Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India

Computer Science and Engineering

SRI KRISHNADEVARAYA UNIVERSITY: ANANTAPUR
College of Engineering & Technology
Academic Regulations 2020 (R20) for
B. Tech (Regular-Full time)

(With effect from the Academic Year 2021-22 for the students admitted into I year I semester)

1. Award of the Degree:

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

i. Pursues a course of study in not less than four and not more than eight academic years.
ii. After eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech. course and their admission stands cancelled.
iii. Registers for 163 credits and must secure all the 163 credits.
iv. A student shall be eligible for the award of B.Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 163 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

2. Programs offered by the College:

The following programs are offered at present as specializations for the B. Tech. course from 2020-2021.

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).

3. Medium of Instructions:

The medium of instruction is **English** for all courses, examinations, seminar presentations and project work. The curriculum will comprise courses of study as given in course structure, in accordance with the prescribed syllabi.

4. Minimum Qualification for Admission:

A candidate seeking admission to the first semester of the eight semester B. Tech. Degree Program should have passed the Intermediate Examination of the Board of Intermediate Education of Andhra Pradesh with Mathematics and Physical Sciences (Physics and Chemistry) as optional courses or any other equivalent examination there to recognized by Govt. of Andhra Pradesh, as per AICTE guidelines. For admissions into the third semester of B. Tech Degree Program under lateral entry scheme a candidate should have passed diploma in the respective branch of study as per AICTE guidelines.

5. Structure of the Program:

Every course of B. Tech. Program shall be placed in one of the nine categories as listed in table below:

Table 2: Category wise distribution of credits

S.No.	Category	Code	Suggested breakup of Credits (APSCHE)	Suggested breakup of Credits (AICTE)
1	Humanities and social science including Management courses	HSMC	13.5*	15
2	Basic Science Courses	BSC	21*	25
3	Engineering science courses	ESC	24*	24
4	Professional Core Courses	PCC	51*	48
5	Open Elective Courses	OEC	12*	18
6	Professional Elective Courses	PEC	15*	18
7	Internship, Project Work Seminar	PROJ	16.5*	15
8	Mandatory courses	NCMC	NC	NC
9	Skill Oriented Courses	SOC	10	-
Total Credits			163	163

Minor variation is allowed as per need of the respective disciplines.

There shall be mandatory student induction program for freshers, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., shall be included in the guidelines issued by AICTE.

6. Scheme of Instruction

The scheme of instruction shall be for duration of four academic years for regular students and three academic years for lateral entry students. Each academic year consists of two consecutive semesters (one odd + one even). There shall be 90 working days in each semester, excluding the days allotted for internal examinations, preparation holidays and university examinations. Each working day shall be for duration of six hours of instruction and or seminar/ tutorial work.

Note: Under unavoidable circumstances, the 90 working days can be inclusive of internal examinations.

The details of syllabi and the list of text books and reference books for each branch of study shall be prescribed by the university from time to time on the recommendation of the Board of Studies.

7. Credit Assignment:

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. **Massive Open Online Course (MOOC):** The MOOC course is a Discipline Centric Elective Course and the student shall register for the course offered by authorized Institutions/Agencies, through online with the approval of Head of the Department.

v. 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
Summer Internship**	2 Months (or 8 weeks)	1.5
Industrial/Research**	2 Months (or 8 weeks)	3
Non-Credit Mandatory Courses	02 / week	00
Project	6 Months (or 24 weeks)	12

Note:

1. Summer Internship for 2 months (Mandatory) after second year (to be evaluated during V semester).
2. The concerned Board of studies can assign tutorial hours to such courses wherever it is necessary, but without change in the total number of credits already assigned for semester.
3. Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester.
4. During Project period the student is supposed to report the Internal Departmental Committee periodically.

8. Weights for Course Evaluation:

8.1 **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.

8.2 **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.

8.3 **Internal Examination Evaluation:**

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

8.4 **End Examination Evaluation:**

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.

8.5 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.

8.6 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.

8.7 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

.

8.8 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.

8.9. There shall be 05 Professional Elective courses and 04 Open Elective courses. All the Professional & Open Elective courses shall be offered for 03 credits, wherever lab component is involved it shall be (2-0-2) and without lab component it shall be (3-0- 0). If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component.

8.10 All Open Electives are offered to students of all branches in general. However, a student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the Programme.

8.11 A student shall be permitted to pursue up to a maximum of TWO Open Elective courses under MOOCs during the Programme. (See the possibility of Min 1 and Max under MOOCs; avoid paid courses; Coursera, NPTEL, TCS ION to be explored). Each of the courses must be of minimum 12 weeks in duration. Attendance will not be monitored for MOOCs. Student has to pursue and acquire a certificate for a MOOC only from the organizations/agencies approved by the BoS in order to earn the 3 credits. The Head of the Department shall notify the list of such courses at the beginning of the semester.

8.12 The college shall invite registration forms from the students at the beginning of the semester for offering professional and open elective courses. There shall be a limit on the minimum and maximum number of registrations based on class/section strength.

8.13 **Internships:**

Students shall undergo mandatory summer internships for a minimum of 2 months duration at the end of second and third year of the Programme. There shall also be mandatory full internship for 6 months in the final semester of the Programme along with the project work.

8.14 S**kill Oriented Courses:**

There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain courses and the remaining one shall be a soft skills course.

8.15.**Honors/Minors:**

Under graduate Degree with Honors/Minor shall be issued by the University to the students who fulfill all the academic eligibility requirements for the B. Tech program and Honors/Minor program. The objective is to provide additional learning opportunities to academically motivated students.

9. Attendance Requirements in Academics:

i. 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.
ii. 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.
iii. Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
iv. A stipulated fee shall be payable towards condonation of shortage of attendance to the Institution.
v. 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.
vi. 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.
vii. 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.

10. 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 9.

10.1 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.

10.2 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.

10.3 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 10.2 and 10.3 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.

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

105 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.

11. 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.

12. 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.

12.1. 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.

13. Award of Class:

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

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

14. 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.

15. 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.

16. Curricular Framework for Mandatory Internships

i. It is mandatory to undergo Community Service Project during II Year Summer Vacation with a minimum of 2 months duration.

ii. It is mandatory to undergo Internship during III Year Summer Vacation with a minimum of 2 months duration. The internship can be done by the students at local industries, Govt. Organizations,

construction agencies, Industries, Hydel and thermal power projects and also in software MNCs.

iii. Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee. The report and the oral presentation shall carry 40% and 60% weightages respectively.

iv. In the final semester, the student should mandatorily undergo internship for 6 Months and parallelly he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

v. The College shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

17. Curricular Framework for Skill oriented

i For skill oriented/skill advanced course, one theory and 2 practical hours or two theory hours may be allotted as per the decision of concerned BOS.

ii Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

iii A pool of interdisciplinary job-oriented skill courses shall be designed by a common Board of studies by the participating departments/disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements. The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.

iv The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies as approved by the concerned BoS.

v The Board of studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest courses based on industrial demand.

vi If a student chooses to take a Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency/professional bodies as approved by the Board of studies.

vii If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance

viii requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.

ix A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades. The recommended conversions and

appropriate grades/marks are to be approved by the University/Academic Council.

18.Curricular Framework for Honors Programme

Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

i A student shall be permitted to register for Honors program at the beginning of 4th

ii semester provided that the student must have acquired a minimum of 8.0 SGPA upto the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

iii Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

iv In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

v Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.

vi It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

vii The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOCs as approved by the concerned Head of the department in consultation with BoS.

viii Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component. MOOCs must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOCs. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOCs is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.

ix The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

x If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the Minors will be shown in the transcript. Courses which are dropped under the Minor will not be shown in the transcript.

xi In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech. Degree only. However, such students will receive a separate grade sheet mentioning the

additional courses completed by them.

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

19. Curricular Framework for Minor Programme:

i Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering.

ii Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

iii The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE,CE,ME etc. or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

iv The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

v There shall be no limit on the number of programs offered under Minor. The University/Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

vi The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOCs as approved by the concerned Head of the department in consultation with BoS.

vii A student shall be permitted to register for Minors program at the beginning of 4^{th} semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) up to the end of 2^{nd} semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4^{th} semester. If a student fails to acquire 8 SGPA up to 3^{rd} semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

viii A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

ix Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

x In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as

decided by the university/academic council.

xi Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

xii A committee should be formed at the level of College/Universities/department to evaluate the grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

xiii If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

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

20. 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.

21.MOOCs through SWAYAM Platform:

There shall be five professional elective courses and four open elective courses, which are Choice Based Credit Courses (CBCC), offered from V semester onwards. Among them, one elective course shall be pursued through MOOCs. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's assignment submissions given by SWAYAM. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.

A Student must complete the SWAYAM MOOC course in all respects on or before 5 / 6 / 7 semester. Students' MOOC course score in terms of marks/grade/credits will be counted in their 5/6/7 semester marks sheet as the case may be. Students who have qualified in the proctored examinations conducted by the SWAYAM and apply for credit transfer as specified are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted by the university.

Necessary amendments in rules and regulations regarding adoption of SWAYAM MOOCS courses would be proposed from time to time.

Credit Equivalence for SWAYAM MOOCs Courses: Courses of 04 weeks duration: 01 Credit Courses of 08 weeks duration: 02 Credits Courses of 12 weeks duration: 03 Credits Courses of 16 weeks duration: 04 Credits.

22.Credit Transfer Policy

Adoption of MOOCs is mandatory for all students, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of 40% of the total courses being offered in a particular Programme in a semester through the Online Learning courses through SWAYAM platform (www.swayam.gov.in).

i. The University shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses through SWAYAM platform.
ii. The online learning courses available on the SWAYAM platform will be considered for credit transfer. SWAYAM course credits are as specified in the platform.
iii. Student registration for the MOOCs shall be only through the institution, it is mandatory for the student to share necessary information with the institution
iv. Credit transfer policy will be applicable to the Professional & Open Elective courses offered by the university under Choice Based Credit System (CBCS).
v. The institution shall select the courses to be permitted for credit transfer through SWAYAM. However, while selecting courses in the online platform institution would essentially avoid the courses offered through the curriculums it may otherwise lead to duplication and repetition of the same course
vi. The University/institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer in the forthcoming Semester.
vii. The institution shall also ensure that the student must complete the course and produce the course completion certificate as per the academic schedule given for the regular courses in that semester
viii. The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
ix. The university shall ensure no overlap of SWAYAM MOOC exams with that of the university examination schedule. In case of delay in SWAYAM results, the university will re-issue the marks sheet for such students.
x. Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.
xi. The institution shall submit the following to the examination section of the university:
    a. List of students who have passed MOOC courses in the current semester along with the certificates of completion.
    b. Undertaking form filled by the students for credit transfer.
xii. The university shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall also be permitted to register for MOOCs offered through online platforms other than

SWAYAM / NPTEL. In such cases, credit transfer shall be permitted only after seeking approval of the University at least three months prior to the commencement of the semester.

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

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2022-2023 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 *124* credits and secures all *124*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. All The regulations except 8.1 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.9

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.

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Computer Science and Engineering

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	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already

	additional sheet, during or after the examination.	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	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other

	malpractice or improper conduct mentioned in clause 6 to 8.	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.

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Computer Science and Engineering

SKUCET Curriculum
B. Tech Course Structure – R20
COMPUTER SCIENCE AND ENGINEERING

Semester – 0 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

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Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science and Engineering					
I Year Ist Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Linear Algebra & Calculus	BS	3-0-0	3
2.		Applied Physics	BS	3-0-0	3
3.		Communicative English	HS	3-0-0	3
4.		Problem Solving & Programming	ES	3-0-0	3
5.		Engineering Drawing	ES	1-0-4	3
6.		Communicative English Lab	HS	0-0-3	1.5
7.		Applied Physics Lab	BS	0-0-3	1.5
8.		Problem Solving & Programming Lab	ES	0-0-3	1.5
9		Environmental Science	MC	2-0-0	0
				Total	**19.5**

Category	**CREDITS**
Basic Science course	7.5
Engineering Science Courses	7.5
Humanities and social science	4.5
TOTAL CREDITS	**19.5**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science and Engineering					
I Year IInd Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Differential Equations & Transforms	BS	3-0-0	3
2.		Chemistry	BS	3-0-0	3
3.		Python and Data Structures	ES	4-0-0	4
4.		Basic Electrical and Electronics Engineering	ES	3-0-0	3
5.		Computer Science & Engineering Workshop	ES	0-0-3	1.5
6.		Python and Data Structures Lab	ES	0-0-4	2
7.		Chemistry Lab	BS	0-0-3	1.5
8.		Basic Electrical and Electronics Engineering Lab	ES	0-0-3	1.5
				Total	**19.5**

Category	**CREDITS**
Basic Science course	7.5
Engineering Science Courses	12
TOTAL CREDITS	**19.5**

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Computer Science and Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science and Engineering					
II Year Ist Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Mathematical Foundation of Computer Science	BS	3-0-0	3
2.		Digital Electronics& Microprocessors	ES	3-0-0	3
3.		Computer Organization	PC	3-0-0	3
4.		Object Oriented Programming Through Java	PC	3-0-0	3
5.		Design and Analysis of Algorithms	PC	1-0-4	3
6.		Digital Electronics& Microprocessors Lab	ES	0-0-3	1.5
7.		Object Oriented Programming Through Java Lab	PC	0-0-3	1.5
8.		Algorithms Lab	PC	0-0-3	1.5
9.		**Skill oriented course*** Exploratory Data Analysis Using Python Programming	SC	1-0-2	2
10.		**NCC/NSS ACTIVITIES**			
				Total	**21.5**

Category	**CREDITS**
Basic Science course	3
Professional core Courses	12
Engineering Science Courses	4.5
Skill oriented course*	2
TOTAL CREDITS	**21.5**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science and Engineering					
II Year IInd Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Probability and Statistics	BS	3-0-0	3
2.		Operating Systems	PC	3-0-0	3
3.		Database Management Systems	PC	3-0-0	3
4.		Software Engineering	PC	3-0-0	3
5.		Managerial Economics and Financial Analysis	HS	3-0-0	3
6		UHV-II: Universal Human Values – Understanding harmony and Ethical Human Conduct	HS	2-1-0	3
6.		Operating Systems Lab	PC	0-0-3	1.5
7.		Database Management Systems Lab	PC	0-0-3	1.5
8.		Software Engineering Lab	PC	0-0-3	1.5
9.		**Skill oriented course*** Web Application Development Client Side	SC	1-0-2	2
				Total	**24.5**
Community Service Project (Mandatory) for 2 months duration during summer vacation					

Category	**CREDITS**
Basic Science Courses	3
Professional core Courses	13.5
Skill oriented course*	2
Humanities and Social Sciences	6
TOTAL CREDITS	**24.5**

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Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science & Engineering					
III Year I Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Computer Networks	PC	3-0-0	3
2.		Formal Language & Automata Theory	PC	3-0-0	3
3.		Artificial Intelligence	PC	3-0-0	3
4.		**Professional Elective – I**	PE	3-0-0	3
5.		**Open Elective – I**	OE	3-0-0	3
6.		Computer Networks Lab	PC	0-0-3	1.5
7.		Artificial Intelligence Lab	PC	0-0-3	1.5
8.		**Skill oriented course– III** Micro Services	SC	1-0-2	2
9.		Evaluation of Community Service Project/Internship	PR		1.5
				Total	**21.5**

List of Professional Electives-I	**List of Open Electives-I**
1)Data Warehousing & Data Mining 2)Digital Image Processing 3)Software Project Management	Candidate should select the subject from list of subjects offered by other departments.

Category	**CREDITS**
Professional Core Courses	12
Professional Elective Courses	3
Open Elective Course/Job Oriented Elective	3
Skill oriented course	2
Summer Internship	1.5
TOTAL CREDITS	**21.5**

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Computer Science and Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science & Engineering					
III Year II[nd] Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Internet of Things	PC	3-0-0	3
2.		Cloud Computing	PC	3-0-0	3
3.		Machine Learning	PC	3-0-0	3
4.		**Professional Elective-II**	PE	3-0-0	3
5.		**Open Elective-II**	ES	3-0-0	3
6.		IoT Lab	PC	0-0-3	1.5
7.		Cloud Computing Lab	PC	0-0-3	1.5
8.		Machine Learning Lab	ES	0-0-3	1.5
9.		**Skill Oriented Course –IV** Soft Skills	SC	1-0-2	2
10		**Mandatory Non-Credit Course-III** Constitution of India	MC	2-0-0	0
				Total	**21.5**
Industrial/Research Internship (Mandatory) for 2 months duration during summer vacation					

List of Professional Electives-II	List of Open Electives-II
1)Deep Learning **2)**Advanced Computer Architecture **3**)Software Testing Methodologies	Candidate should select the subject from list of subjects offered by other departments.

Category	CREDITS
Professional Core Courses	13.5
Professional Elective Courses	3
Open Elective Course/Job Oriented Elective	3
Skill oriented course	2
TOTAL CREDITS	**21.5**

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Computer Science and Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science & Engineering					
IV Year I[st] Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		**Professional Elective – III**	PE	3-0-0	3
2.		**Professional Elective – IV**	PE	3-0-0	3
3.		**Professional Elective – V**	PE	3-0-0	3
4.		**Open Elective-III**	OE	3-0-0	3
5.		**Open Elective – IV**	OE	3-0-0	3
6.		**Humanities Elective-I** 1)Entrepreneurship and Incubation 2)Management Science 3Organizational Behavior	OE	3-0-0	3
7.		**Skill oriented course– V** Mobile Application Development	SC	1-0-2	2
8.		Evaluation of Industrial Internship	PR	0-0-0	3
				Total	**23**

List of Professional Electives-III	**List of Professional Electives-V**
1)Data Science 2)Quantum Computing 3)Agile Methodologies	1)Natural Language Processing 2)Cryptography & Network Security 3)Software Architecture
List of Professional Electives-IV	**Humanities Elective**
1)Robotic Process Automation 2)Block chain Technologies & Applications 3)Software Quality Assurance	1)Entrepreneurship and Design Thinking 2)Management Science 3)Organizational Behavior
List of Open Electives-III & IV Candidate should select the subject from list of subjects offered by other departments.	

Category	**CREDITS**
Professional Elective Courses	9
Open Elective Course/Job Oriented Elective	6
Humanities and Social Science Elective	3
Skill oriented course	2
Industrial Internship	3
TOTAL CREDITS	**23**

Sri Krishnadevaraya University College of Engineering & Technology
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Computer Science and Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science & Engineering					
IV Year II Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Full Internship & Project work	PROJ	0-0-0	12
				Total	**12**

Category	**CREDITS**
Full Internship & Project work	12
TOTAL CREDITS	**12**

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Computer Science and Engineering

LIST OF OPEN ELECTIVES

Open Electives offered by Dept. of C.S.E(Offered to other Departments)

1. Principles of Software Engineering (OE-1)
2. Java Programming (OE-2)
3. Fundamentals of Operating Systems (OE-3)
4. Fundamentals of Computer Networks (OE-4)
5. Principles of Database Management Systems
6. Web Technologies
7. Cyber Security

O**ut of Open elective courses at least one course should be completed through MOOCs**

Open Electives offered by Dept. of E.C.E(Offered to other Departments)

1. Fundamentals of Digital Electronics
2. Basics of Signals and Systems
3. Fundamentals of Communication Systems
4. Fundamentals of Microprocessors and Microcontrollers
5. Microcontroller & Applications
6. Electronic Sensors
7. Electronic Instrumentation
8. Principles of Signal Processing
9. Embedded System Design
10. Introduction to Image Processing
11. Introduction to Internet of things
12. Consumer Electronics

O**ut of Open elective courses at least one course should be completed through MOOCs**

Open Electives offered by Dept. of E.E.E(Offered to other Departments)

1.Electrical circuit Theory (OE-1)
2.Generation of Electric Power (OE-2)
3.Renewable Energy Sources (OE-3)
4.Basics of Power Electronics (OE-4)

O**ut of Open elective courses at least one course should be completed through MOOCs**

Open Electives offered by Dept. of Mech. Engineering(Offered to other Departments)

1. Manufacturing Process
2. IC Engines
3. Automobile Engineering
4. Non Conventional Sources of Energy
5. Non Destructive Evaluation
6. Workshop Technology
7. Total Quality Management

O**ut of Open elective courses at least one course should be completed through MOOCs**

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Open Electives offered by Dept. of Civil Engineering(Offered to other Departments)

Open Elective-I

1. Engineering Material
2. Dister Mitigation and Management
3. Environmental Economics

Open Elective-II

1. Traffic Engineering
2. Ground Improvement Techniques
3. Environmental Pollution Control

Open Elective-III

1. Environmental Impact Assessment
2. Low Cost-Effective Housing Techniques
3. Water shed Management

Open Elective-IV

1. Construction Planning and Project Management
2. Noise and Air Pollution
3. Geographic Information System GIS

O**ut of Open elective courses at least one course should be completed through MOOCs**

Skill Oriented Courses

Skill Oriented Course – I (III Sem) – Exploratory Data Analysis Using Python Programming
Skill Oriented Course – II (IV Sem) – Web Application Development Client side
Skill Oriented Course –III – Micro Services
Skill Oriented Course – IV – Soft Skills
Skill Oriented Course – V – Mobile Application Development

Humanities Electives – I (VII Sem)

1.Entrepreneurship and Incubation
2.Management Science
3.Organizational Behavior

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Computer Science and Engineering

Honours (CSE)

Note
1.A student can opt any Four subjects @ 4 credits per subject
2.Concerned BoS can add or delete the subjects as per the decision of the board.
3.Prerequisites to be defined by the board for each course.
4.Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each

S.No.	Code	Course Name	Offered in Semester	Prerequisite if any	Contact Hours per week		Credits
					L	T	
1		Privacy preserving and Data Publishing	V		4	0	4
2		NoSQL Databases	V	DBMS	4	0	4
3		Software Defined Data Center	VI	Computer Networks	4	0	4
4		Robotics and Intelligent Systems	VII	Machine Learning	4	0	4
5		MOOC - 1	V onwards				2
6		MOOC - 2	V onwards				2

Suggested MOOCs:

1. **Multi-Core Computer Architecture – Storage and Interconnects**
2. **User-centric Computing for Human-Computer Interaction**
3. **GPU Architectures and Programming**
4. **Introduction to Quantum Computing**
5. **Real Time Operating Systems**

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Computer Science and Engineering

Minor(CSE)

Note

1.A student can opt any Four subjects @ 4 credits per subject
2.Concerned BoS can add or delete the subjects as per the decision of the board.
3.Prerequisites to be defined by the board for each course.
4.Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each)

S.No.	Code	Course Name	Offered in Semester	Prerequisite if any	Contact Hours per week			Credits
					L	T	P	
1		Principles of Algorithms	V	C Programming& Data Structures	3	0	2	4
2		Basics of Computer Networks and Operating Systems	V		3	0	2	4
3		Introduction to Machine Learning	VI		3	0	2	4
4		Principles of Programming Languages	VII		3	0	2	4
5		MOOC - 1	V Onwards					
6		MOOC - 2	V onwards					2

Suggested MOOCs:

1. **Introduction to Robotics**
2. **Introduction to Internet of Things**
3. **Introduction to Deep Learning**

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Computer Science and Engineering

Note:

1. Eligible and interested students can register either for Honors or for a Minor in IV Semester as per the guidelines issued by the University
2. Students shall register for NCC/NSS/NSO activities and will be required to participate in an activity for two hours in a week during third semester.
3. Lateral entry students shall undergo a bridge course in Mathematics during third semester

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Computer Science and Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science and Engineering					
I Year Ist Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Linear Algebra & Calculus	BS	3-0-0	3
2.		Applied Physics	BS	3-0-0	3
3.		Communicative English	HS	3-0-0	3
4.		Problem Solving & Programming	ES	3-0-0	3
5.		Engineering Drawing	ES	1-0-4	3
6.		Communicative English Lab	HS	0-0-3	1.5
7.		Applied Physics Lab	BS	0-0-3	1.5
8.		Problem Solving & Programming Lab	ES	0-0-3	1.5
9		Environmental Science	MC	2-0-0	0
				Total	**19.5**

Category	**CREDITS**
Basic Science course	7.5
Engineering Science Courses	7.5
Humanities and social science	4.5
TOTAL CREDITS	**19.5**

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Computer Science and Engineering

Course Code	LINEAR ALGEBRA & CALCULUS (Common to all branches of Engineering)	L	T	P	C
		3	0	0	3

I Year 1st Semester

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 .

Course Outcomes (CO): 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

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

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);

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

UNIT - IV	**Multiple Integrals**	

Double integrals, change of order of integration, change of variables. Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates. Finding areas and volumes using double and triple integrals.

UNIT - V	**Beta and Gamma Functions**	

Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of definite integrals using beta and gamma functions.

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

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.
4. T.K.V Iyengar, B. Krishn Gandhi, S. Ranganatham and M.V.S.N. Prasad., S. chand Publishers.

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Computer Science and Engineering

Course Code	APPLIED PHYSICS (ECE, CSE & EEE Branches)	L	T	P	C
		3	0	0	3
I Year 1st Semester					

Course Objectives:

- To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization.
- To explain the significant concepts of dielectric and magnetic materials this leads to potential 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 and superconductors in the functioning of electronic devices.
- To teach the concepts related to quantum mechanics and electromagnetic theory which led to their fascinating applications.

Course Outcomes (CO):

- 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 (L3)
- interpret the difference between normal conductor and superconductor
- demonstrate the application of nanomaterials

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 and refractive index.

Diffraction: Introduction-Fresnel and Fraunhofer diffraction-Fraunhofer Diffraction-Single and Double slits - Diffraction Grating.

Polarisation: Introduction-Types of polarization- Polarisation by reflection and double refraction-Nicol's Prism-Half wave and Quarter wave plate.

UNIT - II	**Dielectric & Magnetic Materials**

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

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

UNIT - III	**Lasers & Fiber Optics**

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

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

UNIT - IV	**Quantum Mechanics & Electromagnetic waves**

Quantum Mechanics: 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.

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

UNIT - V	**Semiconductors & Superconductors**

Semiconductors: Introduction-Intrinsic semiconductors – Intrinsic carrier concentration and Fermi level- Intrinsic conductivity – Extrinsic semiconductors - P-type Semiconductor & N-type Semiconductor - Drift and Diffusion currents- Einstien's relation -Hall effect-Hall coefficient - Applications of Hall effect -Applications of Semiconductors.

Superconductors: Introduction-Properties of superconductors-Critical magnetic field-Meissner effect-Josephson Effect (AC & DC)-Types of Superconductors-SQUID-Applications of superconductors.

Textbooks:

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. Applied Physics – P.K.Palanisamy SciTech Publications Pvt. Ltd.,
4. Engineering Physics- K. Vijay Kumar, S. Chand Publications.

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Course Code	COMMUNICATIVE ENGLISH (Common to All Branches of Engineering)	L	T	P	C
		3	0	0	3

I Year 1st Semester

Course Objectives:

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

Course Outcomes (CO):

- Retrieve the knowledge of basic grammatical concepts
- 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

UNIT - I	**On the Conduct of Life: William Hazlitt**	

Lesson: 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: Parts of Speech, 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.

UNIT - II	**The Brook: Alfred Tennyson**	

Lesson: 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.

