital (IIR and FIR) filters from analysis tosynthesis for a given specifications.
- To introduce a few real-world signal processing applications.
- To acquaint with DSP processor.

Course Outcomes

- Understand the basic concepts of IIR and FIR filters, DSP building blocks to achievehigh speed in DSP processor, DSP TMS320C54XX architecture and instructions.
- Compute the fast Fourier transforms and find the relationship with other transforms.Realization of digital filter structures.
- Design of FIR and IIR digital filters.
- Compare FIR and IIR filters.

UNIT-I

INTRODUCTION: Review of Discrete time signals and sequences, Frequency domain representation of Discrete time signals and systems.

DISCRETE FOURIER SERIES: Properties of discrete Fourier series, DFS representation of periodic sequences, discrete Fourier transforms: properties of DFT, linear convolution of sequences using DFT, computation of DFT. Relation between Z-Transform and DFS.

UNIT-II

FAST FOURIER TRANSFORM: Radix-2, Decimation in Time and Frequency algorithms, Comparison of DFT & FFT computations, In-place computation, an bit reversal, Finite Word lengths in FFT algorithms, Realization of Digital Filters – Direct forum I & II cascade, parallel.

UNIT-III

IIR DIGITAL FILTERS: Analog filter approximations-Butterworth and chebyshev, design of IIR digital filters from analog filters, design examples: analog-digital transformations, Illustrative Problems.

UNIT-IV

FIR DIGITAL FILTERS: Characteristics of FIR digital filters, frequency response. Design of FIR digital filters using window techniques, frequency sampling technique, comparison of IIR and FIR filters, Illustrative Problems.

UNIT-V

MULTIRATE DIGITAL SIGNAL PROCESSING FUNDAMENTALS: Basic sample rate alteration devices, Multirate Structures for sampling rate Converters, Multistage design of decimator and Interpolator, Polyphase Decomposition, Nyquist filters, Applications of DSP.

Text Books:

1. Discrete Time Signal Processing - Allan V.Oppenhiem & Rouald W.Schafer – Pearson, 2nd Ed. 1989.
2. DSP A Practical Approach by Emmanuel C.Ifearchar, Barrie W.Jervis, Pearson, 2rd Edition, 2002.
3 DSP by S.Salivakanana, Avallavaraj, C.Gnanapriya, TMH, 2000

Reference Books:

1. DSP, Algorithms and applications – Proakis John G, Pearson, 3rd Edition, 2003.
2 Digital Signal Processing by P.Ramesh Babu, Scitech Publications, 3rd Edition, 2007.

REFERENCE SITES:

1)https://www.youtube.com/watch?v=6dFnpz_AEyA

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

Computer Networks

Course Objectives:

- To explain the basic concept of computer communication networks
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- To explore the various layers of OSI Model.
- To introduce IP addressing, UDP and TCP Models.
- have the concept of different routing techniques for data communications

Course Outcomes:

- Understand the requirement of theoretical & practical aspects of computer networks, functions of various layers involved in data communications, building the skills of sub netting and routing mechanisms.
- Explain the role of protocols in networking.
- Analyze the services and features of the various layers in the protocol stack.

UNIT- I

Introduction to Computer Networks: Uses of computer Network, Network Software-design Issues for layers, Service primitives and relationship of services to Protocols, Reference models- OSI & TCP/IP, network architectures introduction, Example of Networks-X.25, FrameRelay & ATM, Protocols and Standards.

UNIT- II

Physical Layer: Physical layer - Data rate limits, Transmission media-guided and Unguided, Switching systems, Circuit switching, Datagram switching & Virtual circuit switching, Structure of circuit and packet switch, cable modem and DSL technologies, SONET basics, selection of IEEE std 802.11, a, b, c, g.

UNIT- III

Data link layer: Framing, Flow & Error control Protocols, HDLC, PPP, Multiple access techniques, random access, controlled access & Channelization, Ethernet types-bridged,

Switched, Full duplex, Fast & gigabit Ethernet, Introduction to Data link layer in 802.11 LAN, connecting devices like passive hubs, repeaters, Active hubs, Bridges, Two-layer Switches, Routers, three layer switches, Gateway etc., Backbone networks, Virtual LANs, Simple Routerarchitecture, Sliding window protocol.

UNIT- IV

Network Layer: IPv4 address, IPv6 address, Address mapping-ARP, RARP & DHCP, IPv4 datagram detail format, IPv6 datagram detail format, ICMP, IGMP, Network layer issues likeDelivery, forwarding, intra-domain and Inter-domain routing, Routing algorithms like Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, Path

vector routing etc.,Addressing types-Physical, Logical & port address.
Transport Layer: Transport layer-Process to process delivery, Connection oriented & Connectionless Transport, UDP, TCP, congestion control and Quality of Service.

UNIT- V

Application Layer: Application layer protocols and applications like Ping, FTP, telnet, HTTP,SMTP, SNMP, TFTP, BOOTP, DNS, NFS, RPC, X-server, E-mail, Introduction to streaming Audio/Video,P2P file sharing, Introduction to socket programming.

TEXT BOOKS:

1. Behrouz A. Forouzan, "Data Communications and Networking", 4th Edition, TataMcGraw Hill, 2007.
2. Andrew Tenenbaum, "Computer Networks", 4th Edition, Pearson Education.
3. Kurose & Ross, "Computer Networking- A top down approach featuring the Internet",3rd Edition, Pearson Education.
4. William Stallings, "Computer Networks and Cryptography", 3rd Edition, PearsonEducation.

REFERENCES:

1. Behrouz A. Forouzan, "TCP/IP protocol Suit", 3rd Edition, Tata McGraw Hill Publications.
2. Stevens, "TCP/IP illustrated Volume - I & II", Pearson education.
3. Feibel Werner, "Encyclopedia of networking", Pearson education.

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

Embedded Systems
(Professional Elective-II)

Course Objectives:

The main objectives of this course are given below:

- The basic concepts of an embedded system are introduced.
- The various elements of embedded hardware and their design principles are explained.
- Different steps involved in the design and development of firmware for embedded systems is elaborated.
- Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed.
- Fundamental issues in hardware software co-design were presented and explained.
- Familiarize with the different IDEs for firmware development for different family of processors/controllers and embedded operating systems.
- Embedded system implementation and testing tools are introduced and discussed.

Course Outcomes:

At the end of this course the student can able to:

- Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
- The hardware components required for an embedded system and the design approach of an embedded hardware.
- The various embedded firmware design approaches on embedded environment.
- Understand how to integrate hardware and firmware of an embedded system using real time operating system.

UNIT-I

INTRODUCTION: Embedded systems overview, design challenge, processor technology, IC technology, DesignTechnology, Trade-offs. Single purpose processors RT-level combinational logic, sequential logic (RT-level),custom single purpose processor design (RT-level), optimizing custom single purpose processors.

UNIT-II

GENERAL PURPOSE PROCESSORS : Basic architecture, operation, Pipelining, Programmer's view,developmentenvironment, Application Specific Instruction-Set Processors (ASIPs) – MicroControllers and Digital SignalProcessors.

