R20
Academic Regulations,
Course Structure and Syllabus

B. TECH.
Computer Science and Engineering
(4 Year Program)

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Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada, Code: 47, NIRF Ranking 251 – 300 Band
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CURRICULAR FRAMEWORK FOR REGULAR, MINORS AND HONORS B.TECH PROGRAMMES OF ALL BRANCHES

1. **PREAMBLE**

The rapid transformation in every sphere of life is augmenting the need to prepare the present fast-paced generation to adapt to the changing knowledge & skill requirement on a life-long basis, in the fields of science, engineering, technology and humanities to influence society positively. The future looks up to multi-disciplinary, competent leaders who are Information and Communication Technology ready and driven by strong ethical values.

NEC envisions to nurture knowledge, skills, and attitude and values of the aspiring youth to enable them to become global citizens and towards that process, the institution has evolved a flexible integrated academic curriculum.

NEC introduced Outcome Based Education (OBE) and Choice Based Credit System (CBCS), which emphasized on honing the skills and knowledge of the graduates.

The Engineering curriculum is revised with an objective to fill the gaps in the existing curriculum with reference to skill development. The revised curriculum underwent a reorganization making the engineering education enshrined with skill development ecosystem to suit the industry's needs and to ensure the graduates employability.

The curriculum mandates students to take up five skill courses, 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. The students are also given the option of choosing between skill courses offered by the college and a certificate course offered by industry, a professional body, APSSDC or any other accredited body.

Another major change brought in the curriculum is the introduction of B.Tech with Honors or a B.Tech. with a Minor. This is to give an opportunity for the fast learners to earn additional credits either in the same domain or in a related domain, making them more proficient in their chosen field of discipline or be a graduate with multidisciplinary knowledge and job ready skills.

2. **PROGRAMMES OFFERED BY THE COLLEGE**

Narasaraopeta Engineering College (NEC) offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice Based Credit System (CBCS) for the following branches of Engineering.

S. No.	Name of the Program	Program Code
1.	Civil Engineering	01
2.	Electrical and Electronics Engineering	02
3.	Mechanical Engineering	03
4.	Electronics and Communication Engineering	04
5.	Computer Science and Engineering	05
6.	Information Technology	12
7.	CSE (Artificial Intelligence and Machine Learning)	42
8.	CSE (Artificial Intelligence)	43
9.	CSE(Data Science)	44
10.	CSE (Cyber Security)	46

3. **ELIGIBILITY FOR ADMISSION**

The total seats available as per the approved intake are grouped into two categories viz. category A and Category B with a ratio of 70:30 as per the state government guidelines vide G.O No.52.

The admissions for category A and B seats shall be as per the guidelines of Andhra Pradesh State Council for Higher Education (APSCHE) in consonance with government reservation policy.

   a. Under Category A: 70% of the seats are filled through EAPCET counselling.
   b. Under Category B: 30% seats are filled based on 10+2 merits in compliance with guidelines of APSCHE

Eligibility for Admission - Under Lateral Entry Scheme (LES)

Students with diploma qualification have an option of direct admission into 2nd year B.Tech. (Lateral Entry Scheme). Under this scheme 10% seats of sanctioned intake will be available in each course as supernumerary seats. Admissions to this three-year B.Tech. Lateral entry Programme will be through ECET.

4. **AWARD OF THE DEGREE:**

For Regular and LES(Lateral Entry Scheme) **students**

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

   (a) Pursues a course of study in not less than four and not more than eight academic years for regular students. For LES students, pursue a course of study for not less than three academic years and not more than six academic years counted from the academic year of admission.
   (b) He/she shall forfeit their seat in B.Tech course and their admission stands cancelled after eight academic years for regular students and six academic years for LES students starting from the academic year of admission.
   (c) Registers for 160 credits and must secure all the 160 credits for Regular students. Registers for 121 credits and must secure all the 121 credits for LES students

(d) 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 160/121 credits and meet other specified requirements in the appropriate section of this document.

(e) A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

Academic Calendar

For all the eight/six semesters a common academic calendar shall be followed in each semester by having sixteen weeks of instruction, one week for the conduct of practical exams and with two weeks for theory examinations. Dates for registration, sessional and end semester examinations shall be notified in the academic calendar of every semester. The schedule for the conduct of all the curricular and co-curricular activities shall be notified in the planner.

4. Assigning of Credits:

      1 Hr. Lecture (L) per week - 1 credit

      1 Hr. Tutorial (T) per week - 1 credit

      1 Hr. Practical (P) per week - 0.5 credits

      2 Hours Practical (Lab)/week - 1 credit

5. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

A three-week induction program for first year B.Tech students is to be held in zero semester. Regular classes will start after the induction program.

The objectives of the program are as follows:

1. Assimilation in the ethos and culture of the institution
2. Exposure to a larger vision of life
3. Bonding among students and teachers
4. Learning a creative skill in arts
5. Regular lifestyle and professional discipline
6. Special assistance for needy students for improving proficiency in English and Mathematics

The above objectives will be achieved through the following activities:

1. Physical activity: Yoga, Mild Exercise, Games and sports etc.
2. Creative arts: Painting, Photography, music, dance etc.

3. Literary activity: General reading, writing summaries, debating, enacting a play etc.

4. Human Values: Discussion/Lectures in small groups of students with a faculty

   member

5. Lectures by eminent people: From industry, entrepreneurs, public life, social

   activists, alumni .

6. Exposure to department/branch, Innovation, Exploring Engineering.

6. DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of a student in each semester shall be evaluated subject – wise with a maximum of 100 marks for Theory and 50 marks for Internship/Community Service Project. The Project Work shall be evaluated for 200 marks.

THEORY

For all theory subjects consisting of 5 units of syllabus in each subject, the assessment shall be for 30 marks through internal evaluation and 70 marks through external end semester examination of 3 hours duration.

INTERNAL EVALUATION

Internal evaluation is based on two **Cycles** of **examinations**. Each **Cycle** consists of three components.

1) **Assignment Test – 1 (A1)**:

A1 will be conducted after the completion of 1st unit of syllabus. 5 or 6 questions will be given to students before 1 week of the commencement of the test. On the day of the test, each student will be given two questions at random. A1 will be evaluated for 05 marks.

2) **Quiz - 1(Q1)**:

After the completion of the first two and half Units of syllabus (first half of the syllabus), along with the descriptive test, an online quiz test will be conducted for 20 marks and scaled down to 10 marks.

3) **Descriptive Test – 1(D1)**:

Along with the Q1, a descriptive test will be conducted for 25 marks and scaled down to 15 marks. Two 10 marks questions from each of Unit-1 & Unit-2, and one 5 marks question from the first half of 3rd unit will be given.

Cycle–I final marks = A1 (05 marks) + Q1 (10 marks) + D1 (15 marks) = 30 marks

In the similar manner, Cycle–II Examination will be conducted as follows:
A2 test will be conducted after 3.5 units of syllabus (covering syllabus from 2.5 to 3.5 units)

After the completion of the 5th unit of Syllabus, Q2 and D2 will be conducted. For D2, one 5 marks question will be given from the second half of the third unit, two 10 marks questions will be given each from units 4 and 5.

Cycle–II final marks = A2 + Q2 + D2 = 30 Marks.

Final internal marks will be computed as **80 % of best cycle marks + 20% of least cycle marks.**

EXTERNAL EVALUATION

The semester end examinations will be conducted for 70 marks consisting of five questions carrying 14 marks each. Students have to answer all the questions. One question from each of the 5 units and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

PRACTICALS
INTERNAL EVALUATION

For practical subjects there shall be continuous evaluation during the semester for 15 internal marks and 35 end examination marks. The internal 15 marks shall be awarded as follows:

Day to day work - 5 marks,

Record-5 marks

Internal laboratory test -5 marks.

EXTERNAL EVALUATION
For practical subjects there shall be an external examination at the end of the semester for 35 marks in the presence of an external examiner. The examination duration is 3 hours.

DRAWING SUBJECTS
For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing etc.,) and estimation, the distribution shall be 30 marks for Internal Evaluation and 70 marks for End Examination. There shall be two internal tests in a semester.

The 30 internal marks will be evaluated as follows:

Cycle–I:
Internal Test   : 15 marks. (1½ hour duration)
Day – to – day work: 15 marks (evaluation of charts)

In the Similar manner, **Cycle–II examination will be conducted for 30 marks**
The sum of 80% of the best and 20% of the least of two internal tests shall be considered.

Mandatory Course (M.C): Environmental Sciences/NSS/NCC, Professional Ethics and Human Values, Constitution of India, etc non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only SATISFACTORY(S)/NOT-SATISFACTORY (F) will be specified.

● 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) or (2-1-0) and for all minors /honors, it shall be (4-0-0). 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.

● 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.

● 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.

● Students shall undergo mandatory summer Internship/Community Service Project for a minimum of 4 to 8 weeks duration at the end of second and third year of the Programme.

● 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.

● Undergraduate Degree with Honors/Minor shall be issued by the Institute 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. The regulations/guidelines are separately provided. Registering for Honors/Minor is optional.

- **Assessment:** The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory, 50 marks for practical subject. The distribution shall be 30% marks for Internal Evaluation and 70% marks for the End Semester Examinations. A student has to secure not less than 35% of marks in the end semester examination and minimum 40% of marks in the sum total of internal and end semester examination marks to earn the credits allotted to each course.

Internship/ Community Service Project (1.5 Credits):

It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydal and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme.

Students shall pursue this course during summer vacation just before its offering as per course structure. The minimum duration of this course is at least 4 to 8 weeks. The student shall register for the course as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted from the institute to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner, Head of the Department, supervisor of the internship and a senior faculty member of the department.

A certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. A student shall secure a minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted.

Internship/Community Service Project will be evaluated at the end of the semester for 50 marks (Record/Report: 20 marks and viva-voce: 30 marks) along with laboratory end examinations in the presence of external and internal examiner. There are no internal marks for the Internship/Community Service Project.

Major Project (12 credits):

Evaluation: The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of

supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner and is evaluated for 140 marks.

MOOCS (1.5 Credits):

Meeting with the global requirements, to inculcate the habit of self-learning and in compliance with AICTE/ UGC guidelines, MOOC (Massive Open Online Course) have been introduced, Student has to complete an on-line course to fulfil the academic requirement of B.Tech course. He/she can start doing the course from II Year I semester and submit the MOOCs certificate before the commencement of the end examinations of IV year I sem. The student shall register for the course (Minimum of 8 weeks) offered by SWAYAM/NPTEL/ Any other reputed organization, through online with the approval of Head of the Department. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only after submission of the certificate.

Skill Oriented Courses (2 Credits)

1. 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.

2. 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.

3. 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.

4. 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 departmental committee.

5. 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.

6. 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 departmental committee.

Evaluation: The job oriented skill courses may be registered at the college or at any accredited external agency as approved by departmental committee. A student shall submit a record/report on the skills learned. If the student completes job oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner. There are no internal marks for the job oriented skill courses.

Curricular Framework for Honors Programme

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

2. A student shall be permitted to register for Honors program at the beginning of 4th 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. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Honors Programme registration active.

3. 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.

4. 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).

5. 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 recoPROGRAMMESmmended by the Departmental committee.

6. 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.

7. The concerned departmental committee 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 MOOC courses as approved by the concerned Head of the department in consultation with departmental committee. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the

departmental committee. 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 per the guidelines approved by the departmental committee. .

8. The concerned BoS shall also consider courses listed under professional electives of the respective B.Tech. programmes 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.

9. 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 be mentioned 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.

10. In case a student fails to meet the SGPA 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.

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

Curricular Framework for Minor Programme:

1.   a) 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

b) 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.

2.   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.

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

4. There shall be no limit on the number of programs offered under Minor. The 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.

5. 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 MOOC courses as approved by the concerned Head of the department in consultation with BoS.

6. A student shall be permitted to register for Minors program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) upto the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 8 SGPA upto 3rd 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.

7. 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).

8. 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.

9. 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.

10. Student can opt for the Industry relevant minor specialization as approved by the concerned Departmental committee. Students 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 a course completion certificate. The Departmental committee 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.

11. A committee should be formed at the level of the College/department to evaluate the grades/marks given by external agencies to a student which are approved by the concerned Departmental committee. 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.

12.   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.

13.   In case a student fails to meet the SGPA 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.

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

PASS MARK CRITERIA

 A student shall be deemed to have satisfied the pass mark, if he secures not less than 35% of marks in the end examinations and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together as detailed below.

On passing a course of a program, the student shall earn the credits as assigned to that course.

S.No	Category of Subject	Max. Marks	Internal Marks	External Marks	External pass %	External pass mark	Over all pass %	Over all pass mark
1	Theory/ Drawing	100	30	70	35	25	40	40
2	Practical	50	15	35	35	12	40	20
3	Internship/ Skill development courses/Community service project	50	-	50	40	20	40	20
4	Project Work	200	60	140	35	50	40	80
5	MOOCs(Credit Course)	Certificate must be submitted before the end semester examinations of that semester in which MOOCS course is offered.						

11.   Attendance Requirements:

a) A student is eligible to write the end semester examinations if he acquires a minimum of 40% in each subject and 75% of attendance in aggregate of all the subjects.

b) Condonation of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) may be granted by the College Academic Committee. However, this condonation concession is applicable only to any two semesters during the entire programme.

c) Shortage of Attendance below 65% in aggregate shall not be condoned.

d) A student who is short of attendance in a semester may seek re-admission into that semester when offered within 4 weeks from the date of commencement of class work.

e) Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.

f) A stipulated fee shall be payable towards condonation of shortage of attendance to the college. Students availing condonation on medical ground shall produce a medical certificate issued by the competent authority.

g) A student will be promoted to the next semester if he satisfies the (i) attendance requirement of the present semester and (ii) minimum required credits.

h) If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

i) For induction programme attendance shall be maintained as per AICTE norms.

j) For non-credit mandatory courses the students shall maintain the attendance similar to credit courses

18.   Promotion Rules:

a) A student shall be promoted from first year to second year if he fulfills the minimum attendance requirements.

b) A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of credits up to II year II-Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.

c) A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

d) For LES, point C is only applicable

19.   Grading:

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

Marks Range	Level	Letter Grade	Grade Point
≥ 90	Outstanding	A+	10
80-89	Excellent	A	9
70-79	Very Good	B	8
60-69	Good	C	7
50-59	Fair	D	6
40-49	Satisfactory	E	5
< 40	Fail	F	0
-	Absent	AB	-
-	Malpractice	MP	-

Calculation of 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 ith subject and G_i is the grade point scored by the student in the ith 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 ith semester and C_i is the total number of credits in that semester

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

iv. SGPA & CGPA will be calculated for those candidates who have passed all the subjects in that or up to that semester respectively.

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

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

vii. As per AICTE regulations, conversion of CGPA into equivalent percentage as follows:

Equivalent Percentage = (CGPA – 0.75) x 10

Award of Class:

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

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.75 (With No subject failures)
First Class	≥ 6.75 (With subject failures)
Second Class	≥ 5.75 & < 6.75
Pass Class	≥ 5.0 & < 5.75

20.   Gap - Year:

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at institute level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

REVALUATION

1. Students can submit the application for revaluation, along with the prescribed fee for revaluation of his answer script(s) of theory subject(s) as per the notification issued by the Controller of Examinations.
2. The Controller of Examinations shall arrange for revaluation of such answer script(s).
3. An evaluator, other than the first evaluator shall revaluate the answer script(s).

SUPPLEMENTARY EXAMINATIONS: A student who has failed to secure the required credits can appear for a supplementary examination, as per schedule announced by the College authorities.

MALPRACTICE IN EXAMINATIONS: Disciplinary action will be taken in case of malpractice during Mid/End examinations as per the rules framed by the College.

MINIMUM INSTRUCTION DAYS

The minimum instruction days for each semester shall be 90 working days.

There shall be no branch transfer after the completion of the admission process.

WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the college or if any case of indiscipline is pending against him, the result of such a student will be kept withheld. His degree will be withheld in such cases.

TRANSITORY REGULATIONS

Discontinued or detained candidates are eligible for readmission as and when next offered. A candidate, who is detained or discontinued in a semester, on readmission shall be required to do all the subjects in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such subjects in the earlier semester(s) he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

A student who is following JNTUK curriculum and detained due to shortage of attendance at the end of the first semester of first year shall join the autonomous batch of first year first semester. Such students shall study all the subjects prescribed for the batch in which the student joins and considered on par with regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUK curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester of first year or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the subjects of the semester(s) of the batch which he had passed earlier and substitute subjects will be offered in place of them as decided by the Board of Studies. The student has to clear all his backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree will be sum of the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

Transfer candidates (from non-autonomous college affiliated to JNTUK)

A student who is following JNTUK curriculum, transferred from other college to this college in second year first semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies

concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the subjects of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of Studies. The student has to clear all his backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree. The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

Transfer candidates (from an autonomous college affiliated to JNTUK)

A student who has secured the required credits up to previous semester as per the regulations of other autonomous institutions shall also be permitted to be transferred to this college.

A student who is transferred from the other autonomous colleges to this college in second year first semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree.

However, exemption will be given in the subjects of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of studies.

The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester as per the regulations of the college from which he has transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

Scope

1. The academic regulations should be read as a whole, for the purpose of any interpretation.
2. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.
3. The college may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the date notified by the College Authorities.

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

➢ The Principal shall refer the cases of Malpractices in Internal Assessment Test and Semester end examinations to a malpractice prevention committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the students based on the recommendations of the committee.

➢ Any action by the candidate trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder:

	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 and sent to the college.

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 and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and to be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college 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.
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	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. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the

	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.	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 thereof 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 college 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	Student of the college expulsion from the examination hall and cancellation of the performance in that subject and all other

	connected with the college indulges in any malpractice or improper conduct mentioned in clause 6to 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 and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the college for further action to award suitable punishment.	

OTHER MATTERS:

1. Physically challenged candidates who have availed additional examination time and a scribe during their intermediate / EAMCET examinations will be given similar concessions on production of relevant proof / documents.

2. The Principal shall deal in an appropriate manner with any academic problem which is not covered under these rules and regulations, in consultation with the Heads of the departments and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of regulation, approved in the meetings of the Heads of the departments shall be reported to the Academic Council for ratification.

GENERAL:

1. The academic council may, from time to time, revise, amend or change the regulations, schemes of examinations and / or syllabi.

2. Where ever the words ''he'' ''him'' ''his'', occur in the regulations, they include ''she'', ''her'', ''hers''.

3. The academic regulation should be read as a whole for the purpose of any interpretation.

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

ANNEXURE-I

COMMUNITY SERVICE PROJECT

……Experiential learning through community engagement

As per the decision of the concerned department BoS

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 4 to 8 weeks of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,

- To help students to realize the stark realities of the society.

- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability

- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation.

- Each class/section should be assigned with a mentor.

- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The log book has to be countersigned by the concerned mentor/faculty incharge.

- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.

- The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.

- The Community Service Project is a twofold one –

o   First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.

o   Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –

- Agriculture
- Health
- Marketing and Cooperation
- Animal Husbandry
- Horticulture
- Fisheries
- Sericulture
- Revenue and Survey
- Natural Disaster Management
- Irrigation
- Law & Order
- Excise and Prohibition
- Mines and Geology
- Energy
- Internet
- Free Electricity
- Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals
- New energy, enthusiasm and perspectives applied to community work
- Enhanced community-college relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY

SERVICE PROJECT

The following is the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students

1. Water facilities and drinking water availability

2. Health and hygiene

3. Stress levels and coping mechanisms

4. Health intervention programmes

5. Horticulture

6. Herbal plants

7. Botanical survey

8. Zoological survey

9. Marine products

10. Aqua culture

11. Inland fisheries

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA-533003, Andhra Pradesh (India)

For Constituent Colleges and Affiliated Colleges of JNTUK

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

⟹ Ragging within or outside any educational institution is prohibited.