UNIT - III	**The Death Trap: Saki**	

Lesson: 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, Paragraph Writing Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

UNIT - IV	**Innovation: Muhammad Yunus**	

Lesson: 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: Letter Writing: Official Letters/Report Writing Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; Voice - Active & Passive Voice.		
UNIT - V	**Motivation: The Dancer with a White Parasol: Ranjana Dave**	
Lesson: 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)		

Textbooks:

1. Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. Oxford Learners Dictionary, 12th Edition, 2011
6. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)
7. Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words by David Butler
8. A Remedial English Grammar For Foreign Students by Frederick T Wood.
9. Oxford English Grammar Course by Michael Swan & Catherine Walter

Web links

www.englishclub.com
www.easyworldofenglish.com
www.languageguide.org/english/
www.bbc.co.uk/learningenglish
www.eslpod.com/index.html www.myenglishpages.com

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Computer Science and Engineering

Course Code	PROBLEM SOLVING AND PROGRAMMING (Common to all Branches Of Engineering)	L	T	P	C
		3	0	0	3
I Year 1st Semester					

Course Objectives:

- To illustrate the basic concepts of C programming language.
- To discuss the concepts of Functions, Arrays, Pointers and Structures.
- To familiarize with Stack, Queue and Linked lists data structures.
- To explain the concepts of non-linear data structures like graphs and trees.
- To learn different types of searching and sorting techniques

Course Outcomes (CO):

- Analyse the basic concepts of C Programming language.
- Design applications in C, using functions, arrays, pointers and structures.
- Apply the concepts of Stacks and Queues in solving the problems.
- Explore various operations on Linked lists.
- Demonstrate various tree traversals and graph traversal techniques.
- Design searching and sorting methods

UNIT - I	**Introduction to C Language** -

C language elements, variable declarations and data types, operators and expressions, decision statements - If and switch statements, loop control statements - while, for, do-while statements, arrays

UNIT - II	**Functions**

Functions, types of functions, Recursion and argument passing, pointers, storage allocation, pointers to functions, expressions involving pointers, Storage classes – auto, register, static, extern, Structures, Unions, Strings, string handling functions, and Command line arguments.

UNIT - III	**Data Structures**,

Overview of data structures, stacks and queues, representation of a stack, stack related terms, operations on a stack, implementation of a stack, evaluation of arithmetic expressions, infix, prefix, and postfix notations, evaluation of postfix expression, conversion of expression from infix to postfix, recursion, queues - various positions of queue, representation of queue, insertion, deletion, searching operations.

UNIT - IV	**Linked Lists**

Singly linked list, dynamically linked stacks and queues, polynomials using singly linked lists, using circularly linked lists, insertion, deletion and searching operations, doubly linked lists and its operations, circular linked lists and its operations.

UNIT - V	**Trees, Graphs ,Searching & Sorting**

Trees - Tree terminology, representation, Binary trees, representation, binary tree traversals. binary tree operations, **Graphs** - graph terminology, graph representation, elementary graph operations, Breadth First Search (BFS) and Depth First Search (DFS), connected components, spanning trees. **Searching and Sorting** – sequential search, binary search, exchange (bubble) sort, selection sort, insertion sort.

Textbooks:

1. The C Programming Language, Brian W Kernighan and Dennis M Ritchie, Second Edition, Prentice Hall Publication.
2. Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni, Susan Anderson-Freed, Computer Science Press.
3. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. AnandaRao, Pearson Education.
4. B.A. Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016.
5. Richard F. Gilberg & Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, CENGAGE Learning, 2011.

Reference Books:

1. Pradip Dey and Manas Ghosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2. E. Balaguruswamy, "C and Data Structures", 4th Edition, Tata Mc Graw Hill.
3. A.K. Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.
4. M.T. Somashekara, "Problem Solving Using C", PHI, 2nd Edition 2009.

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Computer Science and Engineering

Course Code	ENGINEERING DRAWING (Common to CSE, ECE & EEE)	L	T	P	C
		1	0	4	3

I Year 1st Semester

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 in orthographic and isometric drawings.
- Train the usage of 2D and 3D modeling.

Course Outcomes (CO):

- draw various curves applied in engineering.
- Show projections of planes graphically
- show projections of solids graphically.
- draw isometric and orthographic drawings

UNIT - I	**Introduction to Engineering graphics**

Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions. Conic sections including the rectangular hyperbola- general and special methods.

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.

UNIT - IV	**Projections of Solids:**

Projections of regular solids inclined to one plane and both planes rotational or Auxilary views method. – Prism, Cylinder, Pyramid, Cone.

UNIT - V	**Isometric Projections and Orthographic Projections**

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

Orthographic Projections: Systems of projections, conventions and application to orthographic projections (Conversion of isometric Views to Orthographic Views).

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Textbooks:

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
3. Engineering Drawing, Sankar Prasad Dey

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

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Computer Science and Engineering

Course Code	COMMUNICATIVE ENGLISH LAB (Common to All Branches of Engineering)	L	T	P	C
		0	0	3	1.5

I Year 1st Semester

Course Objectives:

- students will be exposed to a variety of self instructional, learner friendly modes of language
- learning
- 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

Course Outcomes (CO):

- Retrieve and reminisce the sounds of English Language
- Understand the different aspects of the English language
- Apply communication skills through various language learning activities
- Analyze the English speech sounds, stress, rhythm, intonation and syllable
- Evaluate and exhibit acceptable etiquette essential in social and professional settings
- Create awareness on mother tongue influence and neutralize it

List of Topics

1. Phonetics
2. Reading comprehension
3. Describing objects/places/persons
4. Role Play or Conversational Practice
5. JAM
6. Etiquettes of Telephonic Communication
7. Information Transfer
8. Note Making and Note Taking
9. E-mail Writing
10. Group Discussions-1
11. Resume Writing
12. Debates
13. Oral Presentations
14. Poster Presentation
15. Interviews Skills-1

Suggested Software

Orel, Walden Infotech, Young India Films

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

Web Links

www.esl-lab.com
www.englishmedialab.com
www.englishinteractive.net

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Computer Science and Engineering

Course Code	APPLIED PHYSICS LAB (Common to ECE, CSE & EEE Branches)	L	T	P	C
		0	0	3	1.5

I Year 1st Semester

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.

Course Outcomes (CO):

- operate optical instruments like microscope and spectrometer
- determine thickness of a hair/paper with the concept of interference
- estimate the wavelength of different colors 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

Experiments(Execute any 12 experiments)

1. Determination of wavelength of LASER light using diffraction grating.
2. Determine the thickness of the wire using wedge shape method.
3. Determination of the radius of curvature of the lens by Newton's ring method.
4. Determination of Dispersive power of a prism.
5. Magnetic field along the axis of a circular coil carrying current-Stewart Gee's method.
6. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum).
7. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle.
8. To determine the energy gap of a semiconductor.
9. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
10. Determination of particle size using LASER.
11. Determination of dielectric constant of dielectric material using charging and discharging of capacitor.
12. Resolving power of a grating.
13. Determination of hysteresis loss by tracing B-H Curve of ferromagnetic material.
14. To determine the measurement of resistance with varying temperature.
15. Resistivity of semiconductor by Four probe method.

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

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Computer Science and Engineering

Course Code	PROBLEM SOLVING AND PROGRAMMING LAB (Common to All Branches of Engineering)	L	T	P	C
		0	0	3	1.5

I Year 1st Semester

Course Objectives:

- To get familiar with the basic concepts of C programming.
- To design programs using arrays, strings, pointers and structures.
- To illustrate the use of Stacks and Queues
- To apply different operations on linked lists.
- To demonstrate Binary search tree traversal techniques.
- To design searching and sorting techniques.

Course Outcomes (CO):

- Demonstrate basic concepts of C programming language.
- Develop C programs using functions, arrays, structures and pointers.
- Illustrate the concepts Stacks and Queues.
- Design operations on Linked lists.
- Apply various Binary tree traversal techniques.
- Develop searching and sorting methods.

List of Experiments:

Week l

Write C programs that use both recursive and non-recursive functions

(i)To find the factorial of a given integer.

(ii)To find the GCD (greatest common divisor) of two given integers.

Week 2

a) Write a C program to find both the largest and smallest number in a list of integers.

b) Write a C program that uses functions to perform the following:

i) Addition of Two Matrices ii) Multiplication of Two Matrices

Week 3

a) Write a C program that uses functions to perform the following operations:

i) To insert a sub-string in to a given main string from a given position.

ii) To delete n characters from a given position in a given string.

Week 4

a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn‘t contain T.

b) Write a C program to count the lines, words and characters in a given text.

Week 5

a)Write a C Program to perform various arithmetic operations on pointer variables.

b)Write a C Program to demonstrate the following parameter passing mechanisms:

i) call-by-value ii) call-by-reference

Week 6

Write a C program that uses functions to perform the following operations:

(i)Reading a complex number

(ii)Writing a complex number

(iii)Addition of two complex numbers

(iv)Multiplication of two complex numbers

(Note: represent complex number using a structure.)

Week 7

Write C programs that implement stack (its operations) using

(i)Arrays (ii) Pointers

Week 8

Write C programs that implement Queue (its operations) using

(i)Arrays (ii) Pointers

Week 9

Write a C program that uses Stack operations to perform the following:

(i) Converting infix expression into postfix expression

(ii) Evaluating the postfix expression

Week 10

Write a C program that uses functions to perform the following operations on singly linked list.

i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 11

Write a C program that uses functions to perform the following operations on Doubly linkedlist.

i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 12

Write a C program that uses functions to perform the following operations on circular linkedlist.

i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 13

Write a C program that uses functions to perform the following:

i) Creating a Binary Tree of integers

ii) Traversing the above binary tree in preorder, inorder and postorder.

Week 14

Write C programs that use both recursive and non-recursive functions to perform the following searching operations for a key value in a given list of integers:

(i)Linear search (ii) Binary search

Week 15

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

(i)Bubble sort

(ii)Selection sort

(iii)Insertion sort

(iv)Description Language

Text Books

1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education.
2. B.A. Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016.
3. Richard F. Gilberg & Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, CENGAGE Learning, 2011.

Reference Books:

1. PradipDey and ManasGhosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2. E.Balaguruswamy, "C and Data Structures", 4th Edition, Tata Mc Graw Hill.
3. A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.
4. M.T.Somashekara, "Problem Solving Using C", PHI, 2nd Edition 2009.

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Computer Science and Engineering

Course Code	ENVIRONMENTAL SCIENCE	L	T	P	C
		2	0	0	0

I Year 1st Semester

Course Objectives:

- 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.

Course Outcomes (CO):

Students should be able to

- Grasp multidisciplinary nature of environmental studies and various renewable and nonrenewable resources
- Understand flow and bio-geo- chemical cycles and ecological pyramids.
- Understand various causes of pollution and solid waste management and related preventive measures.
- About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
- Casus of population explosion, value education and welfare programmes

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:

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.

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.

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.

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..

TEXT BOOKS :

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

REFERENCES :

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

Sri Krishnadevaraya University College of Engineering & Technology
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Computer Science and Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science and Engineering					
I Year II[nd] Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Differential Equations & Transforms	BS	3-0-0	3
2.		Chemistry	BS	3-0-0	3
3.		Python and Data Structures	ES	4-0-0	4
4.		Basic Electrical and Electronics Engineering	ES	3-0-0	3
5.		Computer Science & Engineering Workshop	ES	0-0-3	1.5
6.		Python and Data Structures Lab	ES	0-0-4	2
7.		Chemistry Lab	BS	0-0-3	1.5
8.		Basic Electrical and Electronics Engineering Lab	ES	0-0-3	1.5
				Total	**19.5**

Category	**CREDITS**
Basic Science course	7.5
Engineering Science Courses	12
TOTAL CREDITS	**19.5**

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Computer Science and Engineering

Course Code	DIFFERENTIAL EQUATIONS & TRANSFORMS	L	T	P	C
		3	0	0	3

I Year 2nd Semester

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- 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.

Course Outcomes (CO): Student 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.
- Understand the use of fourier transforms and apply z transforms to solve difference equations.

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. Simultaneous linear equations with constant coefficients, Applications: Mass spring system and L-C-R Circuit problems.

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UNIT - II	**Partial Differential Equations & its applicastions**	

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order equations using Lagrange's method and non-linear PDEs (Standard Forms) Classification of PDE, method of separation of variables for second order equations. Applications of Partial Differential Equations: One dimensional Wave equation, One dimensional Heat equation

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 - 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 - 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.

Textbooks:
1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers. 2. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India
Reference Books:
1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers. 2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.
Online Learning Resources:
1. nptel.ac.in/courses/111107056 2. onlinelibrary.wiley.com 3. https://onlinecourses.nptel.ac.in/noc18ma12.

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Computer Science and Engineering

Course Code	CHEMISTRY (Common CSE,ECE and EEE Branches)	L	T	P	C
		3	0	0	3

I Year 2nd Semester

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

Course Outcomes (CO):

- **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

UNIT - I **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.

UNIT - II **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. .

UNIT - III **Electrochemistry and Fuel cells**

Electrochemical cells: galvanic cells, types of electrodes (standard hydrogen, calomel and quinhydrone). **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

UNIT - IV **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.

UNIT - V **Instrumental methods and Applications**

Electromagnetic spectrum and absorption of radiations. The absorption laws: Beer-Lambert's law. principle, instrument ans its applications of UV-Visible and Infrared spectroscopy. Principle, instrumentation and its applications of pH metry.

Textbooks:

1. **1**.A text book of engineering chemistry., Jain and Jain, Dhanpat Rai Publishing Company., 15th edition, New Delhi,**2008**.
2. **2**. Chemistry of engineering., Prof. K.N. Jayaveera, Dr. G.V. Subba Reddy and Dr. C. Ramachandraiah. McGraw hill higher education. Hyderabad, **2009.**
3. **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 3e,B.Rama Devi et al., Cengage Learning.
5. Text book of Spectroscopy by Y.R. Sharma

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Computer Science and Engineering

Course Code	PYTHON AND DATA STRUCTURES	L	T	P	C
		3	0	0	3

I Year 2nd Semester

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

Course Outcomes (CO):

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

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 - 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 - 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.

Data Structures: Using List as Stacks,Using List as Queues

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 - 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, default dict, Named tuples, Gathering keyword Args,

Textbooks:

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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Computer Science and Engineering

Course Code	BASIC ELECTRICAL & ELECTRONICS ENGINEERING (Common to Civil, CSE and Mechnical.)	L	T	P	C
		3	0	0	3

I Year 1st Semester

Course Objectives:

- To introduce basics of electric circuits.
- To teach DC and AC electrical circuit analysis.
- To explain working principles of transformers and electrical machines.
- To impart knowledge on low voltage electrical installations
- To provide comprehensive idea about working principle, operation and applications of PN junction & zener diodes, BJT and operational amplifier
- To introduce fundamentals of digital electronics.

Course Outcomes (CO):

- Apply concepts of KVL/KCL in solving DC circuits
- Choose correct rating of a transformer for a specific application
- Illustrate working principles of induction motor - DC Motor
- Understand working operation of transformer
- Describe operation and characteristics of diodes and transistors and basic opamps

UNIT - I	**DC & AC Circuits**

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

UNIT - II	**DC Machines:**

DC-Generators: Working Principle and construction of DC Generator– Generated emf equation – types of DC Generators-simple problems regarding EMF.
DC Motors : Working Principle of DC Motor-types of DC Motors -back emf -torque equation –speed control of DC Shunt Motor – applications of DC machines -losses in DC machines- Swinburne's test and efficiency calculation –simple problems.

UNIT - III	**Transformers:**

Principle of operation of single phase transformers –Constructional features –Theory of an Ideal Transformer- EMF equation –Practical Transformer on no load and load–Equivalent circuit- Impedance Ratio-Shifting of Impedances – losses- regulation -OC & SC test- efficiency –simple problems.

UNIT - IV	**Analog Electronics**

Diode and its Characteristics: Formation of n- type and p-type semiconductor –Construction of P-n junction diode, symbol - V-I Characteristics- Diode Applications-Rectifiers – Half wave-Full wave-mid point and bridge type-simple Problems. Formation of PNP and NPN transistors – CE configuration of NPN and PNP transistors- applications -Transistor as an amplifier-SCR characteristics and applications-construction and Principle of CRO(operation only)-Applications..

UNIT - V	**Operational Amplifiers and Digital Electronics**

Operational Amplifiers: Introduction, block diagram, basic op-amp circuits: Inverting, Non Inverting, summer, subtractor, voltage follower.
Introduction, Switching and Logic Levels, Digital Waveform, characteristics of digital ICs, logic gates, number systems.

Textbooks:

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

Reference Books:

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

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Computer Science and Engineering

Course Code	COMPUTER SCIENCE & ENGINEERING WORKSHOP	L	T	P	C
		0	0	3	1.5

I Year 2nd Semester

Course Objectives:

- To make the students know about the internal parts of a computer, assembling and dissembling a computer from the parts, preparing a computer for use by installing the operating system
- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations and LAteX
- To learn about Networking of computers and use Internet facility for Browsing and Searching
- To learn about Google Forms and Google Sites
-

Course Outcomes (COs):

- Disassemble and Assemble a Personal Computer and prepare the computer ready to use.
- Prepare the Documents using Word processors and Prepare spread sheets for calculations
- .using excel and also the documents using LAteX.
- Prepare Slide presentations using the presentation tool.
- Interconnect two or more computers for information sharing.

List of Experiments/Exercises

Note: Use open source tools for implementation of the following exercises.

Preparing your Computer

Task 1: Learn about Computer: 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.

Task 2: Assembling a Computer: 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

Task 3: Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4: **Operating system features**: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

Networking and Internet

Task 5: Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc. should be done by the student. The entire process has to be documented.

Task 6: Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc. If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

Task 7: Antivirus: Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

Productivity tools

Task 8: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered, Image Manipulation tools.

Task 9: Presentations: creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show.

Task 10: Spreadsheet: Students should be 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. Students should submit a user manual of the Spreadsheet

Task 11: LateX: Introduction to Latex and its installation and different IDEs. Creating first document using Latex, using content into sections using article and book class of LaTeX. Styling Pages: reviewing and customizing different paper sizes and formats. Formatting text (styles, size, alignment, colors and adding bullets and numbered items, inserting mathematical symbols, and images, etc.). Creating basic tables, adding simple and dashed borders, merging rows and columns. Referencing and Indexing: cross-referencing (refer to sections, table, images), bibliography (references).

Task 12: Google Forms and Google Sites: Create a Google Form, Add Questions, Edit Questions, Preview and Send Form, Analyze Form Responses. Create a Website using Google Sites. Update, Share and Publish a website.

Sample Programs: Create a Feedback Survey form and download the Responses, Create Online Quiz and Analyze Responses, Create and Publish “Student Profile Website”.

Task 13: Fundamentals of web programming: HTML, DHTML, and JAVA Script.

References:

1. Introduction to Computers, Peter Norton, McGraw Hill
2. MOS study guide for word, Excel, Powerpoint& Outlook Exams, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs, Bigelows, TMH

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Computer Science and Engineering

Course Code	PYTHON AND DATA STRUCTURES LAB	L	T	P	C
		0	0	4	2

I Year 2nd Semester

Course Objectives:

- To train solving computational problems
- To elucidate solving mathematical problems using Python programming language
- To illustrate the features of Python language

Course Outcomes (CO):

- 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

List of 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()

   1437746094.5735958

   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/ π :
11. 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.

12. 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.
13. Given a text of characters. Write a program which counts number of vowels, consonants and special characters.
14. 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.
15. Given rows of text, write it in the form of columns.
16. 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

17. 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

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

19. 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.

20. 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.

21. 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.

22. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.

23. Write a program illustrating the object oriented features supported by Python.

24. 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.

25. 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.

26. 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)

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

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Computer Science and Engineering

Course Code	CHEMISTRY LAB (Common CSE,ECE and EEE Branches)	L	T	P	C
		0	0	3	1.5

I Year 2nd Semester

Course Objectives:

- Verify the fundamental concepts with experiment

Course Outcomes (CO):

- **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:** Verification of Beer-Lambert's law
- **Identify:** Acid -base buffer solution pH meter

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. Verification of Beer-Lambert's law with $K_2Cr_2O_7$ solution.

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

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Computer Science and Engineering

Course Code	BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB	L	T	P	C
		0	0	3	1.5

I Year 1st Semester

Course Objectives:

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

Course Outcomes (CO):

- Verify Kirchoff's Laws & Superposition theorem.
- Perform testing on AC and DC Machines.
- Study I – V Characteristics of PV Cell
- Describe construction, working and characteristics of diodes, transistors and operational amplifiers
- Demonstrate how electronic devices are used for applications such as rectification, switching and amplification
- Build different building blocks in digital electronics using logic gates
- Explain functionality of flip-flops, shift registers and counters for data processing applications

List of Experiments:

Part-A
Electrical Engineering Lab

List of experiments: -

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

Part-B
Electronics Engineering Lab

List of Experiments:

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

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Computer Science and Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science and Engineering					
II Year Ist Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Mathematical Foundation of Computer Science	BS	3-0-0	3
2.		Digital Electronics& Microprocessors	ES	3-0-0	3
3.		Computer Organization	PC	3-0-0	3
4.		Object Oriented Programming Through Java	PC	3-0-0	3
5.		Design and Analysis of Algorithms	PC	1-0-4	3
6.		Digital Electronics& Microprocessors Lab	ES	0-0-3	1.5
7.		Object Oriented Programming Through Java Lab	PC	0-0-3	1.5
8.		Algorithms Lab	PC	0-0-3	1.5
9.		**Skill oriented course*** Exploratory Data Analysis Using Python Programming	SC	1-0-2	2
10.		**NCC/NSS ACTIVITIES**			
				Total	**21.5**

Category	**CREDITS**
Basic Science course	3
Professional core Courses	12
Engineering Science Courses	4.5
Skill oriented course*	2
TOTAL CREDITS	**21.5**

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Computer Science and Engineering

Course Code	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	L	T	P	C
		3	0	0	3

II Year 1st Semester

Course Objectives:

- To explain about the Boolean Algebra, Graph theory and Recurrence relations.
- To demonstrate the application of basic methods of discrete mathematics in Computer Science problem solving.
- To elucidate solving mathematical problems from algorithmic perspective.
- To introduce the mathematical concepts which will be useful to study advanced courses Design and Analysis of Algorithms, Theory of Computation, Cryptography and Software Engineering etc.
- To reveal how solutions of graph theory can be applied to computer science problems

Course Outcomes (CO):

After completion of this course the student would be able to

- Evaluate elementary mathematical arguments and identify fallacious reasoning
- Understand the properties of Compatibility, Equivalence and Partial Ordering relations, Lattices and has see Diagrams
- Understand the general properties of Algebric Systems, Semi Groups, Monoids and Groups
- Design solutions for problems using breadth first and depth first search techniques
- Solve the homogeneous and non-homogeneous recurrence relations
- Apply the concepts of functions to identify the Isomorphic Graphs
- Identify Euler Graphs, Hamilton Graph and Chromatic Number of a graph

UNIT - I

Statements and Notation, **Connectives**- Negation, Conjunction, Disjunction, Conditional and Bi-conditional, Statement formulas and Truth Tables. Well-formed formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications.
Normal Forms: Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Disjunctive Normal Forms (PDNF), Principal Conjunctive Normal Forms (PCNF), Ordering and Uniqueness of Normal Forms.

- **The Theory of Inference for the Statement Calculus:** Rules of Inference, Consistency of Premises and Indirect Method of Proof.

The predicate Calculus, **Inference theory of the Predicate Calculus**.

UNIT - II

Set Theory: Basic concepts of Set Theory, Representation of Discrete structures, Relations and Ordering, Functions, Recursion.
Lattices and Boolean algebra: Lattices as Partially Ordered Sets, Boolean algebra, Boolean Functions, Representation and Minimization of Boolean Functions.
Algebraic Structures: Algebraic Systems: Examples and General Properties, Semi Groups and Monoids, Groups.

UNIT - III

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Permutations and Combinations with constrained Representations, Binomial Coefficients, The Binomial and Multinomial Theorems, The Principle of Inclusion and Exclusion.

UNIT - IV

Recurrence Relations: Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, The method of Characteristic Roots, Solution of Inhomogeneous Recurrence Relations

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Computer Science and Engineering

UNIT - V	
Graphs: Basic Concepts, Isomorphism and Sub graphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi graphs and Euler Circuits, Hamiltonian Graphs, Chromatics Number, The Four-Color Problem.	

Textbooks:

1. Joe L. Mott. Abraham Kandel and Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 2nd Edition, Pearson, 2008. (for Units III toV).
2. J P Trembly and R Manohar, "Discrete Mathematical Structures with Applications to Computer Science", 1st Edition, McGraw Hill, 2017(For Unit I&II).

Reference Books:

1. Ralph P. Grimaldi and B.V. Ramana, "Discrete and Combinatorial Mathematics, an Applied Introduction", 5th Edition, Pearson, 2016.
2. NarsinghDeo, "Graph Theory with Applications to Engineering", Prentice Hall,1979.
3. D.S. Malik and M.K. Sen, "Discrete Mathematics theory and Applications", IstEdition, Cenegage Learning, 2012.
4. C L Liu and D P Mohapatra, "Elements of Discrete Mathematics, A computer Oriented approach", 4th edition, MCGRAW-HILL, 2018.

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Computer Science and Engineering

Course Code	DIGITAL ELECTRONICS AND MICRO PROCESSORS	L	T	P	C
		3	0	0	3

II Year 1st Semester

Course Objectives:

- To understand all the concepts of Logic Gates and Boolean Functions.
- To learn about Combinational Logic and Sequential Logic Circuits.
- To design logic circuits using Programmable Logic Devices.
- To understand basics of 8086 Microprocessor and 8051 Microcontroller.
- To understand architecture of 8086 Microprocessor and 8051 Microcontroller.
- To learn Assembly Language Programming of 8086 and 8051

Course Outcomes (CO):

After Completion of this course, the student will be able to:
Design any Logic circuit using basic concepts of Boolean Algebra.
• Design any Logic circuit using basic concepts of PLDs.
• Design and develop any application using 8086 Microprocessor.
• Design and develop any application using 8051 Microcontroller

UNIT - I	**Number Systems & Code Conversion**	

Number Systems & Code conversion, Boolean Algebra & Logic Gates, Truth Tables, Universal Gates, Simplification of Boolean functions, SOP and POS methods – Simplification of Boolean functions using K-maps, Signed and Unsigned Binary Numbers.

UNIT - II	**Combinational Circuits**	

Combinational Logic Circuits: Adders &Subtractors, Multiplexers, Demultiplexers, Encoders, Decoders, Programmable Logic Devices.

UNIT - III	**Sequential Circuits**	

Sequential Logic Circuits: RS, Clocked RS, D, JK, Master Slave JK, T Flip-Flops, Shift Registers, Types of Shift Registers, Counters, Ripple Counter, Synchronous Counters, Asynchronous Counters, Up-Down Counter.

UNIT - IV	**Microprocessors - I**	

8085 microprocessor Review (brief details only), 8086 microprocessor, Functional Diagram, register organization 8086, Flag register of 8086 and its functions, Addressing modes of 8086, Pin diagram of 8086, Minimum mode & Maximum mode operation of 8086, Interrupts in 8086.

UNIT - V	**Microprocessors –II**	

Instruction set of 8086, Assembler directives, Procedures and Macros, Simple programs involving arithmetic, logical, branch instructions, Ascending, Descending and Block move programs, String Manipulation Instructions. Overview of 8051 microcontroller, Architecture, I/O ports and Memory organization, addressing modes and instruction set of 8051(Brief details only), Simple Programs.