UNIT-III

STATE MACHINE AND CONCURRENT PROCESS MODELS: Introduction, models Vs. languages, Finite state machineswith data path model (FSMD), using state machines, program state Machine model (PSM), concurrent processmodel, concurrent processes, communication among processes, synchronization among processes,implementation, data flow model, real-time systems.

UNIT-IV

INTRODUCTION TO REAL – TIME OPERATING SYSTEMS : Tasks and Task States, Tasks and Data, Semaphores, andShared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, InterruptRoutines in an RTOS Environment.

UNIT-V

BASIC DESIGN USING A REAL-TIME OPERATING SYSTEM : Principles, Semaphores and Queues, Hard Real-TimeScheduling Considerations, Saving Memory and

Power,Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software

TEXT BOOKS

1. Embedded System Design – A Unified Hardware / Software Introduction – Frank Vahid, Tony
2. Computers as Components-principles of Embedded computer system design, Wayne Wolf, Elseveir.
3. Microcontrollers, Raj kamal, Pearson Education.
4. An Embedded Software Primer, David E. Simon, Pearson Education

REFERENCE SITES:

1) nptel.ac.in/courses/108102045/
2) www.youtube.com/playlist?list=PL84637AA7125111CB

Sri Krishnadevaraya University College of Engineering & Technology

B.Tech III– II Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Cellular and Mobile Communication
(Professional Elective-II)

Course Objectives:

- To understand the concepts and operation of cellular systems.
- To apply the concepts of cellular systems to solve engineering problems.
- To analyse cellular systems for meaningful conclusions.
- To evaluate suitability of a cellular system in real time applications.
- To design cellular patterns based on frequency reuse factor.

Course Outcomes:

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

- Understand the concepts and operation of cellular systems (L1)
- Apply the concepts of cellular systems to solve engineering problems (L2).
- Analyse cellular systems for meaningful conclusions, Evaluate suitability of a cellularsystem in real time applications (L3).
- Design cellular patterns based on frequency reuse factor (L4).

UNIT I

INTRODUCTION TO CELLULAR MOBILE SYSTEMS: Limitations of conventional mobile telephone systems ,A basic cellular system, Performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Elements of mobile radio system design, General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, Cell splitting,

UNIT II

INTERFERENCE: Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, design of Antenna system, Antenna parameters and their effects, Non co channel interference.
Cell site and mobile antennas: Omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

UNIT III

CELL COVERAGE FOR SIGNAL AND TRAFFIC: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation,straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model.

UNIT IV

FREQUENCY MANAGEMENT, CHANNEL ASSIGNMENT AND HANDOFF: Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile
units, channel sharing and borrowing, sectorization, overlaid cells. Handoff :types of handoff, handoff initiation, delaying handoff,forced handoff, mobile assigned handoff. Intersystem handoff

UNIT V

INTRODUCTION TO CELLULAR SYSTEMS: Advantages of digital systems, Introduction to digital technology, ARQ techniques, practical multiple access schemes.

DIGITAL CELLULAR SYSTEMS: Global system for mobile(GSM), GSM architecture, GSM Air specifications , GSM channels.

TEXTBOOKS :

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006.
2. Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.

REFERENCES :

1. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.
2. Wireless Communication and Networking – Jon W. Mark and Weihua Zhqung, PHI, 2005.

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Robotics and Automation
(Professional Elective-II)

Course Objective:

- To impart knowledge about basic mathematics related to industrial robots for their control, design and application in robotics & automation Industries.

Course Outcomes:

The student will be able to:

- Perform kinematic and dynamic analyses with simulation.
- Design control laws for a simple robot.
- Integrate mechanical and electrical hardware for a real prototype of robotic device.
- Select a robotic system for given industrial application.

UNIT – I

Introduction to Robotics

Types and components of a robot, classification of robots

Study components of an industrial robot (PUMA, KUKA, FANUC, MTAB, UR, etc.) and its DH parameters.

UNIT – II

Robot Kinematics and Dynamics:

Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Forward and inverse kinematics, Jacobian, Singularity, and Statics.

Dynamic Modelling: Forward and inverse dynamics, Equations of motion using Euler-Lagrange formulation, Newton Euler formulation.

Sensors

Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean / Similarity / Affine / Projective transformations, Vision applications in robotics

UNIT – III

Robot Actuation Systems

Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

Robot Control:

Robot control, Independent joint control, PD and PID feedback, actuator models, nonlinearity of manipulator models, issues in nonlinear control, force feedback, hybrid control, Motion Planning, Obstacle avoidance, configuration space, road map methods, graph search algorithms, potential fieldmethods

UNIT – IV

Control Hardware and Interfacing:

Embedded systems: Microcontroller Architecture and integration with sensors, actuators, components, Programming Applications for Industrial robot - programming in – VAL II **Case Study:** Bin Picking in Industrial Warehouse.

UNIT – V

AI in Robotics:

Applications in unmanned systems, defence, medical, industries, Robotics and Automation for Industry 4.0 Robot safety and social robotics

TEXTBOOKS:

1. Introduction to Robotics – Mechanics and Control, John J. Craig, 3rd Edition, Pearson Prentice Hall,2004.
2. Industrial Robots, Groover M. P. and Ashish Dutta, McGrawHill,2012
3. Robots Dynamics & Control, Spong M. W. and Vidyasagar M., John Wiley & Sons (ASIA) PteLtd.

REFERENCE BOOKS

1. Introduction to Robotics: Analysis, Control, Applications, Saeed B. Niku, 3rdEdition, Wiley,2019
2. Robotics Engineering, R. Klafter,PHI.
3. Robotics, Subir K. Saha, McGrawHill.

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		0	**0**	**3**	**1.5**

Digital Communications Lab

Course Objectives

- To Develops skills for performance analysis of practical digital communication systems.
- To understand the fundamental concepts on TDM, Pulse modulations& digital modulation techniques.
- To evaluate the performance of PCM, DPCM and DM in a digital communicationsystem.
- To learns how to use MATLAB software and hardware effectively and creatively tosynthesis digital communication systems.

Course Outcomes

- Understand real time behavior of different digital modulation schemes and technicallyvisualize spectra of different digital modulation schemes.
- Design and implement different modulation and demodulation techniques.
- Analyze digital modulation & demodulation techniques.
- Simulate all digital modulation and demodulation techniques in MATLAB.

LIST OF EXPERIMENTS

Minimum of Twelve experiments to be conducted (any six from

Part-A)HARDWARE EXPERIMENTS (PART – A)

1. Generation of random data using linear feedback shift registers at a given data rate. Plotthe random data.
2. Construct Time division multiplexing circuit to multiplex three users' data.
3. Verify the functionality of each block in Pulse code modulation system practically.
4. Find the processing gain in a Differential pulse code modulation circuit experimentally.
5. Verify the operation of Delta modulation and demodulation.
6. Design and verify modulated and demodulated circuit for Frequency shift keying.
7. Construct a modulated and demodulated circuit for Differential phase shift keying.
8. Design and verify working principle of QPSK modulation and demodulation withsuitable setup.

SOFTWARE EXPERIMENTS (PART-B)

Modeling of Digital Communications using MATLAB

1. Study Sampling Theorem and verify the effect of under sampling and oversamplingwhile retrieving the original signal.
2. Understand functioning of each block in Pulse code modulation circuit and verifythrough simulation.
3. Write a program on Differential pulse code modulation and demodulation.