⟹ Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

	Imprisonment upto	Fine Upto
Teasing, Embarrassing & Humiliation	6 Months	+ Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+ Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	2 Years	+ Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	5 Years	+ Rs. 10,000/-
Causing death or abetting suicide	10 Months	+ Rs. 50,000/-

In Case of Emergency CALL TOLL FREE No. : 1800 - 425 - 1288

LET US MAKE JNTUK A RAGGING FREE UNIVERSITY

R20 COURSE STRUCTURE
I B.TECH - I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC1101	Technical and Communicative English -I	HS	30	70	100	3	0	0	3
2	R20CC1102	Linear Algebra and Calculus	BS	30	70	100	2	1	0	3
3	R20CC1104	Applied Physics	BS	30	70	100	3	0	0	3
4	R20CC1105	Problem Solving Using C	ES	30	70	100	3	0	0	3
5	R20CC11L1	Soft Skills and Communication Skills Lab - I	HS	15	35	50	0	0	3	1.5
6	R20CC11L2	Problem Solving Using C Lab	ES	15	35	50	0	0	3	1.5
7	R20CC11L4	Applied Physics Lab	BS	15	35	50	0	0	3	1.5
8	R20CS11L8	LINUX Programming Lab	ES	30	70	100	0	1	4	3
TOTAL										19.5

R20 COURSE STRUCTURE
I B.TECH – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC1202	Numerical Methods and Statistics	BS	30	70	100	2	1	0	3
2	R20CC1204	Engineering Chemistry	BS	30	70	100	3	0	0	3
3	R20CC1206	Problem Solving Using Python	ES	30	70	100	3	0	0	3
4	R20CC1208	Electronic Devices and Logic Design	ES	30	70	100	3	0	0	3
5	R20CC12L2	Engineering Chemistry Lab	BS	15	35	50	0	0	3	1.5
6	R20CC12L3	R Programming Lab	ES	15	35	50	0	0	3	1.5
7	R20CC12L12	Problem Solving Using Python Lab	ES	15	35	50	0	0	3	1.5
8	R20CS12L13	CSE Workshop	ES	30	70	100	0	1	4	3
9	R20CC12MC1	Environmental Studies (**Zero Credit Course**)	MC	-	-	-	2	0	0	0
TOTAL										19.5

R20 COURSE STRUCTURE
II B.TECH - I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC2102	Mathematical Foundations of Computer Science	BS	30	70	100	2	1	0	3
2	R20CC2103	OOPS through Java	PC	30	70	100	3	0	0	3
3	R20CC2104	Data Structures	PC	30	70	100	3	0	0	3
4	R20CI2101	Computer Organization	PC	30	70	100	3	0	0	3
5	R20CC2105	Front End Web Technologies	PC	30	70	100	3	0	0	3
6	R20CC21L1	Data Structures Lab	PC	15	35	50	0	0	3	1.5
7	R20CC21L2	OOPS through Java Lab	PC	15	35	50	0	0	3	1.5
8	R20CC21L3	Front End Web Technologies Lab	PC	15	35	50	0	0	3	1.5
9	R20CC21SC1	Data Science Lab	SC	-	50	50	0	0	4	2
10	R20CC21MC2	Constitution of India **(Non Credit Course)**	MC	-	-	-	2	0	0	0
TOTAL										21.5

R20 COURSE STRUCTURE

II B.TECH – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC2201	Technical and Communicative English -II	HS	30	70	100	3	0	0	3
2	R20CC2203	Database Management Systems	PC	30	70	100	3	0	0	3
3	R20CS2202	Formal Languages and Automata Theory	PC	30	70	100	3	0	0	3
4	R20CC2204	Software Engineering	PC	30	70	100	3	0	0	3
5	**Open Elective –I**		OE	30	70	100	3	0	0	3
6	R20CC22L1	Database Management Systems Lab	PC	15	35	50	0	0	3	1.5
7	R20CS22L3	Software Engineering and UML Lab	PC	15	35	50	0	0	3	1.5
8	R20CC22L2	Mobile Application Development Lab	PC	15	35	50	0	0	3	1.5
9	R20CS22SC1	Artificial Intelligence	SC	-	50	50	0	0	4	2
TOTAL										**21.5**
10	Honor / Minor Course			30	70	100	4	0	0	4
Summer Internship / Community Service Project				**To be evaluate in III-I**						

R20 COURSE STRUCTURE
III B.TECH – I SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC3103	Design and Analysis of Algorithms	PC	30	70	100	3	0	0	3
2	R20CC3104	Computer Networks	PC	30	70	100	3	0	0	3
3	R20CS3105	Compiler Design	PC	30	70	100	3	0	0	3
4	R20CC3101	Operating Systems	PC	30	70	100	3	0	0	3
5	R20CC3102 R20CC3106 R20CC3107 R20CS3108	**Professional Elective** – I 1. Data Warehousing and Data Mining 2. Computer Graphics 3. Software Testing Methodologies 4. Distributed Systems	PE	30	70	100	3	0	0	3
6	R20CS31L3	DAA and CD Lab	PC	15	35	50	0	0	3	1.5
7	R20CC31L2	CN and OS Lab	PC	15	35	50	0	0	3	1.5
8	R20CC31SC1	English Employability Skills	SC	-	50	50	0	0	4	2
9	R20CC31IN	Summer Internship / Community Service Project	PR	-	50	50	0	0	0	1.5
10	R20CC31MC02	Essence of Indian Traditional Knowledge	MC	-	-	-	2	0	0	0
TOTAL										21.5
11	**Honors / Minor Course**			30	70	100	4	0	0	4

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20 COURSE STRUCTURE
III B.TECH – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC3204	Machine Learning	PC	30	70	100	3	0	0	3
2	R20CC3205	Advanced Java and Web Technologies	PC	30	70	100	3	0	0	3
3	R20CC3201	Cryptography and Network Security	PC	30	70	100	3	0	0	3
4	R20CC3206 R20CC3202 R20CC3207 R20CS3203	**Professional Elective – II** 1. Big Data Analytics 2. Mobile Computing 3. Design Patterns 4. High Performance Computing	PE	30	70	100	3	0	0	3
5	Open Elective – II		OE	30	70	100	3	0	0	3
6	R20CC32L1	Advanced Java and Web Technologies Lab	PC	15	35	50	0	0	3	1.5
7	R20CC32L2	Machine Learning Lab	PC	15	35	50	0	0	3	1.5
8	R20CC32L3	Software Lab	ES	15	35	50	0	0	3	1.5
9	R20CC32SC4	Internet of Things	SC	-	50	50	0	0	4	2
10	R20CC32MC2	Professional Ethics and Human Values	MC	-	-	-	2	0	0	0
		TOTAL								21.5
11	**Honors / Minor Course**			30	70	100	4	0	0	4

R20 COURSE STRUCTURE
IV B.TECH – I SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CS4107 R20CS4108 R20CC4103 R20CS4109	**Professional Elective – III** 1. Cyber Security 2. Mobile Adhoc and Sensor Networks 3. Service Oriented Architecture 4. Web and Micro Services	PE	30	70	100	3	0	0	3
2	R20CC4110 R20CC4111 R20CS4112 R20CC4104	**Professional Elective – IV** 1.Deep Learning 2.DevOps 3.Inter-Networking With Tcp/Ip 4.E- Commerce	PE	30	70	100	3	0	0	3
3	R20CS4113 R20CC4106 R20CS4114 R20CC4105 R20CC4102	**Professional Elective – V** 1. Social Media Analytics 2. Natural Language Processing 3. Software Defined Networks 4. Software Project Management 5. Human Computer Interaction	PE	30	70	100	3	0	0	3
4		**Open Elective – III**	OE	30	70	100	3	0	0	3
5		**Open Elective – IV**	OE	30	70	100	3	0	0	3
6	R20CC4101 R20CC4117	1. Business Management Concepts for Engineers 2. Entrepreneurship and Innovation	HS	30	70	100	3	0	0	3
7	R20CC41SC1	Agile with SCRUM	SC	-	50	50	0	0	4	2
8	R20CC41IN	Summer Internship / Community Service Project	PR	-	50	50	0	0	0	1.5
9	R20CC41MC	MOOCS								1.5
TOTAL										23

R20 COURSE STRUCTURE
IV B.TECH – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC42PW	Major Project & Internship	PR	60	140	200	-	-	-	12
TOTAL										12

LIST OF HONORS

1. The subjects opted for Honors should be advanced type which are not covered in regular curriculum.

2. Students has to acquire 16 credits with minimum one subject from each pool.

3. Concerned BoS can add or delete the subjects as per the decision of the board.

4. Pre requisites to be defined by the board for each course.

5. Compulsory MOOC / NPTEL Courses for 04 credits (02 courses@ 2 credits each)

POOL – 1
DATA SCIENCE AND ADVANCED SOFTWARE ENGINEERING

S.No.	HONOR Subject Title	Sub Code	No.of periods per week			No.of Credits
			L	T	P	C
1	Data Analytics and Visualization	R20CSHN02	4	0	0	4
2	DevOps	R20CSHN01	4	0	0	4
3	Deep Learning	R20CSHN03	4	0	0	4
4	Agile with Scrum	R20CSHN04	4	0	0	4
5	Computer Vision	R20CSHN05	4	0	0	4
6	Natural Language Processing	R20CSHN06	4	0	0	4

POOL – 2
ADVANCED SOFTWARE ENGINEERING

S.No.	HONOR Subject Title	Sub Code	No.of periods per week			No.of Credits
			L	T	P	C
1	DevOps	R20CSHN01	4	0	0	4
2	Agile with Scrum	R20CSHN04	4	0	0	4
3	Software Quality Assurance and Testing	R20CSHN07	4	0	0	4
4	Software Version Control	R20CSHN08	4	0	0	4

POOL – 3

CYBER SECURITY

S.No.	HONOR Subject Title	Sub Code	No.of periods per week			No.of Credits
			L	T	P	C
1	Digital Forensics	R20CSHN09	4	0	0	4
2	Cyber Laws	R20CSHN10	4	0	0	4
3	Crypto Currency	R20CSHN11	4	0	0	4
4	Ethical Hacking	R20CSHN12	4	0	0	4

POOL – 4

CLOUD COMPUTING AND VIRTUALIZATION TECHNOLOGY

S.No.	HONOR Subject Title	Sub Code	No.of periods per week.			No.of Credits
			L	T	P	C
1	Introduction to IT Infrastructure Landscape	R20CSHN13	4	0	0	4
2	Cloud Computing Virtualization	R20CSHN14	4	0	0	4
3	Cloud Computing Architecture	R20CSHN15	4	0	0	4
4	Cloud Computing Security & Management	R20CSHN16	4	0	0	4

LIST OF MINOR SUBJECTS

S.No.	HONOR Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Front End Web Technologies	CSE	R20CCMN03	4	0	0	4
2	Software Engineering	CSE	R20CCMN34	4	0	0	4
3	Data Warehousing and Data Mining	CSE	R20CCMN35	4	0	0	4
4	Big Data Analytics	CSE	R20CCMN36	4	0	0	4
5	Cloud Computing	CSE	R20CCMN37	4	0	0	4
6	DevOps	CSE	R20CCMN38	4	0	0	4

R20 COURSE STRUCTURE
I B.TECH - I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC1101	Technical and Communicative English -I	HS	30	70	100	3	0	0	3
2	R20CC1102	Linear Algebra and Calculus	BS	30	70	100	2	1	0	3
3	R20CC1104	Applied Physics	BS	30	70	100	3	0	0	3
4	R20CC1105	Problem Solving Using C	ES	30	70	100	3	0	0	3
5	R20CC11L1	Soft Skills and Communication Skills Lab - I	HS	15	35	50	0	0	3	1.5
6	R20CC11L2	Problem Solving Using C Lab	ES	15	35	50	0	0	3	1.5
7	R20CC11L4	Applied Physics Lab	BS	15	35	50	0	0	3	1.5
8	R20CS11L8	LINUX Programming Lab	ES	30	70	100	0	1	4	3
TOTAL										19.5

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CC1101	**TECHNICAL AND COMMUNICATIVE ENGLISH - I** **(Common to All Branches)**						

COURSE OBJECTIVES:

- To enable the engineering students develop their basic communication skills in English for academic and social purposes.
- To equip the students with appropriate oral and written communication skills.
- To inculcate the skills of listening, reading and critical thinking.
- To integrate English Language learning with employability skills and training.
- To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course.

COURSE OUTCOMES:

Learners are able to

CO1: Interpret explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. [K3]**.**

CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **[K6].**

CO3: Build grammatically correct sentences using a variety of sentence structures**. [K3]**

CO4: Enhance word power and usage of lexicons **[K3].**

Teaching Methodology:

The methodology of teaching will be chalk and talk, PPT, audio-visual, flipped class and activity based teaching.

UNIT-I

Hours of Instruction per unit: 8

1. **A Drawer full of Happiness**
   a. **Listening**   : Dialogues, Task based listening activities.
   b**. Speaking**   : Asking and answering general questions.
   c. **Reading**   : Skimming, Scanning.
   d. **Writing**   : Punctuations, Paragraphs.
   e. **Grammar & Vocabulary** : Nouns, Adjuncts,
                                         GRE Vocabulary,
                                         Technical Vocabulary.

UNIT-II

Hours of Instruction per unit: 8

2. **Nehru's Letter to daughter Indira on her Birthday**
   a. **Listening**   : Individual and pair based listening to the audio track.
   b**. Speaking**   : Discussion in pairs / small groups on specific topics.
   c. **Reading**   : Identifying sequence of ideas; recognising verbal techniques.
   d. **Writing**   : Summarising, Paraphrasing.
   e. **Grammar & Vocabulary** : Articles, Adjectives, Prepositions
                                         Verbal Competence,

Synonyms & Antonyms,
Analogy,
GRE Vocabulary,
Technical Vocabulary.

UNIT-III
Hours of Instruction per unit: 8

3. Stephen Hawking- Positivity 'Benchmark'

a. **Listening**	:	Listening for global comprehension and summarising.
b. **Speaking**	:	Discussing specific topics in pairs (or) small groups and reporting the discussion, Complaining, Apologising.
c. **Reading**	:	Reading between the lines, Critical reading for evaluation.
d. **Writing**	:	Official Letter writing, E-Mail etiquette, General Netiquette, Covering Letter & Resume writing.
e. **Grammar & Vocabulary**	:	Phrasal verbs, Verbs, Tenses (Present, Past & Future), Concord: Subject-Verb Agreement, Verbal reason, Using equivalents, Word associations, GRE Vocabulary, Technical Vocabulary.

UNIT-IV
Hours of Instruction per unit: 8

4. Like a Tree, Unbowed: Wangari Maathai- Biography

a. **Listening**	:	Making predictions while listening to conversations (or) transactional dialogues.
b. **Speaking**	:	Role plays for practice of conversational English in academic contexts (formal and informal) .
c. **Reading**	:	Information transfer (Tables, Bar Diagrams, Line Graphs, Pie Diagrams)
d. **Writing**	:	Interpreting visual information, Statement of Purpose (SOP)
e. **Grammar & Vocabulary**	:	Gender inclusive language (Gendered Noun, Gender-neutral Noun), Quantifying expressions, Adjectives, Adverbs, Degrees of comparison, GRE Vocabulary, Technical Vocabulary.

UNIT-V
Hours of Instruction per unit: 8

5. "Stay Hungry, Stay Foolish"- Rushmi Bansal

a. **Listening**	:	Identifying key terms, understanding concepts, interpreting the concepts.
b. **Speaking**	:	Formal oral presentations on topics from academic contexts.

c. **Reading**	: Reading comprehension, The RAP strategy for in-depth reading, Intensive reading and extensive reading.
d. **Writing**	: Academic proposals, Poster presentation.
e. **Grammar & Vocabulary**	: Reported Speech, Reporting verbs for academic purposes, Corrections of sentences, GRE Vocabulary, Technical Vocabulary.

TEXTBOOKS:
1. INFOTECH ENGLISH , Maruthi Publications, Guntur- 522001.

REFERENCES:
1. Raymond Murphy, *Murphy's English Grammar,* Cambridge University Press 2004
2. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: English Skills for Engineers*, Oxford University Press, 2009
3. Michael Swan, *Practical English Usage,* Oxford University Press, 1996

ONLINE SOURCES:
1. www.enchantedlearning.com
2. https://www.englisch-hilfen.de/en/
3. https://www.bbc.co.uk/learningenglish/
4. https://in.usembassy.gov/education-culture/american-spaces/american-space-new-delhi/collection/
5. https://www.talkenglish.com/speaking/basics/speaking_basics_ii.aspx
6. https://www.englishclub.com/speaking/
7. https://agendaweb.org/listening-exercises.html
8. https://www.esolcourses.com/content/topicsmenu/listening.html
9. https://www.esl-lab.com/
10. https://www.eagetutor.com/eage-fluent-english-speaking-search-p.htm?gclid=EAIaIQobChMIpr-F5OzH7QIVChsrCh1kBAkzEAMYASAAEgINpfD_BwE
11. https://www.myenglishpages.com/site_php_files/reading.php
12. https://www.cambridgeenglish.org/learning-english/free-resources/write-and-improve/

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	-	30	70	100	3
SUBCODE: R20CC1102	**LINEAR ALGEBRA AND CALCULUS** **(Common to All Branches)**						

COURSE OBJECTIVES:
- Understanding basic concepts of linear algebra (systems of linear equations, matrix calculus).
- To become proficiency in solving computational problems of linear algebra.
- To acquire knowledge on mean value theorems in calculus.
- Familiarization about the techniques in calculus and multivariate analysis.

COURSE OUTCOMES:
Upon successful completion of the course, the students should be able to
CO 1: Solve the system of linear equations.[K3]
CO 2: Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.[K4]
CO 3: Apply the mean value theorems in calculus to Engineering problems.[K3]
CO 4: Apply the functions of several variables to evaluate the rates of change with respect to Time and space variables in engineering. [K3]
CO 5: Determine the area and volume by interlinking them to appropriate double and triple integrals. [K5]

SYLLABUS
UNIT-I:
LINEAR SYSTEMS OF EQUATIONS: (10 hours)
Rank of a matrix - Echelon form, Normal form, Solution of linear systems, Direct Methods, Gauss elimination, Gauss Jordon and Gauss Seidal Methods. Solutions of linear simultaneous equations: LU decomposition.
Application: Finding the current in a electrical circuit, Traffic flow

UNIT – II:
EIGENVALUES AND EIGENVECTORS (12 hours)
Eigenvalues, Eigenvectors, Properties, Cayley - Hamilton Theorem(without proof), Quadratic forms, Reduction of quadratic form to canonical form, Rank, Positive definite, negative definite, semi definite, index, signature.
Application: Finding powers and inverse of a square matrix using Cayley Hamilton's Theorem.

UNIT – III:
MEAN VALUE THEOREMS (8 hours)
Review on limits and continuity, Mean Value theorems (without proofs): Rolle's theorem, Lagrange's theorem, Cauchy's theorem, Taylor's (Generalized mean value) theorem, increasing and decreasing functions, Maxima and minima of function of single variable.

UNIT- IV:
PARTIAL DIFFERENTION: (8 hours)
Function of two or more variables, Partial derivatives, Total derivatives, change of variables, Jacobian - functional dependence, Taylor's theorem for Two variables. Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

UNIT-V:
MULTIPLE INTEGRALS: **(10 hours)**
Double and triple integrals, Change of Variables, Change of order of Integration, volume.
Application: Momenta of Inertia.

TEXT BOOK :
1. Dr. B.S. Grewal, "*Higher Engineering Mathematics*", 43rd Edition, Khanna Publishers, 2012.
2. B.V. Ramana, "Higher Engineering Mathematics", 32nd Edition, McGraw Hill Education, 2018.

REFERENCES:
1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*Engineering Mathematics*", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. Kreyszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
3. Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
4. Peter V. O'Neil, *"Advanced Engineering Mathematics"*, 7th Edition, Cengage Learning, 2011.
5. Bhavanari Satyanarayana, Pradeep Kumar T.V. & Srinivasulu D, "Linear Algebra and Vector Calculus", Studera Press, New Delhi, 2017.