Textbooks:

1.M. Morris Mano, Michael D. Ciletti, Digital Design, Pearson Education, 5th Edition, 2013
2.Anil K. Maini, Digital Electronics: Principles, Devices and Applications, John Wiley & Sons
3.N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Microprocessor and Microcontrollers, Oxford Publishers, 2010.
4.Advanced microprocessors and peripherals-A.K Ray and K.M.Bhurchandani, TMH, 2nd edition,

Reference Books:

1. Thomas L. Floyd, Digital Fundamentals – A Systems Approach, Pearson, 2013.
2. Charles H. Roth, Fundamentals of Logic Design, Cengage Learning, 5th, Edition, 2004.
3. D.V.Hall, Microprocessors and Interfacing. TMGH, 2nd edition, 2006.
4.Kenneth.J.Ayala, The 8051 microcontroller, 3rd edition, Cengage Learning,2010

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Computer Science and Engineering

Course Code	COMPUTER ORGANIZATION	L	T	P	C
		3	0	0	3
II Year 1st Semester					

Course Objectives:

- To learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design
- To understand the structure and behavior of various functional modules of a computer.
- To learn the techniques that computers use to communicate with I/O devices
- To acquire the concept of pipelining and exploitation of processing speed.
- To learn the basic characteristics of multiprocessors

Course Outcomes (CO):

After completion of the course, students will be able to

- Understand computer architecture concepts related to the design of modern processors, memories and I/Os
- Identify the hardware requirements for cache memory and virtual memory
- Design algorithms to exploit pipelining and multiprocessors
- Understand the importance and trade-offs of different types of memories
- Identify pipeline hazards and possible solutions to those hazards

UNIT - I	**Basic Structure of Computer, Machine Instructions and Programs**

Basic Structure of Computer: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multicomputer.
Machine Instructions and Programs: Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations, Stacks and Queues, Subroutines, Additional Instructions

UNIT - II	**Arithmetic, Basic Processing Unit**

Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.
Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, and Multi programmed Control.

UNIT - III	**The MemorySystem**

The Memory System: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

UNIT - IV	**Input/Output Organization:**

Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces.

UNIT - V	**Pipelining, Large Computer Systems**

Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets.
Large Computer Systems: Forms of Parallel Processing, Array Processors, The Structure of General-Purpose multiprocessors, Interconnection Networks.

Textbooks:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, “Computer Organization”, 5th Edition, McGraw Hill Education, 2013

Reference Books:

1. M.Morris Mano, “Computer System Architecture”, 3rd Edition, Pearson Education.
2. Themes and Variations, Alan Clements, “Computer Organization and Architecture”, CENGAGE Learning.
3. SmrutiRanjanSarangi, “Computer Organization and Architecture”, McGraw Hill Education.
4. John P.Hayes, “Computer Architecture and Organization”, McGraw Hill Education

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Computer Science and Engineering

Course Code	OBJECT ORIENTED PROGRAMMING THROUGH JAVA	L	T	P	C
		3	0	0	3

II Year 1st Semester

Course Objectives:

- To understand object oriented concepts and problem solving techniques
- To obtain knowledge about the principles of inheritance and polymorphism
- To implement the concept of packages, interfaces, exception handling and concurrency mechanism.
- To design the GUIs using applets and swing controls.
- To understand the Java Database Connectivity Architecture

Course Outcomes (CO):

After completion of the course, students will be able to

- Solve real-world problems using OOP techniques.
- Apply code reusability through inheritance, packages and interfaces
- Solve problems using java collection framework and I/O classes.
- Develop applications by using parallel streams for better performance.
- Develop applets for web applications.
- Build GUIs and handle events generated by user interactions.
- Use the JDBC API to access the database

UNIT - I	**Introduction**	

Introduction: Introduction to Object Oriented Programming, The History and Evolution of Java, Introduction to Classes, Objects, Methods, Constructors, this keyword, Garbage Collection, Data Types, Variables, Type Conversion and Casting, Arrays, Operators, Control Statements, Method Overloading, Constructor Overloading, Parameter Passing, Recursion, String Class and String handling methods.

UNIT - II	**Inheritance, Packages, Interfaces**	9Hrs

Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, Using final with inheritance, Object class,
Packages: Basics, Finding packages and CLASSPATH, Access Protection, Importing packages.
Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

UNIT - III	**Exception handling, Stream based I/O** (java.io)	

Exception handling - Fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built-in exceptions, creating own exception subclasses.
Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and Writing Files, Random access file operations, The Console class.

UNIT - IV	**Multithreading, Event Handing**	

Multithreading: The Java thread model, Creating threads, Thread priorities, Synchronizing threads, Inter thread communication.
Event Handing: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

UNIT - V	**Applet, GUI Programming with Swings, Accessing Databases with JDBC**	

Applet: Basics, Architecture, Applet Skeleton, requesting repainting, using the status window, passing parameters to applets
GUI Programming with Swings – The origin and design philosophy of swing, components and containers, layout managers, event handling, using a push button, jtextfield, jlabel and image icon, the swing buttons,

jtext field, jscrollpane, jlist, jcombobox, trees, jtable, An overview of jmenubar, jmenu and jmenuitem, creating a main menu, showmessagedialog, showconfirmdialog, showinputdialog, showoptiondialog, jdialog, create a modeless dialog.

Accessing Databases with JDBC:

Types of Drivers, JDBC Architecture, JDBC classes and Interfaces, Basic steps in developing JDBC applications, Creating a new database and table with JDBC.

Textbooks:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Java How to Program, 10th Edition, Paul Dietel, Harvey Dietel, Pearson Education.

Reference Books:

1. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.
2. Core Java Volume – 1 Fundamentals, Cay S. Horstmann, Pearson Education.
3. Java Programming for core and advanced learners, Sagayaraj, Dennis, Karthik andGajalakshmi, University Press
4. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
5. Object Oriented Programming through Java, P. Radha Krishna, University Press.
6. Programming in Java, S. Malhotra, S. Chaudhary, 2nd edition, Oxford Univ. Press.
7. Java Programming and Object-oriented Application Development, R.A. Johnson, Cengage Learning.

Online Learning Resources:

https://www.w3schools.com/java/java_oop.asp
http://peterindia.net/JavaFiles.html

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Computer Science and Engineering

Course Code	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		3	0	0	3

II Year 1st Semester

Course Objectives:

- Learn asymptotic notations, and analyze the performance of different algorithms.
- Understand and implement various data structures.
- Learn and implement greedy, divide and conquer, dynamic programming and backtracking algorithms using relevant data structures.
- Understand non-deterministic algorithms, polynomial and non-polynomial problems.

Course Outcomes (CO):

After completion of the course, students will be able to

- Analyze the complexity of algorithms and apply asymptotic notations.
- Apply non-linear data structures and their operations.
- Understand and apply greedy, divide and conquer algorithms.
- Develop dynamic programming algorithms for various real-time applications.
- Illustrate Backtracking algorithms for various applications.

UNIT - I

Introduction: Algorithm, Algorithm specification, Performance analysis.
Divide and Conquer: General method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Selection, Strassen's matrix multiplication..

UNIT - II

Greedy Method: General method, Knapsack problem, Job Scheduling with Deadlines, Minimum cost Spanning Trees, Optimal storage on tapes, Single-source shortest paths.
Dynamic programming: General Method, Multistage graphs, All-pairs shortest paths, Optimal binary search trees, 0/1 knapsack, the traveling salesperson problem.

UNIT - III

Basic Traversal and Search Techniques: Techniques for binary trees, Techniques for Graphs, Connected components and Spanning trees, Bi-connected components and DFS
Back tracking: General Method, 8 – queens problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles, Knapsack Problem.

UNIT - IV

Branch and Bound: The method, Travelling salesperson, 0/1 Knapsack problem, Efficiency considerations.
Lower Bound Theory: Comparison trees, Lower bounds through reductions- Multiplying triangular matrices, inverting a lower triangular matrix, computing the transitive closure.

UNIT - V

NP – Hard and NP – Complete Problems: NP Hardness, NP Completeness, Consequences of being in P, Cook‘s Theorem, Reduction Source Problems, Reductions: Reductions for some known problems

Textbooks:

1. Ellis Horowitz, Sartaj Sahni and Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, 2012, University Press.
2. ParagHimanshu Dave and Himanshu Bhalchandra Dave, "Design and Analysis of Algorithms", Second Edition, Pearson Education.

References

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education,2012.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint2006.
4. Donald E. Knuth, "The Art of Computer Programming", Volumes 1&3 Pearson Education, 2009.

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Computer Science and Engineering

Course Code	DIGITAL ELECTRONICS & MICROPROCESSORS LAB	L	T	P	C
		0	0	3	1.5

II Year 1st Semester

Course Objectives:

- To understand all the concepts of Logic Gates and Boolean Functions.
- To learn about Combinational Logic and Sequential Logic Circuits.
- To design logic circuits using Programmable Logic Devices.
- To understand basics of 8086 Microprocessor and 8051 Microcontroller.
- To understand architecture of 8086 Microprocessor and 8051 Microcontroller.
- To learn Assembly Language Programming of 8086 and 8051.

Course Outcomes (CO):

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

- Design any Logic circuit using basic concepts of Boolean Algebra.
- Design any Logic circuit using basic concepts of PLDs.
- Design and develop any application using 8086 Microprocessor.
- Design and develop any application using 8051 Microcontroller.

List of Experiments:

Note: Minimum of 12 (6+6) experiments shall be conducted from both the sections given below:

DIGITAL ELECTRONICS:

1. Verification of Truth Table for AND, OR, NOT, NAND, NOR and EX-OR gates.
2. Realisation of NOT, AND, OR, EX-OR gates with only NAND and only NOR gates.
3. Karnaughmap Reduction and Logic Circuit Implementation.
4. Verification of DeMorgan's Laws.
5. Implementation of Half-Adder and Half-Subtractor.
6. Implementation of Full-Adder and Full-Subtractor.
7. Four Bit Binary Adder
8. Four Bit Binary Subtractor using 1's and 2's Complement.

MICROPROCESSORS (8086 Assembly Language Programming)

1. 8 Bit Addition and Subtraction.
2. 16 Bit Addition.
3. BCD Addition .
4. BCD Subtraction.
5. 8 Bit Multiplication.
6. 8 Bit Division.
7. Searching for an Element in an Array.
8. Sorting in Ascending and Descending Orders.
9. Finding Largest and Smallest Elements from an Array.
10. Block Move

Text Books:

1.M. Morris Mano, Michael D. Ciletti, Digital Design, Pearson Education, 5th Edition, 2013.

2. Anil K. Maini, Digital Electronics: Principles, Devices and Applications, John Wiley & Sons, Ltd., 2007.
3. N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Microprocessor and Microcontrollers,Oxford Publishers, 2010.
4. Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH, 2nd edition, 2006.

Reference Books:

1. Thomas L. Floyd, Digital Fundamentals – A Systems Approach, Pearson, 2013.
2. Charles H. Roth, Fundamentals of Logic Design, Cengage Learning, 5th, Edition, 2004.
3. D.V.Hall, Microprocessors and Interfacing. TMGH, 2nd edition, 2006.
4. Kenneth. J. Ayala, The 8051 microcontroller, 3rd edition, Cengage Learning, 2010.

Online Learning Resources/Virtual Labs:

https://www.vlab.co.in/

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Computer Science and Engineering

Course Code	OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB	L	T	P	C
		0	0	3	1.5

II Year 1st Semester

Course Objectives:

- To introduce the concepts of Java.
- To Practice object-oriented programs and build java applications.
- To implement java programs for establishing interfaces.
- To implement sample programs for developing reusable software components.
- To establish database connectivity in java and implement GUI applications.

Course Outcomes (CO):

After completion of the course, students will be able to

- Recognize the Java programming environment.
- Develop efficient programs using multithreading.
- Design reliable programs using Java exception handling features.
- Extend the programming functionality supported by Java.
- Select appropriate programming constructs to solve a problem.

List of Experiments:

Week-1

a. Installation of Java software, study of any Integrated development environment, Use Eclipse or Netbeans platform and acquaint with the various menus. Create a test project, add a test class and run it.

See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods and classes. Try debug step by step with java program to find prime numbers between 1 to n.

b. Write a Java program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula.

c. Develop a Java application to generate Electricity bills. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Commute the bill amount using the following tariff.

If the type of the EB connection is domestic, calculate the amount to be paid as follows:

- First 100 units - Rs. 1 per unit
- 101-200 units - Rs. 2.50 per unit
- 201 -500 units - Rs. 4 per unit
- > 501 units - Rs. 6 per unit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:

- First 100 units - Rs. 2 per unit
- 101-200 units - Rs. 4.50 per unit
- 201 -500 units - Rs. 6 per unit
- > 501 units - Rs. 7 per unit

d. Write a Java program to multiply two given matrices.

Week-2

a. Write Java program on use of inheritance, preventing inheritance using final, abstract classes.

b. Write Java program on dynamic binding, differentiating method overloading and overriding.

c. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen) using

Interfaces.

Week-3

a. Write Java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read, display it only if it's not a duplicate of any number already read display the complete set of unique values input after the user enters each new value.

b. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

c. Write a Java program to read the time intervals (HH:MM) and to compare system time if the system Time between your time intervals print correct time and exit else try again to repute the same thing. By using StringToknizer class.

Week-4

a. Write a Java program to implement user defined exception handling.

b. Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it‘s not a duplicate of any number already read. Display the complete set of unique values input after the user enters each new value.

Week-5

a. Write a Java program that creates a user interface to perform integer division. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

b. Write a Java program that creates three threads. First thread displays ―Good Morning‖ every one second, the second thread displays ―Hello‖ every two seconds and the third thread displays ―Welcome‖ every three seconds.

Week-6

a. Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by .part where n is the sequence number of the part file.

b. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

Week-7

a. Write a java program that displays the number of characters, lines and words in a text file.

b. Write a java program that reads a file and displays the file on the screen with line number before each line.

Week-8

a. Write a Java program that correctly implements the producer-consumer problem using the concept of inter thread communication.

b. Develop a Java application for stack operation using Buttons and JOptionPane input and Message dialog box.

c. Develop a Java application to perform Addition, Division, Multiplication and subtraction using the JOptionPane dialog Box and Textfields.

Week-9

a. Develop a Java application for the blinking eyes and mouth should open while blinking.

b. Develop a Java application that simulates a traffic light. The program lets the user select one of the three lights: Red, Yellow or Green with radio buttons. On selecting a button an appropriate message with ―STOP‖ or ―READY‖ or ‖GO‖ should appear above the buttons in the selected color.Initially, there is no message shown.

Week-10

a. Develop a Java application to implement the opening of a door while opening man should present before hut and closing man should disappear.

b. Develop a Java application by using JtextField to read decimal values and converting a decimal number into a binary number then print the binary value in another JtextField.

Week-11

a. Develop a Java application that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. Use adapter classes.

b. Develop a Java application to demonstrate the key event handlers.

Week-12

a. Develop a Java application to find the maximum value from the given type of elements using a generic function.

b. Develop a Java application that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.

c . Develop a Java application for handling mouse events.

Week-13

a. Develop a Java application to establish a JDBC connection, create a table student with properties name, register number, mark1, mark2, mark3. Insert the values into the table by using java and display the information of the students at front end.

References:

1. P. J. Deitel, H. M. Deitel, "Java for Programmers", Pearson Education, PHI, 4th Edition, 2007.
2. P. Radha Krishna, "Object Oriented Programming through Java", Universities Press, 2nd Edition, 2007
3. Bruce Eckel, "Thinking in Java", Pearson Education, 4th Edition, 2006.
4. Sachin Malhotra, Saurabh Chaudhary, "Programming in Java", Oxford University Press, 5th Edition, 2010.

Online Learning Resources/Virtual Labs:

https://java-iitd.vlabs.ac.in/
http://peterindia.net/JavaFiles.html

Sri Krishnadevaraya University College of Engineering & Technology
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Computer Science and Engineering

Course Code	ALGORITHMS LAB	L	T	P	C
		0	0	3	1.5

II Year 1st Semester

Course Objectives:

- Learn data structures for various applications.
- Implement different operations of data structures by optimizing the performance.
- Develop applications using Greedy, Divide and Conquer, dynamic programming.
- Implement applications for backtracking algorithms using relevant data structures.

Course Outcomes (CO):

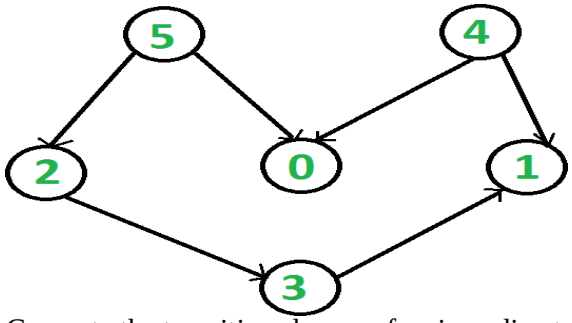
After completion of the course, students will be able to

- Understand and apply data structure operations.
- Understand and apply non-linear data structure operations.
- Apply Greedy, divide and conquer algorithms.
- Develop dynamic programming algorithms for various real-time applications.
- Illustrate and apply backtracking algorithms, further able to understand non-deterministic algorithms.

Week 1
QUICK SORT:
Sort a given set of elements using the quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the 1st to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

Week 2
MERGE SORT:
Implement merge sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

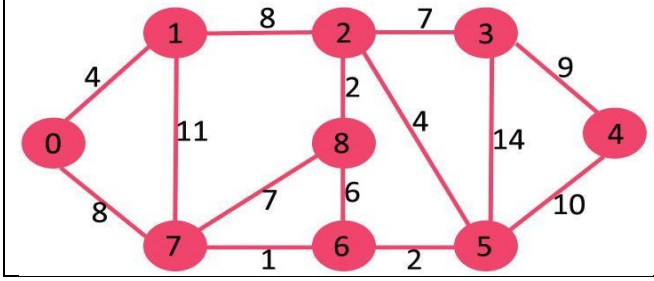
Week 3
WARSHALL'S ALGORITHM.
a. Obtain the Topological ordering of vertices in a given digraph.



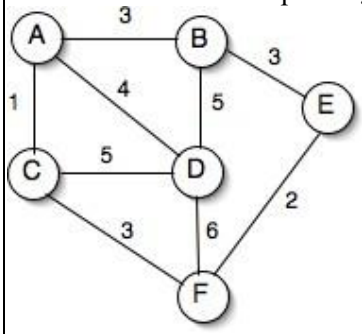
b.Compute the transitive closure of a given directed graph using Warshall's algorithm.

Week 4
KNAPSACK PROBLEM
Implement 0/1 Knapsack problem using Dynamic Programming.

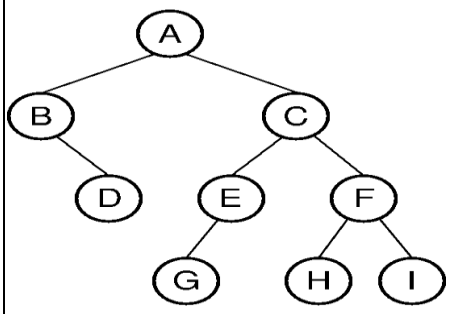
Week 5
From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.



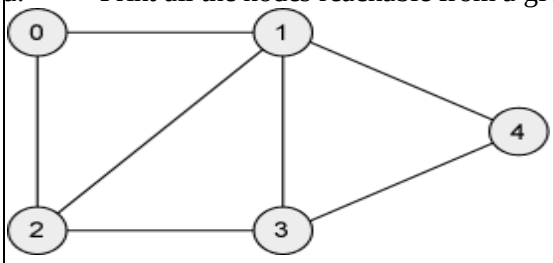
Week6
MINIMUM COST SPANNING TREE
Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.



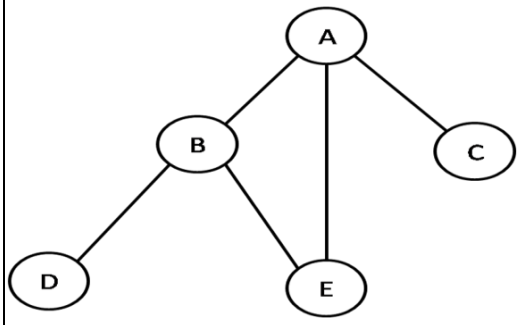
Week 7
TREE TRAVESRSALS
Perform various tree traversal algorithms for a given tree



Week 8
GRAPH TRAVERSALS
a. Print all the nodes reachable from a given starting node in a digraph using BFS method.



b. Check whether a given graph is connected or not using DFS method.



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Computer Science and Engineering

Week 9

SUM OF SUB SETS PROBLEM

Find a subset of a given set S = {sl, s2, , sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1, 2, 6} and {1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.

Week 10

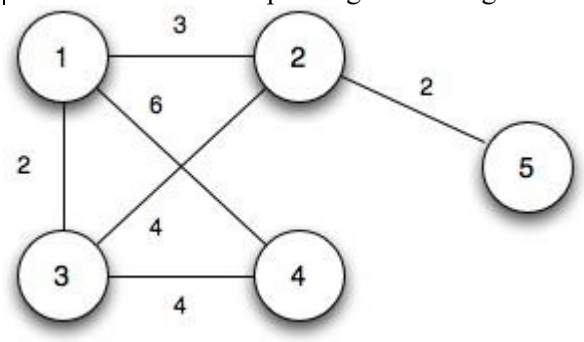
TRAVELLING SALES PERSON PROBLEM

Implement any scheme to find the optimal solution for the Traveling Sales Person problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.

Week 11

MINIMUM COST SPANNING TREE

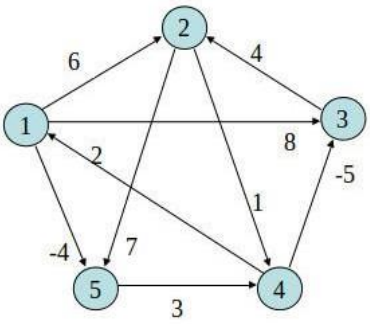
Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.



Week 12

ALL PAIRS SHORTEST PATHS

Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.



	1	2	3	4	5
1	0	6	8	∞	-4
2	∞	0	∞	1	7
3	∞	4	0	∞	∞
4	2	∞	-5	0	∞
5	∞	∞	∞	3	0

Week 13

N QUEENS PROBLEM

Implement N Queen's problem using Back Tracking.

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Computer Science and Engineering

Course Code	EXPLORATORY DATA ANALYSIS USING PYTHON PROGRAMMING	L	T	P	C
		1	0	2	2

II Year 1st Semester

Course Objectives:

- To learn the basic concepts of software engineering and life cycle models
- To explore the importance of Databases in application Development
- Acquire programming skills in core Python
- To understand the importance of Object-oriented Programming

Course Outcomes (CO):

Students should be able to

- Identify the issues in software requirements specification and enable to write SRS documents for software development problems
- Explore the use of Object oriented concepts to solve Real-life problems
- Design database for any real-world problem
- Solve mathematical problems using Python programming language

Module 1. Basic concepts in software engineering and software project management

Basic concepts: abstraction versus decomposition, the evolution of software engineering techniques, Software development life cycle
Software project management: project planning and project scheduling

Task:
1. Identifying the Requirements from Problem Statements

Module 2. Basic Concepts of Databases
Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Data Definition Language(DDL) Statements: (Create table, Alter table, Drop table), Data Manipulation Language(DML) Statements
Task:
1. Implement Data Definition Language(DDL) Statements: (Create table, Alter table, Drop table)
2. Implement Data Manipulation Language(DML) Statements

Module 3. Python Programming:
Introduction to Python: Features of Python, Data types, Operators, Input and output, Control Statements, Looping statements
Python Data Structures: Lists, Dictionaries, Tuples.

Strings: Creating strings and basic operations on strings, string testing methods.

Functions: Defining a function- Calling a function- Types of functions-Function Arguments- Anonymous functions- Global and local variables

OOPS Concepts; Classes and objects- Attributes- Inheritance- Overloading- Overriding- Data hiding

Modules and Packages: Standard modules-Importing own module as well as external modules Understanding Packages Powerful Lamda function in python Programming using functions, modules and external packages

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Computer Science and Engineering

Working with Data in Python: Printing on screen- Reading data from keyboard- Opening and closing file- Reading and writing files- Functions-Loading Data with Pandas-Numpy

Tasks:

1. OPERATORS

a. Read a list of numbers and write a program to check whether a particular element is present or not using membership operators.
b. Read your name and age and write a program to display the year in which you will turn 100 years old.
c. Read radius and height of a cone and write a program to find the volume of a cone.
d. Write a program to compute distance between two points taking input from the user (Hint: use Pythagorean theorem)

2. CONTROL STRUCTURES

a. Read your email id and write a program to display the no of vowels, consonants, digits and white spaces in it using if…elif…else statement.
b. Write a program to create and display a dictionary by storing the antonyms of words. Find the antonym of a particular word given by the user from the dictionary using while loop.
c. Write a Program to find the sum of a Series 1/1! + 2/2! + 3/3! + 4/4! +…….+ n/n!. (Input :n = 5, Output : 2.70833)
d. In number theory, an abundant number or excessive number is a number for which the sum of its proper divisors is greater than the number itself. Write a program to find out, if the given number is abundant. (Input: 12, Sum of divisors of 12 = 1 + 2 + 3 + 4 + 6 = 16, sum of divisors 16 > original number 12)

3: LIST

a. Read a list of numbers and print the numbers divisible by x but not by y (Assume x = 4 and y = 5).
b. Read a list of numbers and print the sum of odd integers and even integers from the list.(Ex: [23, 10, 15, 14, 63], odd numbers sum = 101, even numbers sum = 24)
c. Read a list of numbers and print numbers present in odd index position. (Ex: [10, 25, 30, 47, 56, 84, 96], The numbers in odd index position: 25 47 84).
d. Read a list of numbers and remove the duplicate numbers from it. (Ex: Enter a list with duplicate elements: 10 20 40 10 50 30 20 10 80, The unique list is: [10, 20, 30, 40, 50, 80])

4: TUPLE

a. Given a list of tuples. Write a program to find tuples which have all elements divisible by K from a list of tuples. test_list = [(6, 24, 12), (60, 12, 6), (12, 18, 21)], K = 6, Output : [(6, 24, 12), (60, 12, 6)]
b. Given a list of tuples. Write a program to filter all uppercase characters tuples from given list of tuples. (Input: test_list = [(“GFG”, “IS”, “BEST”), (“GFg”, “AVERAGE”), (“GfG”,), (“Gfg”, “CS”)], Output : [(„GFG“, „IS“, „BEST“)]).
c. Given a tuple and a list as input, write a program to count the occurrences of all items of the list in the tuple. (Input : tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output : 3)

5: SET

a. Write a program to generate and print a dictionary that contains a number (between 1 and n) in the form (x, x*x).
b. Write a program to perform union, intersection and difference using Set A and Set B.
c. Write a program to count number of vowels using sets in given string (Input : “Hello World”, Output: No. of vowels : 3)
d. Write a program to form concatenated string by taking uncommon characters from two strings using set concept (Input : S1 = "aacdb", S2 = "gafd", Output : "cbgf").

6: DICTIONARY

a. Write a program to do the following operations:
i. Create a empty dictionary with dict() method
ii. Add elements one at a time
iii. Update existing key‟s value
iv. Access an element using a key and also get() method
v. Deleting a key value using del() method
b. Write a program to create a dictionary and apply the following methods:
i. pop() method
ii. popitem() method
iii. clear() method
c. Given a dictionary, write a program to find the sum of all items in the dictionary.
d. Write a program to merge two dictionaries using update() method.

7: STRINGS

a. Given a string, write a program to check if the string is symmetrical and palindrome or not. A string is said to be symmetrical if both the halves of the string are the same and a string is said to be a palindrome string if one half of the string is the reverse of the other half or if a string appears same when read forward or backward.
b. Write a program to read a string and count the number of vowel letters and print all letters except 'e' and 's'.
c. Write a program to read a line of text and remove the initial word from given text. (Hint: Use split() method, Input : India is my country. Output : is my country)
d. Write a program to read a string and count how many times each letter appears. (Histogram).

8: USER DEFINED FUNCTIONS

a. A generator is a function that produces a sequence of results instead of a single value. Write a generator function for Fibonacci numbers up to n.
b. Write a function merge_dict(dict1, dict2) to merge two Python dictionaries.
c. Write a fact() function to compute the factorial of a given positive number.
d. Given a list of n elements, write a linear_search() function to search a given element x in a list.