4. Write a program on Frequency shift keying modulation schemes for given two carrier frequencies, determine the bit error probability.
5. Write a program and verify QPSK modulation and demodulation, determine the bit errorprobability.
6. Write a program and verify Differential phase shift keying modulation scheme is a non-coherent modulation scheme, determine the bit error probability is inferior to that of QPSK.

EQUIPMENT REQUIRED FOR LABORATORIES:

1. RPS - 0 – 30V
2. CROs - 0 – 20 MHz.
3. Function Generators - 0 – 1 MHz
4. RF Generators - 0 – 1000 MHz.
5. Multimeters
6. Required Electronic Components (Active and Passive) which include ICs as well.
7. Arbitrary Wave form generators/ PNS generators – 2 Nos. (To generate digital data atrequired data rates)
8. Licensed MATLAB software with required toolboxes.

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Digital Signal Processing Lab

Course Objectives:

- Students can learn the basics of using DSP chips to perform real-time digital signal processing.
- Ability to apply knowledge of mathematics, science and engineering: Construction of tools for visualizing the basic concepts of discrete signal representation such as Fourier transforms, discrete time representations.
- Students will learn numerous programming tools for design and implementations of filtering algorithms.
- Understand the concept of Multi-rate signal processing and sample rate conversion.
- Develop and Implement DSP algorithms in software using CCS with DSP floating pointProcessor.

Course Outcomes

- Ability to design-test, to verify, to evaluate, and to benchmark a real-time DSP system.
- Ability to calculate discrete time domain and frequency domain of signals using discreteFourier series and Fourier transform.
- Ability to design, using MATLAB-based filter design techniques, FIR and IIR digital filters and Determine the frequency response of filters.
- Implementation of basic signal processing algorithms such as convolution, difference equation implementation and application of them in the construction of FIR and IIR filters.
- Design DSP based real time processing systems to meet desired needs of the society.

Conduct any <u>eight</u> experiments from part-A and any <u>four</u> experiments from part-B

List of Experiments:

PART-A

The following experiments shall be conducted using MATLAB / Lab View / C Programming/ Equivalent software.

2. Generation of sinusoidal waveform / signal based on recursive difference equations.
3. Find DFT / IDFT of given discrete time signal.
4. Find frequency response of a system given in transfer function/ differential equation form.
5. Implementation of FFT of given Sequence.
6. Design and implementation of IIR filter using bilinear transformation and impulse invariantmethod.
7. Design and implementationof IIR Butterworth (LP/HP) filter.
8. Design and implementationof IIR Chebyshev(LP/HP) filter.

9. Design and implementation of FIR with low pass filter using any three windowing techniques. Plot its magnitude and phase responses.
10. Design and implementation of FIR filter with high passfilter using any three windowingtechniques. Plot its magnitude and phase responses.
11. Design and implementation of FIR filter with band pass / band stopfilter using any threewindowing techniques. Plot its magnitude and phase responses.

PART-B

The following experiments shall be conducted using (TI / Analog Devices / Motorola / Equivalent DSP processors).

12. Study the architecture of DSP chips – TMS 320C 5X/6X Instructions.
13. Find DFT / IDFT of given discrete time signal.
14. Implementation of FFT of given Sequence.
15. Design and implementationof IIR Butterworth / Chebyshev (LP/HP) filter.
16. Design and implementation of FIR with low pass / high pass filter using any three windowingtechniques. Plot its magnitude and phase responses.

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electronics & Communication Engineering					
IV Year 1st Semester (Theory-5,Lab-2)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		VLSI Design	PC	3-0-0	3
2.		Microwave and Engineering & Optical Communications	PC	3-0-0	3
3.		Management Science	HS	3-0-0	3
4.		Professional Elective courses-III 1)Satellite Communication 2) Pattern Recognition 3) Advanced Digital Signal Processing	PE-III	3-0-0	3
5.		Professional Elective courses-IV 1) Image Processing 2) Fuzzy sets, logic and systems and Applications 3) Micro Electro Mechanical Systems	PE-IV	3-0-0	3
6.		Microwave and Engineering & Optical Communications Lab	PC	3-0-0	1
7.		VLSI Lab	PC	0-0-2	1
8.		Project I	PR	- - -	2
		Socially Relevant Project(15hrs/Sem)	PR	- - -	0.5
9.		Industrial Training/ Internship/ Research Projects in National Laboratories/Academic Institutions	PR	- - -	2
				Total	**21.5**

Category	**CREDITS**
Professional core courses	8
Professional Elective courses	6
Humanities and Social Science	3
Project I	2
Socially Relevant Project(15hrs/Sem)	0.5
Industrial/Research Internship	2
TOTAL CREDITS	**21.5**

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VLSI Design

Course Objectives:

The objectives of the course are to

- Learn and Understand IC Fabrication process steps required for various MOS circuits
- Understand and Experience VLSI Design Flow
- Learn Transistor-Level CMOS Logic Design
- Understand VLSI Fabrication and Experience CMOS Physical Design
- Learn to Analyze Gate Function and Timing Characteristics

Course Outcomes:

- Learn the basic fabrication process of MOS transistors, study CMOS inverter circuits, basic circuit concepts such as Sheet Resistance, Area Capacitance and Delay calculation,Field programmable gate arrays and realization techniques, CPLDs and FPGAs for implementing the various logic functions.
- Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality.
- Analyze the performance of CMOS Inverter circuits
- Compare various Scaling models and understand the effect of scaling on device parameters

UNIT I

INTRODUCTION AND BASIC ELECTRICAL PROPERTIES : Introduction to IC Technology – MOS, PMOS, NMOS, CMOS technologies- Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation, Basic Electrical Properties of MOS Circuits: Ids-Vds relationships,MOS transistor threshold Voltage, gm, gds; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT II

VLSI CIRCUIT DESIGN PROCESSES: MOS Layers, Stick Diagrams, Design Rules and Layout: Lambda based CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates.

UNIT III

BASIC CIRCUIT CONCEPTS: Sheet Resistance RS and its concept to MOS, Area Capacitances of layers,standard unit of capacitance _Cg, area capacitance calculations, The Delay unit, Inverter delays, estimation of MOS inverter delay, Wiring Capacitances, Choice of layers.

UNITI V

DESIGNING ARITHMETIC BUILDING BLOCKS: Introduction; The Adders: Definition, The Full adder Circuit design consideration, The Binary adder: Logic design consideration; The Multiplier: Definition, Partial product generation, Partial product accumulation, Final addition, Multiplier summary. Introduction to FPGAs,CPLDs architectures and Standard Cells.

UNIT V

INTRODCTION TO LOW POWER VLSI: Introduction, over view of power consumption, low power design through voltage scaling, estimation and optimization of switching activity.

TEXTBOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, EshraghianDougles and A. Pucknell, PHI, 2005 Edition.
2. CMOS digital integrated circuits analysis and design by Sung-Mo Kand and Yusuf Leblebici, Tata McGraw Hill, 3rd edition.