WEB SOURCE REFERENCES:

1.https://nptel.ac.in/courses/122107036/32
2.https://nptel.ac.in/courses/122107036/27
3.https://nptel.ac.in/courses/122101003/downloads/Lecture-4.pdf
4.https://nptel.ac.in/courses/122101003/downloads/Lecture-6.pdf
5.https://nptel.ac.in/courses/122104017/28

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CC1104	**APPLIED PHYSICS** **(Common to ECE,EEE,CSE,IT&CAI)**

COURSE OBJECTIVES:

- To impart knowledge in basic concepts of wave optics, fiber optics, properties of solid crystal materials and magnetic materials, acoustics, superconductors.
- To familiarize the applications of materials relevant to engineering field.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Interpret the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polarization in various fields. **[K2]**
CO 2: Analyze and understand various types of lasers & optical fibers.[**K4]**
CO 3: Identify the crystal structures and XRD techniques. **[K3]**.
CO 4: Apply the magnetic materials in engineering field. [**K3]**
CO 5: Identify the various applications of semiconductors in engineering field. **[K3]**

SYLLABUS
UNIT– I
Interference & Diffraction: Introduction -Interference in thin films by reflection – Newton's rings, introduction to diffraction – difference between Fresnel's and Fraunhofer diffraction - Fraunhofer diffraction at single slit (qualitative) - Diffraction grating.

Polarization: Introduction – Types of Polarization – Double refraction – Nicol's prism-Quarter wave plate and Half Wave plate – Applications.

UNIT–II
Lasers: Introduction – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Population inversion – Ruby laser – Helium Neon laser-Applications.

Fiber Optics: Introduction- Basic Structure and Principle of optical fiber - Acceptance angle – Acceptance cone - Numerical Aperture-Applications.

UNIT–III
Crystallography : Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC,BCC and FCC.

X-Ray Diffraction: Directions and planes in crystals – Miller indices – Separation between successive (h k l) planes – Bragg's law.

UNIT-IV
Electromagnetic Fields: Gauss divergence theorem - Stokes theorem (Quantitative) – Fundamental laws of electromagnetism – Maxwell's Electromagnetic Equations.

Magnetic materials: Magnetic Susceptibility- Magnetic permeability –Classification of Magnetic materials – Dia, Para, and Ferro – Hysteresis Loop- Soft and Hard magnetic materials – Applications- Superconductivity-Properties, Meissner effect - Type-I and Type-II super conductors.

UNIT-V
Quantum Mechanics: Introduction –de-Broglie's concept of Matter waves – Physical significance of wave function - Schrodinger Time Independent wave equations – Particle in a one dimensional potential box.
Semiconductor Physics: Origin of energy band formation in solids- classification of materials into conductors, semiconductors and insulators, Intrinsic and Extrinsic semiconductor- Hall Effect.

REFERENCE BOOKS:
1. Charles Kittle, "Introduction to solid state physics" ISBN: 9788126578436, Willey India Pvt.Ltd, 5TH edition, 2012.

2. M.Arumugam, "Applied Physics", ISBN: 81-89638-01-7, Anuradha Agencies, 4th edition, 2013.

3. D.K.Bhattacharya, "Engineering Physics", ISBN: 0198065426, 9780198065425, Oxford University press, 2nd edition, 2010.

4. Sanjay D Jain and Girish G Sahasrabudhe "Engineering Physics", University Press ISBN: 8173716781,1st edition, 2010.

1. B.K.Pandey & S. Chaturvedi "Engineering Physics" ISBN: 8131517616, Cengage Learning, 1st edition, 2012.

WEB REFERENCES:

1. http://link.springer.com/physics
2. http://www.thphys.physics.ox.ac.uk
3. http://www.sciencedirect.com/science
4. http://www.e-booksdirectory.com

E-BOOKS:

1. http://www.peaceone.net/basic/Feynman
2. http://physicsdatabase.com/free-physics-books
3. http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf
4. http://www.freebookcentre.net/Physics/Solid-State-Physics-Books.html

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CC1105	**PROBLEM SOLVING USING C** **(Common to All Branches)**						

COURSE OBJECTIVE:

• To know the basic problem solving process using Flow Charts and algorithms.
• To understand the basic concepts of control structures in C.
• To learn concepts of arrays, functions, pointers and Dynamic memory allocation in C.
• To use the concepts of structures, unions, files and command line arguments in C.

COURSE OUTCOMES:

After completion of this course, the students would be able to:
CO1: Develop algorithms and flow charts for simple problems. [K3]
CO2: Utilize suitable control structures for developing code in C. [K3]
CO3: Make use of functions and arrays in developing modular programs. [K3]
CO4: Make use of structures and pointers to write well-structured programs. [K3]
CO5: Make use of file Operations in C programming for a given application. [K3]

SYLLABUS
UNIT I
Introduction to Algorithms and Programming Languages: Algorithm – Key features of Algorithms – Some more Algorithms – Flow Charts – Pseudo code – Programming Languages – Generation of Programming Languages – Structured Programming Language.
Introduction to C: Structure of C Program – Writing the first C Program -Compiling and Executing C Programs - Using Comments – Keywords – Identifiers – Basic Data Types in C – Variables – Constants – I/O Statements in C - Operators in C -Programming Examples – Type Conversion and Type Casting.

UNIT II
Decision Control and Looping Statements: Introduction to Decision Control Statements – Conditional Branching Statements – Iterative Statements – Nested Loops – Break and Continue Statement – Goto Statement.
Functions: Introduction – using functions – Function declaration/ prototype – Function Definition – function call – return statement – Passing parameters – Scope of variables –Storage Classes – Recursive functions – Recursion vs Iteration.

UNIT III
Arrays: Introduction – Declaration of Arrays – Accessing elements of the Array – Storing Values in Array – Calculating the length of the Array – Operations on Array — Two Dimensional Arrays –Operations on Two Dimensional Arrays.
Strings: Introduction – Reading Strings – Writing Strings – String Manipulation functions -Array of Strings.

UNIT IV
Pointers: Introduction to Pointers – declaring Pointer Variables – Pointer Expressions and Pointer Arithmetic – Null Pointers – Passing Arguments to Functions using Pointer, Dynamic Memory Allocation.
Structure, Union, and Enumerated Data Types: Introduction – Nested Structures –Arrays of Structures – Structures and Functions – Self-referential Structures – Union –Enumerated Data Types.

UNIT V

Files: Introduction to Files – Using Files in C – Reading Data from Files – Writing Data To Files – Detecting the End-of-file – Error Handling during File Operations – Accepting Command Line Arguments – Functions for Selecting a Record Randomly - Remove –Renaming a File – Creating a Temporary File

TEXT BOOKS:

1. Reema Thareja, **"**Programming in C**"**, First **edition,** OXFORD University Press 2018.

REFERENCE BOOKS

1. REEMA THAREJA, "Introduction to C programming" OXFORD UNIVERSITY PRESS
2. Rachhpal Singh, "Programming in C", kalyani publishers.
3. E Balagurusamy, "computing fundamentals & c programming", isbn 978-0-07- 066909-3, Tata McGraw-Hill, Second Reprint, 2008.
1. Ashok N Kamthane, "Programming with ANSI and Turbo C", Pearson Edition Publications, 2002.
5. Dennis Richie and Brian Kernighan, "The C programming Language", 2nd edition.

WEB REFERENCES:

1. http://cprogramminglanguage.net/
2. http://lectures-c.blogspot.com/
3. http://www.coronadoenterprises.com/tutorials/c/c_intro.htm
4. http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf
5. https://www.edx.org/learn/c-programming
6. https://www.programiz.com/c-programming

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	15	35	50	1.5
SUBCODE: R20CC11L1	**SOFT SKILLS & COMMUNICATION SKILLS LAB** **(Common to All Branches)**						

COURSE OBJECTIVES:

- To build confidence in the students to communicate effectively in English.
- To strengthen the oral communication skills to enable them to interact with the people in various social situations.
- To enable the learners improve pronunciation with the knowledge of phonetics.
- To provide exposure to students to soft skills like Goal Setting, Time Management, Interpersonal Skills, and Intra Personal Skills.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment.[K3]

CO 2: Listen and comprehend several accents of English Language.[K4]

CO 3: Take part in various conversations/discourses using formal and informal expressions.[K4]

CO 4: Adapt soft skills successfully in personal and professional life.[K5]

UNIT– I

a. Introduction to Phonetics.
b. Listening - TEDx Talks (https://www.ted.com/talks/ashweetha_shetty_how-education-helped-me-rewrite-my-life?language-en#t-623369)
c. Self-Introduction

UNIT–II

a. Pronunciation Rules & Common Errors in Pronunciation.
b. Listening -TEDx Talks(https://www.youtube.com/watch?v=Dk20-E0yx_s)
c. Role Play

UNIT–III

a. Situational Dialogues (Inviting, Accepting and Declining Invitations)
b. Listening - TEDx Talks (https://www.youtube.com/watch?v=IgAnj6r1O48)
c. JAM

UNIT-IV

a. Situational Dialogues (Commands, Instructions and Requests)
b. Listening -TEDx Talks(https://youtu.be/SKvMxZ284AA)
c. Telephonic Etiquette.

UNIT-V

a. Time Management.
b. Goal Setting.
c. Interpersonal Skills & Intra personal skills.

TEXT BOOKS:

"Strengthen Your Communication Skills", Maruthi Publications, 2013.

REFERENCE BOOKS:

1. Meenakshi Raman, Sangeeta Sharma, Technical Communication: Principles and Practice, Oxford University Press, 2015
2. J.D.O Conner, Better English Pronunciation, Cambridge University Press 1980.
3. T.Balasubramanian, "A Text Book of English Phonetics for Indian Students", Macmillan,1981
4. Penny ur   Grammar Practice Activities, Cambridge University Press, 2010.
5. Mark Hancock, Pronunciation in Use, Oxford University Press 2007.
6. K. R Lakshmi Narayanan, T. Murugavan, Managing Soft Skills,Scitech Publications, 2010.
7. K V S G Murali Krishna, K V K K Prasad, Placement and Personality Development, Second Edition, Reem Publications Pvt. Limited, 2012
8. Shiv Khera, You can Win, Bloomsbury Publication, 2014
9. Stephen R. Covey, The 7 Havits of Highly Effective People, Free Press, 1989

ONLINE SOURCES:

1. www.enchantedlearning.com
2. https://www.englisch-hilfen.de/en/
3. https://www.bbc.co.uk/learningenglish/
4. https://in.usembassy.gov/education-culture/american-spaces/american-space-new-delhi/collection/
5. https://www.talkenglish.com/speaking/basics/speaking_basics_ii.aspx
6. https://www.englishclub.com/speaking/
7. https://agendaweb.org/listening-exercises.html
8. https://www.esolcourses.com/content/topicsmenu/listening.html
9. https://www.esl-lab.com/
10. https://www.eagetutor.com/eage-fluent-english-speaking-search-p.htm?gclid=EAIaIQobChMIpr-F5OzH7QIVChsrCh1kBAkzEAMYASAAEgINpfD_BwE
11. https://www.myenglishpages.com/site_php_files/reading.php
12. https://www.cambridgeenglish.org/learning-english/free-resources/write-and-improve/

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	15	35	50	1.5
SUBCODE: R20CC11L2	**PROBLEM SOLVING USING C LAB** **(Common to All Branches)**						

COURSE OBJECTIVE:

- The purpose of this course is to introduce to students to the field of language. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

COURSE OUTCOMES:

After completion of this C Programming Lab, students would be able to:

CO 1: Study, analyze and understand logical structure of computer programming and different constructs to develop programs in C Language. [K4]

CO 2: Compare and contrast various data types and operator precedence. [K2]

CO 3: Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions. [K4]

CO 4: Analyze simple data structures, use of pointers and dynamic memory allocation techniques. [K4]

CO5: Make use of functions and file I/O operations in developing C Programs. [K3]

EXERCISE 1

Construct Flowcharts for the following through Raptor:
   i)   Develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
   ii) Calculate simple and compound interest for various parameters specified by the user.
   iii) Calculate the average of n numbers.

EXERCISE 2

   a) Write a C Program to calculate the area of triangle using the formula
      $Area = \sqrt{(s*(s-a)*(s-b)*(s-c)}$ where s= (a+b+c)/2.
   b) Write a C Program to find the largest of three numbers using ternary operator.
   c) Write a C Program to swap two numbers without using a temporary variable.

EXERCISE 3

   a) Write a C program to find the roots of a quadratic equation.
   b) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. Consider the operators +,-,*, /, % and use Switch Statement.

EXERCISE 4

   a) Write a C program to find the sum of individual digits of a positive integer and find the reverse of the given number.
   b) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

EXERCISE 5

   a) Write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.
   b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.
   c) Write a C Program to check whether the given number is Armstrong number or not.

EXERCISE 6

a) Write a C program to interchange the largest and smallest numbers in the array.
b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them.

EXERCISE 7

a) Write a C Program to find sum of following series for a given n value.
   i. 1+(1+2)+(1+2+3)+(1+2+3+4)+(1+2+3+4+5)+...+(1+2+...+n).
   ii. 1+(2+2)+(3+3+3)+(4+4+4+4)+…+(n+n+n+n..+n).
b) Write a C Program to display following patterns for a given n value
   i.   1
         2   2
       3   3   3   if n =3

   i.   1
         2 2
       3 3   3
        2 2
          1   if n=3.

EXERCISE 8

Draw a flow chart using Raptor and write C programs that use both recursive and non-recursive Functions for the following

i) To find the factorial of a given integer.
ii) To find the GCD greatest common divisor of two given integers.

EXERCISE 9

a) Write a C Program to find Fibonacci sequence.
b) Write C programs illustrating call by value and call by reference concepts.

EXERCISE 10

Write C Programs for the following string operations without using the built in functions - to concatenate two strings

a) To append a string to another string
b) To compare two strings

EXERCISE 11

Write C Programs for the following string operations without using the built in functions

a) To find whether a given string is palindrome or not
b) Write a C Program to count number of occurrences of each character in a given string. Example: if input 'APPLE' then output is 'A count 1, P count 2, L count 1, E count 1'

EXERCISE 12

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

a) To insert a sub-string in to given main string from a given position.
b) To delete n Characters from a given position in a given string.
c) To replace a character of string either from beginning or ending or at a specified location

EXERCISE 13

a) Write a C Program to Implement Taylor series method
b) Write a C Program to Implement Euler's method
c) Write a C Program to Implement Runge Kutta method

EXERCISE 14

a) Write C Program to reverse a string using pointers
b) Write a C Program to compare two arrays using pointers
c) Write a C program to swap two numbers using pointers

EXERCISE 15

a) Write the following C Programs using Dynamic memory management functions.
   i. Accept size of array from user then read n elements into two arrays and store sum of those two arrays in third array, display three arrays using pointers.
   ii. User will specify data type and data to store, use generic pointer to store that data and display given input.

EXERCISE 16

Examples which explores the use of structures, union and other user defined variables

EXERCISE 17

a) Write a C program which copies one file to another.
b) Write a C program to count the number of characters and number of lines in a file.
c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

EXERCISE 18

Virtual Lab: http://cse02-iiith.vlabs.ac.in/ /

Any three programs must be submitted with result from the above link.

* At the end of the semester the student has to submit a Mini-Project on Computer Programming. The list of Mini-Projects is available in the department.

Virual Lab : http://ps-iiith.vlabs.ac.in/

TEXT BOOKS:

1. Reema Thareja, " Programming in C", OXFORD.
2. The C programming Language by Dennis Richie and Brian Kernighan 2nd ed.

REFERENCE BOOKS:

1. Dr.E.Balaguruswamy, "Programming in ANSI C", Tata McGraw-Hill Education.
2. Hanly, "Problem Solving and Program Design in C", Koffman, 7th ed, PEARSON.
3. Forouzan, Gilberg, Prasad ,"C Programming, A Problem Solving Approach", CENGAGE.
4. Programming in C, Second Edition by Ashok N.Kamthane, Pearson.

WEB REFERENCES:

1. https://www.topcoder.com/community/competitive-programming/
2. https://cboard.cprogramming.com/c-programming/158586-project-euler-problem-2-solution.html
3. https://www.hackerrank.com/domains/c
4. https://leetcode.com/discuss/general-discussion/144138/C-programming-solutions/

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CC11L4	**APPLIED PHYSICS LAB** **(Common to CSE, ECE, IT, CSE(AI), EEE)**						

COURSE OBJECTIVES:

To impart physical measurement skills and make the students understand coherence between theoretical and practical knowledge.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Apply the principle of physics in engineering field **(K3)**
CO2: Utilize the modern engineering physics techniques and tools in real time applications. **(K3)**
CO3: Analyse characteristics, usage and the behaviour of materials**. (K4)**

LIST OF EXPERIMENTS:

1. Rigidity modulus of material by wire-dynamic method (torsional pendulum)
2. Determination of wavelength of a source-Diffraction Grating-Normal incidence
3. Newton's rings –Radius of Curvature of Plano Convex Lens.
4. Determination of thickness of thin wire- Air wedge method
5. Determination of wavelength of Laser Source-single slit diffraction.
6. Determine the Numerical aperture of an optical fiber.
7. Melde's experiment – Transverse and Longitudinal modes.
8. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
9. Verification of laws of stretched string by using Sonometer.
10. Calculate the energy loss in a given ferromagnetic material by plotting B-H Curve.
11. Energy Band gap of a Semiconductor p - n junction.
12. Characteristics of Thermistor – temperature coefficient

TEXT BOOKS:

1. Engineering Physics Lab Manual by Dr.Y. Aparna & Dr.K.Venkateswarao (V.G.S.Book links).
2. Physics Practical Manual, Lorven Publications
3. S. Balasubramanian , M.N. Srinivasan " A Text book of Practical Physics"- S Chand Publishers, 2017.

WEB REFERENCES:

1. https://www.youtube.com/watch?v=NDsSPtL9dyQ
2. https://www.youtube.com/watch?v=9agoJRCnu4w
3. https://www.youtube.com/watch?v=bv-lLJreyCU
4. http://vlab.amrita.edu/index.php

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	1	4	30	70	100	3
SUBCODE: R20CS11L8	**LINUX PROGRAMMING LAB**						

COURSE OBJECTIVES:
- Facility with UNIX command syntax and semantics.
- Ability to read and understand specifications, scripts and programs.
- Individual capability in problem solving using the tools presented within the class.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Apply the fundamental UNIX utilities. [K3]
CO 2: Utilize the Unix file system[K3]
CO 3: Experiment with shell and UNIX filters. [K3]
CO 4: Analyze the Shell Programming constructs to develop shell scripts. [K4]

LIST OF EXPERIMENTS

WEEK1
1. Execution of various basic and file related commands in unix.
   basic and file related commands: man, echo, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, ln.

WEEK2
2. Execution of various disk related commands.
   disk related commands: df, dfspace, du, ulimit
3. Execution of various process related commands.
   process related commands: ps, kill, nice, at, batch, crontab

WEEK3
4. Use the following file permission related commands.
   a) chmod, b) chown, c) chgrp d) umask
5. Execution of various basic filters in unix.
   Filters: head, tail, cut, paste, sort, uniq, cmp, diff, comm and tr

WEEK4
6. Use the following shell metacharacters.
   a) I/O Redirection (>,   <,   >>,   <<, |)
   b) Filename substitution (?,   *,   […..])
   c) Quoting metacharacters (\,   "…",   '….',   ` cmd`)
   d) Process execution (;,   (),   &,   &&, ||)
   e) Positional parameters ($1 to $9)

WEEK5
7. a) Write a grep command that selects the lines from the file1 that have exactly three
       characters

b) Write a grep command that selects the lines from the file1 that have at least three characters.
c) Write a grep command that selects the lines from the file1 that have three or fewer characters
d) Write a grep command that selects the lines from the file1 that have the string UNIX.
e) Write a grep command that selects the lines from the file1 that have only the string UNIX.

WEEK6
8. a) Write a sed command that deletes the first character in each line in a file
   b) Write a sed command that deletes the character before the last character in each line in a file.

WEEK7
9. a) Write an awk command to print the lines and line number in the given input file
   b) Write an awk command to print first field and second field only if third field value is
      >=50 in the given input file.