9: BUILT-IN FUNCTIONS

a. Write a program to demonstrate the working of built-in statistical functions mean(), mode(), median() by importing statistics library.
b. Write a program to demonstrate the working of built-in trignometric functions sin(), cos(), tan(), hypot(), degrees(), radians() by importing math module.
c. Write a program to demonstrate the working of built-in Logarithmic and Power functions exp(), log(), log2(), log10(), pow() by importing math module.
d. Write a program to demonstrate the working of built-in numeric functions ceil(), floor(), fabs(), factorial(), gcd() by importing math module.

10. CLASS AND OBJECTS

a. Write a program to create a BankAccount class. Your class should support the following methods for
i) Deposit
ii) Withdraw
iii) GetBalanace
iv) PinChange
b. Create a SavingsAccount class that behaves just like a BankAccount, but also has an interest rate and a method that increases the balance by the appropriate amount of interest (Hint:use Inheritance).

c. Write a program to create an employee class and store the employee name, id, age, and salary using the constructor. Display the employee details by invoking employee_info() method and also using dictionary (dict).
d. Access modifiers in Python are used to modify the default scope of variables. Write a program to demonstrate the 3 types of access modifiers: public, private and protected.

11. FILE HANDLING

a. . Write a program to read a filename from the user, open the file (say firstFile.txt) and then perform the following operations:
   i. Count the sentences in the file.
   ii. Count the words in the file.
   iii. Count the characters in the file.

b. . Create a new file (Hello.txt) and copy the text to other file called target.txt. The target.txt file should store only lower case alphabets and display the number of lines copied.
c. Write a Python program to store N student‟s records containing name, roll number and branch. Print the given branch student‟s details only.

References:

1. Rajib Mall, “Fundamentals of Software Engineering”, 5th Edition, PHI, 2018.
2. RamezElmasri, Shamkant, B. Navathe, “Database Systems”, Pearson Education, 6th Edition, 2013.
3.Reema Thareja, “Python Programming - Using Problem Solving Approach”, Oxford Press, 1st Edition, 2017.
4. Larry Lutz, “Python for Beginners: Step-By-Step Guide to Learning Python Programming”, CreateSpace Independent Publishing Platform, First edition, 2018

Online Learning Resources/Virtual Labs:

1. http://vlabs.iitkgp.ernet.in/se/
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php
3. https://python-iitk.vlabs.ac.in

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Computer Science and Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science and Engineering					
II Year IInd Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Probability and Statistics	BS	3-0-0	3
2.		Operating Systems	PC	3-0-0	3
3.		Database Management Systems	PC	3-0-0	3
4.		Software Engineering	PC	3-0-0	3
5.		Managerial Economics and Financial Analysis	HS	3-0-0	3
6		UHV-II: Universal Human Values – Understanding harmony and Ethical Human Conduct	HS	2-1-0	3
6.		Operating Systems Lab	PC	0-0-3	1.5
7.		Database Management Systems Lab	PC	0-0-3	1.5
8.		Software Engineering Lab	PC	0-0-3	1.5
9.		**Skill oriented course*** Web Application Development Client Side	SC	1-0-2	2
				Total	**24.5**
Community Service Project (Mandatory) for 2 months duration during summer vacation					

Category	**CREDITS**
Basic Science Courses	3
Professional core Courses	13.5
Skill oriented course*	2
Humanities and Social Sciences	6
TOTAL CREDITS	**24.5**

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Computer Science and Engineering

Course Code	PROBABILITY AND STATISTICS	L	T	P	C
		3	0	0	3

II Year 2nd Semester

Course Objectives:

This course provides a study of various Mathematical Methods and Statistical Methods which is needed for Artificial Intelligence, Machine Learning, and Data Science and also for Computer Science and engineering problems.

Course Outcomes (CO):

After completion of the course, students will be able to

- Apply logical thinking to problem-solving in context.
- Employ methods related to these concepts in a variety of data science applications.
- Use appropriate technology to aid problem-solving and data analysis.
- The Bayesian process of inference in probabilistic reasoning system.
- Demonstrate skills in unconstrained optimization.
-

UNIT - I	Descriptive statistics and methods for data science	

Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variable: dependent and independent Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, regression lines.

UNIT - II	Probability	

UNIT 2:

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

UNIT - III	Probability distributions	

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

UNIT - IV	Estimation and Testing of hypothesis, large sample tests	

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

.

UNIT - V	Small sample tests	

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

.

Textbooks:

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

Reference Books:

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

Online Learning Resources:

https://www.math.brown.edu/swatson2/classes/data1010/pdf/data1010.pdf

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Computer Science and Engineering

Course Code	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

II Year 2nd Semester

Course Objectives:

The course is designed to

- Understand basic concepts and functions of operating systems
- Understand the processes, threads and scheduling algorithms.
- Provide good insight on various memory management techniques
- Expose the students with different techniques of handling deadlocks
- Explore the concept of file-system and its implementation issues
- Familiarize with the basics of the Linux operating system
- Implement various schemes for achieving system protection and security

Course Outcomes (CO):

After completion of the course, students will be able to

- Realize how applications interact with the operating system
- Analyze the functioning of a kernel in an Operating system.
- Summarize resource management in operating systems
- Analyze various scheduling algorithms
- Examine concurrency mechanism in Operating Systems
- Apply memory management techniques in the design of operating systems
- Understand the functionality of the file system
- Compare and contrast memory management techniques.
- Understand deadlock prevention and avoidance.
- Perform administrative tasks on Linux based systems.

UNIT - I	**Operating Systems Overview, System Structures**	

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Open-Source Operating Systems
System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.

UNIT - II	**Process Concept, Multithreaded Programming,Process Scheduling, Inter-process Communication**	

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.
Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples.
Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples.
Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

UNIT - III	**Memory-Management Strategies, Virtual Memory Management**	

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples.
Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples.

UNIT - IV	**Deadlocks, File Systems**	

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention.
File Systems: Files, Directories, File system implementation, management and optimization.
Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

UNIT - V		

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.
System Security: Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification.
Case Studies: Linux, Microsoft Windows.

Textbooks:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008.

(Topics: Inter-process Communication and File systems.)

Reference Books:

1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.
2. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004

Online Learning Resources:

https://nptel.ac.in/courses/106/106/106106144/
http://peterindia.net/OperatingSystems.html

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Computer Science and Engineering

Course Code	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

II Year 2nd Semester

Course Objectives:

This course is designed to:

- Train in the fundamental concepts of database management systems, database modeling and design, SQL, PL/SQL and system implementation techniques.
- Enable students to model ER diagrams for any customized application
- Inducting appropriate strategies for optimization of queries.
- Provide knowledge on concurrency techniques
- Demonstrate the organization of Databases

Course Outcomes (CO):

After completion of the course, students will be able to

- Design a database for a real-world information system
- Define transactions that preserve the integrity of the database
- Generate tables for a database
- Organize the data to prevent redundancy
- Pose queries to retrieve the information from the database.

UNIT - I	**Introduction, Introduction to Relational Model**	

Introduction: Database systems applications, Database Systems v/s File Systems , view of Data, Data Abstraction , Data Models ,Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Database users and Administrators

Introduction to Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations

UNIT - II	**Introduction to SQL**	

Overview of the SQL Query Language,Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, SQL Join Operations ,Null Values,

Aggregate Functions, Nested Sub-queries, Modification of the Database. Views, destroying / altering tables, Triggers ,Procedures , Relational algebra and Relational Calculus: Tuple Relational Calculus ,Domain Relational Calculus.

UNIT - III	**Database Design and the E-R Model, Relational Database Design**	

Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues.

Relational Database Design:

Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms.

UNIT - IV	**Transaction Management, Concurrency Control**	

Transaction Management

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	**NoSQL**	

Overview and History of NoSQL Databases.Definition of the Four Types of NoSQL Database,Challenges NoSQL approach.

Column-oriented NoSQL databases using Apache HBASE,Column-oriented NoSQL databases using Apache Cassandra , NoSQL Key/Value databases using MongoDB

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Textbooks:
1. A.Silberschatz, H.F.Korth, S.Sudarshan, "Database System Concepts",6/e, TMH 2019
Reference Books:
1. Database Management System, 6/e RamezElmasri, Shamkant B. Navathe, PEA 2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning. 3.Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke,TMH
Online Learning Resources:
https://onlinecourses.nptel.ac.in/noc21_cs04/preview

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Computer Science and Engineering

Course Code	SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

II Year 2nd Semester

Course Objectives:

- To learn the basic concepts of software engineering and life cycle models
- To explore the issues in software requirements specification and enable to write SRS documents for software development problems
- To elucidate the basic concepts of software design and enable to carry out procedural and object oriented design of software development problems
- To understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing
- To reveal the basic concepts in software project management

Course Outcomes (CO):

After completion of the course, students will be able to

- Obtain basic software life cycle activity skills.
- Design software requirements specifications for given problems.
- Implement structure, object oriented analysis and design for given problems.
- Design test cases for given problems.
- Apply quality management concepts at the application level.

UNIT - I	**Basic concepts in software engineering and software project management**	

Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, Halstead's Software Science, project scheduling, staffing, Organization and team structure, risk management, configuration management.

UNIT - II	**Requirements analysis and specification**	

The nature of software, The Unique nature of Webapps, Software Myths, Requirements gathering and analysis, software requirements specification, Traceability, Characteristics of a Good SRS Document, IEEE 830 guidelines, representing complex requirements using decision tables and decision trees, overview of formal system development techniques, axiomatic specification, algebraic specification.

UNIT - III	**Software Design**	

Good Software Design, Cohesion and coupling, Control Hierarchy: Layering, Control Abstraction, Depth and width, Fan-out, Fan-in, Software design approaches, object oriented vs. function oriented design. Overview of SA/SD methodology, structured analysis, Data flow diagram, Extending DFD technique to real life systems, Basic Object oriented concepts, UML Diagrams, Structured design, Detailed design, Design review, Characteristics of a good user interface, User Guidance and Online Help, Mode-based vs Mode-less Interface, Types of user interfaces, Component-based GUI development, User interface design methodology: GUI design methodology.

UNIT - IV	**Coding and Testing**	

Coding standards and guidelines, code review, software documentation, Testing, Black Box Testing, White Box Testing, debugging, integration testing, Program Analysis Tools, system testing, performance testing, regression testing, Testing Object Oriented Programs.

UNIT - V	**Software quality, reliability, and other issues**	

Software reliability, Statistical testing, Software quality and management, ISO 9000, SEI capability maturity model (CMM), Personal software process (PSP), Six sigma, Software quality metrics, CASE and its scope, CASE environment, CASE support in software life cycle, Characteristics of software maintenance, Software reverse engineering, Software maintenance processes model, Estimation maintenance cost. Basic issues in any reuse program, Reuse approach, Reuse at organization level.

Textbooks:

1. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI, 2018.
2. Pressman R, "Software Engineering- Practioner Approach", McGraw Hill.

Reference Books:

1. Somerville, "Software Engineering", Pearson 2.
2. Richard Fairley, "Software Engineering Concepts", Tata McGraw Hill.
3. JalotePankaj, "An integrated approach to Software Engineering", Narosa

Online Learning Resources:

https://nptel.ac.in/courses/106/105/106105182/
http://peterindia.net/SoftwareDevelopment.html

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Computer Science and Engineering

Course Code	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	L	T	P	C
		3	0	0	3

II Year 2ND Semester

Course Objectives:

- To inculcate the basic knowledge of micro economics and financial accounting
- To make the students learn how demand is estimated for different products
- To know the input- output relationship for optimizing production and cost
- To give an overview on investment appraisal methods to promote the students to learn howto plan long-term investment decisions.
- To provide fundamental skills on Accounting and to explain the process of preparing Financial statements

Course Outcomes (CO):

- Understand the fundamentals of Economics viz., Demand, Production, cost andrevenue
- Apply concepts of production , cost and revenues for effective business decisions
- Students can analyze how to invest their capital and maximize returns
- Evaluate the capital budgeting techniques
- Prepare the accounting statements and evaluate the financial performance of business entity.

UNIT - I	**Introduction To Managerial Economics**

Introduction to Economics and Managerial Economics – Definitions-Nature and Scope of Managerial Economics–Demand Analysis- Demand determinants- Law of Demand – Exceptions of law of demand

UNIT - II	**Elasticity And Forecasting Demand**

Elasticity of Demand- Definition-Types-Measurement - Significance of Elasticity of DemandDemand Forecasting- Factors governing demand forecasting- Methods of demand forecasting (survey methods- statistical methods- expert opinion method- test marketing- controlled experiments- judgmental approach to demand forecasting).

UNIT - III	**Theory Of Production And Cost Analysis**

Production Function – Iso-quants- Iso-costs - MRTS- least cost combination of inputs- Cobb-Douglas production function -laws of returns - Internal and External economies of scale. Cost concepts- opportunity cost- fixed Vs variable costs-explicit costs Vs Implicit costs- out of pocket costs Vs Imputed costs- Break-Even Analysis (BEA)- Determination of Break Even Point -Simple Problems- Managerial significance and limitations of BEA.

UNIT - IV	**Forms Of Business Organizations And New EconomicEnvironment**

Business & New Economic Environment- Forms of business organizations-Factors affecting the choice of form of business organization- Features and evaluation of Sole Proprietorship- Partnership- Joint Stock Company- Public Enterprises and their types- Liberalization- Privatization-Globalization - Changing Business Environment in Post-liberalization scenario.

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UNIT - V	**Capital Budgeting And Financial Accounting**

Concept of Capital - Significance - Types of Capital - Components of Working Capital - Sources of Short-term and Long-term Capital - Estimating Working capital requirements – Cash Budget - 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) method (simple problems)-Introduction to Financial Accounting-Double-Entry Book Keeping- preparation of Journal- Ledger-Trial Balance- Final Accounts (Trading & Profit and Loss Account and Balance Sheet with simple adjustments).

Textbooks:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

Reference Books:

1. Ahuja Hl Managerial economics Schand,3/e,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.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

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Computer Science and Engineering

Course Code	UHV-II: UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	L	T	P	C
		2	1	0	3
II Year 2nd Semester					

Course Objectives

- To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Thus, this course is intended to provide a much-needed orientational input in value education to the young enquiring minds.

Course Methodology

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. The course is in the form of 28 lectures (discussions) and 14 practice sessions.
3. It is free from any dogma or value prescriptions.
4. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation – the whole existence is the lab and every activity is a source of reflection.
5. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution.
6. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

Catalogue Description

Every human being has two sets of questions to answer for his/her life: a) what to do? and, b) how to do? The first set pertains to the value domain, and the other to the skill domain. Both are complimentary, but value domain has a higher priority. Today, education has become more and more skill biased, and hence, the basic aspiration of a human being, that is to live with happiness and prosperity, gets defeated, in spite of abundant technological progress. This course is aimed at giving inputs that will help to ensure the right understanding and right feelings in the students in their life and profession, enabling them to lead an ethical life. In this course, the students learn the process of self-exploration, the difference between the Self and the Body, the naturally acceptable feelings in relationships in a family, workplace and society, the comprehensive human goal in the society, the mutual fulfillment in the nature and the co-existence in existence. As a natural outcome of such inputs, they are able to evaluate an ethical life and profession ahead.

Course Syllabus

Module 1: Introduction-Basic Human Aspiration, its fulfillment through All-encompassing Resolution

The basic human aspirations and their fulfillment through Right understanding and Resolution, Right understanding and Resolution as the activities of the Self, Self being central to Human Existence; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution

Module2: Right Understanding (Knowing)- Knower, Known & the Process

The domain of right understanding starting from understanding the human being (the knower, the experiencer and the doer) and extending up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).

Module 3: Understanding Human Being

Understanding the human being comprehensively as the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Basis for harmony/contradiction in the self

Module 4: Understanding Nature and Existence

A comprehensive understanding (knowledge) about the existence, Nature being included; the need and process of inner evolution (through self-exploration, self-awareness and self-evaluation), particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).

Module 5: Understanding Human Conduct, All-encompassing Resolution & Holistic Way of Living

Understanding Human Conduct, different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavor viz.,
realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from Self to Nature and entire Existence

Textbook

1. R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course inHuman Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.

References

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya EkParichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
9. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists &Engineers, Oxford University Press
10. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Mode of Evaluation:

Based on participation of student in classroom discussions/Self-assessment/Peer assessment/Assignments/ Seminar/Continuous Assessment Test/Semester End Exam
Socially relevant project/Group Activities/Assignments may be given importance in this course

Course Outcomes

At the end of the course, the students will be able to
1. Evaluate the significance of value inputs in formal education and start applying them in their life and profession
2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Analyze the value of harmonious relationship based on trust and respect in their life and profession
4. Examine the role of a human being in ensuring harmony in society and nature.
5. Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.

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Course Code	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C
		0	0	3	1.5
II Year 2ND Semester					

Course Objectives:

- To implement the basic knowledge of SQL queries and relational algebra.
- To construct database models for different database applications.
- To apply normalization techniques for refining of databases.
- To practice various triggers, procedures, and cursors usingPL/SQL.
- To design and implementation of a database for an organization

Course Outcomes (CO):

After completion of the course, students will be able to

- Design database for any real world problem
- Implement PL/SQL programs
- Define SQL queries
- Decide the constraints
- Investigate for data inconsistency

List of Experiments:

Week-1: CREATION OF TABLES

1. Create a table called Employee with the following structure.

Name	Type
Empno	Number
Ename	Varchar2(20)
Job	Varchar2(20)
Mgr	Number
Sal	Number

a. Add a column commission with domain to the Employee table.
b. Insert any five records into the table.
c. Update the column details of job
d. Rename the column of Employ table using alter command.
e. Delete the employee whose empno is19.

2. Create department table with the following structure.

Name	Type
Dept no	Number
Dept name	Varchar2(20)
location	Varchar2(20)

a. Add column designation to the department table.
b. Insert values into the table.
c. List the records of emp table grouped by dept no.
d. Update the record where dept no is9.
e. Delete any column data from the table 3. Create a table called Customer table

Name	Type
Cust name	Varchar2(20)
Cust street	Varchar2(20)
Cust city	Varchar2(20)

a. Insert records into the table.
b. Add salary column to the table.
c. Alter the table column domain.
d. Drop salary column of the customer table.
e. Delete the rows of customer table whose ust_city is 'hyd'.
f. Create a table called branch table.

Name	Type
Branch name	Varchar2(20)
Branch city	Varchar2(20)
Asserts	Number

4. Increase the size of data type for asserts to the branch.
a. Add and drop a column to the branch table.
b. Insert values to the table.
c. Update the branch name column
d. Delete any two columns from the table
5. Create a table called sailor table

Name	Type
Sid	Number
Sname	Varchar2(20)
Rating	Varchar2(20)

a. Add column age to the sailor table.
b. Insert values into the sailor table.
c. Delete the row with rating>8.
d. Update the column details of sailor.
e. Insert null values into the table.
6. Create a table called reserves table

Name	Type
Boat id	Integer
Sid	Integer
Day	Integer

a. Insert values into the reserves table.

b. Add column time to the reserves table.
c. Alter the column day data type to date.
d. Drop the column time in the table.`
e. Delete the row of the table with some condition.

Week-2: QUERIES USING DDL AND DML

1. a. Create a user and grant all permissions to the user.
   b. Insert the any three records in the employee table and use rollback. Check the result.
   c. Add primary key constraint and not null constraint to the employee table.
   d. Insert null values to the employee table and verify the result.
2. a. Create a user and grant all permissions to the user.
   b. Insert values in the department table and use commit.
   c. Add constraints like unique and not null to the department table.
   d. Insert repeated values and null values into the table.
3. a. Create a user and grant all permissions to the user.
   b. Insert values into the table and use commit.
   c. Delete any three records in the department table and use rollback.
   d. Add constraint primary key and foreign key to the table.
4. a. Create a user and grant all permissions to the user.
   b. Insert records in the sailor table and use commit.
   c. Add save point after insertion of records and verify save point.
   d. Add constraints not null and primary key to the sailor table.
5. a. Create a user and grant all permissions to the user.
   b. Use revoke command to remove user permissions.
   c. Change password of the user created.
   d. Add constraint foreign key and no tnull.
6. a. Create a user and grant all permissions to the user.
   b. Update the table reserves and use save point and rollback.
   c. Add constraint primary key , foreign key and not null to the reserves table
   d. Delete constraint not null to the table column

Week-3: QUERIES USING AGGREGATE FUNCTIONS

1. a. By using the group by clause, display the names who belongs to dept no 10 along with average salary.
   b. Display lowest paid employee details under each department.
   c. Display number of employees working in each department and their department number.
   d. Using built in functions, display number of employees working in each department and their department name from dept table. Insert dept name to dept table and insert dept name for each row, do the required thing specified above.
   e. List all employees which start with either B or C.
   f. Display only these ename of employees where the maximum salary is greater than or equal to 5000.
2. a. Calculate the average salary for each different job.
   b. Show the average salary of each job excluding manager.
   c. Show the average salary for all departments employing more than three people.
   d. Display employees who earn more than thelo west salary in department 30
   e. Show that value returned by sign (n) function.
   f. How many days between day of birth to current date 3. a. Show that two substring as single string.
   b. List all employee names, salary and 15% rise in salary.

c. Display lowest paid emp details under each manager
d. Display the average monthly salary bill for each deptno.
e. Show the average salary for all departments employing more than two people.
f. By using the group by clause, display the eid who belongs to dept no 05 along with average salary.

4. a. Count the number of employees in department20
b. Find the minimum salary earned by clerk.
c. Find minimum, maximum, average salary of all employees.
d. List the minimum and maximum salaries for each job type.
e. List the employee names in descending order.
f. List the employee id, names in ascending order by empid.

5. a. Find the sids ,names of sailors who have reserved all boats called "INTERLAKE
Find the age of youngest sailor who is eligible to vote for each rating level with at least two such sailors.
b. Find the sname , bid and reservation date for each reservation.
c. Find the ages of sailors whose name begin and end with B and has at least 3characters.
d. List in alphabetic order all sailors who have reserved red boat.
e. Find the age of youngest sailor for each rating level.

6. a. List the Vendors who have delivered products within 6 months from order date.
b. Display the Vendor details who have supplied both Assembled and Subparts.
c. Display the Sub parts by grouping the Vendor type (Local or Non Local).
d. Display the Vendor details in ascending order.
e. Display the Sub part which costs more than any of the Assembled parts.
f. Display the second maximum cost Assembled part

Week-4: PROGRAMS ON PL/SQL

1. a. Write a PL/SQL program to swap two numbers.
b. Write a PL/SQL program to find the largest of three numbers.
2. a. Write a PL/SQL program to find the total and average of 6 subjects and display the grade.
b. Write a PL/SQL program to find the sum of digits in a given umber.
3. a. Write a PL/SQL program to display the number in reverse order.
b. Write a PL/SQL program to check whether the given number is prime or not.
4. a. Write a PL/SQL program to find the factorial of a given number.
b. Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7.
Store the radius and the corresponding values of calculated area in an empty table named areas, consisting of two columns radius and area.
5. a. Write a PL/SQL program to accept a string and remove the vowels from the string. (When 'hello' passed to the program it should display 'Hll' removing e and o from the world Hello).
b. Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is less than or equal to10. Else display an error message. Otherwise Display the remainder in words.

Week-5: PROCEDURES AND FUNCTIONS

1. Write a function to accept employee number as parameter and return Basic +HRA together as single column.
2. Accept year as parameter and write a Function to return the total net salary spent for a given year.
3. Create a function to find the factorial of a given number and hence find NCR.
4. Write a PL/SQL block o pint prime Fibonacci series using local functions.
5. Create a procedure to find the lucky number of a given birth date.
6. Create function to the reverse of given number

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Week-6: TRIGGERS

1. Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and new values:CUSTOMERS table:

ID	NAME	AGE	ADDRESS	SALARY
1	Alive	24	Khammam	2000
2	Bob	27	Kadapa	3000
3	Catri	25	Guntur	4000
4	Dena	28	Hyderabad	5000
5	Eeshwar	27	Kurnool	6000
6	Farooq	28	Nellur	7000

2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database.

   Passenger(Passport_ id INTEGER PRIMARY KEY, Name VARCHAR (50) Not NULL, Age Integer Not
   NULL, Sex Char, Address VARCHAR (50) Not NULL);

   a. Write a Insert Trigger to check the Passport_id is exactly six digits or not.
   b. Write a trigger on passenger to display messages '1 Record is inserted', '1 record is deleted', '1 record is updated' when insertion, deletion and updation are done on passenger respectively.

3. Insert row in employee table using Triggers. Every trigger is created with name any trigger have same name must be replaced by new name. These triggers can raised before insert, update or delete rows on data base. The main difference between a trigger and a stored procedure is that the former is attached to a table and is only fired when an INSERT, UPDATE or DELETE occurs.
4. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert or update.
5. Trigger before deleting a record from emp table. Trigger will insert the row to be deleted into table called delete _emp and also record user who has deleted the record and date and time of delete.
6. Create a transparent audit system for a table CUST_MSTR. The system must keep track of the records that are being deleted or updated

Week-7: PROCEDURES

1. Create the procedure for palindrome of given number.
2. Create the procedure for GCD: Program should load two registers with two Numbers and then apply the logic for GCD of two numbers. GCD of two numbers is performed by dividing the greater number by the smaller number till the remainder is zero. If it is zero, the divisor is the GCD if not the remainder and the divisors of the previous division are the new set of two numbers. The process is repeated by dividing greater of the two numbers by the smaller number till the remainder is zero and GCD is found.
3. Write the PL/SQL programs to create the procedure for factorial of given number.
4. Write the PL/SQL programs to create the procedure to find sum of N natural number.
5. Write the PL/SQL programs to create the procedure to find Fibonacci series.
6. Write the PL/SQL programs to create the procedure to check the given number is perfect or not

Week-8: CURSORS

1. Write a PL/SQL block that will display the name, dept no, salary of fist highest paid employees**.**

2. Update the balance stock in the item master table each time a transaction takes place in the item transaction table. The change in item master table depends on the item id is already present in the item master then update operation is performed to decrease the balance stock by the quantity specified in the item transaction in case the item id is not present in the item master table then the record is inserted in the item master table.
3. Write a PL/SQL block that will display the employee details along with salary using cursors.
4. To write a Cursor to display the list of employees who are working as a Managers or Analyst.
5. To write a Cursor to find employee with given job and dept no.
6. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the 'employee' table are updated. If none of the employee's salary are updated we get a message 'None of the salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in 'employee' table

Week-9: CASE STUDY: BOOK PUBLISHING COMPANY

A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications.
A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with on editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject for the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

Week-10: **CASE STUDY GENERAL HOSPITAL**

A General Hospital consists of a number of specialized wards (such as Maternity, Pediatric, Oncology, etc). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward. For the above case study, do the following.

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

Week-11: **CASE STUDY: CAR RENTAL COMPANY**

A database is to be designed for a car rental company. The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly the cash inflow coming from all sources: Car hire, car sales, insurance claims must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special credit card facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental, unless they wish to pay by credit card. All major credit cards are accepted.

Personal details such as name, address, telephone number, driving license, number about each customer are kept in the database. For the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

Week-12: **CASE STUDY: STUDENT PROGRESS MONITORING SYSTEM**

A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA (Hons) M.Sc., etc) within the framework of the modular system. The college provides a number of modules, each being characterized by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: Some modules require pre- requisites modules and some degree programs have compulsory modules. The database is also to contain some information about studentsincludingtheirnumbers,names,addresses,degrees they read for , and their past performance i.e. modules taken and examination results. For the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.
3. Create the logical data model i.e., ER diagrams.
4. Comprehend the data given in the case study by creating respective tables with primary keys and foreign keys wherever required.
5. Insert values into the tables created (Be vigilant about Master- Slavetables).
6. Display the Students who have taken M.Sc course
7. Display the Module code and Number of Modules taught by each Lecturer.
8. Retrieve the Lecturer names who are not Module Leaders.
9. Display the Department name which offers ‘English ‘module.
10. Retrieve the Prerequisite Courses offered by every Department (with Department names).
11. Present the Lecturer ID and Name who teaches ‘Mathematics’.
12. Discover the number of years a Module is taught.
13. List out all the Faculties who work for ‘Statistics ‘Department.
14. List out the number of Modules taught by each Module Leader.
15. List out the number of Modules taught by a particular Lecturer.
16. Create a view which contains the fields of both Department and Module tables. (Hint- The fields like Module code, title, credit, Department code and its name).
17. Update the credits of all the prerequisite courses to 5. Delete the Module ‘History’ from the Module table.