REFERENCES:

1. Introduction to VLSI Circuits and Systems - John .P. Uyemura, JohnWiley, 2003.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
3. VLSI Technology – S.M. SZE, 2nd Edition, TMH, 2003.
4. Principles of CMOS VLSI Design - Weste and Eshraghian, Pearson Education, 1999.
5. Digital Integrated Circuits – A design perspective, John M. Rabaey, AnanthaChandrakasan, BorivojeNikolic Pearson Education, 2rd Edition

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Microwave Engineering and Optical Communications

Course Objectives:

- To understand the wave propagation in waveguides, principle of operation of opticalsources, detectors, microwave active and passive devices.
- To apply the boundary conditions of the waveguides to solve for field expressions inwaveguides.
- To derive the field expressions for different modes of the waveguides, and Scatteringmatrix for passive microwave devices.
- To differentiate Linear bean tubes and crossed field tubes in terms of operation andperformance.
- To remember various types of fibers, modes, configurations and signal degradations.
- To analyze signal degradation in optical fibers and compare the performance ofvarious optical sources and detectors.

Course Outcomes:

- Understand the wave propagation in waveguides, principle of operation of optical sources, detectors, microwave active and passive devices. Also remember various types of fibers, modes, configurations and signal degradations
- Apply the boundary conditions of the waveguides to solve for field expressions in waveguides.
- Derive the field expressions for different modes of the waveguides, and Scattering matrix for passive microwave devices.Analyze signal degradation in optical fibers andcompare the performance of various optical sources and detectors
- Differentiate Linear bean tubes and crossed field tubes in terms of operation and performance.

UNIT I:

Waveguides (Microwave Transmission lines): Introduction, Rectangular waveguides, Field expressions for TE and TM modes, Wave propagation in the guide, Phase and group velocities, Power transmission and attenuation, Waveguide current and mode excitation, Circular waveguide – TE and TM modes, Wave propagation, waveguide resonators – problem solving.

UNIT II:

Passive Microwave Devices: Introduction to scattering parameters and their properties, Terminations, Variable short circuit, Attenuators, Phase shifters, Hybrid Tees (H-plane, E-plane,Magic Tees), Hybrid ring, Directional Couplers – Bethe hole and Two hole Couplers, Microwave propagation in Ferrites, Microwave devices

employing Faraday rotation – Isolator, Circulator, Deriving Scattering matrix for Microwave passive devices.

UNIT III:

Microwave Amplifiers and Oscillators:

Microwave Tubes: (i) Linear Beam Tubes – Two cavity Klystron amplifier -velocity modulation, bunching process, output power, Reflex Klystron oscillator, power output and efficiency, Travelling Wave Tube (TWT) – Bunching process and amplification process (Qualitative treatment only).

(iii) Crossed Field Tubes – Magnetron oscillator, pi-mode operation, power output and efficiency, Hartree Condition, Mode jumping in Magnetron, Principle of operation of Cross Field Amplifier (CFA).

Microwave Semiconductor Devices: Gunn Oscillator – Principle of operation, Characteristics, Two valley model, IMPATT, TRAPATT diodes, Parametric Amplifier.

UNIT IV:

Optical Communications:

Overview of Optical Fiber Communications, optical fibers – Structures, Optical fiber modes andconfigurations, Signal degradation in optical fibers – Signal attenuation, absorption, scattering losses, Bending Losses, Core and Cladding losses, Signal distortion in optical waveguides, Information capacity determination, Group delay, waveguide dispersion, Inter model dispersion.

UNIT V:

Optical Sources and Detectors: Introduction, LEDs – structure – Light source, Quantumefficiency, Modulation of an LED, LASER diodes, Source to Fiber power launching, LASER diode to fiber coupling, LED coupling to single mode fibers, Fiber, Splicing, Optical Fiber connectors, Photo diodes – Principle of Photo diodes, Avalanche Photodiodes, Photo detector noise, detector response time, Comparison of Photo diodes.

TEXT BOOKS:

1. Matthew N. O. Sadiku, "Elements of Electromagnetics", Oxford Publications, ThirdEdition, 2003. (For Unit 1)
2. R. E. Collin, "Foundations for Microwave Engineering", Wiley Student Edition, SecondEdition, 2009. (For Units 2, and 3)
3. Samuel Y. Liao, "Microwave Devices and Circuits", PHI publications, Third Edition,1997. (For Units 2, and 3)
4. Gerd Keiser, "Optical Fiber Communications", McGraw Hill, Third Edition, 2000.(For Units 4, and 5)

REFERENCES:

1. Om. P. Gandhi, "Microwave: Engineering and Applications", Kai Fa Book Company,1981.
2. Reich H. J., et al, "Microwave Principles", MIT Press, 1972.
3. F E Terman, "Electronic and Radio Engineering", McGraw Hill, 4th Edition, 1984.

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B.Tech IV– I Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
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Management Science

Course objectives:

The objectives of this course are

- To provide fundamental knowledge on Management, Administration, Organization & its concepts.
- To make the students understand the role of management in Production
- To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
- To make the students aware of the contemporary issues in management

Course Outcomes:

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

- Understand the concepts & principles of management and designs of organization in a practical world
- Apply the knowledge of Work-study principles & Quality Control techniques in industry
- Analyze the concepts of HRM in Recruitment, Selection and Training & Development.
- Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
- Create Modern technology in management science.

UNIT- I

INTRODUCTION TO MANAGEMENT

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles - Eltan Mayo's Human relations - Systems Theory - Organisational Designs - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

UNIT II

OPERATIONS MANAGEMENT

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control - Deming's contribution to Quality.

Material Management - Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Purchase Procedure and Stores Management - Marketing Management - Concept - Meaning - Nature- Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

UNIT III

HUMAN RESOURCES MANAGEMENT (HRM)

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Evolution of HRM - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process and Tests in Employee Selection - Employee Training and Development - On-the- job &

Off-the-job training methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

UNIT IV

STRATEGIC & PROJECT MANAGEMENT

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis -Project Management - 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 (Simple problems).

UNIT V

CONTEMPORARY ISSUES IN MANAGEMENT

The concept of Management Information System(MIS) - Materials Requirement Planning (MRP) - Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management - Business Process Outsourcing (BPO) - Business Process Re- engineering and Bench Marking - Balanced Score Card - Knowledge Management.

TEXT BOOKS:

1. A.R Aryasri, “Management Science”, TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 2012.

REFERENCES:

1. Koontz & Weihrich, “Essentials of Management”, 6th edition, TMH, 2005.
2. Thomas N.Duening & John M.Ivancevich, “Management Principles and Guidelines”, Biztantra.
3. Kanishka Bedi, “Production and Operations Management”, Oxford University Press, 2004.
4. Samuel C.Certo, “Modern Management”, 9th edition, PHI, 2005

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Satellite Communications
(Professional Elective III)

Course Objectives:

- To understand the basic concepts of satellite communications, orbital mechanics and launchers, various subsystems of a satellite and earth station, multiple access techniques,low earth orbit and geo-stationary satellite systems.
- To apply frequency allocation standards, reliability techniques, multiple access techniques power test methods to satellite systems.
- To analyze satellite navigation and global positioning system.
- To design Uplink and Downlink of a satellite.