WEEK8
10. a) Write A shell script that takes a command –line argument and reports on whether it is
       directory, a file, or something else
    b) Write a shell script that accepts one or more file name as a arguments and converts all
       of them to uppercase, provided they exits in the current directory
    c) Write a shell script that determines the period for which a specified user is working on
       the system

WEEK9
11. a) Write a shell script that accepts a file name starting and ending line numbers as
       arguments and displays all the lines between the given line numbers
    b) Write a shell script that deletes all lines containing a specified word I one or more files supplied as
       arguments to it.

WEEK10
12. a) Write a shell script that computes the gross salary of a employee according to the
       following
       1) if basic salary is <1500 then HRA 10% of the basic and DA =90% of the basic
       2) if basic salary is >1500 then HRA 500 and DA =98% of the basic
       The basic salary is entered interactively through the key board

    b) Write a shell script that accepts two integers as its arguments and computes the value of first number
       raised to the power of the second number

WEEK 11
13. a) Write an interactive file handling shell program. Let it offer the user the choice of
       copying, removing, renaming or linking files. Once the user has made a choice, have
       the program ask the user for necessary information, such as the file name ,new name
       and so on.
    b) Write a shell script that takes a login name as command –line argument and reports when that person
       logs in
    c) Write a shell script which receives two files names as arguments. It should check whether the two file
       contents are same or not. If they are same then second file should be deleted.

WEEK 12

14. a) Write a shell script that displays a list of all files in the current directory to which the
    user has read write and execute permissions
   b) Develop an interactive script that asks for a word and file name and then tells how many times that
      word occurred in the file.
   c) Write a shell script to perform the following string operations.
      1) To extract a sub string from a given string
      2) To find the length of a given string

WEEK 13

15. a) Write a shell script to display reverse numbers from given argument list
   b) Write a shell script to display factorial value from given argument list
   c) Write a shell script to search given number using binary search.
   d) Write a shell script to sort the elements in a array using bubble sort technique

WEEK 14

16. a) Write a C program that simulate the following unix commands
      1. mv
      2. cp
   b) Write a C program that simulates ls command.

TEXT BOOKS:

1. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson.

REFERENCE BOOKS:

1. Unix and shell programming by B.M. Harwani, OXFORD university press.
2. Unix Concepts and Applications by Sumitabha Das, 4thEdition., Tata McGraw Hill.

WEB REFERENCES:

2. https://www.learnshell.org
3. https://www.udemy.com/shellprogramming/ 3
4. https://www.edureka.co/unix
5. https://www.goeduhub.com/8761/online-tutorial-training-certification-in-linux-unix

I B.TECH – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC1202	Numerical Methods and Statistics	BS	30	70	100	2	1	0	3
2	R20CC1204	Engineering Chemistry	BS	30	70	100	3	0	0	3
3	R20CC1206	Problem Solving Using Python	ES	30	70	100	3	0	0	3
4	R20CC1208	Electronic Devices and Logic Design	ES	30	70	100	3	0	0	3
5	R20CC12L2	Engineering Chemistry Lab	BS	15	35	50	0	0	3	1.5
6	R20CC12L3	R Programming Lab	ES	15	35	50	0	0	3	1.5
7	R20CC12L12	Problem Solving Using Python Lab	ES	15	35	50	0	0	3	1.5
8	R20CS12L13	CSE Workshop	ES	30	70	100	0	1	4	3
9	R20CC12MC1	Environmental Studies (**Zero Credit Course**)	MC	-	-	-	2	0	0	0
TOTAL										19.5

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	0	30	70	100	3
SUBCODE: R20CC1202	**NUMERICAL METHODS AND STATISTICS (CSE, IT & AI)**						

COURSE OBJECTIVES:

- To elucidate the different numerical methods to solve nonlinear algebraic equations.
- To propagate the use of different numerical techniques for carrying out numerical integration.

COURSE OUTCOMES:

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

CO1: Evaluate approximating roots of polynomials and transcendental equations by different algorithms. [**K5**]

CO2: Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals. [**K3**]

CO3: Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations.[**K3**]

CO4: Decide whether to accept or reject a statement about parameter in decision making problems. [**K5**]

SYLLABUS

UNIT –I: ITERATION METHODS: (8 hours)

Solution of Algebraic and Transcendental Equations: Introduction- Bisection method, Method of false position, Iteration method, Newton-Raphson method (One variable and simultaneous Equations).

UNIT –II: INTERPOLATION: (10 hours)

Interpolation: Introduction- Errors in polynomial interpolation – Finite differences- Forward differences-Backward differences –Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals – Newton's Divided difference formula, Lagrange's interpolation formula.

UNIT –III: NUMERICAL DIFFERENTIATION AND INTEGRATION: (10 hours)

Numerical Differentiation, Ordinary differential equations-Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations. Numerical integration-trapezoidal rule, Simpson's 1/3rd and 3/8th rules.

UNIT IV: SAMPLING DISTRIBUTION: (10 hours)

Estimation: Point Estimation, Interval Estimation, Bayesian Estimation.

UNIT V: TESTING OF HYPOTHESIS: (10 hours)

Formulation of null hypothesis, critical regions, level of significance.

Large sample tests: test for single mean test for single proportion.

Small Sample tests: Student t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test), $\chi2$ - test for goodness of fit, $\chi2$ - test for independence of attributes.

 TEXT BOOK :

1. Dr. B.S. Grewal, "*Higher Engineering Mathematics*", 43nd Edition, Khanna Publishers, 2012.
2. **Miller and Freund's,** Probability and Statistics for Engineers, 7/e, Pearson, 2008.

REFERENCES:

1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*Engineering Mathematics*", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. Kreyszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
3. Jaan Kiusalaas "Numerical Methods in Engineering with Python", Cambridge University Press, 2005 Edition.
4. Curtis F. Gerald, Patrick O. Wheatley, "Applied Numerical Analysis", 7 th edition, Pearson.

WEB SOURCE REFERENCES:

1. https://www.youtube.com/watch?v=QqhSmdkqgjQ
2. https://www.digimat.in/nptel/courses/video/111107105/L01.html
3. https://nptel.ac.in/courses/122/102/122102009/
4. http://www.nptelvideos.in/2012/11/numerical-methods-and-computation.html
5. https://nptel.ac.in/courses/111/105/111105041/
6. https://nptel.ac.in/courses/111/106/111106112/
7. https://nptel.ac.in/content/storage2/courses/103106120/LectureNotes/Lec1_2.pdf

I B.TECH II SEMESTERS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC1204	**ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES)**						

COURSE OBJECTIVES:
- To analyze water for its various parameters and its significance in industrial and domestic allocations.
- To acquire the knowledge on types of polymers, fuels and their applications.
- To provide information on exciting advanced materials available in engineering.
- To apply the electrochemical principles, understand the fundamentals of corrosion and development of different techniques in corrosion control.
- To learn the importance of engineering materials used in daily life and industry.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Analyze the suitable method of water treatment depending on the quality treatment. [K4]
CO 2: Compare different types of polymers, fuels and their importance.[K4]
CO 3: Utilize the advanced materials as engineering materials and apply them in domestic and industrial life.[K3]
CO 4: Distinguish electrical energy sources and importance of corrosion science.[K4]
CO 5: Identify different types of engineering materials and applications in engineering. **[K3]**

SYLLABUS

UNIT-I: WATER CHEMISTRY
Characteristics of water: Sources, Impurities–Hardness & its units–Industrial water characteristics– Softening of water by external treatment methods (Lime soda process, Zeolite and Ion exchange process)–Numerical problems on lime soda process–Desalination of brackish water (Reverse osmosis and Electrodialysis).
Water analysis techniques: Alkalinity–hardness (Complexo-metric)–Break point chlorination–Free chlorine–DO–BOD and COD.

UNIT-II: POLYMERS AND FUEL CHEMISTRY
Polymers: Introduction to polymers–Chain growth (free radical, ionic)–Step growth polymerization–Coordination polymerization–Copolymerization with specific examples–Thermoplastics and thermosets–Plastic moulding methods (Compression & Injection moulding)–Rubbers–Natural rubber–Processing–Vulcanization.
Fuels-Types of fuels–Calorific value–Numerical problems based on calorific value–Analysis of coal–Liquid fuels–Refining of petroleum–Cracking of heavy oil–Knocking and anti knocking agents–Octane and cetane values.

UNIT-III: CHEMISTRY OF ADVANCED MATERIALS
Nano materials: Introduction–Sol-gel method & Chemical reduction method of preparation – Characterization by BET method and TEM methods–Carbon nano tubes and fullerenes: Types–Preparation–Properties and Applications.
Liquid crystals: Introduction–Types–Applications.
Composite materials: Introduction–Definition–Types–Applications–Cermets.

UNIT-IV: ELECTROCHEMISTRY AND CORROSION

Electrochemistry: Galvanic cells–Single electrode potential–Reference electrodes–Electrochemical series–Batteries (primary, secondary and fuel cells)–Applications of secondary batteries in E-vehicles.

Corrosion: Causes and effects of corrosion–Theories of corrosion (chemical and electrochemical corrosion)–Factors effecting corrosion–Corrosion control methods–Cathode protection–Sacrificial anodic, Impressed current methods–Surface coatings–Methods of application on metals (Hot dipping, Galvanizing, Tinning, Cladding, Electroplating, Electroless plating)–Organic surface coatings–Paints–Constituents and their functions–Pigment Volume Concentration.

UNIT-V: CHEMISTRY OF ENGINEERING MATERIALS

Lubricants: Introduction–Mechanism of lubrication–Classification of lubricants–Properties and testing of lubricating oils.

Cement & Refractories: Manufacture–Setting and hardening of cement–Failures of cement–Slag cement–Refractory: Introduction–Classification and properties of refractories.

TEXT BOOKS:

1. Shikha Agarwal, "**Engineering Chemistry**", ISBN 1107476410, 2nd Edition, Cambridge University Press, New Delhi, (2019).
2. O.G. Palana, "**Engineering Chemistry**", ISBN 0070146101, Tata McGraw Hill Education Private Limited, New Delhi, (2009).
3. B. Rama Devi, Ch. Venkata Ramana Reddy, Prashantharath, "**Text Book of Engineering Chemistry**", ISBN 9789353500511, Cenage Learning India Pvt. Ltd, (2016).

REFERENCE BOOKS:

1. P.C. Jain and M. Jain "**Engineering Chemistry**", ISBN 8187433175, 15/e, Dhanpat Rai & Sons, Delhi, (2015).
2. B.S Murthy and P. Shankar, "**A Text Book of NanoScience and NanoTechnology**", University Press (2013).
3. K. Sesha Maheshwaramma and Mridula Chugh, "**Engineering Chemistry**", Pearson India Edn services, (2016).
4. S.S. Dara, "**A Textbook of Engineering Chemistry**", ISBN 8121932645, S.Chand Publisher, (2010)

WEB REFERENCES:

1. URL: https://www.youtube.com/watch?v=CWOJW4357Bg
2. URL: https://www.youtube.com/watch?v=H1Y1oxQ5eUA&t=627s
3. URL: https://www.youtube.com/watch?v=1xWBPZnEJk8
4. URL: https://www.youtube.com/watch?v=p9yPXdT0k48&t=225s
5. URL: https://www.youtube.com/watch?v=xb_xndPe4n0&t=390s

E-BOOKS:

1. "**Engineering Chemistry**" (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan.

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CC1206	**PROBLEM SLOVING USING PYTHON** (Common to CSE & IT)						

COURSE OBJECTIVE:

- To teach problem solving through flow charting tool-Raptor.
- To elucidate problem solving through python programming language.
- To introduce function oriented programming paradigm through python.
- To train in development of solutions using modular concepts.

COURSE OUTCOMES:

After successful completion of this course, the students would be able to:
CO 1: Summarize the fundamental concepts of python programming. [K2]
CO 2: Interpret object oriented and event driven programming in python. [K2]
CO 3: Apply the suitable data structures to solve the real time problems. [K3]
CO 4: Apply regular expressions for many different situations. [K3]

SYLLABUS:

UNIT-I
Introduction to python: Numbers, strings, variables, operators, expressions, Indentation, String operations and functions, math function calls, Input/output statements, conditional if, while and for loops,

UNIT-II
Functions: user defined functions, parameters to functions, recursive functions, and lambda function.
Event driven programming: Turtle graphics, Turtle bar chart, Widgets, key press events, mouse events, timer events.

UNIT-III
Data structures: List- list methods & functions, Tuple-tuple methods & functions, Dictionaries-dictionary methods & functions, traversing dictionaries. Sets-methods & functions, Files.

UNIT-IV
OOP: class, object, methods, constructors, inheritance, inheritance types, polymorphism, operator overloading, abstract classes, exception handling.

UNIT-V:
Regular expressions: Power of pattern matching and searching using regex in python, Meta characters and Sequences used in Patterns, Password, email, URL validation using regular expression, Pattern finding programs using regular expression.

TEXT BOOKS:
1. Kenneth Lambert, "Fundamentals of Python: First Programs" , ISBN-13: 978-1337560092,cengage learning publishers, first edition,2012.

2. Allen B. Downey, "think python: how to think like a computer scientist", ISBN-13: 978-1491939369, O'reilly, 2nd edition, 2016.

3. Reema Thareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19-948017-3, Oxford University Press, 2017.

REFERENCE BOOKS:

1. Vamsi kurama, "Python programming : A modern approach", ISBN-978-93-325-8752-6,pearson,2018.
2. Mark Lutz , "Learning python", ISBN: 1-56592-464-9,Orielly, 4th edition, 1999 .
3. W.Chun, "Core python programming", ISBN-13: 978-0132269933, pearson, 2nd edition, 2016.

WEB RESOURCES:

1. https://raptor.martincarlisle.com/
2. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
3. https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf
4. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
5. https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf
6. https://nostarch.com/scratchplayground
7. http://fusecontent.education.vic.gov.au/9f79537a-66fc-4070-a5ce-e3aa315888a1/scratchreferenceguide14.pdf

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CC1208	**ELECTRONIC DEVICES AND LOGIC DESIGN**						

COURSE OBJECTIVES:

- To discuss the characteristics of semiconductor diodes.
- To illustrate the different types of Transistors and their applications.
- To demonstrate the basics of Boolean algebra and reduction techniques.
- To design of combinational circuits.
- To design sequential circuits like registers and counters.

COURSE OUTCOMES:

After completion of this course, the students will be able to

CO1: Apply P-N diodes and Special diodes in electronic circuits.[K3]

CO2: Compare different types of transistors (BJT, FET and MOSFET) with their working principles.[K2]

CO3: Make use of Boolean algebra and K-map and to minimize combinational functions.[K3]

CO4: Develop combinational circuits and sequential circuits.[K3]

CO5: Construct different types of registers and counters.[K3]

SYLLABUS:

UNIT I: Junction Diode Characteristics

Open circuited PN Junction, Forward and Reverse bias, V-I characteristics, Applications of Diode – Switch, Rectifiers (without and with filters), Zener Diode characteristics, Zener as voltage regulator, LED.

UNIT II: Transistors

BJT, Configuration of BJT, Input and Output Characteristics of CB, CE and CC Configuration, JFET, MOSFETs – Construction, Characteristics and Applications, Comparison between BJT and JFET, Comparison between JFET and MOSFET.

UNIT III: Number Systems, Logic Gates and Boolean algebra

Binary, Octal, Decimal and Hexadecimal Number Systems, Conversion of Numbers from one Radix to another Radix, 1's Complement and 2's Complement.

Basic Gates- AND, OR and NOT, Universal Gates- NAND and NOR, EX-OR and EX-NOR Gates, De-Morgan's Laws, Minimization of Logic Functions using Boolean Theorems and Karnaugh map method.

UNIT IV: Combinational and Sequential Logic Circuits

Combinational: Design of Half Adder, Full Adder, Half Subtractor, Full Subtractor, Design of Decoders, Encoders, Multiplexers, Demultiplexers. Sequential:Basic sequential logic circuits: Latch and Flip-Flop, Truth tables and excitation tables of RS, JK, T and D Flip-Flops.

UNIT V: Registers and Counters

Buffer Register, Control Buffer Register, Bidirectional Shift Registers, Universal Shift Registers. Synchronous Counter, Ripple Counter, Ring Counter, Modulus Counter.

TEXT BOOKS:

1. Electronic Devices and Circuits – J. Millman, C.C. Halkias, TMGH, 2nd Edition 1998.
2. Digital Design – M. Morris Mano, Pearson, 3rd Edition, 2009.

REFERENCES:

1. Electronic Devices and Circuits Theory- Robert L. Boylestad and Louis Nashelsky, Pearson Education, 9th Edition, 2008.
2. Fundamentals of Logic Design- Charles H. Roth, Jr, Thomson Learning, 5th Edition, 2005.

WEB REFERENCES:

1. Student Resources provided in https://www.electronics-tutorials.ws/ for basic electronic circuits
 2. http://nptel.ac.in/courses/117105080/ on Electronics and Communication Engineering
3. http://www2.ece.ohio-state.edu/ee327/ Electronic Devices and Circuit laboratory
4. https://searchworks.stanford.edu/view/11352963 for fundamentals of Electronics available in Digital Library
5. https://archive.org/details/ElectronicDevicesCircuits
6. https://www.youtube.com/watch?v=CeD2L6KbtVM
7. http://onlinecourses.nptel.ac.in/noc20_ee70/preview

I B.TECH II SEMESTERS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	15	35	50	1.5
SUBCODE: R20CC12L2	ENGINEERING CHEMISTRY LAB (COMMON TO ALL BRANCHES)						

COURSE OBJECTIVES:

- To provide the students with a solid foundation in chemistry laboratory required to solve the engineering problems.
- To expose the students in practical aspects of the theoretical concepts.
- To train the students on how to handle the instruments.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Develop and perform analytical chemistry techniques to address the water related problems (hardness, alkalinity, Chlorine, DO). [K6]

CO 2: Explain the functioning of different analytical instruments.[K5]

CO 3: Compare viscosity and surface tension of different oils.[K4]

CO 4: Measure molecular/system properties such as strength of solutions, conductance of solutions and acid number of lubricating oils, etc.[K5]

LIST OF EXPERIMENTS

Introduction to chemistry laboratory–Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis etc.

1. Estimation of NaOH using standard HCl solution

2. Determination of hardness of water sample by EDTA method

3. Determination of alkalinity of water sample

4. Determination of Dissolved Oxygen content of water sample by Winkler's method

5. Determination of Dissolved Chlorine by Mohr's method

6. Estimation of Fe^{+2} by using $KMnO_4$

7. Preparation of phenol formaldehyde resin/Urea formaldehyde

8. Conductometric titration between strong acid and strong base

9. Determination of viscosity of a liquid by Ostwald's viscometer

10. Determination of surface tension of a liquid by Stalagnometer

11. Determination of moisture content present in given coal sample

12. Determination of acid value of an oil

VIRTUAL LABS:

1. Soil Analysis- Determination of pH of soil
2. Water analysis - Determination of Physical parameters

TEXT BOOKS:
1. N.K Bhasin and Sudha Rani "**Laboratory Manual on Engineering Chemistry**" 3/e, Dhanpat Rai Publishing Company (2007).
2. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B "**Vogel's Quantitative Chemical Analysis**" 6/e, Pearson publishers (2000).
3. Sudharani, "**Lab manual on Engineering Chemistry**" Dhanpat Rai Publications, Co., New Delhi. (2009).

WEB REFERENCES:
1. URL: https://vlab.amrita.edu

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CC12L3	**R PROGRAMMING LAB**						

COURSE OBJECTIVES:
- To make the student to get a clear understanding of the core concepts of R like import data in various formats for statistical computing, data manipulation, business analytics etc.
- To implement various functions, data structures.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Apply the all basic operators on various data types.[K3]
CO 2: Develop programs using Conditional Statements and various types of loops.[K3]
CO 3: Develop programs using Matrices, Lists and Frames.[K3]
CO 4: Develop programs using Functions, Math functions and Statistical functions in R.[K3]
CO 5: Analyze the real word datasets presented in different formats using R libraries to perform exploratory data analysis and visualization.[K3]

LIST OF EXPERIMENTS
EXERCISE 1:
   a) Write a program to illustrate basic Arithmetic in R
   b) Write a program to illustrate Variable assignment in R
   c) Write a program to illustrate data types in R

EXERCISE 2:
   a) Write a program to illustrate if-else-else if in R
   b) Write a Program to illustrate While and For loops in R
   c) Write a program to illustrate Logical & and Logical | operators in R.