Reference Books:

1. RamezElmasri, Shamkant, B. Navathe, “Database Systems”, Pearson Education, 6th Edition, 2013.
2. Peter Rob, Carles Coronel, “Database System Concepts”, Cengage Learning, 7th Edition, 2008.

Web References:

http://www.scoopworld.in

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India

Computer Science and Engineering

Course Code	OPERATING SYSTEMS LAB	L	T	P	C
		0	0	3	1.5

II Year 2ND Semester

Course Objectives:

- To familiarize students with the architecture of OS.
- To provide necessary skills for developing and debugging CPU Scheduling algorithms.
- To elucidate the process management and scheduling and memory management.
- To explain the working of an OS as a resource manager, file system manager, process manager,memory manager, and page replacement tool.
- To provide insights into system calls, file systems and deadlock handling.

Course Outcomes (CO):

After completion of the course, students will be able to

- Trace different CPU Scheduling algorithms (L2).
- Implement Bankers Algorithms to Avoid and prevent the Dead Lock (L3).
- Evaluate Page replacement algorithms (L5).
- Illustrate the file organization techniques (L4).
- Illustrate shared memory process (L4).
- Design new scheduling algorithms (L6)

List of Experiments:

1. Practicing of Basic UNIX Commands.
2. Write programs using the following UNIX operating system callsFork, exec, getpid, exit, wait, close, stat, opendir and readdir
3. Simulate UNIX commands like cp, ls, grep, etc.,
4. Simulate the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority
5. Implement a dynamic priority scheduling algorithm.
6. Assume that there are five jobs with different weights ranging from 1 to 5. Implement round robin algorithm with time slice equivalent to weight.
7. Implement priority scheduling algorithm. While executing, no process should wait for more than 10 seconds. If the waiting time is more than 10 seconds that process has to be executed for at least 1 second before waiting again.
8. Control the number of ports opened by the operating system with
   a) Semaphore b) Monitors.
9. Simulate how parent and child processes use shared memory and address space.
10. Simulate sleeping barber problem.
11. Simulate dining philosopher's problem.
12. Simulate producer-consumer problem using threads.
13. Implement the following memory allocation methods for fixed partition
    a) First fit b) Worst fit c) Best fit
14. Simulate the following page replacement algorithms
    a) FIFO b) LRU c) LFU etc.,
15. Simulate Paging Technique of memory management
16. Simulate Bankers Algorithm for Dead Lock avoidance and prevention
17. Simulate the following file allocation strategies
    a) Sequential b) Indexed c) Linked
18. Simulate all File Organization Techniques
    a) Single level directory b) Two level c) Hierarchical d) DAG

References:

1. "Operating System Concepts", Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Eighth Edition, John Wiley.
2. "Operating Systems: Internals and Design Principles", Stallings, Sixth Edition–2009, Pearson Education
3. "Modern Operating Systems", Andrew S Tanenbaum, Second Edition, PHI.
4. "Operating Systems", S.Haldar, A.A.Aravind, Pearson Education.
5. "Principles of Operating Systems", B.L.Stuart, Cengage learning, India Edition.2013-2014
6. "Operating Systems", A.S.Godbole, Second Edition, TMH.
7. "An Introduction to Operating Systems", P.C.P. Bhatt, PHI.

Online Learning Resources/Virtual Labs:

https://www.cse.iitb.ac.in/~mythili/os/
http://peterindia.net/OperatingSystems.html

Sri Krishnadevaraya University College of Engineering & Technology
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Computer Science and Engineering

Course Code	SOFTWARE ENGINEERING LAB	L	T	P	C
		0	0	3	1.5

II Year 2ND Semester

Course Objectives:

- To learn and implement the fundamental concepts of Software Engineering.
- To explore functional and non-functional requirements through SRS.
- To practice the various design diagrams through the appropriate tool.
- To learn to implement various software testing strategies.

Course Outcomes (CO):

After completion of the course, students will be able to

- Acquaint with historical and modern software methodologies
- Understand the phases of software projects and practice the activities of each phase
- Practice clean coding
- Take part in project management
- Adopt skills such as distributed version control, unit testing, integration testing, build management, and deployment

List of Experiments:

1. Draw the Work Breakdown Structure for the system to be automated
2. Schedule all the activities and sub-activities Using the PERT/CPM charts
3. Define use cases and represent them in use-case document for all the stakeholders of the system to be automated
4. Identify and analyze all the possible risks and its risk mitigation plan for the system to be automated
5. Diagnose any risk using Ishikawa Diagram (Can be called as Fish Bone Diagram or Cause& Effect Diagram)
6. Define Complete Project plan for the system to be automated using Microsoft Project Tool
7. Define the Features, Vision, Business objectives, Business rules and stakeholders in the vision document
8. Define the functional and non-functional requirements of the system to be automated by using Use cases and document in SRS document
9. Define the following traceability matrices :
    1. Use case Vs. Features
    2. Functional requirements Vs. Usecases
10. Estimate the effort using the following methods for the system to be automated:
    1. Function point metric
    2. Usecase point metric
11. Develop a tool which can be used for quantification of all the non-functional requirements
12. Write C/C++/Java/Python program for classifying the various types of coupling.
13. Write a C/C++/Java/Python program for classifying the various types of cohesion.
14. Write a C/C++/Java/Python program for object oriented metrics for design proposed by Chidamber and Kremer. (Popularly called CK metrics)
15. Convert the DFD into appropriate architecture styles.
16. Draw a complete class diagram and object diagrams using Rational tools
17. Define the design activities along with necessary artifacts using Design Document.
18. Reverse Engineer any object-oriented code to an appropriate class and object diagrams.
19. Test a piece of code that executes a specific functionality in the code to be tested and assertsa certain behavior or state using Junit.
20. Test the percentage of code to be tested by unit test using any code coverage tools
21. Define appropriate metrics for at least 3 quality attributes for any software application ofyour interest.

22	Define a complete call graph for any C/C++ code. (Note: The student may use any tool that generates call graph for source code)

References:

1. Software Engineering? A Practitioner‟ s Approach, Roger S. Pressman, 1996, MGH.
2. Software Engineering by Ian Sommerville, Pearson Edu, 5th edition, 1999
3. An Integrated Approach to software engineering by Pankaj Jalote , 1991 Narosa

Online Learning Resources/Virtual Labs:

http://vlabs.iitkgp.ac.in/se/

Sri Krishnadevaraya University College of Engineering & Technology
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Computer Science and Engineering

Course Code	WEB APPLICATION DEVELOPMENT CLIENT SIDE	L	T	P	C
		1	0	2	2

II Year 2nd Semester

Course Objectives:

- Learn website development using HTML, CSS, JavaScript.
- Understand the concepts of responsive web development using the bootstrap framework
- Make use of the JQueryjavascript library to provide interactiveness to the websites.
- Discover how to use Google Charts to provide a better way to visualize data on a website
- 5. Learn Content Management Systems to speed the development process

Course Outcomes (CO):

After completion of the course, students will be able to

- Construct web sites with valid HTML, CSS, JavaScript
- Create responsive Web designs that work on phones, tablets, or traditional laptops and wide-screen monitors.
- Develop websites using jQuery to provide interactivity and engaging user experiences
- Embed Google chart tools in a website for better visualization of data.
- Design and develop web applications using Content Management Systems like WordPress

Activities:

Module - 1:
HTML: What is a browser?, What is HTML?, Elements and Tags, Basic HTML5 structure, Metadata, <title>, Adding favicon, Comments, headings
Task: Create a Basic HTML document

Module - 2:
HTML (continued): Block-Level Elements & Inline Elements, Links (Understand Absolute vs Relative paths), Lists, Images, iframe (embed youtube video)
Task: Create your Profile Page

Module - 3:
HTML (continued): Tables: <table>, <tr>, <th>, <td>, Attributes for each Table element
Task: Create a Class Timetable (to merge rows/columns, use rowspan/colspan)
Module - 4:
HTML (continued): Form Elements: <input>, <select>, <textarea>, <button>, Attributes for each Form element
Task: Create a Student Hostel Application Form

Module - 5:
Cascading Style Sheets (CSS): CSS Properties, Types of CSS, Selectors, box model, Pseudo-elements, z-index
Task: Make the Hostel Application Form designed in Module -4 beautiful using CSS (add colors, backgrounds, change font properties, borders, etc.)

Module - 6:
Bootstrap - CSS Framework: Layouts (Containers, Grid system), Forms, Other Components
Task: Style the Hostel Application Form designed in Module-5still more beautiful using Bootstrap CSS (Re-size browser and check how the webpage displays in mobile resolution)

Module - 7:
HTTP & Browser Developer Tools: Understand HTTP Headers (Request & Response Headers), URL & its Anatomy, Developer Tools: Elements/Inspector, Console, Network, Sources, performance, Application Storage.

Task:Analyse various HTTP requests (initiators, timing diagrams, responses) and identify problems ifany.

Module - 8:
Javascript: Variables, Data Types, Operators, Statements, Objects, Functions, Events & EventListeners, DOM.
Task: Design a simple calculator using JavaScript to perform sum, product, difference, and quotient operations:

Module - 9:
Dynamic HTML with JavaScript: Manipulate DOM, Error Handling, Promises, async/await, Modules.
Task:Design& develop a Shopping Cart Application with features including Add Products, Update Quantity, Display Price(Sub-Total & Total), Remove items/products from the cart.

Module - 10:
JQuery - A Javascript Library: Interactions, Widgets, Effects, Utilities, Ajax using JQuery.
Task: Validate all Fields and Submit the Hostel Application Form designed in Module-6 using JQuery

Module - 11:
Google Charts: Understand the Usage of Pie chart, Bar Chart, Histogram, Area & Line Charts, GanttCharts.
Task: Develop an HTML document to illustrate each chart with real-time examples.

Module - 12:
Open Source CMS (Content Management System): What is a CMS?, Install CMS, Themes, Plugins.Task: Develop an E-learning website using any CMS(for example WordPress)

References:

1. Deitel and Deitel and Nieto, ―Internet and World Wide Web - How to Program‖, PrenticeHall, 5th Edition, 2011.
2. Web Technologies, Uttam K. Roy, Oxford Higher Education., 1st edition, 10th impression,2015.
3. Stephen Wynkoop and John Burke ―Running a Perfect Website‖, QUE, 2nd Edition,1999.
4. Jeffrey C and Jackson, ―Web Technologies A Computer Science PerspectivePearsonEducation, 2011.
5. Gopalan N.P. and Akilandeswari J., ―Web Technology, Prentice Hall of India, 2011.

Online Learning Resources/Virtual Labs:

a. HTML: https://html.spec.whatwg.org/multipage/
b. HTML: https://developer.mozilla.org/en-US/docs/Glossary/HTML5
c. CSS: https://www.w3.org/Style/CSS/
d. Bootstrap - CSS Framework: https://getbootstrap.com/
e. Browser Developer Tools: https://developer.mozilla.org/en-US/docs/Learn/Common_questions/What_are_browser_developer_tools
f. Javascript: https://developer.mozilla.org/en-US/docs/Web/JavaScript
g. JQuery: https://jquery.com
h. Google Charts: https://developers.google.com/chart
i. Wordpress: https://wordpress.com

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Computer Science and Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science & Engineering					
III Year I Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Computer Networks	PC	3-0-0	3
2.		Formal Language & Automata Theory	PC	3-0-0	3
3.		Artificial Intelligence	PC	3-0-0	3
4.		**Professional Elective – I**	PE	3-0-0	3
5.		**Open Elective – I**	OE	3-0-0	3
6.		Computer Networks Lab	PC	0-0-3	1.5
7.		Artificial Intelligence Lab	PC	0-0-3	1.5
8.		**Skill oriented course– III** Micro Services	SC	1-0-2	2
9.		Evaluation of Community Service Project/Internship	PR		1.5
				Total	**21.5**

List of Professional Electives-I	**List of Open Electives-I**
1)Data Warehousing & Data Mining 2)Digital Image Processing 3)Software Project Management	Candidate should select the subject from list of subjects offered by other departments.

Category	**CREDITS**
Professional Core Courses	12
Professional Elective Courses	3
Open Elective Course/Job Oriented Elective	3
Skill oriented course	2
Summer Internship	1.5
TOTAL CREDITS	**21.5**

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Computer Science and Engineering

Course Code	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

III Year Ist Semester

Course Objectives:

The course is designed to

- Understand the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP
- Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

Course Outcomes (CO):

After completion of the course, students will be able to

1. Identify the software and hardware components of a Computer network
2. Design software for a Computer network
3. Develop new routing, and congestion control algorithms
4. Assess critically the existing routing protocols
5. Explain the functionality of each layer of a computer network
6. Choose the appropriate transport protocol based on the application requirements

UNIT - I	**Computer Networks and the Internet**	Lecture 8Hrs

What Is the Internet?, The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks(Text book 2),
Reference Models, Example Networks,
Guided Transmission Media, Wireless Transmission(Text book 1)

UNIT - II	**The Data Link Layer, Access Networks, and LANs**	Lecture 10Hrs

Data Link Layer Design Issues, Error Detection And Correction, Elementary Data Link Protocols, Sliding Window Protocols(Text book 1)
Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, SwitchedLocal Area Networks
Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request(Text book 2)

UNIT - III	**The Network Layer**	Lecture 8Hrs

Routing Algorithms, Internetworking, TheNetwork Layer In The Internet (Text book 1)

UNIT - IV	**The Transport Layer**	Lecture 9Hrs

ConnectionlessTransport: UDP(Text book 2), The Internet Transport Protocols: TCP, Congestion Control(Text book 1)

UNIT - V	**Principles of Network Applications**	Lecture 8Hrs

Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks(Text book 2)

Textbooks:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.

2. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.

Reference Books:

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2 Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.

Online Learning Resources:

https://nptel.ac.in/courses/106105183/25
http://www.nptelvideos.in/2012/11/computer-networks.html
https://nptel.ac.in/courses/106105183/3

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Computer Science and Engineering

Course Code	FORMAL LANGUAGES AND AUTOMATA THEORY	L	T	P	C
		3	0	0	3

III Year Ist Semester

Course Objectives:

This course is designed to:

- Introduce languages, grammar, and computational models
- Explain the Context Free Grammars
- Enable the students to use Turing machines
- Demonstrate decidability and un-decidability for NP-Hard problems

Course Outcomes (CO):

After completion of the course, students will be able to

1. List types of Turing Machines
2. Design Turing Machine
3. Formulate decidability and undecidability problems

UNIT - I	**Finite Automata**	Lecture Hrs

Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String by a Finite Automaton, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with E-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT - II	**Regular Expressions**	Lecture Hrs

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two Regular Expressions, Manipulations of Regular Expressions, Finite Automata, and Regular Expressions, Inter Conversion, Equivalence between Finite Automata and Regular Expressions, Pumping Lemma, Closers Properties, Applications of Regular Expressions, Finite Automata and Regular Grammars, Regular Expressions and Regular Grammars.

UNIT - III	**Context Free Grammars**	Lecture Hrs

Formal Languages, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Context-Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, E-Productions and Unit Productions, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

UNIT - IV	**Pushdown Automata**	Lecture Hrs

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalenceof Pushdown Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

UNIT - V	**Turing Machine**	Lecture Hrs

Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine, Design of Turing Machines, Techniques for Turing Machine Construction, Types of Turing Machines, Church's Thesis, Universal Turing Machine, Restricted Turing Machine.
Decidable and Undecidable Problems: NP, NP-Hard and NP-Complete Problems.

Textbooks:

1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3rd Edition, Pearson, 2008.
2. Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandrasekaran, 3rd Edition, PHI, 2007.

Reference Books:
1. Formal Language and Automata Theory, K.V.N.Sunitha and N.Kalyani, Pearson, 2015. 2. Introduction to Automata Theory, Formal Languages and Computation, ShyamalenduKandar, Pearson, 2013. 3. Theory of Computation, V.Kulkarni, Oxford University Press, 2013. 4. Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014.
Online Learning Resources:
https://nptel.ac.in/courses/106106049/ https://nptel.ac.in/courses/106104028

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Computer Science and Engineering

Course Code	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

III Year Ist Semester

Course Objectives:

This course is designed to:

- Introduce Artificial Intelligence
- Teach about the machine learning environment
- Present the searching Technique for Problem Solving
- Introduce Natural Language Processing and Robotics

Course Outcomes (CO):

After completion of the course, students will be able to

1. Apply searching techniques for solving a problem
2. Design Intelligent Agents
3. Develop Natural Language Interface for Machines
4. Design mini robots
5. Summarize past, present and future of Artificial Intelligence

UNIT - I	**Introduction**	Lecture 9Hrs

Introduction: What is AI, Foundations of AI, History of AI, The State of Art.
Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT - II	**Solving Problems by searching**	Lecture 9 Hrs

Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

UNIT - III	**Reinforcement Learning & Natural Language Processing**	Lecture 8Hrs

Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL
Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

UNIT - IV	**Natural Language for Communication**	Lecture 8 Hrs

Natural Language for Communication: Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition
Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, Reconstructing the 3D World, Object Recognition from Structural information, Using Vision.

UNIT - V	**Robotics**	Lecture 10Hrs

Robotics: Introduction, Robot Hardware, Robotic Perception, planning to move, planning uncertain movements, Moving, Robotic software architectures, application domains
Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right direction, What if AI does succeed.

Textbooks:

1. Stuart J.Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education, 2019.

Reference Books:

1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.

2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.

Online Learning Resources:

http://peterindia.net/AILinks.html
http://nptel.ac.in/courses/106106139/
https://nptel.ac.in/courses/106/105/106105152/

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Computer Science and Engineering

Course Code	DATA WAREHOUSING AND DATA MINING	L	T	P	C
		3	0	0	3

III Year Ist Semester

UNIT-I

Introduction: introduction to data mining- data mining- data mining functionalities: classification of data mining systems; data mining task primitives;

data warehouse and olap technology: data warehouse, multidimensional data model: from tables and spreadsheet to data cubes,stars,snowflakes and fact constellation schemas for multidimensional databases, measures: their categorization and computation, concept hierarchies, olap operations in the multidimensional data model; data warehouse architecture:

UNIT-II

Data preprocessing: why preprocess the data; descriptive data summarization: measuring the central tendency, measuring the dispersion of data, graphic displays of basic descriptive data summaries; data cleaning: missing values, noisy data cleaning as a process; data integration and transformation: data integration, data transformation, data reduction: data cube aggregation, attribute subset selection; dimensionality reduction, numerosity reduction;

UNIT-III

Mining frequent patterns, associations, and correlations: basic concepts; efficient and scalable frequent item set mining methods: the apriori algorithm, generating association rules from frequent item sets, improving efficiency of apriori, mining frequent item sets without candidate generation; mining various kinds of association rules: mining multilevel & multi-dimensional association rules; from association mining to correlation analysis: strong rules are not necessarily interesting, from association analysis to correlation analysis;

UNIT-IV

Classification i:overview of classification and prediction: what is classification, what is prediction?; issues regarding classification and prediction: preparing data for classification and prediction , comparing classification and prediction methods; Bayesian classification: Bayes' theorem, naïve Bayesian classification; classification by decision tree induction: decision tree induction,attribute selectionmeasures,tree pruning, scalability and decision tree induction; rule-based classification: using if-thenrules for classification, rule extraction from decision tree, rule induction using a sequntial coveringalgorithm; classification by back propagation: a multilayer feed-forward neural network, defining networktopology, backpropagation;

UNIT-V

Classification ii and prediction:support vector machines: the case when the data are linearlyseparable, the case when the data are linearly inseparable; lazy learners: k-nearest-neighbor classifiers,case-based reasoning; prediction:linear regression, nonlinear regression; accuracy and error measures:classifier accuracy measures, predictor error measures; evaluating the accuracy of a classifier or predictor:holdout method and random subsampling, cross validation, bootstrap;

Cluster analysis:overview of cluster analysis; types of data in cluster analysis: interval-scaledvariables, binary variables, categorical, ordinal, and ratio-scaled variables, variables of mixed types; acategorization of major clustering methods; partitioning methods: classical partitioning methods: k-meansand k-medoids, partitioning methods in large databases: from k-medoids to clarans; hierarchicalmethods: agglomerative and divisive hierarchical clustering, birch, rock; density-based methods:
dbscan; grid-based methods: sting; model-based clustering methods: expectation-maximization;

Text books:

1. Data Mining – Concepts And Techniques - Jiawei Han & Micheline Kamber Harcourt India, SecondEdition.

References:

1. Data Mining Introductory And Advanced Topics–Margaret H Dunham, PearsonEducation
2. Data Mining Techniques – Arun K Pujari, University Press.
3. Data Warehousing In The Real World – Sam Anahory & Dennis Murray. Pearson Edn Asia.
4. Data Warehousing Fundamentals – Paulraj Ponnaiah Wiley Student Edition
5. The Data Warehouse Life Cycle Tool Kit – Ralph Kimball Wiley Student Edition

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Computer Science and Engineering

Course Code	DIGITAL IMAGE PROCESSING (Professional Elective Course– I)	L	T	P	C
		3	0	0	3

III Year Ist Semester

Course Objectives:

This course is designed to enable the students to familiarize themselves with basic concepts of digital image processing and different image transformsand Learn various image processing techniques like image enhancement, restoration, segmentation and compression

Course Outcomes (CO):

After completion of the course, students will be able to

1. Perform image manipulations and different digital image processing techniques
2. Illustrate basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image.
3. Analyze pseudo and fullcolor image processing techniques.
4. Apply various morphological operators on images

UNIT - I		Lecture 8Hrs

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing. Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms.

UNIT - II		Lecture 9Hrs

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters , sharpening spatial filters, Combining spatial enhancement methods Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

UNIT - III		Lecture 9Hrs

Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filter ,image reconstruction from projections.

UNIT - IV		Lecture 8Hrs

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

UNIT - V		Lecture 9Hrs

Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation. Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.
Textbooks:
1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008. 2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw-Hill Education, 2011.
Reference Books:
1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002. 2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009
Online Learning Resources:
https://nptel.ac.in/courses/117105079 https://nptel.ac.in/courses/117105135

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Computer Science and Engineering

Course Code	SOFTWARE PROJECT MANAGEMENT (Professional Elective Course– I)	L	T	P	C
		3	0	0	3

III Year Ist Semester

Course Objectives:

This course is designed to enable the students to understand the fundamental principles of Software Project management & will also have a good knowledge of the responsibilities of a project manager and how to handle them.

Course Outcomes (CO):

After completion of the course, students will be able to

1. Describe the fundamentals of Project Management
2. Recognize and use Project Scheduling Techniques
3. Familiarize with Project Control Mechanisms
4. Understand Team Management
5. Recognize the importance of Project Documentation and Evaluation

UNIT - I		Lecture 9Hrs

Conventional Software Management: The waterfall model, conventional software Management performance
Evolution of Software Economics: software Economics. Pragmatic Software Cost Estimation
Improving Software Economics: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.

UNIT - II		Lecture 9Hrs

The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.
Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.
Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts

UNIT - III		Lecture 9Hrs

Work Flows of the process: Software process workflows, Inter Trans workflows.
Checkpoints of the Process: Major Mile Stones, Minor Milestones, Periodic status assessments.
Iterative Process Planning: work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning

UNIT - IV		Lecture 9Hrs

Process Automation: Automation Building Blocks, The Project Environment.
Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators
Tailoring the Process: Process discriminants. Managing people and organizing teams.

UNIT - V		Lecture 9Hrs

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Future Software Project Management: modern Project Profiles, Next generation Software economics, modern process transitions.
Case Study: The Command Center Processing and Display System-Replacement (CCPDS-R)

Textbooks:

1. Software Project Management, Walker Royce, Pearson Education, 2012
2. Bob Hughes, Mike Cotterell and Rajib Mall "Software Project Management", 6th Edition, McGraw Hill Edition, 2017

Reference Books:

1. PankajJalote, "Software Project Management in practice", 5th Edition, Pearson Education, 2017.
2. Murali K. Chemuturi, Thomas M. Cagley Jr." Mastering Software Project Management: Best Practices, Tools and Techniques", J. Ross Publishing, 2010
3. Sanjay Mohapatra, "Software Project Management", Cengage Learning, 2011

Online Learning Resources:

http://nptel.ac.in/courses/106101061/29

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Computer Science and Engineering

Course Code	COMPUTER NETWORKS LAB	L	T	P	C
		0	0	3	1.5

III Year Ist Semester

Course Objectives:

- To understand the different types of networks
- To discuss the software and hardware components of a network
- To enlighten the working of networking commands supported by operating system
- To impart knowledge of Network simulator 2/3
- To familiarize the use of networking functionality supported by JAVA
- To familiarize with computer networking tools.

Course Outcomes (CO):

After completion of the course, students will be able to

- Apply the existing algorithms for error and flow control
- Experiment with the Network simulation environment
- Experiment with socket programming
- Develop various applications using socket programming
- Design the necessary Security and Authentication algorithms

List of Experiments:

1. Implementation of a program for CRC and Hamming code for Error Handling.
2. Implementation of a program for Remote command execution (Two M/C's maybe used)
3. Implementation of an authentication algorithm to access a file.
4. Implement a Chatting application using JAVA TCP and UDP sockets.
5. Implementation of a Socket program for Echo/Ping/Talk commands.
6. Creation of a Socket between two Computers and Enable File Transfer between them using a) TCP b) UDP
7. Create a Socket using HTTP for Web Page Upload & Download.
8. Using Wireshark perform the following operations:
   1.Inspect HTTP Traffic
   2.Inspect HTTP Traffic from a Given IP Address,
   3.Inspect HTTP Traffic to a Given IP Address,
   4.Reject Packets to Given IP Address,
9. 5.Monitor Apache and MySQL Network Traffic.
10. Use CISCO Packet tracer software to build network topology and configure using Distance vector routing protocol.
11. Use CISCO Packet tracer software to build network topology and configure using Link State routing protocol.
12. Install Network Simulator 2/3. Create a wired network using dumbbell topology. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.
13. Create a static wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.
14. Create a mobile wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.

References:

1. **ShivendraS.Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, "TCP/IP Essentials:A Lab-Based Approach", Cambridge University Press, 2004.**
2. **Cisco Networking Academy, "CCNA1 and CCNA2 Companion Guide", Cisco Networking Academy Program, 3rd edition, 2003.**
3. Elloitte Rusty Harold, "Java Network Programming", 3rd edition, O'REILLY, 2011.

Online Learning Resources/Virtual Labs:

1. https://www.netacad.com/courses/packet-tracer - Cisco Packet Tracer.
2. Ns Manual, Available at: https://www.isi.edu/nsnam/ns/ns-documentation.html, 2011.
3. https://www.wireshark.org/docs/wsug_html_chunked/ -Wireshark.
4. https://nptel.ac.in/courses/106105183/25
5. http://www.nptelvideos.in/2012/11/computer-networks.html
6. https://nptel.ac.in/courses/106105183/3
7. http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php

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Computer Science and Engineering

Course Code	ARTIFICIAL INTELLIGENCE LAB	L	T	P	C
		0	0	3	1.5

III Year Ist Semester

Course Objectives:

- To teach the methods of implementing algorithms using artificial intelligence techniques
- To illustrate search algorithms

  To demonstrate the building of intelligent agents

Course Outcomes (CO):

After completion of the course, students will be able to

- Implement search algorithms
- Solve Artificial intelligence problems
- Design chatbot and virtual assistant

List of Experiments:

1. Write a program to implement DFS and BFS
2. Write a Program to find the solution for traveling salesman Problem
3. Write a program to implement Simulated Annealing Algorithm
4. Write a program to find the solution for the wumpus world problem
5. Write a program to implement 8 puzzle problem
6. Write a program to implement Towers of Hanoi problem
7. Write a program to implement A* Algorithm
8. Write a program to implement Hill Climbing Algorithm
9. Build a Chatbot using AWS Lex, Pandora bots.
10. Build a bot that provides all the information related to your college.
11. Build a virtual assistant for Wikipedia using Wolfram Alpha and Python
12. The following is a function that counts the number of times a string occurs in another string:

```
# Count the number of times string s1 is found in string s2
defcountsubstring(s1,s2):
count = 0
for i in range(0,len(s2)-len(s1)+1):
if s1 == s2[i:i+len(s1)]:
count += 1
return count
```

For instance, countsubstring('ab','cabalaba') returns 2.