Course Outcomes

- Understand the basic concepts of satellite communications, orbital mechanics andlaunchers, various subsystems of a satellite and earth station, multiple access techniques low earth orbit and geo-stationary satellite systems
- Apply frequency allocation standards, reliability techniques, multiple access techniquespower test methods to satellite systems
- Analyze satellite navigation and global positioning system
- Design Uplink and Downlink of a satellite
- Choosing different kinds of transmitter and receiver antennas to provide Uplink andDown Link Frequency.

UNIT- I

Introduction: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

Orbital Mechanics and Launchers: Orbital Mechanics, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance.

UNIT- II

Satellite Subsystems: Altitude and Orbit Control System, Telemetry, Tracking, Command and Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

UNIT- III

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design of Satellite Links for Specified C/N, System Design Examples.

Multiple Access: Frequency Division Multiple Access (FDMA), Inter modulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

UNIT- IV

Earth Station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

UNIT- V

Low Earth Orbit and Geo-Stationary Satellite Systems: Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational NGSO Constellation Designs.

Satellite Navigation & Global Positioning System: Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A Code Accuracy,Differential GPS.

Text Books:

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, "Satellite Communications", Wiley Publications, 2nd Edition, 2003.
2. Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, "Satellite Communications Engineering" , 2nd Edition, Pearson Publications, 2003.

References:

1. M. Richharia, "Satellite Communications: Design Principles" –BS Publications, 2nd Edition, 2003.
2. D.C Agarwal, "Satellite Communication", Khanna Publications, 5th Ed.
3. K.N. Raja Rao, "Fundamentals of Satellite Communications", PHI, 2004
4. Dennis Roddy, "Satellite Communications", McGraw Hill, 4th Edition, 2009.

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B.Tech IV– I Sem	**(Electronics & Communication Engineering)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pattern Recognition
(Professional Elective-III)

Course Objectives:

- To convey methods for learning from data, with an emphasis on pattern classification.
- To expose various pattern recognition algorithms.
- To present pattern recognition algorithms to solve the real world problems in various fields.

Course Outcomes:

- Formulate systems and algorithms for pattern recognition, with focus on sequences ofpatterns
- Interpret principles of Bayesian parameter estimation
- Analyze Non-parametric decision-making algorithms in pattern recognition
- Analyze clustering and partitioning techniques in pattern recognition
- Apply pre-processing and feature selection methods in pattern recognition
- Develop various applications using pattern recognition algorithms

Unit 1

Introduction - Basic concepts, Applications, Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Examples of Automatic Pattern recognitionsystems, Simple pattern recognition model.

Unit 2

Statistical Decision Making - Introduction, Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.

Unit 3

Non Parametric Decision Making: Histogram, kernel and window estimation, nearest neighbor classification techniques. Adaptive decision boundaries, adaptive discriminant functions, Minimum squared error discriminant functions, choosing a decision making techniques.

Unit 4

Clustering and Partitioning: Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward's methodPartition clustering-Forg's algorithm, K-means's algorithm, Isodata algorithm.

Unit 5

Pattern Pre-Processing and Feature Selection:Introduction, distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection, Applications of Pattern Recognition inbio-metric, facial recognition, Finger prints, etc.

Text Books:

1. Gose.Johnsonbaugh,Jost." Pattern recognition and Image Analysis", PHI.
2. Tou. Rafael. Gonzalez. "Pattern Recognition Principle", Pearson Education.

References:

1. Richard duda, Hart., David Strok, "Pattern Classification", John Wiley.
2. Theodoridis, S. and K. Koutroumbas, Pattern recognition. 4th ed. 2009, San Diego,

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B.Tech IV– I Sem	**(Electronics & Communication Engineering)**	**3**	**0**	**0**	**3**

Advanced Digital Signal Processing
(Professional Elective-III)

Course Objectives:

The main objectives of the course are

- To study about discrete time systems and to learn about FFT algorithms.
- To study the design techniques for FIR and IIR digital filters
- To study the finite word length effects in signal processing
- To study the properties of random signal, Multirate digital signal processing and about QMF filters

Course Outcomes:

On completion of the course, students will be able to:

- Comprehend the DFT, FFT and IIR filters.
- To study the modern digital signal processing algorithms and applications.
- Have an in-depth knowledge of use of digital systems in real time applications
- Acquire the basics of multi rate digital signal processing and apply the algorithms for wide area of recent applications.
- Analyze the power spectrum estimation and Comprehend the Finite word length effects in Fixed point DSP Systems.

UNIT –I: Review of DFT, FFT, IIR Filters and FIR Filters: Introduction to filter structures (IIR & FIR). Implementation of Digital Filters, specifically 2nd Order Narrow Band Filter and 1st Order All Pass Filter. Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Back ward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT - II: Non-Parametric Methods: Estimation of spectra from finite duration observation of signals, Nonparametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametricmethods

UNIT – III: Parametric Methods: Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models – Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

UNIT –IV: Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion. Examples of up-sampling using an All Pass Filter.

UNIT –V: Applications of Multi Rate Signal Processing: Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Sub-band Coding of Speech Signals, Quadrature Mirror Filters, Transmultiplexers, Over Sampling A/D and D/AConversion.

TEXT BOOKS:

1. J.G.Proakis & D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms& Applications", 4th Edition,PHI,2008.
2. Alan V Oppenheim & Ronald W Schaffer, "Discrete Time signal processing ", PHI. 2nd Edition,1999.
3. Emmanuel C. Ifeacher, Barrie. W. Jervis, "DSP – A Practical Approach", 2nd Edition, PearsonEducation,2000.

REFERENCE BOOKS:

1. S. M .Kay, "Modern spectral Estimation: Theory & Application ", 1988,PHI.
2. P.P.Vaidyanathan, "Multi Rate Systems and Filter Banks", PearsonEF E Terman, "Electronic and Radio Engineering", McGraw Hill, 4th Edition, 1984.

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Image Processing
(Professional Elective IV)

Course Objectives:

- To introduce fundamentals of Image Processing.
- To expose various intensity transformations in spatial and frequency domains.
- To impart concepts of wavelets and various coding techniques for image compression.
- To dissimilate various segmentation techniques for images.
- To teach various color models and to introduce the concepts of color imagesegmentation.

Course Outcomes:

- Analyze various types of images mathematically.
- Compare image enhancement methods in spatial and frequency domains.
- Demonstrate various segmentation algorithms for given image.
- Justify DCT and wavelet transform techniques for image compression.
- Describe various color models for color image processing.

UNIT I

Digital Image Fundamentals-Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighbourhood, adjacency, connectivity, distance measures.

UNIT II

Image Enhancements and Filtering- Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequencydomain filters – low-pass and high-pass.

UNIT-III

Image Segmentation, Detection of discontinuities, edge linking and boundary detection, thresholding – global and adaptive, region-based segmentation.

UNIT-IV

Wavelets and Multi-resolution image processing- Uncertainty principles of Fourier Transform, Time-frequency localization, continuous wavelet transforms, wavelet bases and multi-resolutionanalysis, wavelets and Sub-band filter banks.

Image Compression, -Redundancy, inter-pixel and psycho-visual; Loss less compression – predictive, entropy; Lossy compression- predictive and transform coding; Discrete Cosine Transform; Still image compression standards – JPEG and JPEG-2000.

UNIT V

Color Image Processing-Color models–RGB, YUV, HSI; Color transformations– formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation.