EXERCISE 3:
   a) Write a program to illustrate creating and naming a vector in R
   b) Write a program to illustrate create a matrix and naming matrix in R
   c) Write a program to illustrate Add column and Add a Row in Matrix in R
   d) Write a program to illustrate Selection of elements in Matrixes in R
   e) Write a program to illustrate Performing Arithmetic of Matrices
EXERCISE 4:
   a) How to Create a Matrix in R
   b) Print dimension of the matrix with dim()
   c) Construct a matrix with 5 rows that contain the numbers 1 up to 10 and byrow = FALSE
   d) Print dimension of the matrix with dim()
   e) Add a Column to a Matrix with the cbind()
   f) Slice a Matrix
   g) Write a program to illustrate Compare Matrices and Compare vectors
EXERCISE 5:
   a) Write a program to illustrate Factors in R
   b) Case study of why you need use a Factor in R

    c)   Write a program to illustrate Ordered Factors in R

EXERCISE 6:
   a) How to Create a Data Frame
   b) Slice Data Frame
   c) Append a Column to Data Frame
   d) Select a Column of a Data Frame
   e) Subset a Data Frame
   f) Write a program to illustrate Data Frame Selection of elements in a Data frame
   g) Write a program to illustrate Sorting a Data frame
   h) Merge Data Frames in R: Full and Partial Match

EXERCISE 7:

   a)   Write a program to illustrate List ? Why would you need a List
   b)   Write a program to illustrate Adding more elements into a List

EXERCISE 8:
   a)   Write a program to illustrate Function inside function in R
   b)   Write a program to illustrate some built in Mathematical Functions.
   c)   Write a program to calculate mean, mode, SD, variance.

EXERCISE 9:
     Cleaning data in R:
   a) Characteristics of Clean Data and Messy Data
   b) Load Data into R with readxl
   c) View the Data with tidyr::glimpse()
   d) Looking to Data Types
   e) Comparing to read.csv()
   f) Combining Datasets
   g) Clean Up Column Names with magrittr Magic!
   h) The Pipe Operation

EXERCISE 10:
     Data visualization in R:
   a) Histogram
   b) Bar / Line Chart
   c) Box plot
   d) Scatter plot
   e) Heat Map
   f) Mosaic Map
   g) Map Visualization
   h) 3D Graphs
   i) Correlogram
   j) Write a program to illustrate Customizing and Saving to Graphs in R.

TEXT BOOKS:

1. Robert I. Kabacoff, R in Action-Data analysis and graphics with R, 2e, Manning Publications
2. David Dietrich, Barry Heller, and Beibei Yang, Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services, John Wiley & Sons, Inc.

REFERENCE BOOKS:

1. Garrett Grolemund, Hands-On Programming with R, Orielly. 2. Paul Teetor, R Cookbook, O'Reilly

WEB REFERENCES:

1. https://rpubs.com/
2. https://b-ok.asia/ireader/2604048
3. https://d1b10bmlvqabco.cloudfront.net/attach/ighbo26t3ua52t/igp9099yy4v10/igz7vp4w5su9/OReilly_HandsOn_Programming_with_R_2014.pdf
4. https://www.guru99.com/r-matrix-tutorial.html
5. https://www.guru99.com/r-data-frames.html
6. https://www.guru99.com/r-sort-data-frame.html
7. https://www.guru99.com/r-dplyr-tutorial.html
8. https://www.guru99.com/r-merge-data-frames.html
9. https://www.guru99.com/r-functions-programming.html
10. https://www.dataquest.io/blog/load-clean-data-r-tidyverse/
11. https://www.analyticsvidhya.com/blog/2015/07/guide-data-visualization-r/

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	15	35	50	1.5
SUBCODE: R20CC12L12	**PROBLEM SOLVING USING PYTHON LAB** (Common to CSE & IT)						

COURSE OBJECTIVE:

- To introduce programming through Visual programming tool - Scratch
- To teach problem solving through Flow charting tool - Raptor
- To elucidate problem solving through python programming language
- To introduce function-oriented programming paradigm through python
- To train in development of solutions using modular concepts
- To teach practical Python solution patterns

COURSE OUTCOMES:

After successful completion of this course, the students would be able to:
CO1: Develop interactive visual programs using Scratch.[K3].
CO2: Develop Python programs for numerical and text based problems. [K3].
CO3: Develop graphics and event based programming using Python. [K3].
CO4: Develop Python programs on object oriented programming and regular expressions.
[K3].

LABORATORY EXPERIMENTS

WEEK-1:
1. Design a script in Scratch to make a sprite to draw geometrical shapes such as Circle, Triangle, Square, and Pentagon.
2. Design a script in Scratch to make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result.

WEEK-2:
3. Design a Python script to convert a Binary number to Decimal number and verify if it is a Perfect number.
4. Design a Python script to determine if a given string is a Palindrome using recursion
5.
WEEK-3:
6. Design a Python script to sort numbers specified in a text file using lists.
7. 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.

WEEK-4:
8. Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.
9. Design a Python Script to determine the time difference between two given times in HH:MM:SS format. $0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59$.
10. Write a Python program to convert a date of yyyy-mm-dd format to dd-mm-yyyy format.

WEEK-5:
11. Design a Python Script to convert a given number to words

12. Design a Python Script to convert a given number to roman number.

WEEK-6:
13. Design a Python Script to generate the frequency count of words in a text file.
14. Design a Python Script to print a spiral pattern for a 2 dimensional matrix.

WEEK-7:
15. Write a Python program to convert a given tuple of positive integers into an integer.
16. Write a Python program to create a dictionary grouping a sequence of key-value pairs into a dictionary of lists.
    Original list:
    [('yellow', 1), ('blue', 2), ('yellow', 3), ('blue', 4), ('red', 1)]
    Grouping a sequence of key-value pairs into a dictionary of lists:
    {'yellow': [1, 3], 'blue': [2, 4], 'red': [1]}

WEEK-8:
17. Write a Python program to remove the intersection of a 2nd set from the 1st set.
18. Write a Python program to count the number of strings where the string length is 2 or more and the first and last character are same from a given list of strings.
    SampleList:['abc','xyz','aba','1221']
    Expected Result : 2

WEEK-9:
19. Design a Python script to generate statistical reports Minimum, Maximum, Count, Average, Sum etc) on public datasets.
20. 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.

WEEK-10:
21. Write a Python program to replace all occurrences of space, comma, or dot with a colon.
22. Write a Python program to match a string that contains only upper and lowercase letters, numbers, and underscores.

WEEK-11:
23. Write a Python program to check that a string contains only a certain set of characters in this case a-z, A-Z and 0-9
24. Write a Python program to find the occurrence and position of the substrings within a string.

WEEK-12:
25. Design a Python script on oop's concepts: Class variables and instance variable
        i.   Robot ii) ATM Machine
26. Virtual Lab: http://ps-iiith.vlabs.ac.in/ any three programs must be submitted with result from the above link.

TEXT BOOKS:

1. Kenneth Lambert, "Fundamentals of Python: First Programs" , ISBN-13: 978-1337560092,cengage learning publishers, first edition,2012.
2. Allen B. Downey, "think python: how to think like a computer scientist", ISBN-13: 978-1491939369, O'reilly, 2nd edition, 2016.
3. Reema Thareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19-948017-3, Oxford University Press, 2017.

REFERENCE BOOKS:

1. Vamsi kurama, "Python programming : A modern approach", ISBN-978-93-325-8752-6,pearson,2018.
2. Mark Lutz , "Learning python", ISBN: 1-56592-464-9,Orielly, 4th edition, 1999 .
3. W.Chun, "Core python programming", ISBN-13: 978-0132269933, pearson, 2nd edition, 2016.

WEB RESOURCES:

1. https://raptor.martincarlisle.com/
2. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
3. https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf
4. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
5. https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf
6. https://nostarch.com/scratchplayground
7. http://fusecontent.education.vic.gov.au/9f79537a-66fc-4070-a5ce-e3aa315888a1/scratchreferenceguide14.pdf

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	6	30	70	100	3
SUBCODE: R20CS12L13	CSE WORKSHOP						

COURSE OBJECTIVES:

- Enabling the student to understand basic hardware and software tools through practical exposure.

COURSE OUTCOME:

After completion of this course, the student should be able to
CO1: Demonstrate the need of PC hardware components, applications and softwares.[K2]
CO2: Explain the knowledge of networks, internet and World Wide Web, Search engines, Netiquette. [K2]
CO3: Install and use different software like Windows XP, Linux.
CO4: Identify and fix the defective PC and software related issues.[K3]
CO5: Formalise with parts of windows word, Excel and Power point.

PC Hardware
Task 1: Identification of the peripherals of a computer. To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices.

Task 2: (Optional): A Practice on disassembling the components of a PC and assembling them to back to working condition.

Task 3: Examples of Operating Systems- DOS, MS Windows, Installation of MS windows on a PC

Task 4: Introduction to Memory and Storage Devices, I/O Port, Device Drivers, Assemblers, Compilers, Interpreters, Linkers, Loaders.

Task 5: Hardware Troubleshooting (Demonstration): Identification of a problem and fixing a defective PC (improper assembly or defective peripherals).
Software Troubleshooting (Demonstration): Identification of problem and fixing the PC for any software issues.
Internet & Networking Infrastructure
Task 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC, Bluetooth technology, Wireless Technology, Modem, DSL, and Dialup Connection.
Orientation & Connectivity Boot Camp and Web Browsing: Students are trained to configure the network settings to connect to the Internet. They are trained to demonstrate the same through web browsing (including all tool bar options) and email access.

Task 7: Search Engines & Netiquette:
Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc).Students are acquainted to the principles of micro-blogging, wiki, collaboration using social networks, participating in online technology forums.

Task 8: Cyber Hygiene (Demonstration) : Awareness of various threats on the internet. Importance of Security patch updates and Anti-Virus solution Ethical Hacking, Firewalls, Multi-factors authentication techniques including Smart card Biometrics and also practiced.

Word
Task 9: MS Word Orientation: Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting, Drop Cap, Applying Text effects, Using Character Spacing, OLE in Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving.

Task 10 : Creating Project : Abstract Features to be covered:-Formatting Styles, Inserting Table, Bullets and Numbering, Changing Text Direction, Cell alignment, footnote, Hyperlink, Symbols, Spell Check, Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

Excel
Task 11: Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations.
Creating Scheduler - Features to be covered:-Gridlines, Format Cells, Summation, auto fill, Formatting Text.

Task 12: Performance Analysis: Features to be covered:-Split cells, freeze panes, group and outline, Sorting, Boolean and Logical operators, Conditional Formatting.

Power Point
Task 13: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes:- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting – Images, Clip Art, Tables and Charts in PowerPoint.

Task 14: Focusing on the power and potential of Microsoft power point Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes:- Master Layouts (slide, template and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background , textures, Design Templates, Hidden slides, OLE in PPT.

TEXT BOOKS:
Faculty to consolidate the workshop manuals using the following references.
1. Anita Goel , Computer Fundamentals, Pearson
2. Scott. Mueller QUE , Scott Mueller's Upgrading and Repairing PCs, 18/e, Pearson, 2008

REFERENCE BOOKS:
1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Venkateswarlu.
2. G Praveen Babu, M V Narayana, "Information Technology Workshop", BS Publications, 3e
3. Vikas Gupta, "Comdex Information Technology", Dreamtech.

WEB REFERENCES:
1. https://www.microsoft.com/en-us/garage/profiles/script-lab/
2. https://algonquincollege.libguides.com/slc/library-lab
3. https://technology.ku.edu/services/training-workshops
4. https://appsource.microsoft.com/en-us/product/office/wa104380862?tab=overview

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	-	-	-	-	-	0
SUBCODE: R20CC12MC1	**ENVIRONMENTAL STUDIES**						

COURSE OBJECTIVES:

• To make the students aware about the environment and it's inter–disciplinary, to familiarize the concept of ecosystem and their importance, basic understanding of the ecosystem and its diversity.
• Overall understanding of the natural resources.
• To bring the awareness among students about the importance of biodiversity and the need for its conservation.
• To make the students understand the adverse effects of environmental pollution, its causes and measures to control it.
• Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities. Awareness on the social issues, environmental legislation and global treaties understanding the environmental policies and regulations.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.[K2]
CO 2: Analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.[K4]
CO 3: Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity.[K2]
CO 4: Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices.[K4]
CO 5: Interpret Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.[K2]

UNIT – I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness. Institutions and people in Environment.

Ecosystems:

Definitions and concepts – Characteristics of ecosystem – Structural and functional features – Producers, consumers and decomposers and food webs – Types of ecosystems – Forests, grassland, desert, crop land, pond, lake, river and marine ecosystems – Energy flow in the ecosystem – Ecological pyramids – Ecological successions.

UNIT – II

Natural Resources: Water resources–Use and over utilization of surface and natural resourced ground water–Floods, drought, conflicts over water, dams–benefits and problems on tribal population & Environment. Forest resources: Use and over–exploitation, deforestation.

Mineral resources: Use and exploitation, tribal & environmental effects of extracting and using mineral resources.
Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer–pesticide problems, water logging, salinity–concept of sustainable agricultural methods.
Energy Resources: Renewable (wind energy, tidal energy) and non-renewable energy resources (Fossil fuels, coal).

UNIT – III

Biodiversity: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity
Conservation of biodiversity: Threats to biodiversity: habitat loss, man wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: In-Situ conservation and Ex- situ conservation.

UNIT – IV

Environmental Pollution and Control Technologies: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, and nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Good Agricultural Practices – Drip irrigation, soil erosion and desertification.
Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.Covid-19- and environmental Health –Impact of the Coronavirus-Precautions and infection control.

UNIT – V

Environmental Policy, Legislation and Environmental Management: Environmental ethics: Issues and possible solutions. Environmental Protection Act, Legal aspects -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.
Impact Assessment and its significance - various stages of EIA, preparation of EMP and EIS, Environmental audit, Ecotourism.
Visit to some local Polluted Site: Study of an industrially Polluted area.

TEXT BOOKS:

1. AnubhaKaushik& C. P. Kaushik, Environmental Studies,NewAge   International (P) Ltd., New Delhi. Fourth edition,2014.
2. P. N. Palanisamy, P. Manikandan, A. Geetha, and K. ManjulaRani,Environmental Studies, Pearson Education, Chennai.ISBN 978-93-325-2052-3,Secondedition-2014.

REFERENCE BOOKS:

1. Deekshita Dave & P. UdayaBhaskar, Text Book of Environmental Studies CengageLearning.
2. Shaashi Chawla, a Textbook of Environmental Studies, TMH, NewDelhi.
3. Benny Joseph Environmental Studies, Tata McGraw Hill Co, NewDelhi.
4. Dr.K.V.S.G. Murali Krishna, Environmental Studies VGS Publishers, Vijayawada, First Edition2016.
5. Bharucha, E. Text book of Environmental Studies, First edition, Universities Press (India) Pvt., Ltd., Hyderabad,2005.

WEB REFERENCES:

1.URL: https://www.youtube.com/watch?v=7G3eXI_DPn8
2.URL: https://www.eolss.net/sample-chapters/C09/E6-70-05-01.pdf
3.URL: https://www.youtube.com/watch?v=QuRL6NbyvEQ
4.URL: https://google/ Introduction to Environmental Studies5JM1G2
5.URL: http://www.teacherspayteachers.com/Product/Food-Chains-Trophic-Levels-and-
       Ecological-Pyramids-PowerPoint Click theabove

R20 COURSE STRUCTURE
II B.TECH - I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC2102	Mathematical Foundations of Computer Science	BS	30	70	100	2	1	0	3
2	R20CC2103	OOPS through Java	PC	30	70	100	3	0	0	3
3	R20CC2104	Data Structures	PC	30	70	100	3	0	0	3
4	R20CI2101	Computer Organization	PC	30	70	100	3	0	0	3
5	R20CC2105	Front End Web Technologies	PC	30	70	100	3	0	0	3
6	R20CC21L1	Data Structures Lab	PC	15	35	50	0	0	3	1.5
7	R20CC21L2	OOPS through Java Lab	PC	15	35	50	0	0	3	1.5
8	R20CC21L3	Front End Web Technologies Lab	PC	15	35	50	0	0	3	1.5
9	R20CC21SC1	Data Science Lab	SC	-	50	50	0	0	4	2
10	R20CC21MC2	Constitution of India **(Non Credit Course)**	MC	-	-	-	2	0	0	0
TOTAL										21.5

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC2102	**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE** **(CSE & IT)**						

COURSE OBJECTIVE:

• The course provides with the basic mathematical implication for computer science, applications of mathematics in computer science.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO 1: Apply the logical statements, connectivity among the statements and forms different types of normal forms. [K3]

CO 2: Analyze the theory of Inference for statement calculus. [K4]

CO 3: Classify the types of graphs and trees to formulate computational problems.[K4]

CO 4: Apply DNF and CNF on Boolean algebraic functions to simplify the digital (logic) circuits. [K3]

CO 5: Solve mathematical problems with recurrence relations using different methods. [K3]

SYLLABUS
UNIT – I: Mathematical Logic: (10 hours)

Statements and Notations, Connectives - Negation, Conjunction, Disjunction, Statement Formulas and Truth tables, Conditional Statements, Bi Conditional Statements, Well-formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Functionally Complete Sets of Connectives, Other Connectives; Normal Forms - Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Disjunctive Normal Forms, Principal Conjunctive Normal Forms, Ordering and Uniqueness of Normal Forms.

UNIT – II: THE THEORY OF INFERENCE FOR THE STATEMENT CALCULUS:
                                                          (10 hours)

Validity Using Truth Tables, Consistency of Premises and Indirect method of proof.

Predicate calculus: Predicates, Statement Function, Variables and Quantifiers, Free and Bound Variables, Inference Theory of Predicate Calculus, Exercises.

Mathematical Induction: Principle of Mathematical Induction, Exercises.

UNIT – III: GRAPH THEORY: (12 hours)

Definitions, finite and infinite graphs, incidence and degree, isolated pendant vertices, isomorphism, sub graphs, walk, path and circuit, connected and disconnected graphs, components, Euler graphs, Euler graph theorem, operations on graphs, decomposition of Euler graphs into circuits, arbitrarily traceable Euler graphs, Hamiltonian paths and circuits, number of edge disjoint Hamiltonian circuits in complete graph with odd number of vertices, travelling salesman problem.

Trees: Some properties of trees, pendant vertices, distance and centers, rooted and binary trees, spanning trees, fundamental circuit, shortest spanning trees, Kruskal's algorithm

UNIT – IV: RECURRENCE RELATION: (8 hours)

Recurrence Relations, Formation of Recurrence Relations, Solving linear homogeneous recurrence Relations by substitution method, generating functions and The Method of Characteristic Roots. Solving Inhomogeneous Recurrence Relations.

UNIT – V: BOOLEAN ALGEBRAS & COMBINATORICS: (8 hours)

Boolean Algebras: Boolean Algebras, Boolean Polynomials, Disjunctive and Conjunctive Normal forms, Switching Circuits and Applications.

Combinatorics: Basic Counting Principles, Permutations and Combinations: Permutations, Combinations, Restricted Combinations, Pigeonhole Principle and its Application.

TEXT BOOKS:

1. Tremblay & Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TMH.
2. Bhavanari Satyanarayana and Kunchan Syam Prasad "Discrete Mathematics", PHI, India, ISBN: 978-81-203-4948-3.
3. Bhavanari Satyanarayana, T. V. Pradeep, Sk. Mohiddin Shaw, "Mathematical Foundation for Computer Science", B.S Publications, Hyd: 2016, ISBN: 978-93-83635-81-8.