Write a recursive version of the above function. To get the rest of a string (i.e. everything but the first character).

13. Higher order functions. Write a higher-order function count that counts the number of elements in a list that satisfy a given test. For instance: count (lambda x: x>2, [1, 2, 3, 4, 5]) should return 3, as there are three elements in the list larger than 2. Solve this task without using any existing higher-order function.

14. Brute force solution to the Knapsack problem. Write a function that allows you to generate random problem instances for the knapsack program. This function should generate a list of items containing N items that each have a unique name, a random size in the range 1 ..... 5 and a random value in the range 1..... 10.

Next, you should perform performance measurements to see how long the given knapsack solver take to solve different problem sizes. You should perform at least 10 runs with different randomly generated problem instances for the problem sizes 10,12,14,16,18,20 and 22. Use a backpack size of 2:5 x N for each value problem size N. Please note that the method used to generate random numbers can also affect performance, since different distributions of values can make the initial conditions of the problem slightly more or less demanding.
How much longer time does it take to run this program when we increase the number of items? Does the backpack size affect the answer?
Try running the above tests again with a backpack size of 1 x N and with 4:0 x N.

15. Assume that you are organising a party for N people and have been given a list L of people who, for social reasons, should not sit at the same table. Furthermore, assume that you have C tables (that are infinitely large).

Write a function layout (N,C,L) that can give a table placement (i.e. a number from 0 : : :C -1) for each guest such that there will be no social mishaps.

For simplicity we assume that you have a unique number 0 .....N-1 for each guest and that the list of restrictions is of the form [(X, Y) ...] denoting guests X, Y that are not allowed to sit together. Answer with a dictionary mapping each guest into a table assignment, if there are no possible layouts of the guests you should answer False.

References:

1. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: a logical approach", Oxford University Press, 2004.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2002.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers, 1998.
4. Artificial Neural Networks, B. Yagna Narayana, PHI
5. Artificial Intelligence, 2nd Edition, E.Rich and K.Knight, TMH.
6. Artificial Intelligence and Expert Systems, Patterson, PHI.

Online Learning Resources/Virtual Labs:

https://www.tensorflow.org/
https://pytorch.org/
https://github.com/pytorch
https://keras.io/
https://github.com/keras-team
http://deeplearning.net/software/theano/
https://github.com/Theano/Theano
https://caffe2.ai/
https://github.com/caffe2
https://deeplearning4j.org/Scikit-learn:https://scikit-learn.org/stable/
https://github.com/scikit-learn/scikit-learn
https://www.deeplearning.ai/
https://opencv.org/
https://github.com/qqwweee/keras-yolo3
https://www.pyimagesearch.com/2018/11/12/yolo-object-detection-with-opencv/
https://developer.nvidia.com/cuda-math-library
http://vlabs.iitb.ac.in/vlabs-dev/labs/machine_learning/labs/index.php

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Computer Science and Engineering

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Computer Science and Engineering

Course Code	MICRO SERVICES	L	T	P	C
SKILL Oriented Course	Skill Oriented Course - III	1	0	2	2

III Year Ist Semester

Course Objectives:

1. Gain a thorough understanding of the philosophy and architecture of Web applicationsusing ASP.NET Core MVC;
2. Understand the common Web Application Vulnerabilities and provide Security.
3. Gain a practical understanding of.NET Core;

Activities:

Module 1:
Building APT.NET Core MVC Application

Module 2:
Building ASP.NET Core REST API.

Module 3:
Working with Docker, Docker Commands, Docker Images and Containers.

Module 4:
Installing software packages on Docker, Working with Docker Volumes and Networks.

Module 5:
Working with Docker Swarm

Module 6:
Working with Circle CI for continuous integration

Module 7:
Creating Microservice with ASP.NET Core.

Module 8:
Working with Kubernetes

Module 9:
Creating Backing Service with ASP.NET Core.

Module 10:
Building real-time Microservice with ASP.NET Core

References:

1 Microservice Architecture: Aligning Principles,Practices, and Culture by Irakli Nadareishvili, Ronnie Mitra,Matt McLarty,and Mike Amundsen Publisher : O'Reilly Edition:2016
2. Building Microservices with ASP.NET Core By Kevin Hoffman O'Reilly Edition: 2017.
Practicals can be done with VS2017, VS2019, Visual Code with ASP.NET Core 3.1.x installedalong with Docker and Docker Desktop.

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Dept. of Computer Science & Engineering					
III Year IInd Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Internet of Things	PC	3-0-0	3
2.		Cloud Computing	PC	3-0-0	3
3.		Machine Learning	PC	3-0-0	3
4.		**Professional Elective-II**	PE	3-0-0	3
5.		**Open Elective-II**	ES	3-0-0	3
6.		IoT Lab	PC	0-0-3	1.5
7.		Cloud Computing Lab	PC	0-0-3	1.5
8.		Machine Learning Lab	ES	0-0-3	1.5
9.		**Skill Oriented Course –IV** Soft Skills	SC	1-0-2	2
10		**Mandatory Non-Credit Course-III** Constitution of India	MC	2-0-0	0
				Total	**21.5**
Industrial/Research Internship (Mandatory) for 2 months duration during summer vacation					

List of Professional Electives-II	List of Open Electives-II
1)Deep Learning **2)**Advanced Computer Architecture **3**)Software Testing Methodologies	Candidate should select the subject from list of subjects offered by other departments.

Category	CREDITS
Professional Core Courses	13.5
Professional Elective Courses	3
Open Elective Course/Job Oriented Elective	3
Skill oriented course	2
TOTAL CREDITS	**21.5**

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Computer Science and Engineering

Course Code	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

III Year IInd Semester

Course Objectives:

- Understand the basics of Internet of Things and protocols.
- Discuss the requirement of IoT technology
- Introduce some of the application areas where IoT can be applied.
- Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management

Course Outcomes (CO):

After completion of the course, students will be able to

- Understand general concepts of Internet of Things.
- Apply design concept to IoT solutions
- Analyze various M2M and IoT architectures
- Evaluate design issues in IoT applications
- Create IoT solutions using sensors, actuators and Devices

UNIT - I	**Introduction to IoT**	Lecture 8Hrs

Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates

UNIT - II	**Prototyping IoT Objects using Microprocessor/Microcontroller**	Lecture 9Hrs

Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

UNIT - III	**IoT Architecture and Protocols**	Lecture 8Hrs

Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

UNIT - IV	**Device Discovery and Cloud Services for IoT**	Lecture 8Hrs

Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

UNIT - V	**UAV IoT**	Lecture 10Hrs

Introduction toUnmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.

Textbooks:

1. Vijay Madisetti and ArshdeepBahga, " Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.

Reference Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, " From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

5. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493- 9357-1
6. DGCA RPAS Guidance Manual, Revision 3 – 2020
7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

Online Learning Resources:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4

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Computer Science and Engineering

Course Code	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

IV Year Ist Semester

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

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Computer Science and Engineering

Course Code	MACHINE LEARNING	L	T	P	C
		3	0	0	3

III Year IInd Semester

Course Objectives:

The course is introduced for students to

- Gain knowledge about basic concepts of MachineLearning
- Study different learning algorithms
- Learn about of evaluation of learning algorithms
- Learn about Dimensionality reduction

Course Outcomes (CO):

After completion of the course, students will be able to

- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Apply Dimensionality reduction techniques
- Design application using machine learning techniques

UNIT - I		Lecture 8Hrs

Introduction: Definition of learning systems, Goals and applications of machine learning, Aspects of developing a learning system: training data, concept representation, function approximation.
Inductive Classification: The concept learning task, Concept learning as search through a hypothesis space, General-to-specific ordering of hypotheses, Finding maximally specific hypotheses, Version spaces and the candidate elimination algorithm, Learning conjunctive concepts, The importance of inductive bias.

UNIT - II		Lecture 8Hrs

Decision Tree Learning: Representing concepts as decision trees, Recursive induction of decision trees, Picking the best splitting attribute: entropy and information gain, searching for simple trees and computational complexity, Occam's razor, Overfitting, noisy data, and pruning.
Experimental Evaluation of Learning Algorithms: Measuring the accuracy of learned hypotheses.
Comparing learning algorithms: cross-validation, learning curves, and statistical hypothesis testing.

UNIT - III		Lecture 9Hrs

Computational Learning Theory: Models of learnability: learning in the limit; probably approximately correct (PAC) learning. Sample complexity for infinite hypothesis spaces, Vapnik-Chervonenkis dimension.
Rule Learning: Propositional and First-Order, Translating decision trees into rules, Heuristic rule induction using separate and conquer and information gain, First-order Horn-clause induction (Inductive Logic Programming) and Foil, Learning recursive rules, Inverse resolution, Golem, and Progol.

UNIT - IV		Lecture 9Hrs

Artificial Neural Networks: Neurons and biological motivation, Linear threshold units. Perceptrons: representational limitation and gradient descent training, Multilayer networks and backpropagation, Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.
Support Vector Machines: Maximum margin linear separators. Quadratic programming solution to finding maximum margin separators. Kernels for learning non-linear functions.

UNIT - V		Lecture 9Hrs

Bayesian Learning: Probability theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logistic regression. Bayes nets and Markov nets for representing dependencies.
Instance-Based Learning: Constructing explicit generalizations versus comparing to past specific examples. k-Nearest-neighbor algorithm. Case-based learning.

Textbooks:

1) T.M. Mitchell, "Machine Learning", McGraw-Hill,1997.
2) Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

Reference Books:

1. EthernAlpaydin, "Introduction to Machine Learning", MIT Press,2004.
2. Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014.
3. Andreas C. Müller and Sarah Guido "Introduction to Machine Learning with Python:A Guide for Data Scientists",Oreilly.

Online Learning Resources:

1. Andrew Ng, "Machine Learning"https://www.deeplearning.ai/machine-learning-yearning/
2. Shai Shalev-Shwartz , Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms" , Cambridge University Press. https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html
3. http://nptel.ac.in/courses/106106139/

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Computer Science and Engineering

Course Code	DEEP LEARNING	L	T	P	C
		3	0	0	3

III Year IInd Semester

Course Outcomes:

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

- **i.** Demonstrate the basic concepts fundamental learning techniques and layers.
- **ii.** Discuss the Neural Network training, various random models.
- **iii.** Explain different types of deep learning network models.
  Classify the Probabilistic Neural Networks and Sequence model neural networks.
- **iv.** Implement tools on Deep Learning techniques

UNIT I: Introduction: Various paradigms of learning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques. Feed forward neural network: Artificial Neural Network, activation function, multi-layer neural network

UNIT II: Training Neural Network: Risk minimization, loss function, back propagation, regularization, model selection, and optimization. Conditional Random Fields: Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.

UNIT III: Deep Learning: Deep Feed Forward network, regularizations, training deep models, dropouts, Convolution Neural Network, Recurrent Neural Network, and Deep Belief Network

UNIT IV: Probabilistic Neural Network: Hopfield Net, Boltzmann machine, RBMs, Sigmoid net, Auto encoders. Sequence Modeling: LSTM, Gated RNNs & Deep Generative Models

UNIT V: Applications: Object recognition, sparse coding, computer vision, natural language processing. Introduction to Deep Learning Tools: Caffe, Theano, Torch

Text Books:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.. 2. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.

References:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009. 2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013. 3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

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Computer Science and Engineering

Course Code	Advanced Computer Architecture (Professional Elective Course-II)	L	T	P	C
		3	0	0	3

III Year IInd Semester

Course Objectives:

- Understand the Concept of Parallel Processing and its applications
- Implement the Hardware for Arithmetic Operations
- Analyse the performance of different scalar Computers
- Develop the Pipelining Concept for a given set of Instructions
- Distinguish the performance of pipelining and non-pipelining environment in a processor

Course Outcomes (CO):

After completion of the course, students will be able to

- Illustrate the types of computers, and new trends and developments in computer architecture
- Outline pipelining, instruction set architectures, memory addressing
- Apply ILP using dynamic scheduling, multiple issue, and speculation
- Illustrate the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges
- Apply multithreading by using ILP and supporting thread-level parallelism (TLP)

UNIT - I		Lecture 8Hrs

Computer Abstractions and Technology: Introduction, Eight Great Ideas in Computer Architecture, Below Your Program, Under the Covers, Technologies for Building Processors and Memory, Performance, The Power Wall, The Sea Change: The Switch from Uni-processors to Multiprocessors, Benchmarking the Intel Core i7, Fallacies and Pitfalls.

UNIT - II		Lecture 9Hrs

Instructions: Language of the Computer: Operations of the Computer Hardware, Operands of the Computer Hardware, Signed and Unsigned Numbers, Representing Instructions in the Computer, Logical Operations, Instructions for Making Decisions, Supporting Procedures in Computer Hardware, Communicating with People, MIPS Addressing for 32-Bit Immediates and Addresses, Parallelism and Instructions: Synchronization, Translating and Starting a Program, A C Sort Example to Put It All Together, Arrays versus Pointers, ARMv7 (32-bit) Instructions, x86 Instructions, ARMv8 (64-bit) Instructions.

UNIT - III		Lecture 9Hrs

Arithmetic for Computers: Introduction, Addition and Subtraction, Multiplication, Division, Floating Point, Parallelism and Computer Arithmetic: Subword Parallelism, Streaming SIMD Extensions and Advanced Vector Extensions in x86, Subword Parallelism and Matrix Multiply.

UNIT - IV		Lecture 8Hrs

The Processor: Introduction, Logic Design Conventions, Building a Datapath, A Simple Implementation Scheme, An Overview of Pipelining, Pipelined Datapath and Control, Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions, The ARM Cortex-A8 and Intel Core i7 Pipelines.

UNIT - V		Lecture 8Hrs

Large and Fast: Exploiting Memory Hierarchy: Introduction, Memory Technologies, The Basics of Caches, Measuring and Improving Cache Performance, Dependable Memory Hierarchy, Virtual Machines, Virtual Memory, A Common Framework for Memory Hierarchy, Using a Finite-State Machine to Control a Simple Cache, Parallelism and Memory Hierarchies: Cache Coherence, Parallelism and Memory Hierarchy: Redundant Arrays of

Inexpensive Disks, Advanced Material: Implementing Cache Controllers, The ARM Cortex-A8 and Intel Core i7 Memory Hierarchies.
Textbooks:
1) Computer Organization and Design: The hardware and Software Interface, David A Patterson, John L Hennessy, 5th edition, MK. 2) Computer Architecture and Parallel Processing – Kai Hwang, Faye A.Brigs, Mc Graw Hill.
Reference Books:
1) Modern Processor Design: Fundamentals of Super Scalar Processors, John P. Shen and Miikko H. Lipasti, Mc Graw Hill. 2) Advanced Computer Architecture – A Design Space Approach – DezsoSima, Terence Fountain, Peter Kacsuk , Pearson.
Online Learning Resources:
https://nptel.ac.in/courses/106/105/106105163/

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Computer Science and Engineering

Course Code	SOFTWARE TESTING METHODOLIGIES (Professional Elective Course-II)	L	T	P	C
		3	0	0	3

III Year IInd Semester

Course Objectives:

- Introduce the fundamentals of various testing methodologies.
- Describe the principles and procedures for designing test cases.
- Teach debugging methods.

Course Outcomes (CO):

After completion of the course, students will be able to

- Understand the basic testing procedures.
- Develop reliable software
- Design test cases for testing different programming constructs
- Test the applications by applying different testing methods and automation tools

UNIT - I	**Introduction**	Lecture 8Hrs

Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences ofBugs, Taxonomy of Bugs.
Flow graphs and Path testing: Basics Concepts of Path Testing, Predicates, PathPredicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application ofPath Testing.

UNIT - II	**Flow Testing**	Lecture 9Hrs

Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques.
Dataflow testing: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing.

UNIT - III	**Domain Testing**	Lecture 9Hrs

Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing, Domains and Interfaces Testing, Domain and Interface Testing, Domains and Testability.

UNIT - IV	**Logic Based Testing**	Lecture 8Hrs

Paths, Path products and Regular expressions: Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.
Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, Specifications.

UNIT - V	**Graph Matrices and Application**	Lecture 8Hrs

State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, State Testing, Testability Tips.
Graph Matrices and Application: Motivational Overview, Matrix of Graph, Relations, Power of a Matrix, Node Reduction Algorithm, Building Tools.

Textbooks:

1. Boris Beizer, “Software testing techniques”, Dreamtech, second edition, 2002.

Reference Books:

.1. Brian Marick, “The craft of software testing”, Pearson Education.
2. Yogesh Singh, “Software Testing”, Camebridge
3. P.C. Jorgensen, “Software Testing” 3rd edition, Aurbach Publications (Dist.by SPD).
4. N.Chauhan, “Software Testing”, Oxford University Press.
5. P.Ammann&J.Offutt, “Introduction to Software Testing” , Cambridge Univ. Press.
6. Perry, “Effective methods of Software Testing”, John Wiley, 2nd Edition, 1999.

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Computer Science and Engineering

Course Code	INTERNET OF THINGS LAB	L	T	P	C
		0	0	3	1.5

III Year IInd Semester

Course Objectives:

- To introduce components such as WiFi, Bluetooth, Temperature, Moisture sensors
- To know the Micro controller such as Arduino
- To know the System on Chip (SOC) / Single Board Computer such as Raspberry Pi
- To understand HTTP IoT protocols and perform Experiments for data transmission
- To understand UAV/Drones and Internet of Drones Experiments

Course Outcomes (CO):

After completion of the course, students will be able to

- Know the various IoT sensors and understand the functionality
- Design and analyze IoT experiments and transfer the data to IoT Clouds
- Design the IoT systems for real time applications
- Understand Drones and Perform Internet of Drones Experiments

List of Experiments:

Experiments using ESP32

1. Serial Monitor, LED, Servo Motor - Controlling

- **Experiment1:**
  Controlling actuators through Serial Monitor. Creating different led patterns and controlling them using push button switches. Controlling servo motor with the help of joystick.

2. **Distance Measurement of an object**

- **Experiment 2:**
  Calculatethe distance to an object with the help of an ultrasonic sensor and display it on an LCD.

3, **LDR Sensor, Alarm and temperature, humidity measurement**

Experiment 3:

- Controlling relay state based on ambient light levels using LDR sensor.
- Basic Burglar alarm security system with the help of PIR sensor and buzzer.
- Displaying humidity and temperature values on LCD

4. Experiments using Raspberry Pi

Experiment 4:

- Controlling relay state based on input from IR sensors
- Interfacing stepper motor with R-Pi
- Advanced burglar alarm security system with the help of PIR sensor, buzzer and keypad. (Alarm gets disabled if correct keypad password is entered)
- 5. Automated LED light control based on input from PIR (to detect if people are present) and LDR(ambient light level)

5. IOT Framework

Experiment 5:

Upload humidity & temperature data to ThingSpeak, periodically logging ambient light level to ThingSpeak

Experiment 6:

Controlling LEDs, relay & buzzer using Blynk app

6. HTTP Based

Experiment 7:

- Introduction to HTTP. Hosting a basic server from the ESP32 to control various digital based

actuators (led, buzzer, relay) from a simple web page.

Experiment 8:

- Displaying various sensor readings on a simple web page hosted on the ESP32.

7. MQTT Based

Experiment 9:

Controlling LEDs/Motors from an Android/Web app, Controlling AC Appliances from an android/web app with the help of relay.

Experiment 10:

Displaying humidity and temperature data on a web-based application

8. UAV/Drone:

Experiment 11:

- Demonstration of UAV elements, Flight Controller
- Mission Planner flight planning design

Experiment 12:

- Python program to read GPS coordinates from Flight Controller

Reference:

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012.
2. Alexander Osterwalder, and Yves Pigneur – Business Model Generation – Wiley, 2011
3. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
4. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.

Online Learning Resources/Virtual Labs:

https://www.arduino.cc/
https://www.raspberrypi.org/

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Computer Science and Engineering

Course Code	CLOUD COMPUTING LAB	L	T	P	C
		0	0	3	1.5

III Year IInd Semester

Course Objectives:

- Be exposed to tool kits for grid and cloud environment.
- Be familiar with developing web services/Applications in grid framework
- Learn to run virtual machines of different configuration.
- Learn to use Hadoop.

Course Outcomes (CO):

After completion of the course, students will be able to

- To develop web applications in cloud
- To learn the design and development process involved in creating a cloud based application
- To learn to implement and use parallel programming using Hadoop

List of Experiments:

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.

2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs

3. Install Google App Engine. Create hello world app and other simple web applications using python/java.

4. Use GAE launcher to launch the web applications.

5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.

6. Find a procedure to transfer the files from one virtual machine to another virtual machine.

7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)

8. Install Hadoop single node cluster and run simple applications like wordcount

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Computer Science and Engineering

Course Code	MACHINE LEARNING LAB	L	T	P	C
		0	0	3	1.5

III Year IInd Semester

Course Objectives:

1. Make use of Data sets in implementing the machine learning algorithms
2. Implement the machine learning concepts and algorithms in any suitable language of choice.

Course Outcomes (CO):

After completion of the course, students will be able to

1. Understand the implementation procedures for the machine learning algorithms.
2. Design Java/Python programs for various Learning algorithms.
3. Apply appropriate data sets to the Machine Learning algorithms.
4. Identify and apply Machine Learning algorithms to solve real world problems.

List of Experiments:

Note:

1. The programs can be implemented in either JAVA or Python.
2. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.
3. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

1. Implement and demonstrate the FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge toclassify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement a k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

References:

1. Aamodt, Agnar, and Enric Plaza. "Case-based reasoning: Foundational issues, methodological variations, and system approaches." AI communications 7.1 (1994): 39-59.

2. Adebayo, Julius, Justin Gilmer, Michael Muelly, Ian Goodfellow, Moritz Hardt, and Been Kim. "Sanity checks for saliency maps." arXiv preprint arXiv:1810.03292 (2018).

3. Alain, Guillaume, and YoshuaBengio. "Understanding intermediate layers using linear classifier probes." arXiv preprint arXiv:1610.01644 (2016).

Online Learning Resources/Virtual Labs:

http://vlabs.iitb.ac.in/vlabs-dev/labs/machine_learning/labs/index.php
https://www.numpy.org/
https://www.scipy.org/
https://matplotlib.org/
https://pandas.pydata.org/
https://scikit-learn.org/stable/

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Computer Science and Engineering

Course Code	SOFT SKILLS	L	T	P	C
		1	0	2	2

II Year 2nd Semester

Course Objectives:

- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking and problem-solving skills
- To develop leadership skills and organizational skills through group activities
- To function effectively with heterogeneous teams

Course Outcomes (CO):

By the end of the program students should be able to

- Memorize various elements of effective communicative skills
- Interpret people at the emotional level through emotional intelligence
- apply critical thinking skills in problem solving
- analyse the needs of an organization for team building
- Judge the situation and take necessary decisions as a leader
- Develop social and work-life skills as well as personal and emotional well-being

UNIT – I	Soft Skills & Communication Skills	10 Hrs

Introduction, meaning, significance of soft skills – definition, significance, types of communication skills - Intrapersonal & Inter-personal skills - Verbal and Non-verbal Communication

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self- expression – articulating with felicity

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

UNIT – II	Critical Thinking	10 Hrs

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT – III	Problem Solving & Decision Making	

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution –
Methods of decision making – Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.

Case Study & Group Discussion

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Computer Science and Engineering

UNIT – IV	Emotional Intelligence & Stress Management	10 Hrs

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT – V	Leadership Skills	10 Hrs

Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – Risk-Taking - Team Building - Time Management

Activities:

Forming group with a consensus among the participants- choosing a leader- encouraging the group members to express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment – vision – accommodating nature- eliciting views on successes and failures of leadership using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making, Group discussion etc.

NOTE-:

1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear or for good Leadership – Mahendar Singh Dhoni etc.

Textbooks:

1. Personality Development and Soft Skills (English, Paperback, Mitra Barun K.)Publisher: Oxford University Press; Pap/Cdr edition (July 22, 2012)
2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha KapoorPublisher : I K International Publishing House; 0 edition (February 28, 2018)

Reference Books:

1. Soft skills: personality development for life success by Prashant Sharma, BPB publications 2018.
2. Soft Skills By Alex K. Published by S.Chand
3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeetha Sharma Published by Wiley.
4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books
5. SOFT SKILLS for a BIG IMPACT (English, Paperback, RenuShorey) Publisher: Notion Press
6. Life Skills Paperback English Dr. Rajiv Kumar Jain, Dr. Usha Jain Publisher: Vayu Education of India

Online Learning Resources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc

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Computer Science and Engineering

Course Code	CONSITUTION OF INDIA (Mandatory Course)	L	T	P	C
		2	0	0	0

III Year 2nd Semester

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

Course Outcomes (CO):

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

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.

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;
.

UNIT - III

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

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

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

Reference Books:

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

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Computer Science and Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Computer Science & Engineering					
IV Year Ist Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		**Professional Elective – III**	PE	3-0-0	3
2.		**Professional Elective – IV**	PE	3-0-0	3
3.		**Professional Elective – V**	PE	3-0-0	3
4.		**Open Elective-III**	OE	3-0-0	3
5.		**Open Elective – IV**	OE	3-0-0	3
6.		**Humanities Elective-I** 1)Entrepreneurship and Incubation 2)Management Science). 3Organizational Behavior	OE	3-0-0	3
7.		**Skill oriented course– V** Mobile Application Development	SC	1-0-2	2
8.		Evaluation of Industrial Internship	PR	0-0-0	3
				Total	**23**

List of Professional Electives-III	**List of Professional Electives-V**
1)Data Science 2)Quantum Computing 3)Agile Methodologies	1)Natural Language Processing 2)Cryptography & Network Security 3)Software Architecture
List of Professional Electives-IV	**Humanities Elective**
1)Robotic Process Automation 2)Block chain Technologies & Applications 3)Software Quality Assurance	1. 1)Entrepreneurship and Design Thinking 2. 2)Management Science 3)Organizational Behavior
3. List of Open Electives-III & IV	
4. Candidate should select the subject from list of subjects offered by other departments.	

Category	**CREDITS**
Professional Elective Courses	9
Open Elective Course/Job Oriented Elective	6
Humanities and Social Science Elective	3
Skill oriented course	2
Industrial Internship	3
TOTAL CREDITS	**23**

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Computer Science and Engineering

COURSE CODE	DATA SCIENCE	L	T	P	C
		3	0	0	3

IV Year Ist Semester

UNIT-I

Introduction: What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication - Current landscape of perspectives - Skill sets needed Statistical Inference - Populations and samples - Statistical modeling, The Data Science Process.

UNIT-II

Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study: RealDirect (online real estate firm) Three Basic Machine Learning Algorithms - Linear Regression - k-Nearest Neighbors (k-NN) - k-means

UNIT-III

One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam - Why Linear Regression and k-NN are poor choices for Filtering Spam - Naive Bayes and why it works for Filtering Spam - Data Wrangling: APIs and other tools for scrapping the Web

UNIT-IV

Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests

UNIT-V

Recommendation Systems: Building a User-Facing Data Product - Algorithmic ingredients of a Recommendation Engine - Dimensionality Reduction - Singular Value Decomposition - Principal Component Analysis - Exercise: build your own recommendation system. Data Visualization - Basic principles, ideas and tools for data visualization

TEXT BOOKS:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.