Text Books:

1. R.C. Gonzalez and R.E. Woods, “Digital Image Processing”, 2nd Edition, PearsonEducation, 2008.
2. Anil Kumar Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India,2nd edition 2004.

References:

1. Rafael C. Gonzalez, Richard E woods and Steven L. Eddins, “Digital Image processingusing MATLAB”, Tata McGraw Hill, 2010.
2. Milan Sonka, Vaclav Hlavac, Roger Boule, “ Image Processing, Analysis, andMachine Vision”,, 3rd Edition, Cengage Learning, 2016.
3. S Jayaraman, S Esakkirajan, T Veerakumar, “Digital Image processing”, Tata McGrawHill.
4. William K. Pratt, “Digital Image Processing”, John Wiley, 3rd Edition, 2004.

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Micro Electro Mechanical Systems
(Professional Elective-IV)

Course Objectives:

- To provide knowledge of semiconductors and solid mechanics to fabricate mems devices.
- To educate on the rudiments of micro fabrication techniques.
- To introduce various sensors and actuators
- To introduce different materials used for mems.
- To educate on the applications of mems to disciplines beyond electrical and mechanical engineering.

Course Outcomes:

- Explain electrical and mechanical principles of MEMS
- Describe working of electrostatic, thermal and magnetic sensors and actuators
- Demonstrate piezoelectric effect and its applications
- Categorize micromachining processes
- Describe operation of polymer and optical MEMS

Unit 1

INTRODUCTION : Intrinsic Characteristics Of MEMS – Energy Domains And Transducers-Sensors And Actuators – Introduction To Micro Fabrication – Silicon Based MEMS Processes – New Materials – Review Of Electrical And Mechanical Concepts In MEMS – Semiconductor Devices – Stress And Strain Analysis – Flexural Beam Bending-TorsionalDeflection.

Unit 2

SENSORS AND ACTUATORS-I: Electrostatic Sensors – Parallel Plate Capacitors – Applications – Interdigitated Finger Capacitor – Comb Drive Devices – Micro Grippers – Micro Motors – Thermal Sensing And Actuation – Thermal Expansion – Thermal Couples – Thermal Resistors – Thermal Bimorph – Applications – Magnetic Actuators – Micromagnetic Components – Case Studies Of MEMS In Magnetic Actuators- Actuation Using Shape Memory Alloys.

Unit 3

SENSORS AND ACTUATORS-II: Piezoresistive Sensors – Piezoresistive Sensor Materials – Stress Analysis Of Mechanical Elements – Applications To Inertia, Pressure, Tactile And Flow Sensors – Piezoelectric Sensors And Actuators – Piezoelectric Effects – Piezoelectric Materials – Applications To Inertia , Acoustic, Tactile And Flow Sensors.

Unit 4

MICROMACHINING: Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching Of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case Studies – Basic Surface Micro Machining Processes – Structural And Sacrificial Materials – Acceleration Of Sacrificial Etch – Striction And Antistriction Methods – LIGA Process – Assembly Of 3D MEMS – Foundry Process.

Unit 5

POLYMER AND OPTICAL MEMS: Polymers In MEMS– Polimide – SU-8 – Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon – Application To Acceleration, Pressure, Flow And Tactile Sensors- Optical MEMS – Lenses And Mirrors – Actuators For Active Optical MEMS.

Text Books:

1. Chang Liu, 'Foundations Of MEMS', Pearson Education Inc., 2012.
2. Stephen D Senturia, 'Microsystem Design', Springer Publication, 2000.
3. Tai Ran Hsu, "MEMS & Micro Systems Design And Manufacture" Tata McGrawHill, New Delhi, 2002.

References:

1. NadimMaluf," An Introduction To Micro Electro Mechanical System Design",Artech House, 2000.
2. Mohamed Gad-El-Hak, Editor, " The MEMS Handbook", CRC Press Baco Raton, 2001.
3. Julian W. Gardner, Vijay K. Varadan, Osama O.Awadelkarim, Micro Sensors MEMSAnd Smart Devices, John Wiley & Son LTD, 2002.
4. James J.Allen, Micro Electro Mechanical System Design, CRC Press Publisher, 2005.

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Fuzzy Sets, Logic and Systems & Applications
(Professional Elective IV)

Course Objectives:

- To introduce fuzzy sets, logic and systems from an engineering perspective.
- To provide solid foundation of fundamental concepts of fuzzy logic, systems and itsapplications.
- To teach about the concept of fuzziness involved in various systems.
- To expose to the concepts of neural networks.
- To explain how neuro-fuzzy concepts can be used for solving real world problems.

Course Outcomes:

After completion of the course students will be able to

- Identify and describe Fuzzy Logic and Neural Network techniques in building intelligentmachines
- Apply Neural Network & Fuzzy Logic models to handle uncertainty and solve engineering problems
- Recognize the feasibility of applying a Neuro-Fuzzy model for a particular problem

UNIT – I

Introduction to Neuro–Fuzzy and Soft Computing, Fuzzy Sets, Basic Definition and Terminology, Set-theoretic Operations, Member Function Formulation and parameterization, Fuzzy set properties, Arithmetic operations on fuzzy numbers, complement, T-norm and S- norm on fuzzy sets, parameterized T-norm and parameterized S- norm.

UNIT – II

Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems – Introduction, Mamdani Fuzzy Models, – Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy modeling

UNIT – III

Neural networks: Adaptive networks, Introduction, architecture, backpropagation for feedforward networks, perceptrons, adaline, backpropagation for multilayer perceptrons, radial basis function networks, unsupervised learning, introduction, competitive learning networks, kohenen self-organizing networks

UNIT – IV

Neuro fuzzy modeling: Adaptive Neuro-Fuzzy Inference Systems (ANFIS), Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN, Coactive Neuro Fuzzy Modeling, Framework, Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum

UNIT- V

ANFIS Applications: Printed Character Recognition, Inverse Kinematics Problems
, Automobile Fuel Efficiency Prediction, Nonlinear system identification, Channel equalization.

TEXT BOOKS:

1. Neuro-"Fuzzy and Soft Computing", J.S.R.Jang, C.T.Sun and E.Mizutani, PHI, 2004, Pearson Education.

REFERENCE BOOKS:

1. T.J. Ross: "Fuzzy Logic with Engineering Applications", 3rd Ed., Wiley India Pvt. Ltd.,2011.
2. Neural Networks, "Fuzzy Logic and Genetic Algorithms", S. Rajasekaran and G.A.V.Pai, PHI, 2003.
3. H.J. Zimmerman: Fuzzy Set Theory and its Application, 3rd Ed., Springer India Pvt.Ltd., 2006.
4. Kosko, B, "Neural Networks and Fuzzy Systems: A Dynamical Approach to MachineIntelligence", Prentice Hall, NewDelhi, 2004.

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Microwave and Optical Communications Lab

Course Outcomes:

- Understand the mode characteristics of Reflex Klystron oscillator and negative resistance characteristics of Gunn Oscillator.
- Determine the Scattering matrix of given passive device experimentally and verify the same theoretically. Also determine numerical aperture and bending losses of a given optical fiber
- Analyze the radiation characteristics to find the directivity and HPBW of a given antenna.
- Establish optical link between transmitter and receiver **experimentally** to find attenuation and signal strength of the received signal.