REFERENCE BOOKS:

1. Rosen, "Discrete Mathematics and its Applications with combinatorics and graph theory", 7th edition, TMH
2. Purna Chandra Biswal, "Discrete Mathematics and Graph theory", 3rd rd, PHI.
3. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists and Mathematicians", 2nd Edition, PHI.

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106106094
2. nptel.ac.in/courses/106108054 (Graph Theory)

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CC2103	**OOPS THROUGH JAVA** (Common to CSE & IT)						

COURSE OBJECTIVE:

- The course provides fundamentals of object-oriented programming in Java and development of user interface.

COURSE OUTCOMES:

After completion of this course, the students would be able to:

CO1: Interpret the syntax and semantics of java programming language and OOPs concepts. [K2]

CO2: Make use of different predefined classes and packages and interfaces to develop programmes using OOPs concepts. [K3]

CO3: Apply exception handling and multithreading mechanisms on java programs.[K3]

CO4: Develop java programmes using collection framework & I/O. [K3]

CO5: Make use of AWT, Applets and Event-Handling to develop GUI. [K3]

SYLLABUS

UNIT-I

Oriented Languages (Classes, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism), Procedural languages Vs. OOP. The History and Evolution of Java, Java Buzzwords, java program structure.

Data Types, Variables, and Arrays: The primitive types, variables, type conversion and casting, Automatic Type Promotion in Expressions, Arrays, Operators, Control statements.

Introducing Classes : Class fundamentals, Declaring the objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this keyword, Garbage Collection, the finalize() Method.

UNIT-II

A Closer Look at Methods and Classes: Overloading Methods, Using objects as Parameters, Returning Objects, Understanding static , Nested and Inner Classes.

Inheritance: Inheritance Basics and types of inheritance, Using super, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, using final with Inheritance, The Object class.

Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces, Default Interface Methods, Use static Methods in an Interface.

UNIT-III

String Handling: String class, StringBuffer class, StringBuilder Class,

Exception Handling: Fundamentals, Exception types, Uncaught Exceptions, Using try and catch, multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses.

Multithreaded Programming : The Java Threaded Model, The Main Thread , Creating a Thread, Creating Multiple Threads, Using is Alive() and join(), Thread Priorities, Synchronization, Inter Thread

Communication, Suspending, Resuming, Stopping Threads.

UNIT-IV

Collections Framework in Java- Introduction to Java collections, Overview of Java collection frame work, Commonly used Collection classes- ArrayList,LinkedList, HashSet, Hash table, HashMap, TreeSet,TreeMap , StringTokenizer.

Input/Output: reading and writing data - Byte Stream, Console, Character Stream, Buffered Byte Stream, Buffered Character Stream; java.io package.

UNIT-V

The Applet Class: Applet Basics, Applet Architecture, An Applet Skeleton, Simple Applet Display Methods, Requesting Repainting, The HTML APPLET Tag, Passing Parameters to Applets.
Event Handling: Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, The KeyEvent Class, Sources of Events, Event Listener Interfaces, Using The Delegation Event Model, Adapter Classes , Inner Classes.
Introducing the AWT: java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar.

TEXT BOOKS:

1. Herbert Schildt, "The Complete Reference Java", 8/e, , TMH, 2011. (UNITS : I, IV, V 2. Sachin Malhotra, Saurabh Choudhary, "Programming in JAVA", 2/e, , Oxford, 2014.   (UNITS: I, II & III)

REFERENCE BOOKS:

1. JAVA Programming, K. Rajkumar,1/e, Pearson,2013.
2. Core JAVA, Black Book, Nageswara Rao, Wiley, 1/e, Dream Tech, 2012.

WEB REFERENCES:

https://www.tutorialspoint.com/java/index.html

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CC2104	**DATA STRUCTURES** (Common to CSE, IT & AI)						

COURSE OBJECTIVE:

- Comprehensive knowledge of data structures and exposure to algorithmic complexities, recursive algorithms, searching, sorting and hashing techniques
- Applying Stack and Queue techniques for logical operations
- Understand Linked-list representation models in various types of applications
- Implementation of tree in various forms, orientation on graphs, representation of graphs, graph traversals, spanning trees Graphs

COURSE OUTCOMES:

After the completion of this course the student should be able to:
CO1 : Apply Searching, Sorting and Hashing techniques to solve problems.[K3]
CO2 : Analyze basic data structures such as Stacks, Queues and Linked List. [K4]
CO3 : Solve problems involving Advanced concepts of Trees. [K3]
CO4 : Analyze variety of Graph data structures that are used in various applications. [K4]

SYLLABUS:

UNIT – I
Introduction to Data Structures and Algorithms: Basic Terminology – Preliminaries of algorithms. Data Structures, Abstract Data Types (ADTs) Algorithms, Time and Space Complexity (worst-case, average-case, best-case).

UNIT-II

Searching and Sorting : Introduction to Searching, Linear Search, Binary Search, Fibonacci Search. Introduction to Sorting, Bubble sort, Selection sort, Insertion sort , Merge sort Algorithm, Heap sort, Quick sort Algorithm.

UNIT – III

Stacks: Definition, Representation of Stack, Stack ADT, Applications, Implementation, Reversing List. **Queues:** Definition, Representation of Queue, Queue ADT, Implementation of Queue using two Stacks, Exceptions, Applications, Circular Queues , Priority Queues. Infix to Postfix Conversion, Factorial Calculation,

UNIT - IV

Linked Lists: Introduction, Singly linked list, Representation of Single Linked List, Operations of SLL-Insertion, Deletion, Applications of Single Linked List: Polynomial Expression Representation. Doubly linked list, Representation of Double Linked List, Operations of Double Linked List- Insert, Delete. Circular linked list, Representation of Circular Linked List, Operations of Circular Linked List.

UNIT – V

Trees: Introduction, Binary Trees, Traversing a Binary Tree. Binary Search Trees, operations on Binary Search Trees (insertions and deletions), AVL Trees.
Graphs: Introduction, Graph Terminology, Directed Graphs, Representations of Graphs, Adjacency Matrix Representation, (Adjacency List Representation), Applications(Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path)

TEXT BOOKS:

1. "Data Structures and Algorithmic Thinking with Python", Narasimha Karumanchi, IIT Bombay, CareerMonk Publications, First Edition, 2018.
2. Data Structures and Algorithms in Python, Michael T. Goodrich, Second Edition,2013.

REFERENCE BOOKS:

1. Python Data Structures and Algorithms, Benjamin Baka, Kindle Edition.
2. Hands-On Data Structures and Algorithms with Python, Dr. Basant Agarwal and Benjamin Baa, 2nd Edition.

WEB REFERENCES:

1. https://www.youtube.com/watch?v=YWnBbNj_G-U
2. https://www.youtube.com/watch?v=RBxS6niE6q4

II B.TECH. I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CI2101	**COMPUTER ORGANIZATION** **(Common to CSE, IT & CSE(AI))**						

COURSE OBJECTIVES:

- Comprehensive knowledge of computer system including the analysis and design of components of the system.
- Describes different parameters of a memory system, organization and mapping of various types of memories.
- Illustrates algorithms for basic arithmetic operations using binary representation.
- Describes the means of interaction of devices with CPU, their characteristics and operating modes.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO 1: Interpret the computer system from user's perspective and can explain how Arithmetic Logic Unit works. [K2]

CO 2: Explain of basic components of the system and illustrate data paths and control flow for sequencing in CPUs. [K2]

CO 3: Interpret the Micro operations and Microprogramming for design of control unit of CPU. [K2]

CO 4: Develop Main Memory Interfacing Circuit and can apply various cache memory mapping techniques. [K3]

CO 5: Apply algorithms to perform arithmetic operations on binary representation of fixed point data. [K3]

CO 6: Interpret various I/O interface devices. [K2]

SYLLABUS:

UNIT - I

Introduction: Types of Computers, Functional units of Basic Computer (Block diagram of Micro Computer).

Register Transfer and Micro-operations: Register Transfer language, Register Transfer, Bus and memory transfers - Three-State Bus Buffers, Memory Transfer; Arithmetic micro operations, Binary Adder, Binary Adder _Subtractor, Binary Incrementer, Arithmetic Circuit; Logical micro operations- List of Logic Microoperations, Hardware Implementation, Some Applications; Shift micro operations-Hardware Implementation, Arithmetic logic shift unit.

UNIT - II

Basic Computer Organization and Design: Instruction codes – Stored Program Organization, Indirect Address, Computer Registers – Common Bus Systems, Computer instructions – Instruction Set Completeness, Timing and control, Instruction cycle – Fetch and Decode, Determine the Type of Instruction, Register Reference Instructions, Memory – Reference Instructions – AND to AC, ADD to AC, LDA :Load to AC,STA: Store AC, BUN: Branch Unconditionally, BSA: Branch and Save Return Address, ISZ: Increment and Skip if Zero, Control Flow Chart, Input – Output Instructions and Interrupt – Input – Output Configuration, Input-Output Instructions.

UNIT - III

Central Processing Unit: Instruction formats – Three Address Instructions, Two Address Instructions, One Address Instructions, Zero Address Instructions, RISC Instructions, Addressing modes – Numerical Example, Data Transfer and manipulation – Data Transfer Instructions, Data Manipulation Instructions, Arithmetic

Instructions, Logical and Bit Manipulation Instructions, Shift Instructions, Program control – Status Bit Conditions, Conditional Branch Instructions, Subroutine Call and Return, Program Interrupt, Types of Interrupts, Reduced Instruction Set Computer – CISC Characteristics, RISC Characteristics. Micro Programmed Control Unit: Control memory, Address sequencing – Conditional Branching, Mapping of Instructions, Subroutines, Micro program example – Computer Configuration, Microinstruction Format, Symbolic Microinstructions, The Fetch Routine, Symbolic Microprogram, Design of control unit – Microprogram Sequencer.

UNIT - IV

The Memory System: Memory Hierarchy, Main memory - RAM and ROM Chips, Memory Address Maps, Memory Connection to CPU, Auxiliary memory – Magnetic Disks, Magnetic Tape, Associative Memory – Hardware Organization, Match Logic, Cache Memory – Associative Mapping, Direct Mapping, Set-Associative Mapping, Writing into Cache. Computer Arithmetic: Addition and subtraction – Addition and Subtraction with Signed Magnitude Data, Hardware Implementation, Hardware Algorithm, Addition and Subtraction with Signed 2's Complement Data, Multiplication Algorithms –Booth Multiplication Algorithm.

UNIT – V

Input-Output Organization: Peripheral Devices – ASCII Alphanumeric Characters, Input Output Interface – I/O Bus and Interface Modules, I/O vs Memory Bus, Isolated vs Memory Mapped I/O, Example of I/O Interface, Asynchronous data transfer – Strobe Control, Handshaking, Asynchronous Serial Transfer, Modes of Transfer – Example of Programmed I/O, Interrupt Initiated I/O, Priority Interrupts – Daisy Chaining Priority, Parallel Priority Interrupt, Priority Encoder, Interrupt Cycle, Direct memory Access – DMA Controller, DMA Transfer.

TEXT BOOKS:

1. M. Morris Mano, "Computer System Architecture", Third Edition, Pearson.2008

REFERENCE BOOKS:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", McGraw Hill, 5/e, 2002.
2. William Stallings, "Computer Organization and Architecture", Pearson 6/e, 2006.
3. Structured Computer Organization, Andrew S. Tanenbaum, Pearson, 4/e, 2005.
4. Sivarama P. Dandamudi, "Fundamentals of Computer Organization and Design", Springer, 2006.

WEB REFERENCES:

1. nptel.ac.in/courses/106106092
2. nptel.ac.in/courses/106103068

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CC2105	FRONT END WEB TECHNOLOGIES						

COURSE OBJECTIVE:

- This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web. The course will introduce web-based media-rich programming tools for creating interactive web pages.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1: Interpret a webpage and identify its elements and attributes.[K2].
CO2: Build webpages using HTML5 [K3].
CO3: Make use of Cascading Style Sheets on webpages [K3].
CO4: Make use of Java Script to write nteractive webpages [K3].
CO5: Build dynamic webpages with JQuery [K3].
CO6: Make use of JQuery UI to develop dynamic webpages [K3].

SYLLABUS:

UNIT I:

HTML5: Fundamentals of HTML, working with text, organizing text in HTML, working with Links and URLs, creating tables, working with Images, Colors and Canvas, working with Forms, working with Multimedia.

UNIT II:

Cascading Style Sheets: CSS3-Introduction to Cascading Style Sheets-Features – Inline Style, – Internal or embedded style sheets, External Style Sheet, backgrounds and color gradients in CSS, fonts and text styles, creating boxes and columns using CSS. Displaying, positioning and floating an element, list styles, table layouts, pseudo-classes and pseudo-elements. Effects in CSS.

UNIT - III

Introduction to JavaScript: General syntactic characteristics, primitives, operations, expressions and Control Statements. **Objects in JavaScript**: Object creation and modification, Arrays, Functions. **Dynamic HTML with JavaScript**: Positioning elements, moving elements, element visibility, changing colors and fonts, dynamic content. **Regular Expressions in JavaScript**: Pattern matching using regular expressions. **Working with Events**: onload, onclick, onsubmit, onmouseover, onmouseout, onkeydown, onkeyup and onkeypress.

UNIT - IV

JQuery API:

Introduction: What jQuery can Do, Who Develops jQuery? Obtaining jQuery, Installing jQuery, programming conventions, markup and CSS conventions, JavaScript conventions. **Selecting and Filtering Elements**: Using the selectors API, filtering a selection, working within the context of a selection, working with an element's relatives, slicing a selection, adding to a selection. **Events**: The

various event wrapper methods, attaching other events, attaching persistent event handlers, removing event Handlers,creating custom events.

UNIT - V

JQuery UI: Drag and Drop: Implementing Drag and Drop, **Sortable**: Making a List Sortable, Customizing Sortable, **Selectable, Accordion**: Building an Accordion UI, Changing the Default Pane, Changing the Accordion Event, Setting the Header Elements, **Date picker**: Implementing a Date picker, Localizing the Date picker, **Dialogue**: Implementing a Dialog, Styling a Dialog, Making a Modal Dialog, Auto-Opening the Dialog, Controlling Dynamic Interaction, Animating the Dialog, Working with Dialog Events.

TEXT BOOKS:

1. Kogent Learning solutions Inc., "HTML 5 Black book", Dreamtech.,2011, (Unit I,II,III).
2. Uttam K Roy, "Web Technologies",Oxford,2010 (Unit IV).
3. Richard York , Web Development with JQuery, Wiley publications, 2/e ,2015(Unit V)

REFERENCE BOOKS:

1. Robert W Sebesta, "Programming the World Wide Web", 7ed, Pearson, 2012
2. Paul S Wang, Sanda S Katila, "An Introduction to Web Design, Programming", Cengage, 2003.

WEB REFERENCES:

1. https://www.w3schools.com/
2. nptel.ac.in/courses/106105084/13
3. https://www.coursera.org
4. https://www.w3schools.com/
5. https://jqueryui.com/
6. https://api.jquery.com/
7. https://www.educba.com/what-is-html5/

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	15	35	50	1.5
SUBCODE: R20CC21L1	**DATA STRUCTURES LAB** (Common to CSE, IT & AI)						

COURSE OBJECTIVES:

- To teach efficient storage mechanisms of data for an easy access
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

COURSE OUTCOMES:

After the completion of this course the student should be able to
CO 1: Analyze algorithms, Searching, Sorting and hashing Techniques.[K4]
CO 2: Make use of elementary data structures such as stacks, Queues and linked list to develop their applications.[K3]
CO 3: Examine different tree traversal techniques. [K4]
CO 4: Experiment with different graph traversal techniques.[K4]

LABORATORY EXPERIMENTS

WEEK - 1
a) Write a recursive Python program which computes the nth Fibonacci number, for appropriate values of n.
b) Write recursive Python programs for the following
   i)   Factorial of a given number
   ii) GCD Computation
   iii) Towers of Hanoi

WEEK - 2
a) Write a Python program that use both recursive and non-recursive functions to perform linear search.
b) Write a Python program that use both recursive and non-recursive functions to perform binary search.

WEEK - 3
a) Write a Python program to implement Bubble sort.
b) Write a Python program to implement Insertion sort.
c) Write a Python program to implement Selection sort.

WEEK - 4
a) Write a Python program to implement Quick sort.
b) Write a Python program to implement Merge sort.
c) Write a Python program to implement Heap sort.

WEEK - 5
a)   Write a Python program to implement Stack operations using arrays
b)   Write a Python program to implement Queue operation using arrays.

WEEK – 6
a)   Write a Python program to convert infix expression into postfix expression using Stack.
WEEK - 7
a)   Write a Python program to implement Stack operation using Linked list.
b)   Write a Python program to implement Queue operations using Linked lists.
WEEK - 8
Write a Python program to implement the following operations on a singly linked using functions
i)   Insertion
ii)   Deletion
iii)   Displaying
iv)   Reversing
WEEK - 9
a)   Write a Python program to store a polynomial expression in memory using linked list
b)   Write a Python program to representation the given sparse matrix using arrays.
WEEK - 10
a)   Write a Python program to implement following Operations on a Binary Tree
i)   Create
ii)   In-order traversal
iii)   Pre-order traversal
iv)   Post-order traversal
b)   Write a Python program to implement following Operations a Binary Search Tree
i)   Create
ii)   Insert
iii)   Delete
WEEK - 11
a)   Write a Python program to compute the shortest path of a graph using Dijkstra's algorithm
b)   Write a Python program to find the minimum spanning tree using Krushkall's Algorithm.

WEEK - 12
        Virtual Lab: http://cse01-iiith.vlabs.ac.in/
        Any three programs must be submitted with result from the above link.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	15	35	50	1.5
SUBCODE: R20CC21L2	OOPS THROUGH JAVA LAB						

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	15	35	50	1.5
SUBCODE: R20CC21L2	OOPS THROUGH JAVA LAB						

COURSE OBJECTIVE:

- The course provides user interface and application development program implementation using core java principles.

COURSE OUTCOMES:

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

CO1: Develop java programs by using OOP concepts. [K3]

CO2: Make use of interfaces, exception handling and threads to develop JAVA programs. [K3]

CO3: Make use of exception handling and collections in Java Programming. [K3]

CO4: Develop GUIs with AWT, Applets and Event Handling. [K3]

LIST OF PROGRAMS:

1. Write a JAVA program to display default value of all primitive data types of JAVA.
2. Write a JAVA program to display the Fibonacci sequence
3. Write a JAVA program give example for command line arguments.
4. Write a JAVA program to sort given list of numbers.
5. Write a JAVA program to search for an element in a given list of elements (linear search).
6. Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
7. Write a JAVA program to determine multiplication of two matrices.
8. Write a JAVA program to sort an array of strings
9. Write a JAVA program to check whether given string is palindrome or not.
10. Write a JAVA program to give the example for 'this' operator. And also use the 'this' keyword as return statement.
11. Write a JAVA program to demonstrate static variables, methods, and blocks.
12. Write a JAVA program to give the example for 'super' keyword.
13. Write a JAVA program that illustrates simple inheritance.
14. Write a JAVA program to maintain Student Grading Database using multilevel inheritance. Student is Super class, which contains roll no, name, address. Marks derived from Student class, which contains subject names and respective marks. Result is derived from Marks class, which contains total, grade.
15. Write a JAVA program demonstrating the difference between method overloading and method overriding.
16. Write a JAVA program demonstrating the difference between method overloading and constructor overloading.
17. Write a JAVA program to create a package named pl, and implement this package in Ex class.
18. Write a JAVA program to create a package named mypack and import it in Circle class.

19. Write a JAVA program illustrating multiple inheritance using interfaces.
20. Write a JAVA program for example of try and catch block. In this check whether the given array size is negative or not.
21. Write a JAVA program for creation of user defined exception.