REFERENCE BOOKS:

1. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
2. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013

3. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online)
4. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science.
5. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014
6. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.

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Computer Science and Engineering

Course Code	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3

IV Year Ist Semester

UNIT-I : FOUNDATION

Overview of traditional computing – Church-Turing thesis – circuit model of computation – reversible computation – quantum physics – quantum physics and computation – Dirac notation and Hilbert Spaces – dual vectors – operators – the spectral theorem – functions of operators – tensor products – Schmidt decomposition theorem

UNIT-II : QUBITS AND QUANTUM MODEL OF COMPUTATION

State of a quantum system – time evolution of a closed system – composite systems – measurement – mixed states and general quantum operations – quantum circuit model – quantum gates – universal sets of quantum gates – unitary transformations – quantum circuits.

UNIT III : QUANTUM ALGORITHMS-I

Superdense coding – quantum teleportation – applications of teleportation – probabilistic versus quantum algorithms – phase kick-back – the Deutsch algorithm – the Deutsch-Jozsa algorithm – Simon's algorithm – Quantum phase estimation and quantum Fourier Transform – eigenvalue estimation

UNIT IV : QUANTUM ALGORITHMS – II

Order-finding problem – eigenvalue estimation approach to order finding – Shor's algorithm for order finding – finding discrete logarithms – hidden subgroups – Grover's quantum search algorithm – amplitude amplification – quantum amplitude estimation – quantum counting – searching without knowing the success probability

UNIT V : QUANTUM COMPUTATIONAL COMPLEXITY AND ERROR CORRECTION

Computational complexity – black-box model – lower bounds for searching – general black-box lower bounds – polynomial method – block sensitivity – adversary methods – classical error correction – classical three-bit code – fault tolerance – quantum error correction – three- and nine-qubit quantum codes – fault-tolerant quantum computation

TEXTBOOKS:

1. P. Kaye, R. Laflamme, and M. Mosca, "An introduction to Quantum Computing", Oxford University Press, 1999.

REFERENCES:

1. V. Sahni, "Quantum Computing", Tata McGraw-Hill Publishing Company, 2007.

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Computer Science and Engineering

Course Code	AGILE METHODOLOGIES	L	T	P	C
		3	0	0	3

IV Year Ist Semester

UNIT-I **AGILE METHODOLOGY**

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT-II **AGILE PROCESSES**

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT-III **AGILITY AND KNOWLEDGE MANAGEMENT** **9**

Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT-IV **AGILITY AND REQUIREMENTS ENGINEERING**

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT-V **AGILITY AND QUALITY ASSURANCE**

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

TEXT BOOKS:

1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

REFERENCES:

1. Craig Larman, ―Agile and Iterative Development: A Manager_s Guide‖, Addison-Wesley, 2004.
2. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.

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Computer Science and Engineering

Course Code	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

IV Year Ist Semester

UNIT-I:

Introduction to Natural language

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems,Different Levels of Language Analysis, Representations and Understanding, Organization ofNaturallanguageUnderstandingSystems,LinguisticBackground:AnoutlineofEnglishSyntax.

Unit-II:Grammars andParsing

Grammars and Parsing- Top- Down and Bottom-Up Parsers, Transition Network Grammars,Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, ParsingwithFeatures,AugmentedTransitionNetworks,BayeesRule,Shannongame,EntropyandCross Entropy.

UNIT-III: Grammars for Natural Language

Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT-IV:

Semantic interpretation

Semantic&Logicalform,Wordsenses&ambiguity,Thebasiclogicalformlanguage,Encodingambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts &embedded sentences, Defining semantics structure model theory.

Language Modeling

Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modeling Problems ,Multilingual and Cross lingual Language Modeling.

UNIT-V:

Machine Translation

Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible,BriefHistory, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the GordianKnot,TheProblem,Structure of Anusaraka System, UserInterface ,Linguistic Area, Givingup Agreement in Anusarsaka Output, Language Bridges.

Multilingual Information Retrieval

Introduction, Document Preprocessing, Monolingual Information Retrieval, CLIR, MLIR ,Evaluation in Information Retrieval, Tools, Software and Resources.

Multilingual Automatic Summarization

Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

TEXTBOOKS:

1. JamesAllen,NaturalLanguageUnderstanding, 2ndEdition,2003,PearsonEducation.

2. MultilingualNaturalLanguageProcessingApplications:FromTheoryToPractice-DanielM.Bikel andImedZitouni, PearsonPublications.

3. NaturalLanguageProcessing,Apaninianperspective,AksharBharathi,Vineetchaitanya,Prentice–HallofIndia.

REFERENCESBOOKS:

1. Charniack,Eugene,StatisticalLanguageLearning,MITPress,1993.

2. Jurafsky,DanandMartin,James,SpeechandLanguageProcessing,2ndEdition,PrenticeHall, 2008.

3. Manning,ChristopherandHenrich,Schutze,FoundationsofStatisticalNaturalLanguageProcessing, MIT Press, 1999.

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Computer Science and Engineering

Course Code	CRYPTOGRAPHY & NETWORK SECURITY	L	T	P	C
		3	0	0	3

IV Year Ist Semester

UNIT – I

Attacks on Computers and Computer Security: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks

UNIT – II

Symmetric key Ciphers: Block Cipher principles &Algorithms (DES, AES, Blowfish), Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4,Location and placement of encryption function, Key distribution

Asymmetric key Ciphers: Principles of public key cryptosystems, Algorithms(RSA, Diffie- Hellman,ECC), Key Distribution

UNIT – III

Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm.

UNIT – IV

E-Mail Security: Pretty Good Privacy, S/MIME

IP Security: IP Security overview, IP Security architecture, Authentication Header, encapsulating security payload, combining security associations, key management.

UNIT – V

Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction

Intruders, Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls

Case Studies on Cryptography and security: Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability, Virtual Elections.

TEXT BOOKS:

1. William Stallings, “Cryptography and Network Security”, 5th Edition, Pearson Education, 2011.
2. Atul Kahate, “Cryptography and Network Security”, 2nd Edition, Mc Graw Hill, 2010.
3. Bernard Menezes “Network Security and Cryptography”, 1stEdition, CENGAGE Learning, 2010.

REFERENCES:

1. C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, “Cryptography and Network Security”,1st Edition, Wiley India Pvt Ltd, 2011.
2. ForouzanMukhopadhyay “Cryptography and Network Security”, 2nd Edition , Mc Graw Hill, 2010.
3. Mark Stamp, Wiley India, “Information Security, Principles and Practice”, 2nd Edition, Wiley, 2011.

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Computer Science and Engineering

Course Code	SOFTWARE ARCHITECTURE	L	T	P	C
		3	0	0	3

IV Year Ist Semester

UNIT-I

Introduction: The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; What makes a "good" architecture? What software architecture is and what it is not; Other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views.

UNIT-II

Architectural Styles and Case Studies: Architectural styles; Pipes and filters; Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous architectures. Case Studies: Keyword in Context; Instrumentation software; Mobile robotics; Cruise control; Three vignettes in mixed style.

UNIT-III

Quality: Functionality and architecture; Architecture and quality attributes; System quality attributes; Quality attribute scenarios in practice; Other system quality attributes; Business qualities; Architecture qualities. Achieving Quality: Introducing tactics; Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics; Relationship of tactics to architectural patterns; Architectural patterns and styles.

UNIT-IV

Architectural Patterns: Introduction; From mud to structure: Layers, Pipes and Filters, Blackboard. Distributed Systems: Broker; Interactive Systems: MVC, Presentation-Abstraction-Control.

UNIT-V

Designing and Documenting Software Architecture: Architecture in the life cycle; Designing the architecture; Forming the team structure; Creating a skeletal system. Uses of architectural documentation; Views; Choosing the relevant views; Documenting a view; Documentation across views.

TEXT BOOKS:

1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 2nd Edition, Pearson Education, 2003.
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007.
3. Mary Shaw and David Garlan: Software Architecture- Perspectives on an Emerging Discipline, PHI, 2007.

REFERENCE BOOKS:

1. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns- Elements of Reusable Object-Oriented Software, Pearson Education,1995.

Web Reference: http://www.hillside.net/patterns/

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Computer Science and Engineering

Course Code	BLOCK CHAIN TECHNOLOGIES & APPLICATIONS	L	T	P	C
		3	0	0	3

IV Year Ist Semester

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

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Computer Science and Engineering

Course Code	SOFTWARE QUALITY ASSURANCE	L	T	P	C
		3	0	0	3

IV Year Ist Semester

UNIT I INTRODUCTION TO SOFTWARE QUALITY & ARCHITECTURE

Need for Software quality – Quality challenges – Software quality assurance (SQA) – Definition and objectives – Software quality factors- McCall's quality model – SQA system and architecture – Software Project life cycle Components – Pre project quality components – Development and quality plans.

UNIT II SQA COMPONENTS AND PROJECT LIFECYCLE

Software Development methodologies – Quality assurance activities in the development process- Verification & Validation – Reviews – Software Testing – Software Testing implementations – Quality of software maintenance – Pre-Maintenance of software quality components – Quality assurance tools – CASE tools for software quality – Software maintenance quality – Project Management.

UNIT III SOFTWARE QUALITYINFRASTRUCTURE

Procedures and work instructions - Templates - Checklists – 3S developmenting - Staff training and certification Corrective and preventive actions – Configuration management – Software change control – Configuration management audit -Documentation control – Storage and retrieval.

UNIT IV SOFTWARE QUALITY MANAGEMENT & METRICS

Project process control – Computerized tools - Software quality metrics – Objectives of quality measurement – Process metrics – Product metrics – Implementation – Limitations of software metrics – Cost of software quality – Classical quality cost model – Extended model – Application of Cost model.

UNIT V STANDARDS, CERTIFICATIONS &ASSESSMENTS

Quality manangement standards – ISO 9001 and ISO 9000-3 – capability Maturity Models – CMM and CMMI assessment methodologies - Bootstrap methodology – SPICE Project – SQA project process standards – IEEE st 1012 & 1028 – Organization of Quality Assurance – Department management responsibilities – Project management responsibilities – SQA units and other actors in SQA systems.

TEXT BOOKS:

1. Daniel Galin, "Software Quality Assurance", Pearson Publication, 2009.

REFERENCES:

1. Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.
2. Mordechai Ben-Menachem "Software Quality: Producing Practical Consistent Software", International Thompson Computer Press, 1997.

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Computer Science and Engineering

Course Code	ROBOTIC PROCESS AUTOMATION	L	T	P	C
		3	0	0	3

IV Year Ist Semester

UNIT-I: Introduction: What is Robotic Process Automation (RPA), Scope & techniques of Automation, Benefits of RPA, Components of RPA, RPA Platforms, UiPath Studio, Installation of UiPath Studio, Learning UiPath Studio

UNIT-II: Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making.
Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations
Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events
Recording and advanced UI Interaction
Basic recording, Desktop recording, Web recording, Citrix, Screen Scraping, When to use OCR, Types of OCR available, How to use OCR Avoiding typical failure points.

UNIT-III: Plugins and Extensions: Terminal plugin, Java plugin, Java plugin with UiPath Studio, Citrix automation, Citrix environment, Mail plugin, PDF plugin, Web integration, Excel and Word plugins, Credential management Extensions
Handling User Events and Assistant Bots: What are assistant bots, Monitoring system event triggers: Hotkey trigger, Mouse trigger, System trigger, Monitoring image and element triggers, Launching an assistant bot on a keyboard event

UNIT-IV: Exception Handling, Debugging, and Logging: Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots Debugging techniques, Setting breakpoints, Slow step, Highlighting, Break, Collecting crash dumps: Enabling crash dumps, Disabling crash dumps, Error reporting: Enterprise Edition customers, Community Edition users.

Managing and Maintaining the Code: Project organization, Picking an appropriate layout for each workflow, Breaking the process into smaller parts, Using exception handling, Making your workflow readable, Keeping it clean, Nesting workflows, Reusability of workflows, Templates, Commenting techniques, State Machine, When to use Flowcharts State Machines or Sequences.

UNIT-V: Deploying and Maintaining the Bot: Publishing using publish utility, Overview of Orchestration Server, Using Orchestration Server to control bots, Using Orchestration Server to deploy bots, License management,

Activating and uploading a license to Orchestrator, Publishing and managing updates, Packages, Managing packages
Learning Resources: 1. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: OReilly Publishing, 2018, ISBN: 9781788470940 2. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited, 2018 3. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018 4. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation, 1st Edition, Consulting Opportunity Holdings LLC, 2018 5. https://www.uipath.com/rpa/robotic-process-automation 6. https://www.udemy.com/robotic-process-automation/

Course Code	**ENTREPRENEURSHIP & INCUBATION (Humanities Elective-I)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
IV Year 1st Semester					
Course Objectives:					
The objectives of this course are • To make the student understand about Entrepreneurship • To enable the student in knowing various sources of generating new ideas in setting up of New enterprise • To facilitate the student in knowing various sources of finance in starting up of a business • To impart knowledge about various government sources which provide financial assistance to entrepreneurs/ women entrepreneurs • To encourage the student in creating and designing business plans					
Course Outcomes (CO):					
• Understand the concept of Entrepreneurship and challenges in the world of • competition. • Apply the Knowledge in generating ideas for New Ventures. • Analyze various sources of finance and subsidies to entrepreneur/women • Entrepreneurs. • Evaluate the role of central government and state government in promoting • Entrepreneurship.					

- Create and design business plan structure through incubations.

UNIT - I		

Entrepreneurship -Concept, knowledge and skills requirement - Characteristics of successfulentrepreneurs - Entrepreneurship process - Factors impacting emergence of entrepreneurship -Differences between Entrepreneur and Intrapreneur - Understanding individual entrepreneurialmindsetand personality-Recent trends in Entrepreneurship

UNIT - II		

Starting the New Venture - Generating business idea – Sources of new ideas & methods ofgeneratingideas-Opportunityrecognition-Feasibilitystudy-Marketfeasibility,technical/operational feasibility - Financial feasibility - Drawing business plan - Preparingprojectreport -Presentingbusiness plan to investors

UNIT - III		

Sources of finance - Various sources of Finance available - Long term sources - Short term sources - Institutional Finance – Commercial Banks, SFC's in India - NBFC's in India - their way of financing in India for small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions in aid of entrepreneurship development

UNIT - IV		

Women Entrepreneurship - Entrepreneurship Development and Government - Role of CentralGovernment and State Government in promoting women Entrepreneurship - Introduction tovarious incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessionsavailable-Womenentrepreneurship-Roleandimportance-GrowthofwomenentrepreneurshipinIndia- Issues &Challenges – Entrepreneurialmotivations

UNIT - V		

Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence the Type/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure - Value proposition

Textbooks:

1. D F Kuratko and T V Rao, "Entrepreneurship" - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)
2. 2 . Nandan H, " Fundamentals of Entrepreneurship", PHI, 2013

Reference Books:

1. VasantDesai,"SmallScaleIndustriesandEntrepreneurship",HimalayaPublishing2012.
2. RajeevRoy"Entrepreneurship",2nd Edition,Oxford,2012.
3. B.JanakiramandM.Rizwana‖ "Entrepreneurship Development: Text &Cases",Excel Books, 2011.
4. StuartRead,Effectual"Entrepreneurship",Routledge,2013.

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Computer Science and Engineering

Course Code	MANAGEMENT SCIENCE (Humanities Elective-I)	L	T	P	C
		3	0	0	3

IV Year 1st Semester

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 (CO):

- 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 - importance of Management. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles – Abraham Maslow's hierarchy theory of needs - 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 - Functions of Marketing - Marketing Mix - Channels of Distribution - 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- 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.
Textbooks:
1. A.R Aryasri, "Management Science", TMH, 2013 2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 2012.
Reference Books:
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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Computer Science and Engineering

Course Code	ORGANISATIONAL BEHAVIOUR (Humanities Elective-I)	L	T	P	C
		3	0	0	3

IV Year 1st Semester

Course Objectives:

The objectives of this course are

- To make the student understand about the organizational behavior
- To enable them to develop self-motivation, leadership and management
- To facilitate them to become powerful leaders
- Impart knowledge about group dynamics

Course Outcomes (CO):

- Understand the nature and concept of Organizational behavior
- Apply theories of motivation to analyze the performance problems
- Analyze the different theories of leadership
- Evaluate group dynamics

UNIT - I

Organizational Behavior - Introduction to OB - Meaning and definition, scope - Organizing Process – Making organizing effective - Understanding Individual Behavior – Attitude - Perception - Learning - Personality Types

UNIT - II

Motivation and Leading - Theories of Motivation - Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Leading - Leading Vs Managing

UNIT - III

Leadership and Organizational Culture and Climate - Leadership - Traits Theory–ManagerialGrid - Transactional Vs Transformational Leadership - Qualities of good Leader - ConflictManagement-EvaluatingLeader-Women and Corporateleadership

UNIT - IV

Group Dynamics - Types of groups - Determinants of group behavior - Group process – GroupDevelopment - Group norms - Group cohesiveness - Small Groups - Group decision making -Teambuilding-Conflictin theorganization– Conflict resolution

UNIT - V

Organizational Change and Development - Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development

Textbooks:

1. Luthans, Fred, "OrganisationalBehaviour" , McGraw-Hill, 12 Th edition 2011 2. P Subba Rao, OrganisationalBehaviour, Himalya Publishing House 2017

Reference Books:

1. McShane, "Organizational Behaviour", TMH 2009
2. Nelson, "OrganisationalBehaviour", Thomson, 2009.
3. Robbins, P.Stephen, Timothy A. Judge, "OrganisationalBehaviour", Pearson 2009.
4. Aswathappa, "OrganisationalBehaviour", Himalaya, 2009

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Computer Science and Engineering

Course Code	**MOBILE APPLICATION DEVELOPMENT**		**L**	**T**	**P**	**C**
SKILL Oriented Course	**(Skill Oriented Course – V)**		**1**	**0**	**2**	**2**
Pre-requisite		**Semester**	**VII**			

Course Objectives:

- Learn the configuration of Android Studio, SDK Manager, and AVD Emulators
- Understand Android UI Components and make use of Material Design for Android
- Learn the usage of Libraries, APIs and handle messages
- Explore various Hybrid App Development Platforms
- Acquire the knowledge of app releases and publishing and app to the play store

Course Outcomes (CO):

After completion of the course, students will be able to

1. demonstrate the configuration of Android Software Development tools
2. design and develop Mobile Applications using Android and Kotlin
3. develop a complex android application by using APIs, Libraries, and message handling techniques
4. Construct the mobile application using a hybrid framework or SDK
5. release and publish an application on Google Play Store

Activities:

Module 1:
Android OS Architecture: Application Layer, Framework Layer, Libraries and Runtime, Hardware Abstraction Layer, and Kernel
Task: Select any two Mobile Apps used in your mobile phone and note the various functionalities and their corresponding layers

Module 2:
Android Studio: Install Android Studio, SDK Manager, Configure Plugins, Android Virtual Device(AVD) Emulators
Task: Install Android Studio and Configure Latest Android SDKs and Android Virtual Devices

Module 3:
Building your First Application: Understanding Activities and Intents, Activity Lifecycle and Managing State, Activities and Implicit Intents
Task: Build and Run Hello World Application on the virtual Device and also test the app on your mobile phone

Module 4:
Android UI components: Text Controls, Buttons, Widgets, Layouts, Containers

Task: Explore all the UI Controls and design a Student Registration Activity

Module 5:
Material Design for Android: Material theme and widgets, Elevation shadows, Cards, Animations, Drawables
Task: Design the Student Registration Activity using Material Design for Android Components

Module 6:
Navigation: Back-button navigation, Hierarchical navigation patterns, Ancestral navigation (Up button), Descendant navigation, Lateral navigation with tabs and swipes
Task: Design a complete Student Management Application using Android and provide effective navigation between various Activities

Module 7:
Connect to the Internet: Security best practices for network operations, Including permissions in the manifest, Performing network operations on a worker thread, Making an HTTP connection, Parsing the results, Managing the network state
Task: Develop an Android Application that stores Student Details into the hosting server and retrieve student details from the server

Module 8:
Messages and Storage: Creating a Snackbar object, Showing the message to the user, instantiate a Toast object, Show the toast, Add Notification to your App, Customize Notifications, App-specific storage, Preferences, Room persistence library
Task: Secure the Student Management Application with proper hints, messages, notifications, and logging

Module 9:
GeoLocation: Set up the project and get an API Key, Add Markers on the map, map Styles, Enable location tracking
Task: Add your college location on maps and also provide a location tracking feature in your app

Module 10:
Authentication: Add Firebase to the project, Email Authentication, Phone Authentication, Gmail Authentication
Task: Design and implement an effective student Login System with OTP feature and email authentication using firebase

Module 11:
Hybrid App Development: Hybrid App vs Native App, React-Native, Flutter, Ionic, Xamarin
Task: Design Student Management App using any one of the Hybrid Frameworks or SDKs.

Module 12:

Publish App to Play Store: Add a launcher icon and Application ID, Specify API Level targets and version number, Disable logging and debugging, Generate signed APK for release, Create a Google Developer Account, Run pre-launch reports, Review criteria for publishing, Submit your app for publishing. Task: Prepare and Publish Your Android Apps in Google Play Store
References:
1. Smyth, Neil. Android Studio 4.2 Development Essentials - Kotlin Edition: Developing Android Apps Using Android Studio 4.2, Kotlin, and Android Jetpack, Payload Media, Incorporated, 2021. 2. Cheng, Fu. Build Mobile Apps with Ionic 4 and Firebase: Hybrid Mobile App Development. Germany, Apress, 2018. 3. Derks, Roy, and Boduch, Adam. React and React Native: A Complete Hands-on Guide to Modern Web and Mobile Development with React.js, 3rd Edition. United Kingdom, Packt Publishing, 2020.
Online Learning Resources/Virtual Labs:

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India

Computer Science and Engineering

Open Electives offered by Department of CSE

Sri Krishnadevaraya University College of Engineering & Technology
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Computer Science and Engineering

Open Electives offered by Dept. of C.S.E(Offered to other Departments)

1. Principles of Software Engineering (OE-1)
2. Java Programming (OE-2)
3. Fundamentals of Operating Systems (OE-3)
4. Fundamentals of Computer Networks (OE-4)
5. Principles of Database Management Systems
6. Web Technologies
7. Cyber Security

Sri Krishnadevaraya University College of Engineering & Technology
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Computer Science and Engineering

Course Code	**PRINCIPLES OF SOFTWARE ENGINEERING (Open Elective Course – I)**		**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Pre-requisite		**Semester**	**V**			

Course Objectives:

The course is designed to

- To learn the basic concepts of software engineering and life cycle models .
- To explore the issues in software requirements specification and enable to write SRS documents for software development problems .
- To elucidate the basic concepts of software design and enable to carry out procedural and object oriented design of software development problems .
- To understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing .
- To reveal the basic concepts in software project management.

Course Outcomes (CO):

After completion of the course, students will be able to

- Recognize the basic issues in commercial software development
- Summarize software life cycle models
- Identify basic issues in software requirements analysis and specification
- Identify the basic issues in coding practice
- Recognize the basic issues in software testing.

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.		
Textbooks:		
1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition.McGrawHill InternationalEdition. 2. Software Engineering- Sommerville, 7th edition, Pearson education		
Reference Books:		
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		

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Computer Science and Engineering

Course Code	**JAVA PROGRAMMING (Open Elective Course – II)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Pre-requisite		**Semester**	**VI**		

Course Objectives:

1.To understand object-oriented concepts and problem-solving techniques
2.To obtain knowledge about the principles of inheritance and polymorphism
3.To implement the concept of packages, interfaces, exception handling and concurrency chanism.
4.To design the GUIs using applets and swing controls.
5.To understand the Java Database Connectivity Architecture

Course Outcomes (CO):

After completion of the course, students will be able to

- Solve real-world problems using OOP techniques.
- Apply code reusability through inheritance, packages and interfaces
- Solve problems using java collection framework and I/O classes.
- Develop applications by using parallel streams for better performance and develop applets for web applications.
- Build GUIs and handle events generated by user interactions and Use the JDBC API to access the database.

UNIT - I	**Introduction**	Lecture 8Hrs

Introduction to Object Oriented Programming, The History and Evolution of Java, Introduction to Classes, Objects, Methods, Constructors, this keyword, Garbage Collection, Data Types, Variables, Type Conversion and Casting, Arrays, Operators, Control Statements, Method Overloading, Constructor Overloading, Parameter Passing, Recursion, String Class and String handling methods

UNIT - II	**Inheritance, Packages, Interfaces**	Lecture 9Hrs

Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, Using final with inheritance, Object class,
Packages: Basics, Finding packages and CLASSPATH, Access Protection, Importing packages.
Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

UNIT - III	**Exception handling, Stream based I/O**	Lecture 9Hrs

Exception handling - Fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built-in exceptions, creating own exception subclasses.
Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and Writing Files, Random access file operations, The Console class, Serialization, Enumerations, Autoboxing, Generics.

UNIT - IV	**Multithreading, The Collections Framework**	Lecture 8Hrs

Multithreading: The Java thread model, Creating threads, Thread priorities, Synchronizing threads, Interthread communication.

The Collections Framework (java.util): Collections overview, Collection Interfaces, The Collectionclasses- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Hashtable, Properties, Stack, Vector, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner.		
UNIT - V	**Applet, GUI Programming with Swings, Accessing Databases with JDBC**	Lecture 8Hrs
Applet: Basics, Architecture, Applet Skeleton, requesting repainting, using the status window, passing parameters to applets GUI Programming with Swings – The origin and design philosophy of swing, components and containers, layout managers, event handling, using a push button, jtextfield, jlabel and image icon, the swing buttons, jtext field, jscrollpane, jlist, jcombobox, trees, jtable, An overview of jmenubar, jmenu and jmenuitem, creating a main menu, show message dialog, show confirmdialog, show input dialog, show option dialog, jdialog, create a modeless dialog. Accessing Databases with JDBC: Types of Drivers, JDBC Architecture, JDBC classes and Interfaces, Basic steps in developing JDBC applications, Creating a new database and table with JDBC.		
Textbooks:		
1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd. 2. Java How to Program, 10th Edition, Paul Dietel, Harvey Dietel, Pearson Education.		
Reference Books:		
Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education. Core Java Volume – 1 Fundamentals, Cay S. Horstmann, Pearson Education. Java Programming for core and advanced learners, Sagayaraj, Dennis, Karthik and Gajalakshmi, University Press Introduction to Java programming, Y. Daniel Liang, Pearson Education. Object Oriented Programming through Java, P. Radha Krishna, University Press. Programming in Java, S. Malhotra, S. Chaudhary, 2nd edition, Oxford Univ. Press. Java Programming and Object-oriented Application Development, R.A. Johnson, Cengage Learning.		
Online Learning Resources:		
https://www.w3schools.com/java/java_oop.asp http://peterindia.net/JavaFiles.html		

Course Code	FUNDAMENTALS OF OPERATING SYSTEMS (Open Elective Course – III)	L	T	P	C
		3	0	0	3

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Computer Science and Engineering

Pre-requisite		**Semester**	**VII**			
Course Objectives:						
The course is designed to • Understand basic concepts and functions of operating systems Understand the processes, threads and scheduling algorithms. • Provide good insight on various memory management techniques • Expose the students with different techniques of handling deadlocks • Explore the concept of file-system and its implementation issues • Familiarize with the basics of Linux operating system • Implement various schemes for achieving system protection and security						
Course Outcomes (CO):						
After completion of the course, students will be able to 1. Demonstrate and understand of computer systems and operating systems functions 2. Distinguish between process and thread and classify scheduling algorithms 3. Solve synchronization and deadlock problems 4. Compare various memory management schemes 5. Explain file systems concepts and i/o management						
UNIT - I			Lecture 9Hrs			
Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Open-Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.						
UNIT - II			Lecture 9Hrs			
Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems. Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples. Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem..						
UNIT - III			Lecture 9Hrs			
Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples.						
UNIT - IV			Lecture 9Hrs			
Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention.						