Note: All the experiments shall be conducted and there is no choice.Microwave Engineering:

1. Set up the Full Microwave bench and know the importance of each block. Identify the pin configuration of Reflex Klystron with the help of its power supply cable connected from the power supply unit. Also identify the Microwave signal coupling from KlystronOscillator to the waveguide.
2. Make use of the bench set up and conduct the experiment to find mode characteristics of Reflex Klystron: (i) Repeller voltage vs output power (ii) Repeller voltage vs Frequency.
3. Measurement of Frequency and wavelength of generated Microwave signal using ReflexKlystron oscillator.
4. Verify the negative resistance characteristics of Gunn oscillator using the Microwave bench set up with Gunn oscillator set up.
5. Find the Scattering matrix of E-plane, H-plane, and Magic Tees experimentally.
6. Make use of Microwave bench setup to find VSWR and impedance of an unknown loadthat is connected at the end of the bench set up. Make use of VSWR meter for the measurement of VSWR of a given load.
7. Determine directivity, insertion loss and coupling factor of a given Directional Couplerexperimentally.
8. Making use of Microwave bench set up, find the radiation characteristics in both the planes and determine HPBW and directivity of a pyramidal horn antenna.

Optical Communication:

9. Conduct the experiment to draw the DC characteristics of LED and Photo diode.
10. Make use of Fiber optic kit to determine the **numerical aperture** and **bending losses** ofa given optical fiber (transmission line).
11. Establish an optical link between transmitter and receiver and determine the signalstrength at the receiver. Give the comments about the experiment by transmitting
    (i) analog signal (ii) **digital signal.**
12. Attenuation measurement in Fibers for various lengths.

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VLSI Design Lab

Objectives:

- To understand and develop HDL source code for the given problem/experiment
- To analyze the obtained results of the given experiment/problem
- To simulate the given circuit with suitable simulator and verify the results
- To understand how to use FPGA/CPLD hardware tools in the lab
- To design and implement the experiments using FPGA/CPLD hardware tools

List of Experiments:

PART (A): FPGA Level Implementation (Any Seven Experiments)

Note 1: The students need to develop VHDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.

Note 2: All the experiments need to be implemented on the latest FPGA/CPLD Hardware in theLaboratory.

1. Realization of Logic gates

Design and Implementation of the following

2. 4-bit ripple carry and carry look ahead adder using behavioral, dataflow and structuralmodelling
    a) 16:1 mux through 4:1 mux
    b) 3:8 decoder realization through 2:4 decoder
3. 8:3 encoder
4. 8-bit parity generator and checker
5. Flip-Flops
6. 8 bit synchronous up-down counter
7. 4bit sequence detector through Mealy and Moore state machines.

EDA Tools/Hardware Required:

1. EDA Tool that supports FPGA Programming including Xilinx Vivado / Altera (Intel) /Cypress / Equivalent Industry Standard tool along with corresponding FPGA Hardware.
2. Desktop Computer with appropriate Operating system that supports the EDA tools.

PART (B): Back-end Level Design and Implementation (Any Five Experiments)

Note: The students need to design the following experiments at schematic level using CMOS logic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can beused while simulating the design using Industry standard EDA Tools.

Design and Implementation of the following

1. Universal Gates
2. an Inverter

3. Full Adder
4. Full Subtractor
5. Decoder
6. D-Flip-Flop

EDA Tools/Hardware Required:

1. Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry StandardSoftware/CAD Tool.
2. Desktop Computer with appropriate Operating system that supports the EDA tools.

Course Outcomes:

- Understand how to use FPGA/CPLD hardware tools in the lab.
- Develop HDL source code for the given problem/experiment, and simulate the givencircuit with suitable simulator and verify the results.
- Analyze the obtained results of the given experiment/problem.
- Design and implement the experiments using FPGA/CPLD hardware tools.

List of Experiments

PART (A): Any Seven Experiments

Note 1: The students need to develop VHDL Source code, perform simulation using relevantsimulator and analyze the obtained simulation results using necessary synthesizer.

Note 2: All the experiments need to be implemented on the latest FPGA/CPLD Hardware in theLaboratory.

1. Realization of Logic gates
2. Design and Implementation of 4-bit ripple carry and carry look ahead adder usingbehavioral, dataflow and structural modelling
3. Design and Implementation of
    a. 16:1 mux through 4:1 mux
    b. 3:8 decoder realization through 2:4 decoder
4. Design and Implementation of 8:3 encoder
5. Design and Implementation of 8-bit parity generator and checker
6. Design and Implementation of different Flip-Flops
7. Design and Implementation of 8 bit synchronous up-down counter
8. Design and Implementation of 4bit sequence detector through Mealy and Moore statemachines.

Equipment/Software required:

1. FPGA Programming Software like Xilinx Vivado / Altera (Intel) / Cypress / EquivalentIndustry Standard Software
2. FPGA Hardware like Xilinx / Altera (Intel) / Cypress / Equivalent Industry StandardHardware
3. Personal computer system with necessary software to run the programs and Implement.

PART (B): Any Five Experiments

Note: The students need to design the schematic diagrams using CMOS logic and to draw the layout diagrams, to perform the following experiments using 130nm technology with the Industry standard EDA Tools.

1. Design and Implementation of Universal Gates
2. Design and Implementation of an Inverter
3. Design and Implementation of Full Adder
4. Design and Implementation of Full Subtractor
5. Design and Implementation of Decoder
6. Design and Implementation of D-Latch

Software Required:

1. Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry Standard Software/CAD Tool.

b. Personal computer system with necessary software to run the programs and to implement.

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electronics & Communication Engineering					
IV Year 2nd Semester					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Professional Elective courses 1) Advanced 3G and 4G Wireless Mobile Communications 2) Radar Engineering 3) Introduction to Internet Of Things	PE-V	3-0-0	3
2		Open Elective-III	OE-III	3-0-0	3
3		Project II			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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Advanced 3G And 4G Wireless Mobile Communications (Professional Elective – V)

Course Objectives:

- To understand the concepts of wireless communications and standards (L1).
- To apply a wireless technique to solve engineering problem (L2).
- To analyze working of wireless technologies (L3).
- To evaluate a wireless technique in a given situation (L4).
- To plan a wireless system for deployment (L5).

Course Outcomes:

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

- Understand the concepts of wireless communications and standards
- Apply a wireless technique to solve engineering problem
- Analyze working of wireless technologies
- Evaluate a wireless technique in a given situation
- Plan a wireless system for deployment

UNIT-I:

Introduction to 3G and 4G standards.

Teletraffic Theory:

Introduction to teletraffic theory, Cellular traffic modelling and blocking probability.

Large Scale Path Loss:

Introduction to wireless propagation models, Ground reflection model, Okumura model, Hatamodel, Link budget analysis,Log normal shadowing.

UNIT-II:

Small Scale Fading and Multipath:

Fading in wireless channel, Rayleigh fading, BER in wired and wireless channels. Wireless channel and delay spread, Coherence bandwidth of wireless channel, ISI and Doppler in wirelesschannel, Doppler spectrum and Jake's model.