22. Write a JAVA program to illustrate creation of threads using runnable interface (start method start each of the newly created thread. Inside the run method there is sleep() for suspend the thread for 500 milliseconds).
23. Write a JAVA program to create a class MyThread in this class a constructor, call the base class constructor, using super and starts the thread. The run method of the class starts after this. It can be observed that both main thread and created child thread are executed concurrently.
24. Write a JAVA program to create an abstract class named Shape, that contains an empty method named numberOfSides ().Provide three classes named Trapezoid, Triangle and Hexagon, such that each one of the classes contains only the method numberOfSides (), that contains the number of sides in the given geometrical figure.
25. Write a Java Program to Implement HashMap API.
26. Write a Java Program to Implement HashSet API.
27. Write a Java Program to Implement ArrayList API.
28. Write a Java Program to Implement TreeSet API.
29. Write a Java Program to Implement TreeMap API.
30. Write a JAVA program using StringTokenizer class, which reads a line of integers and then displays each integer and the sum of all integers.
31. Write a JAVA program that displays number of characters, lines and words in a text file.
32. Write a JAVA program that describes the life cycle of an applet.
33. Write a JAVA program that describes passing parameters to an applet.
34. Write a JAVA program that allows user to draw lines, rectangles and ovals.
35. Write a JAVA program that displays the x and y position of the cursor movement using Mouse.
36. Write a JAVA program to create a border layout control.
37. Write a JAVA program to create a grid layout control.
38. Write a JAVA program to create a simple calculator.

Virtual Lab: http://ps-iiith.vlabs.ac.in/, www.w3schools.com
Any three programs must be submitted with result from the above link.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	15	35	50	1.5
SUBCODE: R20CC21L3	**FRONT END WEB TECHNOLOGIES LAB**						

COURSE OBJECTIVES:

- This course provide students with theoretical and practical skills in the design and development of web pages using HTML5,CSS, JS and jQery.

COURSE OUTCOMES:

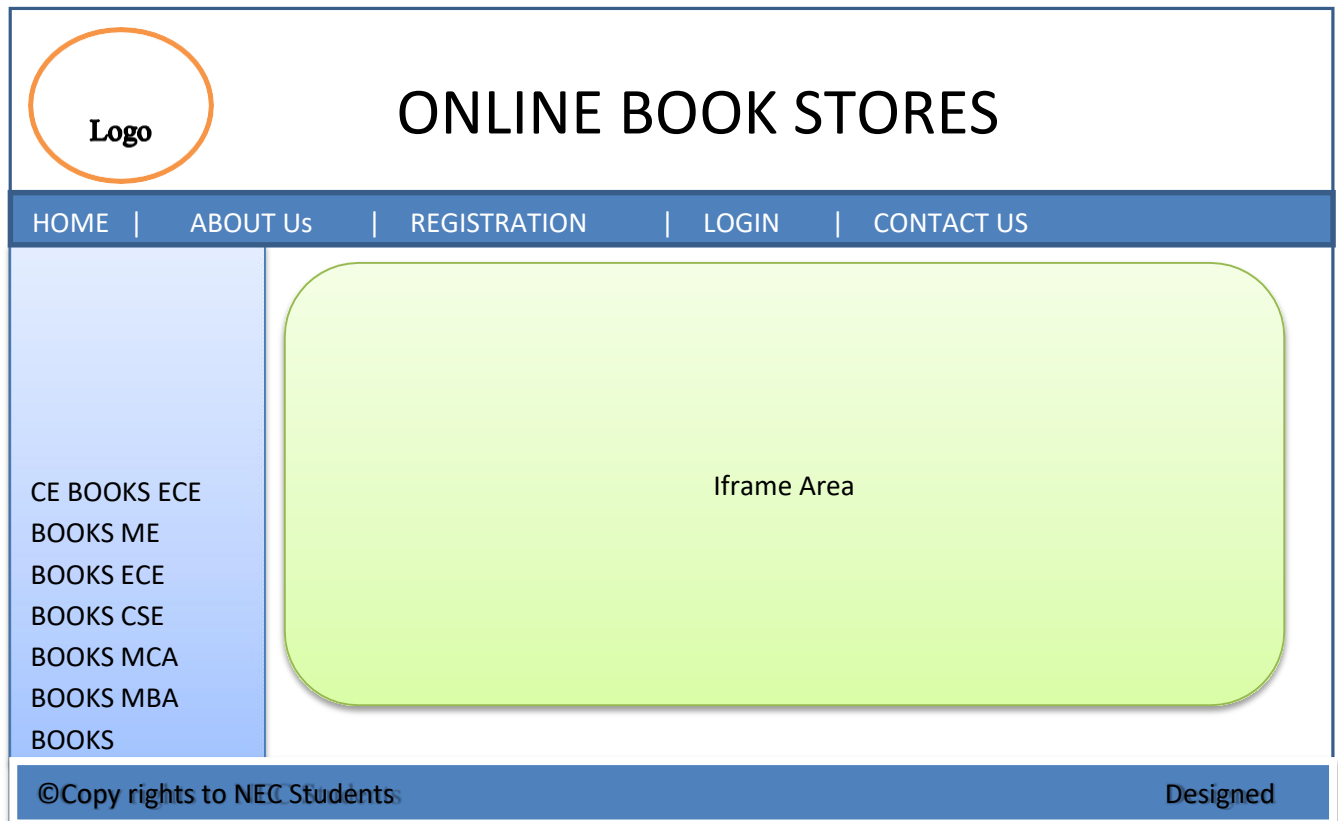After Completion of this course, students would be able to:

CO 1: Develop static html pages [K3].

CO 2: Develop Interactive Web Pages with different styles and client side validations[K3].

CO 3: Make use of JQuery programming to develop Web pages [K3].

CO 4: Apply JQuery UI to HTML pages [K3].

LIST OF PROGRAMS:

LAB 1: Create the following web

1.   Welcome.html
        It explain about website
        (Hint: Heading the website (Preferable H1, Describe website) it includes minimum two paragraphs)

2.   Aboutus.html   (Hint: About owner of website)
3.   Contactus.html
4.   List.html (Hint: Mention List of courses)

Lab 2:

a.   Create web pages for each course. Example cse.html (Hint: It contains Heading and List of subjects in tabular form) Example

SNo	Title Book	Author	Publisher	Price	Image
--	--	--	--	--	--

b.   Create Registration and Login forms
Registration Form: It contains Student Name, Roll Number, Password, Gender, Email ID, Phone Number, opted course and languages known.
Login Form: It contains roll number as User ID, password, submit button and cancel button.

Lab 3: Apply CSS 3 on web-pages created on Lab 1 and Lab2.
Make use of the selectors like class, id, html elements, pseudo classes and elements

Lab 4:

a.   Apply validation on Registration and Login forms.
b.   In contactus.html web-page add Google maps.

Lab 5:

a.   Design HTML5 web page by embedding Audio, Video elements.
b.   Write HTML5 and JavaScript code to draw Arc, Circle, Rectangle and Triangle using Canvas.

Lab 6: Bootstrap Concepts on Grid System, Menus

Lab 7: Create index.html page and design it as shown in above screen (Hint: Use Bootstrap Grid System, Horizontal and vertical menus, footer, table etc.)

Lab 8: Write a jQuery code to make draggable Rectangle

Lab 9: Write jQuery code to demonstrate the usage of important options disabled, delay,   distance and clone in the drag function of jQuery UI.

Lab 10: Write jQuery code to demonstrate three options addClass, disable and tolerance in the drop function of jQuery UI.

Lab 11: Write jQuery code to demonstrates the use of two options delay and distance of selectable() method.

Lab 12: Write jQuery code to demonstrate Accordion and Date Picker.

Lab 13: Virtual Lab : www.w3schools.com

WEB REFERENCES:

1.   https://www.w3schools.com/
2.   https://jqueryui.com/
3.   https://api.jquery.com/
4.   https://www.educba.com/software-development/software-development-tutorials/html-tutorial/

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	4	0	50	50	2
SUBCODE: R20CC21SC1	... DATA SCIENCE						

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	4	0	50	50	2
SUBCODE: R20CC21SC1	**DATA SCIENCE**						

COURSE OBJECTIVE:

• To familiarize students with how various statistics like mean median etc. can be collected for data exploration in Python

• To provide a solid undergraduate foundation in both probability theory and mathematical statistics and at the same time provides an indication of the relevance and importance of the theory in solving practical problems in the real world

COURSE OUTCOMES:

After completion of this course, the students will be able to:

CO 1: Demonstrate the basic arithmetic programming in python[K3]

CO 2: Analyze different data structures and choose suitable one for a given problem[K4]

CO 3: Demonstrate Data cleaning, processing for the given dataset using respective packages.[K3]

CO 4: Perform Data visualization[K3]

CO 5: Solve the problems related to Descriptive and Inferential Statistics for a given scenario.[K4]

Syllabus:

Experiment 1: Basic Arithmetic with Python

A. Develop a python program to calculate the Greatest Common Divisor for two numbers. Create two separate procedures(functions) to illustrate the iterative and recursive solutions.

B. Develop a python program to calculate the next number in the Fibonacci series for a given number (which may or may not be in the Fibonacci series).

C. Develop a python program to calculate the square root of (N+1)th Prime number for a given number N using binary search with a precision of upto 7 decimal places.(Avoid built-in square root function)

D. Design a Python program to determine the difference in days for two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.

Experiment 2: Text file processing & Basic Statistics

A. Develop Python program to generate count of words in a text file

B. Write a program in Python with functions to calculate the following for comma-separated numbers in a text file(.txt)

    a. 3rd Maximum number

    b. 9th Minimum number

    c. Total Unique Count

    d. Mean

    e. Standard Deviation

    f. Number(s) with maximum frequency

    g. Number(s) with minimum frequency

Experiment 3: Exploring the Numpy library for multi-dimensional array processing

A. Develop programs in Python to implement the following in Numpy

    a. Array slicing, reshaping, concatenation and splitting

    b. Universal functions in Numpy

    c. Aggregations

    d. Broadcasting

    e. Fast sorting

Experiment 4: Data cleaning and Processing with Pandas

  A. Develop the following programs in Python

    a. Implementing and querying the Series data structure

    b. Implementing and querying the DataFrame data structure

    c. Perform DataFrame indexing

    d. Merge DataFrames

Experiment 5: Advanced Data Processing and Transformation

  A. Implement the following using the Pandas library

    a. Pandas idioms

    b. Groupby

    c. Scales

    d. Pivot tables

Experiment 6: Data Visualization-I

  A. Write programs to demonstrate different plots like Line Chart, Bar Chart, Histogram, Pie Chart, Stacked Bar Chart, Scatter Plot, Box Plot, Heat Map by loading the real-time data.

  B. Write programs to create subplots.

Experiment 7: Data Visualization-II

  A. Write programs to illustrate different plotting data distributions like Univariate Distributions, Bivariate Distributions.

  B. Write programs to demonstrate plotting Categorical and Time-Series Data.

Experiment 8: Probability Distributions

  A. Generate and Visualize Discrete and continuous distributions using the statistical environment. Demonstration of normal, binomial and Poisson distributions.

  B. Generate artificial data using and explore various distributions and its properties. Various parameter changes may be studied.

Experiment 9: Building Confidence in Confidence Intervals

  A. Populations Versus Samples

  B. Large Sample Confidence Intervals

  C. Simulating Data Sets

  D. Evaluating the Coverage of Confidence Intervals

Experiment 10: Perform Tests of Hypotheses

  A. Perform tests of hypotheses about the mean when the variance is known. Compute the p-value. Explore the connection between the critical region, the test statistic, and the p-value

TEXT BOOKS:

1. EMC Education Services "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley Publishers, 2012.
2. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
3. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining: Concepts and Techniques, 3rd ed.

REFERENCE BOOKS:

1. Jojo Moolayil, "Smarter Decisions : The Intersection of IoT and Data Science", PACKT, 2016.
2. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013.
3. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global.
4. Hastie, Trevor, et al., "The elements of statistical learning: Data Mining, Inference, and Prediction", Vol. 2. No. 1. New York: Springer, 2009.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	-	-	-	-	-	0
SUBCODE: R20CC21MC2	**CONSTITUTION OF INDIA**						

COURSE OBJECTIVES:

- To train students in understanding the basic structure of Indian Constitution
- To aware the students about the role of constitution in a democratic society
- To prepare students to live better and happily with other fellow beings through the application of Fundamental Rights in their lives.
- To know about the powers of Union Government and State Government

COURSE OUTCOMES:

CO1: Examine salient features of Indian Constitution and live accordingly in society & interpret the meaning of Fundamental Rights of State Policy.

CO2: Discover various aspects of Union Government legislation and live up to the expectations of the rules.

CO3: Critically examine State Government legislation and improve your living standards by following the rules strictly

CO4: Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living

CO5: Analyze the powers and functions of Election Commission and The Union Public Service Commission and decide upon it for safe and secured life.

UNIT-I:
INTRODUCTION TO INDIAN CONSTITUTION & FUNDAMENTAL RIGHTS:
Meaning of the term Indian Constitution –Preamble- Constituent Assembly- Salient Features of Indian Constitution. Fundamental Rights -Fundamental Duties -The Directive Principles of State Policy.

UNIT-II:
UNION GOVERNMENT : Union Government -Union Legislature (Parliament) -Lok Sabha and Rajya Sabha (with Powers and Functions) -Union Executive -President of India (with Powers and Functions) -Prime Minister of India (with Powers and Functions) -Union Judiciary (Supreme Court) -Jurisdiction of the Supreme Court

UNIT-III:
STATE GOVERNMENT : State Government -State Legislature (Legislative Assembly / Vidhan Sabha, Legislative Council / Vidhan Parishad) -Powers and Functions of the State Legislature -State Executive-Governor of the State (with Powers and Functions) -The Chief Minister of the State (with Powers and Functions) -State Judiciary (High Courts)

UNIT-IV:
LOCAL SELF GOVERNANCE : Powers and functions of Municipalities, Panchyats, ZP's and Co – Operative Societies

UNIT-V:

SOVEREIGN BODIES : Election Commission of India (with Powers and Functions) -The Union Public Service Commission (with Powers and Functions)

TEXT BOOKS:

1. Introduction to constitution of India, Durga Das Basu, Lexis Nexis Publications
2. Constitution of India by PRFESSIONAL BOOK PUBLISHERS
3. The Constitution of India by Arun K Tiru vengadam, Blooms bury publishers.
4. The constitution of India by PM Bakshi, Universal law publishing co
5. The Constitution of India by S.R. Bhansali, Universal law publishing co

II B.TECH – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC2201	Technical and Communicative English -II	HS	30	70	100	3	0	0	3
2	R20CC2203	Database Management Systems	PC	30	70	100	3	0	0	3
3	R20CS2202	Formal Languages and Automata Theory	PC	30	70	100	3	0	0	3
4	R20CC2204	Software Engineering	PC	30	70	100	3	0	0	3
5	**Open Elective –I**		OE	30	70	100	3	0	0	3
6	R20CC22L1	Database Management Systems Lab	PC	15	35	50	0	0	3	1.5
7	R20CS22L3	Software Engineering and UML Lab	PC	15	35	50	0	0	3	1.5
8	R20CC22L2	Mobile Application Development Lab	PC	15	35	50	0	0	3	1.5
9	R20CS22SC1	Artificial Intelligence	SC	-	50	50	0	0	4	2
TOTAL										**21.5**
10	Honor / Minor Course			30	70	100	4	0	0	4
Summer Internship / Community Service Project				**To be evaluate in III-I**						

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CC2201	**TECHNICAL AND COMMUNICATIVE ENGLISH - II** (Common to All Branches)						

COURSE OBJECTIVES:
- To equip the students with appropriate oral and written communication skills.
- To inculcate the skills of listening, reading and critical thinking.
- To enhance the students' proficiency in reading skills enabling them meet the academic needs of their course.
- To enable the engineering students develop their basic communication skills in English for academic and social purposes.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:

CO 1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it **(Apply-3).**

CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **(Creating-5).**

CO3: Build grammatically correct sentences using a variety of sentence structures **(Apply3).**

CO4: Enhance word power and usage of lexicons **(Apply3).**

UNIT– I
1. **A Proposal to Gridle the Earth, Nellie Bly**
   a) **Placement Papers**.
   b) **Reading**: Skimming for main idea, scanning for specific piece of information.
   c) **Writing**: Note – making flowed by paragraph writing, effective opening sentences, introducing the topic, key words, main idea, summarize the main idea.
   d) **Grammar and Vocabulary**: Content words and function words, verbs, nouns, adjectives and adverbs. Basic sentence structure and simple question form, framing jargon, technical vocabulary (15 words)

UNIT–II
2. **The District School As It Was by One who Went to It, Warren Burton**
   a) **Placement Papers.**
   b) **Reading**: Identifying the sequence of ideas and recognizing verbal techniques to link the ideas in a paragraph.
   c) **Writing**: Paragraph writing, using key words/phrases and organizing points in a coherent manner.
   d) **Grammar and Vocabulary**: Linkers, articles and prepositions.

UNIT–III
3. **The future of Work- Jacob Morgan**
   a) **Placement Papers**.
   b) **Reading**: Sequencing of ideas and recognizing verbal techniques to link the ideas in a paragraph.
   c) **Writing**: Paragraph writing, using key words/phrases and organizing points in a coherent manner.
   d) **Grammar and Vocabulary**: Cohesive devices, articles and prepositions.

UNIT-IV
4. **H.G.Wells and the Uncertainties of Progress, Peter J. Bowler**
   a) **Placement Papers**.
   b) **Reading**: Understand and interpret graphic elements used in texts.
   c) **Writing**: Information transfer.
   d) **Grammar and Vocabulary**: Adjectives, adverbs and antonyms.

UNIT-V
5. **Leaves from the Mental Portfolio of a Eurasian, Sui Sin Far**
   a) **Placement Papers**.
   b) **Reading:** Reading for comprehension.
   c) **Writing**: Essay writing
   d) **Grammar and Vocabulary**: Articles, prepositions, tenses, subject verb agreement and technical jargon (15 words)

TEXT BOOKS:
1. English All Round -I (Communication skills for Under Graduate Learners)– Orient Black Swan Pvt.Ltd.Publisher, 1st edition,2019

REFERENCE BOOKS:
1. Raymond Murphy, *Murphy's English Grammar,* Cambridge University Press 2004
2. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: English Skills for Engineers*, Oxford University Press, 2009
3. Michael Swan, *Practical English Usage,* Oxford University Press, 1996

WEB REFERENCES:
1. https://www.grammarly.com/blog
2. https://www.englishclub.com/
3. www.nonstopenglish.com/
4. https://www.fluentu.com/blog/english/
5. https://beta.freerice.com/
6. https://prepinsta.com/cognizant/
7. https://www.geeksforgeeks.org/tcs-placement-paper-mcq-1/
8. https://www.firstnaukri.com/career-guidance/infosys-placement-papers-with-solutions-2019-firstnaukri-prep
9. https://in.usembassy.gov/education-culture/american-spaces/dostihouse-mumbai/library-services/
10. https://www.youtube.com/user/bbclearningenglish
11. https://www.cambridgeenglish.org/learning-english/free-resources/write-and-improve/
12. https://englishlive.ef.com/blog/language-lab/5-simple-ways-improve-written-english/

II B.TECH. II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUB CODE: R20CC2203	**DATABASE MANAGEMENT SYSTEMS** (Common to CSE, IT & AI)						

COURSE OBJECTIVE:

- Provides students with theoretical knowledge and practical skills in the design, use of databases and database management systems in information technology applications.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Interpret the fundamentals of DBMS. [K2]

CO2 : Analyze DB design methodology and normalization process. [K4]

CO3 : Develop Queries in RDBMS. [K3]

CO4 : Compare and Contrast various transaction and concurrency management techniques. [K2]

CO5 : Analyze various file organizations and indexing techniques. [K4]

SYLLABUS:

UNIT I:

Introduction: History of Data base Systems, Data base System Applications, purpose of database systems, View of Data, Database Languages, Database Access from applications Programs, data base System Structure, data base Users and Administrators, Transaction Management, Storage Manager, the Query Processor.

UNIT-II:

Introduction to Database Design: Data base design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Case Study .

The Relational Model: Introduction to the Relational Model, Integrity Constraint Over relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design ER to Relational, Introduction to Views, Destroying /altering Tables and Views.