File Systems: Files, Directories, File system implementation, management and optimization. Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.		
UNIT - V	**Input/ Output and Files**	Lecture 8Hrs
System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. System Security: Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification. Case Studies: Linux, Microsoft Windows.		
Textbooks:		
1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016. 2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Inter-process Communication and File systems.)		
Reference Books:		
1.Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006. 2.Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012. 3.Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009 4.Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004		
Online Learning Resources:		
https://nptel.ac.in/courses/106/106/106106144/ http://peterindia.net/OperatingSystems.html		

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Computer Science and Engineering

Course Code	**FUNDAMENTALS OF COMPUTER NETWORKS (Open Elective Course- IV)**		**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Pre-requisite		**Semester**	**VII**			

Course Objectives:

The course is designed to

- Understand the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP
- Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

Course Outcomes (CO):

After completion of the course, students will be able to

1. Identify the software and hardware components of a Computer network
2. Design software for a Computer network
3. Develop new routing, and congestion control algorithms
4. Assess critically the existing routing protocols
5. Explain the functionality of each layer of a computer network
6. Choose the appropriate transport protocol based on the application requirements

UNIT - I	**Introduction**

Network Hardware, Network Software, References Models. The Physical Layer: Guided Transmission 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, Access Networks, and LANs**

The Data Link Layer: Data link Layer Design Issues, Elementary Data Link Protocols, Sliding Window 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), Congestion Control Algorithms ,Internetworking.

UNIT - IV	**The Transport Layer**

The Transport Service, Elements of Transport Protocols, The Internet Transport Protocols: UDP, TCP.

UNIT - V	**Application Layer**

DNS-The Domain Name System, Electronic Mail, The World Wide Web. Network Security: Cryptography, Symmetric-Key Algorithms, Public-Key Algorithms, Digital Signatures.

Textbooks:

1. Computer Networks, Andrew S. Tanenbaum, Fouth Edition, Pearson Education.
Reference Books:
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, Cengage Learning.
Online Learning Resources:
https://nptel.ac.in/courses/106105183/25 http://www.nptelvideos.in/2012/11/computer-networks.html https://nptel.ac.in/courses/106105183/3

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Computer Science and Engineering

HONORS IN CSE

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Computer Science and Engineering

Honours (CSE)

Note
1.A student can opt any Four subjects @ 4 credits per subject
2.Concerned BoS can add or delete the subjects as per the decision of the board.
3.Prerequisites to be defined by the board for each course.
4.Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each

S.No.	Code	Course Name	Offered in Semester	Prerequisite if any	Contact Hours per week		Credits
					L	T	
1		Privacy preserving and Data Publishing	V		4	0	4
2		NoSQL Databases	V	DBMS	4	0	4
3		Software Defined Data Center	VI	Computer Networks	4	0	4
4		Robotics and Intelligent Systems	VII	Machine Learning	4	0	4
5		MOOC - 1	V onwards				2
6		MOOC - 2	V onwards				2

Suggested MOOCs:

1. **Multi-Core Computer Architecture – Storage and Interconnects**
2. **User-centric Computing for Human-Computer Interaction**
3. **GPU Architectures and Programming**
4. **Introduction to Quantum Computing**
5. **Real Time Operating Systems**

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Computer Science and Engineering

Course Code	**PRIVACY PRESERVING AND DATA PUBLISHING**		**L**	**T**	**P**	**C**
Honours			**4**	**0**	**0**	**4**
Pre-requisite	Probability, Design and Analysis of Algorithms	**Semester**	**V**			

Course Objectives:

Introduce attack models, provide methods and tools for publishing useful information while preserving data privacy.

Course Outcomes (CO):

After completion of the course, students will be able to

1. Apply anonymization methods for sensitive data protection.
2. Apply state-of art techniques for data privacy protection.
3. Design privacy preserving algorithms for real-world applications.
4. Identify security and privacy issues in OLAP systems.
5. Apply information metrics for Maximizing the preservation of information in the anonymization process.

UNIT - I		12 Hrs

Data Collection and Data Publishing, Introduction to Privacy-Preserving Data Publishing, Attack Models and Privacy Models: Record Linkage Model, Attribute Linkage Model, Probabilistic Model, Modeling Adversary's Background Knowledge

UNIT - II		12 Hrs

Anonymization Operations, Generalization and Suppression, Anatomization and Permutation, Random Perturbation, Information Metrics, General Purpose Metrics, Special Purpose Metrics, Trade-Off Metrics, Anonymization Algorithms: Algorithms for the Record Linkage Model, Algorithms for the Attribute Linkage Model, Algorithms for the Table Linkage Model, Algorithms for the Probabilistic Attack Model, Attacks on Anonymous Data,

UNIT - III		12 Hrs

Anonymization for Classification Analysis: Introduction, Anonymization Problems for Red Cross BTS, High-Dimensional Top-Down Specialization (HDTDS), Workload-Aware Mondrian, Bottom-Up Generalization, Genetic Algorithm, Evaluation Methodology, Anonymization for Cluster Analysis: Introduction, Anonymization Framework for Cluster Analysis, Dimensionality Reduction-Based Transformation

UNIT - IV		12 Hrs

Multiple Views Publishing: Introduction, Checking Violations of *k*-Anonymity on Multiple Views, Checking Violations with Marginals, Anonymizing Sequential Releases with New Attributes: Introduction, Monotonicity of Privacy, Anonymization Algorithm for Sequential Releases, Anonymizing Incrementally Updated Data Records: Introduction, Continuous Data Publishing, Dynamic Data Republishing		
UNIT - V		12 Hrs
Collaborative Anonymization for Vertically Partitioned Data: Introduction, Privacy-Preserving Data Mashup, Cryptographic Approach, Collaborative Anonymization for Horizontally Partitioned Data: Introduction, Privacy Model, Overview of the Solution, Anonymizing Transaction Data: Introduction, Cohesion Approach, Band Matrix Method, *km*-Anonymization, Transactional *k*-Anonymity, Anonymizing Query Logs		
Textbooks:		
1. Benjamin C.M. Fung, Ke Wang, Ada Wai-Chee Fu and Philip S. Yu, Introduction to Privacy-Preserving Data Publishing: Concepts and Techniques, 1st Edition, Chapman & Hall/CRC, 2010. 2. Charu C. Aggarwal, Privacy-Preserving Data Mining: Models and Algorithms, 1st Edition, Springer, 2008.		
Reference Books:		
1. Chen, B. C., Kifer, D., LeFevre, K., &Machanavajjhala, A. (2009). Privacy-preserving data publishing. *Foundations and Trends® in Databases*, *2*(1–2), 1-167.		
Online Learning Resources:		
https://archive.nptel.ac.in/courses/106/106/106106235/ https://archive.nptel.ac.in/courses/106/106/106106146/		

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Computer Science and Engineering

Course Code	**NoSQL DATABASES**		**L**	**T**	**P**	**C**
Honours			**4**	**0**	**0**	**4**
Pre-requisite	**DBMS**	**Semester**	**V**			

Course Objectives:

- Discuss the history unstructured data
- To know non-relational databases and their importance in Data science.
- Understand the differences between Relational and NoSQL databases
- To explore the several types of NoSQL databases and understand the role in Big Data.

Course Outcomes (CO):

After completion of the course, students will be able to

- Explain and compare different types of NoSQL database.
- Compare and contrast RDBMS with different NoSQL databases.
- Define, compare and use the four types of NoSQL databases (Document-oriented, KeyValue pairs, Column-oriented and Graph
- Demonstrate the architecture, define objects, load data, query data and performance tune Column-oriented, Key-Value pair, Document and Graph databases.
- Evaluate NoSQL database development tools and programming languages

UNIT - I	**Overview and history of NoSQL Databases**	Lecture 12Hrs

Definition of the four types of NoSQL databases. The value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The emergence of NoSQL, Key Points.

UNIT - II	**RDBMS Vs NoSQL**	Lecture 12Hrs

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregated-Oriented Databases, Replication and Sharding, MapReduce on databases, Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT - III	**Document Databases**	Lecture 12Hrs

No-SQL Key-Value Databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analysis or Real Time Analytics.

UNIT - IV	**Column Oriented Databases**	Lecture 12Hrs

Column-oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT - V	**Key Value Databases**	Lecture 12Hrs

NoSQL Key-Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets, Firebase- Cloud hosted NoSQL Database, Graph NoSQL databases using Neo4j, NoSQL database development tools and programming languages, Graph Databases features, consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.
Textbooks:
1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition 2019.
Reference Books:
1. Redmond, E. & Wilson, J. (2012). Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement (1st Ed.). Raleigh, NC: The Pragmatic Programmers, LLC. ISBN-13: 978-1934356920 ISBN-10: 1934356921 2. Guy Harrison, Next Generation Database: NoSQL and big data, Apress.
Online Learning Resources:
1. https://www.ibm.com/cloud/learn/nosql-databases 2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp 3. https://www.geeksforgeeks.org/introduction-to-nosql/ 4. https://www.javatpoint.com/nosql-databa

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Computer Science and Engineering

Course Code	**SOFTWARE DEFINED DATA CENTER**		**L**	**T**	**P**	**C**
Honours			**3**	**0**	**0**	**3**
Pre-requisite		**Semester**	**VI**			

Course Objectives:

- Introduce conventional Data Centers followed by Modern Data Centers
- To discuss various software elements of modern data centers
- Explain Virtualization concepts for Data Centers
- Discuss Compute, Storage and Network virtualization

Course Outcomes (CO):

After completion of the course, students will be able to

- Understanding of difference between Conventional Data Center Vs Modern Data Centers
- Differentiate Cloud computing and Software Defined Data Centers
- Differentiate Virtualization with conventional techniques
- Explore the techniques of Software Defined Compute, Storage and Networking components
- Able Manage Software Defined Data Centers and Develop the techniques for future Data Centers.

UNIT - I	**Introduction**	Lecture 12Hrs

Data Center evolution, A history of Modern Data Center, Focus on cost reduction, Focus on Customer service in the business, Flattening of the IT organization, IT as an operational Expense, Monolithic Storage Array rise and fall, Move From Disk to Flash, Emergence of Convergence, The Role of Cloud computing.

UNIT - II	**Emerging Data Center Trends**	Lecture 12Hrs

Emergence of SDCC, Commoditization of Hardware, Software Defined – Compute, Storage, Networking and Security, Software Defined Storage (SDS), Hyperconvergence, Hyper Converged Infrastructure(HCI) and SDS relationship, Flash in Hyperconvergence, Modern IT business Requirements.

UNIT - III	**Data Center Agility**	Lecture 12Hrs

Principles and Strategies, Transform Data Center, Align Data Center and Business Needs, Server virtualization, VDI, Eliminate and Implement Monolithic to Hyperconvergence, Full Stack Management.

UNIT - IV	**Hyperconverged Infrastructure**	Lecture 12Hrs

Software Defined Storage, SDS comparison to Traditional Storage, SDS requirements, SDS in Hyperconverged, Hyperconvergence Design Model, Virtual Storage appliances, Appliance vs. Software/Reference Architecture,

UNIT - V	**Future Data Centers**	Lecture 12Hrs

Data growth, Storage capacity, flash storage deployment, Deployment Experiences SDS and HCI, IT transformations- Automation, Orchestration, DevOps, Open Standards and Interoperability, Performance Benchmarking Standards, Future Trends, Containers Instead of virtual machines, Open Source tools, Beyond Today's Flash, Pooling of Resources.

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Textbooks:
1. Building a Modern Data Center, Principles and Strategies of Design, Scott D.Lowe, James Green, David Davis. Actual Tech Media, 2016.
Reference Books:
1. Data Center Handbook: Plan, Design, Build, and Operations of a Smart Data Center, Second Edition, HwaiyuGeng P.E.,2021 John Wiley & Sons.
Online Learning Resources:

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Computer Science and Engineering

Course Code	**ROBOTICS AND INTELLIGENT SYSTEMS**		**L**	**T**	**P**	**C**
Honours			**3**	**0**	**0**	**3**
Pre-requisite		**Semester**	**VII**			

Course Objectives:

- Understand the basic concepts of robotics.
- Discuss the requirement of robotic technology
- Introduce robotics kinematics, dynamic analysis and programming.
- Understand the concepts of intelligent system and apply them to robotics

Course Outcomes (CO):

After completion of the course, students will be able to

1. Understand general concepts of Robotics and intelligent systems.
2. Understand robotics control systems
3. Analyze and understand the various programming languages of robotics
4. Understand Industrial robots and its applications
5. Create IoT solutions using sensors, actuators and Devices

UNIT – I	Lecture 8Hrs

Introduction to Robotics : Background, Historical development, Robot Arm Kinematics and Dynamics, Manipulator Trajectory planning and Motion Control, Robot Sensing

UNIT – II	Lecture 9Hrs

Robot Arm Kinematics and Dynamics: Introduction to Kinematics, Direct and Inverse Kinematics Problem and solution, Dynamics introduction, Lagrange-Euler Formulation, Newton Euler Formation, Generalized D'Alembert Equations of motion. Trajectory planning,

UNIT – III	Lecture 9Hrs

Sensing and Vision: Introduction to Sensing, Proximity Sensing, Touch Sensors, Force and Torque Sensing, Image acquisition, Illumination techniques, Imaging Geometry, Recognition and Interpretation.

UNIT – IV	Lecture 8Hrs

Robot Programming Languages: Introduction to Robot Programming Languages, Characteristics of Robot Level Languages, three levels of robot programming, requirements of a robot programming language, Task Level Languages, problems peculiar to robot languages, Introduction to Robot Operating System (ROS)

UNIT – V	Lecture 8Hrs

Robot Intelligence: Introduction, State Space Search, Problem Reduction, Use of Predicate Logic, Means-Ends Analysis, Problem solving, Robot Learning, Robot Task Planning, Basic Problems in Task Planning, Expert systems and knowledge engineering.

Textbooks:

1. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, Robotics : Control, Sensing, Vision and Intelligence
2. Aaron Martinez, Enrique Fernandez, Learning ROS for Robotics Programming: A practical, instructive, and comprehensive guide to introduce yourself to ROS, the top-notch, leading robotics framework, PACKT publishing, Open Source.

Reference Books:
1. John J. Craig, Introduction to Robotics: Mechanics and Control, Addison Wesley publication, Third Edition.
Online Learning Resources:
https://nptel.ac.in/courses/107106090 https://nptel.ac.in/courses/112108298

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India

Computer Science and Engineering

MINORS IN CSE

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Computer Science and Engineering

Minor(CSE)

Note

1.A student can opt any Four subjects @ 4 credits per subject
2.Concerned BoS can add or delete the subjects as per the decision of the board.
3.Prerequisites to be defined by the board for each course.
4.Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each)

S.No.	Code	Course Name	Offered in Semester	Prerequisite if any	Contact Hours per week			Credits
					L	T	P	
1		Principles of Algorithms	V	C Programming& Data Structures	3	0	2	4
2		Basics of Computer Networks and Operating Systems	V		3	0	2	4
3		Introduction to Machine Learning	VI		3	0	2	4
4		Principles of Programming Languages	VII		3	0	2	4
5		MOOC - 1	V Onwards					
6		MOOC - 2	V onwards					2

Suggested MOOCs:

1. **Introduction to Robotics**
2. **Introduction to Internet of Things**
3. **Introduction to Deep Learning**

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Computer Science and Engineering

Course Code	**BASICS OF COMPUTER NETWORKS AND OPERATING SYSTEMS**		**L**	**T**	**P**	**C**
			3	**0**	**2**	**4**
Pre-requisite		**Semester**	**V**			

Course Objectives:

The objective of this course is to learn the concepts of computer operating systems, including the main functions, similarities, and differences. Students can explore a variety of topics, including configuration, file systems, security, administration, interfacing, multitasking, and performance analysis. In addition, they can further their understanding of computers through the study of computer networks by learning key networking concepts, components, and the design of information and communication infrastructure solutions.

Course Outcomes (CO):

1. Demonstrate and understand of operating systems functions and Process
2. Solve synchronization and deadlock and Memory Management problems
3. Explain File systems, I/O Management and proper delivery of data between two neighbours
4. Designing Medium access control algorithms and Routing algorithms
5. Explain Transport layer and Application layer protocols

UNIT - I	**Introduction to Operating system and Process**	Lecture 12Hrs

Architecture Operating System Structure, Operations Process,Memory, Storage Management, Protection and Security Computing Environments OperatingSystem Services User Operating System Interface System Calls Types System Programs OSStructure OS Generation System Boot.

Process Concept Scheduling Operations on Processes Cooperating Processes Inter-ProcessCommunication Threads - Multithreading Models

UNIT - II	**ProcessScheduling, Synchronization and Memory Management**	Lecture 12Hrs

SchedulingCriteria Scheduling Algorithms

The Critical-Section Problem Synchronization Hardware Mutex Locks -Semaphores Classic Problems of Synchronization Critical Regions Monitors Deadlocks

Introduction - Swapping Contiguous Memory Allocation Paging Segmentation- Structure of thePage Table - Virtual Memory- Background Demand Paging

UNIT - III	**Storage and I/O management, Introduction to Networks**	Lecture 12Hrs

Overview of Mass Storage Structure - Disk Structure - File Concept - Access Methods - Directory and Disk Structure- DirectoryImplementation -Allocation Methods- I/O Systems I/O Hardware

Introduction to Computer Networking – Uses – Network Hardware – Software – Reference Models - Framing - Error Control - Flow Control - Error Detection and Correction Codes – Hamming Code – Cyclic Redundancy Check - Sliding Window Protocols

UNIT - IV	**MAC Layer and Network Layer**	Lecture 12Hrs

Medium Access Control Sublayer – Channel Allocation Problem – Multiple Access Protocols – ALOHA – CSMA Protocols - Collision-Free Protocols - Wireless LAN Protocols. Ethernet MAC Sublayer Protocol – 802.11 MAC Sublayer Protocol Routing Algorithms - The Optimality Principle - Shortest Path Algorithm – Flooding - Distance Vector Routing - Link State Routing – Internetworking - Tunneling - Internetwork Routing - IPv4 - IP Addresses – IPv6.		
UNIT - V	**Transport Layer and Application Layer**	Lecture 12Hrs
Transport Layer - Services - Berkeley Sockets -Example – Elements of Transport Protocols – Addressing - Connection Establishment - Connection Release - UDP TCP: Segment Header – Connection Establishment – Connection Release DNS – Name Space – Resource Records – Name Servers – E-Mail - Architecture and Services – WWW – Architecture - HTTP – Content Delivery - Server Farms and Web Proxies		
Textbooks:		
1. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating Systems Concepts, Ninth Edition, Wiley, 2012. 2. Tanenbaum, A.S. and David J. Wetherall, Computer Networks, Fifth Edition, Prentice Hall, 2011		
Reference Books:		
3. William Stallings, Operating Systems: Internals and Design Principles, Ninth Edition, Prentice-Hall, 2018. 4. Andrew Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall, 2009. 5. Larry L. Peterson and Bruce S. Davie, Computer Networks- A System Approach, Fifth Edition, Elsevier, 2012 6. 3. Stallings, Data and Computer Communications, Tenth Edition., Prentice Hall Int. Ed., 2013 7. 4. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Third Edition, Pearson Education, 2006.		
Online Learning Resources:		
https://nptel.ac.in/courses/106105183/25 https://nptel.ac.in/courses/106106144		

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Computer Science and Engineering

Course Code	**PRINCIPLES OF ALGORITHMS**		**L**	**T**	**P**	**C**
			3	**0**	**2**	**4**
Pre-requisite	C Programming& Data Structures	**Semester**	**V**			

Course Objectives:

The objective of the course is to provide students with solid foundations to deal with a wide variety of computational problems and provide a thorough knowledge of the most common algorithms. The course introduces the basics of computational complexity analysis and various algorithm design paradigms

Course Outcomes (CO):

After completion of the course, students will be able to

1. Analyze the performance of algorithms.
2. Comprehend Divide and conquer technique to solve problems.
3. Apply Greedy method to solve problems.
4. Apply Dynamic programming technique to solve problems.
5. Understand Tree traversal, Graph traversal and Backtracking techniques.
6. Understand Branch and Bound technique

UNIT - I		9Hrs

Introduction: Introduction to Algorithm, Performance Analysis: Space &Time Complexities, Asymptotic notations.

Divide and Conquer: General method, Binary search, Finding Maximum and Minimum, Merge sort, Quicksort, Strassen's Matrix Multiplication

UNIT - II		9 Hrs

Greedy Method: The General Method, Knapsack Problem, Tree Vertex splitting, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees, Optimal Storage on Tapes, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT - III		9 Hrs

Dynamic Programming: The General Method, Multistage Graphs, All Pairs Shortest Paths, Optimal Binary Search Trees, String Editing problem, 0/1-Knapsack, The Travelling Salesperson Problem.

UNIT - IV		9 Hrs

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Biconnected Components and DFS Backtracking: The General Method, The 8-Queens Problem, Sum of Subsets, Graph Coloring, and Hamiltonian cycles**{{{**

UNIT - V		9 Hrs

Branch and Bound: The Method, 15 Puzzle problem, Job Sequencing with Deadlines, Travelling Salesperson problem Anonymizing Query Logs

List of Experiments: 30 Hrs
1. Write a program to perform a Binary Search for a given set of integer values. 2. Write a program to implement Merge sort for the given list of integer values. 3. Write a program to implement Quicksort for the given list of integer values. 4. Write a program to find the solution for the knapsack problem using the greedy method. 5. Write a program to find a minimum cost spanning tree using Prim's algorithm 6. Write a program to find a minimum cost spanning tree using Kruskal's algorithm 7. Write a program to find a single source shortest path for a given graph. 8. Write a program to find the solution for job sequencing with deadlines problems. 9. Write a program to find the solution for a 0-1 knapsack problem using dynamic programming. 10. Implement N Queen's problem using Back Tracking.
Textbooks:
3. Fundamentals of Computer Algorithms by Ellis Horowitz, SartazSahni&SanguthevarRajasekaran, Galgotia Publications Second Edition 4. Introduction to the Design and Analysis of Algorithms by Anany Levitin, Third Edition, Pearson Education, 2012
Reference Books:
2. Algorithm Design by Jon Kleinberg, Eva Tardos, Pearson Education Seventh Impression 3. Introduction to Algorithms by Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Third Edition, PHI Learning Private Limited, 2012. 4. Data Structures and Algorithms by Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Pearson Education, Reprint 2006
Online Learning Resources:
https://www.tutorialspoint.com/advanced_data_structures/index.asp http://peterindia.net/Algorithms.html http://cse01-iiith.vlabs.ac.in/ http://peterindia.net/Algorithms.html

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Computer Science and Engineering

Course Code	**INTRODUCTION TO MACHINE LEARNING**		**L**	**T**	**P**	**C**
			3	**0**	**2**	**4**
Pre-requisite		**Semester**	**VI**			

Course Objectives:

This course is designed to:
Understand the basic theory underlying machine learning Formulate machine learning problems corresponding to different applications.
Illustrate a range of machine learning algorithms along with their strengths and weaknesses
Apply machine learning algorithms to solve problems of moderate complexity.
Understand how Machine Learning imbibes the philosophy of Human learning.

Course Outcomes (CO):

Upon completion of the course, the students shall be able to
1. Identify machine learning techniques suitable for a given problem.
2. Appreciate Supervised learning techniques - Linear Regression, Decision Trees.
3. Apply Dimensionality Reduction techniques for data preprocessing.
4. Illustrate the principles of Probability for classification as an important area of Machine Learning Algorithms.
5. Illustrate the concepts of Logistic Regression and Support Vector Machines necessary to address Regression and Classification problems.

UNIT - I	**Introduction**	Lecture 12Hrs

Introduction to Machine Learning, Examples of Machine Learning Applications, Hypothesis space,Inductive bias, Evaluation,Cross-validation

UNIT - II	**Emerging Data Center Trends**	Lecture 12Hrs

Linear Regression, Introduction to Decision Trees, Learning Decision Trees, Overfitting

UNIT - III	**Data Center Agility**	Lecture 12Hrs

K-Nearest Neighbors, Feature Selection, Feature Extraction, Collaborative Filtering

UNIT - IV	**Hyperconverged Infrastructure**	Lecture 12Hrs

Bayesian Decision Theory: Bayes' Theorem, Naive Bayes Classifier, Losses and Risks, Discriminant Functions, Association Rules

UNIT - V	**Future Data Centers**	Lecture 12Hrs

Logistic Regression, Support Vector Machine, Dual formulation, Maximum margin with noise, Non-linear SVM.

Textbooks:

2. EthernAlpaydin, "Introduction to Machine Learning", MIT Press, 2004.
3. T.M. Mitchell, "Machine Learning", McGraw-Hill, 1997.

Reference Books:

2. Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

3. Andreas C. Müller and Sarah Guido "Introduction to Machine Learning with Python: A Guide for Data Scientists", Oreilly.

Online Learning Resources:

4. Andrew Ng, "Machine Learning"https://www.deeplearning.ai/machine-learning- yearning/
5. Shai Shalev-Shwartz , Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms" , Cambridge University Press. https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

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Computer Science and Engineering

Course Code	**PRINCIPLES OF PROGRAMMING LANGUAGE**		**L**	**T**	**P**	**C**
			3	**0**	**2**	**4**
Pre-requisite		**Semester**	**VI**			

UNIT - I	**Introduction**	Lecture 12Hrs

Preliminary Concepts: Reasons for studying, concepts of programming languages, Programming domains, Language Evaluation Criteria, influences on Language design, Language categories, Programming
Paradigms: Imperative, Object Oriented, functional Programming, Logic Programming. Programming Language Implementation, Compilation and Virtual Machines, Programming environments.

UNIT - II	**Emerging Data Center Trends**	Lecture 12Hrs

Syntax and Semantics: general Problem of describing Syntax and Semantics, formal methods of describing syntax, BNF, EBNF for common programming languages features.
Data types: Introduction, primitive, character, user defined, array, union, pointer and reference types, design and implementation uses related to these types. Names, Variable, concept of binding, type checking, strong typing, type compatibility, variable initialization.

UNIT - III	**Data Center Agility**	Lecture 12Hrs

Expressions and Statements: Arithmetic relational and Boolean expressions, Short circuit evaluation mixed mode assignment, Assignment Statements,
Control Structures: Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements.

UNIT - IV	**Hyperconverged Infrastructure**	Lecture 12Hrs

Subprograms and Blocks: Fundamentals of sub-programs, Scope and lifetime of variable, static and dynamic scope, Design issues of subprograms and operations, parameter passing methods, overloaded sub-programs, generic sub-programs, parameters that are sub-program names.
Abstract Data types: Abstractions and encapsulation, introductions to data abstraction, design issues, language examples, object oriented programming in C++, Java.
Exception handling: Exceptions, exception Propagation, Exception handler in C++ and Java.

UNIT - V	**Future Data Centers**	Lecture 12Hrs

Logic Programming Language : Introduction and overview of logic programming, basic elements of prolog, application of logic programming.
Functional Programming Languages: Introduction, fundamentals of FPL, LISP, ML, Haskell, application of Functional Programming Languages.
Scripting Language: Pragmatics, Key Concepts, **Case Study :** Python – Values and Types, Variables , Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction.

Textbooks:

1. Concepts of Programming Languages Robert W. Sebesta, Eighth Edition, Pearson Education, 2008.
2. Programming Language Design Concepts, D. A. Watt, Wiley Dreamtech, rp-2007.

Reference Books:

1. Programming Languages, Second Edition, A.B. Tucker, R.E. Noonan, TMH.

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