Diversity Techniques:

Introduction to diversity techniques, MRC for multi-antenna system, BER with diversity, Spatialdiversity and diversity order.

UNIT-III:

Code Division Multiple Access

Introduction to CDMA, spread spectrum and LFSR. Generation and properties of PN sequences,Correlation of PN sequences and Jammer margin, CDMA advantages and RAKE receiver, Multiuser CDMA downlink,Multiuser CDMA uplink and asynchronous CDMA, CDMA near- far problem.

UNIT-IV:

Multiple Input Multiple Output Systems:

Introduction to MIMO, MIMO system model, Zero-forcing receiver, MIMO MMSE receiver, Introduction to SVD, SVD based optimal MIMO transmission and capacity, OSTBCs, V-blast receiver, MIMO beam forming.

Orthogonal Frequency Division Multiplexing:

Introduction to OFDM, Multicarrier modulation, IFFT sampling for OFDM, OFDM schematic,Cyclic prefix, OFDM based parallelization, OFDM examples.

UNIT-V:

MIMO-OFDM:

Introduction to MIMO-OFDM, Impact of carrier frequency offset in OFDM, PAPR in OFDMsystems, Introduction to SC-FDMA.

3G and 4G Standards:

WCDMA, LTE/ LTE Advanced and WiMAX.

REFERENCES:

1. Aditya K. Jagannatham, "Principles of Modern Wireless Communications Systems –Theory and Practice", McGraw-Hill International, 2015.
2. Theodore S. Rappaport, "Wireless Communications – Principles and Practice", 2nd Edition, PHI, 2004.
3. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communications",Cambridge University Press.
4. Andrea Goldsmith, "Wireless Communications", Cambridge University Press.
5. Ezio Biglieri, "MIMO Wireless Communications", Cambridge University Press.

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B.Tech IV– II Sem (Electronics & Communication Engineering)

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Radar Engineering
(Professional Elective – V)

Course Objectives:

- To understand the basic principles of RADAR and its varients, RADAR based Microwave imaging.
- To apply the fundamental knowledge of various RADARs, Matched Filter and to findthe range between the target and RADAR, frequency and phase of the received signal.
- To analyze the received data from the target using CW RADAR & MTI RADAR and tofind the distance, tracking range for clutter analysis.

Course Outcomes:

- CO1: Understand the basic principles of RADAR and its varients, RADAR basedMicrowave imaging.
- CO2: Apply the fundamental knowledge of various RADARs, Matched Filter and to findthe range between the target and RADAR, frequency and phase of the received signal.
- CO3: Analyze the received data from the target using CW RADAR & MTI RADAR andto find the distance, tracking range for clutter analysis.

UNIT I

INTRODUCTION TO RADAR: Basic Radar, The Simple Form of the Radar Equation, Radar block Diagram, Radar Frequencies, Applications of Radar. THE RADAR EQUATION: Introduction, detection of Signals in Noise, Receiver Noise and the Signal-to-Noise Ratio, Probability Density Functions, Probabilities of detection and False Alarm, Integration of radar Pulses, Radar Cross-section of Targets, Radar Cross-section Fluctuations, Transmitter Power, Pulse Repetition Frequency, Antenna Parameters, System Losses.

UNIT II

CW AND FREQUENCY-MODULATED RADAR: The Doppler Effect, CW Radar, Frequency-Modulated CW Radar, Air-Borne Doppler Navigation, Multiple –Frequency CW Radar.

MTI AND PULSE DOPPLER RADAR: Introduction to Doppler and MTI Radar, Delay-line Cancellers, Staggered Pulse-Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations of MTI Performance, MTI from a moving Platform(AMTI), Pulse Doppler Radar.

UNIT III

TRACKING RADAR: Tracking with Radar, Monopulse Tracking, Conical Scan and Sequential Lobing, Limitations of Tracking Accuracy, Low-Angle Tracking, Tracking in Range, Other Tracking Radar Topics, and Comparison of Trackers.

UNIT IV

RECEIVERS AND DETECTION OF RADAR SIGNALS IN NOISE: The Radar Receiver, Noise Figure,Mixers, Low-Noise Front-Ends, Displays, Duplexers and Receiver Protectors; Matched-Filter Receiver, Correlation Detection, Detection Criteria, Detector Characteristics, Performance of Radar Operator, Automatic Detection, Constant-False-Alarm-Rate (CFAR) Receiver, ECMS & ECCMS.

UNIT V

INFORMATION FROM RADAR SIGNALS: Introduction, Basic Radar measurements, , Theoretical accuracy of Radar measurements, Ambiguity diagram, Pulse compression, Target recognition.

TEXT BOOKS:

1. Introduction to Radar systems by Merrill I.Skolnik, Second edition, Tata McGraw Hill.
2. Introduction to Radar systems by Merrill I.Skolnik, Third edition, Tata McGraw Hill.

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Introduction to Internet Of Things

(Professional Elective –V)

Course Objectives:

- To present interconnection and integration of the physical world and the cyber space.
- To demonstrate applications of Internet of Things
- To educate building blocks and characteristics of Internet of Things
- To introduce communication protocols used in Internet of Things
- To impart knowledge on design & develop IoT devices

Course Outcomes:

- Examine the application areas of IoT (L4)
- Illustrate revolution of Internet in Mobile Devices, Cloud & Sensor Networks (L2)
- Examine communication protocols used in IoT (L4)
- Make use of python programming to implement Internet of Things (L3)
- Design IoT applications using Raspberry Pi (L6)

UNIT-I

Introduction & Concepts: Introduction to Internet of Things, physical design of IoT, logicaldesign of IoT, IoT enabling Technologies, IoT levels.

UNIT –II

Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics,Agriculture, Industry, Health & Life Style.

UNIT –III

M2M & System Management with NETCONF-YANG: M2M, Difference between IOT andM2M, SDN and NFV for IOT, Software defined Networking, Network FunctionVirtualization, Need for IOT Systems Management, Simple Network Management Protocol,Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systemsmanagement with NETCONF-YANG.

UNIT –IV

Internet of Things Systems - Logical Design using Python: Introduction, Motivation for using Python, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages of Interestfor IoT.

UNIT-V

IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device, Board, Linuxon Raspberry Pi, Interfaces, and Programming with Python; Python web application framework – Django, Designing a Restful web API.

TEXT BOOKS:

1. Vijay Madisetti, ArshdeepBahga, “Internet of Things A Hands-On- Approach”,2014.

REFERENCES:

1. Matt Richardson & Shane Wallace, Getting Started with Rasperry Pi, O’Reilly (SPD),2014.
2. Adrian McEwen, “Designing the Internet of Things”, Wiley Publishers, 2013
3. Daniel Kellmereit, “The Silent Intelligence: The Internet of Things”, 2013

OPEN ELECTIVES OFFERED BY DEPARTMENT OF E.C.E

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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

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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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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

OPEN ELECTIVES OFFERED BY DEPARTMENT OF E.E.E

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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
		3	0	0	3

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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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.

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**
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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**
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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**
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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

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
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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
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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.

Sri Krishnadevaraya University College of Engineering & Technology

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

Sri Krishnadevaraya University College of Engineering & Technology

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

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.

Sri Krishnadevaraya University College of Engineering & Technology

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