UNIT III:

Relational Algebra: Relational Algebra.

SQL: Queries, Constraints, Triggers:- Form of Basic SQL Query, Union, Intersect and Except, Nested Queries, Aggregative Operators, NULL values, Complex Integrity Constraints in SQL, Triggers and Active Data bases.

UNIT IV:

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies, reasoning about FDS, FIRST, SECOND and THIRD Normal forms, BCNF, Properties of Decomposition, Multi valued Dependencies, FOURTH Normal Form.

UNIT V:

Transactions: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation.

Concurrency Control: Lock-based protocols, Timestamp-based protocols.

Overview of Storage and Indexing:

Data on External Storage, File Organization and Indexing, Index data Structures

Tree Structured Indexing: Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic index Structure.

TEXT BOOKS:

1. Raghuram Krishnan, Johannes Gehrke, "Database Management Systems", TMH, 3/e, 2008.
2. Silberschatz, Korth, "Database System Concepts", TMH, 6/e, 2010.

REFERENCE BOOKS:

1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", PEA, 6/e, 2011.
2. C J Date, "Introduction to Database Systems", PEA, 8/e, 2006.
3. Database System Concepts, Peter ROB, Coronel, Ceneage, 6/2, 2011.

WEB REFERENCES:

1. nptel.ac.in/courses/106106093
2. nptel.ac.in/courses/106104135

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CC2202	**FORMAL LANGUAGES AND AUTOMATA THEORY** (Common to CSE & IT)						

COURSE OBJECTIVE:

- Introduce concepts in automata theory and theory of computation.
- Identify different formal language classes and their relationships.
- Design grammars and recognizers for different formal languages.
- Prove or disprove theorems in automata theory using its properties.
- Determine the decidability and intractability of computational problems.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1: Interpret the core concepts relating to the theory of computation, formal languages, Regular Expressions[K2].

CO2: Analyze the functioning of Finite-State Machines, Pushdown Automata and Turing Machines to solve problems [K4].

CO3: Build grammars and Normal forms for given grammars for different language classes and able to prove and disprove theorems establishing key properties of formal languages and Automata [K3].

CO4: Identify formal language classes and their membership properties[K3].

SYLLABUS:

UNIT - I

Fundamentals of Automata: Computation, Finite State Machine, Examples Finite State Automata, Components of Finite State Automata, Elements of Finite State System, Mathematical representation of Finite State Machine, Automata in Real World - Advantages of FSM, Disadvantages of FSM, Applications of FSM.

Formal Language Theory: Symbols, Alphabets and Strings, Operations on Strings, Formal Languages, Operations on Languages.

Formal Languages / Grammar Hierarchy: Formal Grammar, Generative Grammars, Types of Generative Grammar, Formal Languages, Regular Language, Context-Free Language, Context-Sensitive Language, Recursive Language, Recursively Enumerable Language, Relationship between Grammars and Languages.

UNIT – II

Finite Automata: Introduction, Deterministic Finite Automata, Design of DFAs, Non Deterministic Finite Automata, Design of NFAs, Non-Deterministic Automata with ϵ-moves, Design of NFA- ϵ s, Advantages of Non-Deterministic Finite automata, NFA Versus DFA.

Equivalent Automata: Equivalent Finite-State Automata, Equivalence of NFA/NFA- ϵ and DFA, Equivalence of NFA - ϵ to NFA.

Transducers: Introduction, Moore Machine, Design of a Moore Machine, Mealy Machine Design

of a Mealy Machine; Difference between Moore and Mealy Machines, Properties / Equivalence of Moore and Mealy Machines.

UNIT - III
Minimization/ Optimization of DFA: Optimum DFA, Minimal DFA, 2DFA, DFA vs. 2DFA.
Regular Expressions and Languages: Regular Languages, Regular Expressions, Components of Regular Expression, Languages Associated with Regular Expression, Properties of Regular Expressions, Uses of Regular Expressions.
Finite Automata and Regular Expressions: Properties of Regular Sets or Regular Languages, Arden's Theorem, Equivalence of Finite Automata and Regular Expressions, Cycle of Constructions, Equivalence of DFA and Regular Expressions, Equivalence of NFA And Regular Expressions.

UNIT – IV
Context-Free Grammars and Context-Free Languages: Types of Grammar, Ambiguous and Unambiguous Grammars, Relation between Regular Grammar and Finite Automata**.**
Simplification of Context - Free Grammar: Simplification of Context-Free Grammars, Elimination of ∈ - Productions, Elimination of Unit Productions, Normal Forms for Context Free Grammars, Chomsky Normal Form, Greibach Normal Form, Chomsky Vs. Greibach Normal Form, Application of Context-Free Grammars.
Push Down Automata: Definition, Model, Graphical notation, and Instantaneous descriptions, Acceptance of context free languages, Acceptance by final state and acceptance by empty Stack.

UNIT - V
Turing Machine: Introduction, Components of Turing Machine, Description of a Turing Machine, Observations on TM, Elements of TM, Instantaneous description of TM, Moves of a TM, Language accepted by a TM, Role of TM's, Design of TM's, Undecidable Problem, P and NP Classes of Languages.

TEXT BOOKS:
1. Nasir S.F.B, P.K. Srimani, "A Text Book on Automata Theory", 1/e, Foundation Publications Cambridge University Press, 2014. (UNITS: I, II, III, IV,V).
2. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and computation", 3/e, PEA, 2009. (UNIT-IV)

REFERENCE BOOKS:
1. Shamalendu Kandar, "Introduction to Automata Theory, Formal Languages and Computation", 1/e, Pearson, 2013.
2. Michel Sipser, "Introduction to Theory of Computation", 2/e, , CENGAGE, 2007.

ADDITIONAL RESOURCES:
1. nptel.ac.in/courses/106104028
2. nptel.ac.in/courses/106104148

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CC2204	**SOFTWARE ENGINEERING**						

COURSE OBJECTIVES:
- The student will have a broad understanding of the discipline of software engineering and its application to the development and management of software systems.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:

CO 1: Analyse basic software engineering models. [K4].

CO 2: Demonstrate the various Object Oriented Design models [K2].

CO 3: Outline the software prototyping, analysis and design [K2].

CO 4: Outline the importance of software testing and project management [K4].

SYLLABUS

UNIT I
Introduction to software engineering : Evolution and impact of software engineering, Software life cycle models, Waterfall model, Prototyping model, Evolution and spiral models, Feasibility study, Functional and non-functional requirements, Requirement gathering, Requirement analysis and specification.

UNIT II
SRS Documentation: Requirements Elicitation, Requirements Documentation, Use Cases, Unified Modeling Language, Introduction

Conceptual Model of the UML, Architecture, **Class Diagrams**-Terms and Concepts, Common Modeling Techniques- Modeling Logical Database Schema, Forward and Reverse Engineering, **Object Diagrams**- Terms and Concepts, Common Modeling Techniques, Modeling Object Structures, Forward and Reverse Engineering, **Interaction Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling a Flows of Control by Time Ordering, Modeling a Flows of Control by Organization, Forward and Reverse Engineering.

UNIT III
Use cases- Terms and Concepts, **Use case Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling the Requirements of a System, Forward and Reverse Engineering, **Activity Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling a Workflow, Modeling an Operation, Forward and Reverse Engineering, **State Machines**-Terms and Concepts, **State Chart Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling Reactive Objects, Forward and Reverse Engineering, **Component**-Terms and Concepts, **Deployment**- Terms and Concepts, **Component Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling Executable Release, Modeling a Physical Database, Forward and Reverse Engineering and **Deployment Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling an Embedded System, Modeling a Client/Server System, Forward and Reverse Engineering.

UNIT IV
Analysis Phase: Analysis Object Model (Domain Model), Analysis Dynamic Model, Non-Functional Requirements, Analysis Patterns.

Design Phase: System Design Architecture, Design Principles, Design Concepts, Design Patterns, Architecture Styles, Dynamic Object Modeling, Static Object Modeling, Interface Specification, Object Constraint Language.

UNIT V

Testing: Fundamentals of testing, Black box testing techniques, White box testing techniques, Levels of testing, Test cases

Software project management : Project management, Project planning and control, Cost estimation, Project scheduling using PERT and GANTT charts, Software configuration management.

TEXT BOOKS:

1. Software Engineering:A Practitioner Approach By Roger S.Pressman, Mcgraw Hill Education
2. Grady Booch, James Rumbaugh, Lvor Jacobson, "The Unified Modeling Language - User Guide", Addition Wesley 1999.

REFERENCES:

1. Software Engineering By Ian Sommerville, Pearson
2. Fundamentals Of Software Engineering By Rajib Mall, Prentice Hall
3. Software Engineering Fundamentals By Ali Behforooz And Fredericks J. Hudson, Oxford University Press

WEB REFERENCES:

1.URL: https://www.youtube.com/watch?v=BqVqjJq7_vI
2.URL: https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/

E-BOOKS:

1. https://www.edutechlearners.com/object-oriented-system-development-by-ali-bahrami/

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	15	35	50	1.5
SUBCODE: R20CC22L1	**DATABASE MANAGEMENT SYSTEMS LAB** (Common to CSE, IT & AI)						

COURSE OUTCOMES:

After Completion of this course student must be able to
CO1 : Apply SQL commands like DDL, DML and DCL to perform different Database operations [K3].
CO2 : Develop PL/SQL block statements, control statements and cursors. [K3]
CO3 : Develop PL/SQL programs using functions and procedures. [K3]
CO4 : Develop PL/SQL programs using packages and Triggers. [K3]

PROGRAMS LIST:

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date).
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.
   Example:- Select the roll number and name of the student who secured fourth rank in the class.
5. i) Creation of simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
   ii) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Program development using creation of package specification, package bodies, private objects, package variables and cursors and calling stored packages.
11. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
12. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

TEXT BOOKS:

1. SCOTT URMAN, "ORACLE DATA BASE LOG PL/SQL Programming", Tata Mc-Graw Hill.

REFERENCES:

1. Benjamin Rosenzweig, Elena Silvestrova "ORACLE PL/SQL by example", Pearson Education 3/e
2. Dr.P.S. Deshpande, "SQL & PL/SQL for Oracle 10g", Black Book.
3. Pranab kumar Das Gupta, P Radha Krishna, "Data Base Management System, Oracle SQL and PL/SQL", PHI.

WEB REFERENCES:

3. nptel.ac.in/courses/106106093
4. nptel.ac.in/courses/106104135
5. https://www.edx.org/course/databases-5-sql
6. https://www.coursera.org/projects/introduction-to-relational-database-and-sql

II B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CS22L3	**SOFTWARE ENGINEERING AND UML LAB**						

COURSE OBJECTIVES:
- To Classify the requirements and prepare software requirement documents for analyzing the projects.
- To learn importance of modelling in Software Development Life Cycle.
- To know about different diagrams and relationships.
- To develop a unified application for a system.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to :

CO 1: Compare the process of requirements development and requirements management and Examine the importance of requirements classification. [K4]

CO 2: Build use case diagrams that specify requirements for a software system.[K3]

CO 3: Develop class diagrams that demonstrate design model of a software system. .[K3]

CO 4: Make use of interaction diagrams to model the dynamic aspects of a software system [K3]

CO 5: Develop various applications using unified modeling language. .[K3]

LIST OF EXPERIMENTS
1. Requirements Development
2. Requirements Classification and Verification
3. Learning the usage of Rational Rose Software and different tools that are helpful to implement UML.
4. Create UML for Library Management system
5. Create UML for ATM system
6. Create UML for Online Railway Reservation system.
7. Create UML for Banking System.
8. Create UML for Airlines System.
9. Create UML for Student Information System.

ONLINE REFERENCES:
1. https://www.udemy.com/uml-fundamentals/
2. https://www.youtube.com/watch?v=OkC7HKtiZC0&list=PLGLfVvz_LVvQ5G-LdJ8RLqe-ndo7QITYc
3. https://www.youtube.com/watch?v=RRXe1omEGWQ&list=PLD4EF3E3AD055F3C7

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	15	35	50	1.5
SUBCODE: R20CC22L2	**MOBILE APPLICATION DEVELOPMET LAB**						

COURSE OBJECTIVES:

- To enlighten the student with knowledge base in Android Applications Development.

COURSE OUTCOMES:

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

CO1 : Demonstrate various components of Android Framework.[K2].

CO2 : Develop user Interfaces for the Android Application.[K3].

CO3 : Develop Android Applications using Android API and Services.[K3].

CO4 : Develop Android Applications which access data from Internet.[K3].

LIST OF EXPERIMENTS

1. Create Hello World Android App using **Android Studio** and explain each step in detail.
2. Create an Activity that receive name form the user and displays **Hello Name** to the user using Android Studio.
3. Create an Activity that demonstrates the Life Cycle of an Activity.
4. Create an Android Application which receives URL form the user and open appropriate page in the system browser with the help of Implicit Intents using Android Studio.
5. Create an Android App which receives name form the user and displays welcome name in Second Activity.
6. Create Login Screen Application which shows Home screen if Login success otherwise displays error message using Android Studio.
7. Write an Android application program that demonstrate the use of
   a. RelativeLayout.
   b. LinearLayout.
   c. GridLayout.
   d. TableLayout.
8. Write an Android application program that demonstrates the use ImageView.
9. Write an Android application program that demonstrates the use of ListView and ArrayAdapter.
10. Write an Android application program that demonstrates how to create Custom ListView and Custom Adapters.
11. Write an Android application program that demonstrates the use of SQLite Database and Cursor.
12. Write an Android application program that demonstrates the use AsyncTask.
13. Write an Android application program that demonstrates Notifications.
14. Write an Android application program that demonstrates Shared Preferences.
15. Write an Android application program that connect to the internet, gets JSON data and displays the result in UI by parsing JSON data.

ONLINE REFERENCES:

1. https://developer.android.com/index.html
2. http://nptel.ac.in/courses/106106147/10
3. https://www.edx.org/course/introduction-mobile-application-hkustx-comp107x-2
4. https://www.coursera.org/specializations/android-app-development

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	4	0	50	50	2
SUBCODE: R20CS22SC1	**ARTIFICIAL INTELLIGENCE**						

COURSE OBJECTIVE:

- Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic and learning.
- The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO 1: Summarize the characteristics of AI that make it useful to real-world problems. [K2]

CO 2: Analyse different search techniques and predicate logic in artificial Intelligence. [K4]

CO 3: Interpret knowledge representation and symbolic reasoning using different rules. [K2]

CO 4: Apply the basic knowledge on learning and reinforcement learning. [K3]

CO 5: Make use of the power of AI in Natural language processing as an advanced Application of AI. [K3]

SYLLABUS

UNIT - I

Introduction to AI, Problems, Problem Spaces and Search: Defining the Problem as a State space Search, Production Systems, Problem Characteristics, Production system characteristics, Issues in the Design of Search Programs.

UNIT - II

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

Knowledge Representation Using Predicate Logic: Representing Simple Facts in logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution.

UNIT - III

Representing Knowledge Using Rules: Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge.

Weak slot-and-filler structures: Semantic Nets, Frames,

Strong slot-and-filler structures: Conceptual dependency, Scripts

UNIT - IV

Learning: Rote learning, learning by taking advice, learning in problem solving,

Reinforcement Learning: Markov Decision Problem, Q-Learning, Q-Learning Algorithm, temporal difference Algorithm

UNIT – V

Natural Language Processing: Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural language Processing, Spell Checking,

Parallel and Distributed AI: Parallelism in Reasoning Systems, Distributed Reasoning Systems

TEXT BOOKS:
1. Elaine Rich & Kevin Knight, "Artificial Intelligence", Tata McGraw Hill Edition, 3rd Edition, Reprint 2008.
2. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
3. Carl Townsend, "Introduction to TURBO PROLOG", BPB Publications. 2011
4. Tom M Mitchell, "Machine Learning", McGraw-Hill Science/Engineering/Math, 1997.

REFERENCE BOOKS:
1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
2. Patrick Henry Winston, 'Artificial Intelligence', Pearson Education, 2003
3. Russel and Norvig, 'Artificial Intelligence', Pearson Education, PHI, 2003

WEB REFERENCES
1. https://www.coursera.org/learn/machine-learning
2. https://www.simplilearn.com/big-data-and-analytics/machine-learning
3. https://www.appliedaicourse.com/course/applied-ai-course-online
4. http://nptel.ac.in/courses/106105152

R20 COURSE STRUCTURE

III B.TECH – I SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC3103	Design and Analysis of Algorithms	PC	30	70	100	3	0	0	3
2	R20CC3104	Computer Networks	PC	30	70	100	3	0	0	3
3	R20CS3105	Compiler Design	PC	30	70	100	3	0	0	3
4	R20CC3101	Operating Systems	PC	30	70	100	3	0	0	3
5	R20CC3102 R20CC3106 R20CC3107 R20CS3108	**Professional Elective** – I 5. Data Warehousing and Data Mining 6. Computer Graphics 7. Software Testing Methodologies 8. Distributed Systems	PE	30	70	100	3	0	0	3
6	R20CS31L3	DAA and CD Lab	PC	15	35	50	0	0	3	1.5
7	R20CC31L2	CN and OS Lab	PC	15	35	50	0	0	3	1.5
8	R20CC31SC1	English Employability Skills	SC	-	50	50	0	0	4	2
9	R20CC31IN	Summer Internship / Community Service Project	PR	-	50	50	0	0	0	1.5
10	R20CC31MC02	Essence of Indian Traditional Knowledge	MC	-	-	-	2	0	0	0
TOTAL										21.5
11	**Honors / Minor Course**			30	70	100	4	0	0	4

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CC3103	**DESIGN AND ANALYSIS OF ALGORITHMS** **(Common to CSE & IT)**						

COURSE OBJECTIVES:

- To analyze the asymptotic performance of algorithms.
- To write rigorous correctness proofs for algorithms.
- To demonstrate a familiarity with major algorithms and data structures.
- To apply important algorithmic design paradigms and methods of analysis.
- To synthesize efficient algorithms in common engineering design situations.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Apply asymptotic notations to measure the performance of algorithms [K3]

CO 2: Apply divide-and-conquer paradigm when an algorithmic design situation calls for it
[K3].

CO 3: Identify all feasible solutions to get optimal solutions using greedy method [K3].

CO 4: Apply dynamic-programming approach, to solve real world problems [K3].

CO 5: Apply fundamental graph traversal techniques to solve various applications using
Backtracking [K3].

CO 6: Analyse least cost and FIFO branch and bound paradigms [K4].

SYLLABUS:

UNIT-I

Introduction: Algorithm Specification, Performance Analysis -Space complexity, Time complexity, Asymptotic Notations (Big-oh notation, Omega notation, Theta notation).

UNIT-II

Divide and Conquer: General method, Binary search, Merge sort, Quick sort, Strassen's matrix multiplication.

UNIT-III

Greedy method: General method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest paths.

UNIT-IV

Dynamic Programming: The General method, All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack, Reliability design, The Travelling sales person problem, Matrix-chain multiplication.

UNIT-V

Backtracking: The General method, N-Queen problem, Sum of subsets, Graph coloring, Hamiltonian cycles.

Branch and Bound: The method, 0/1 knapsack problem, Travelling sales person problem.

TEXT BOOK:

1. Fundamentals of Computer Algorithms, Second Edition – Ellis Horowitz, Sartaj Sahni and rdSanguthevar Rajasekaran, Universities Press.

REFERENCE BOOKS:

1. S. Sridhar, Oxford, Design and Analysis of Algorithms, First Edition –.
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein , Introduction to Algorithms, second edition, , PHI Pvt.Ltd.
3. Parag Himanshu Dave, Himanshu Bhalchandra Dave , Design and Analysis of Algorithms, Second Edition –, Pearson Education.
4. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman , Design and Analysis of Computer Algorithms –, Pearson Education.
5. Anany Levitin , Introduction to the Design and Analysis of Algorithms, Third Edition –, Pearson Education.

ONLINE REFERENCES:

1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2. https://www.coursera.org/learn/algorithms-divide-conquer
3. http://nptel.ac.in/courses/106101060/
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/index.html

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3104	COMPUTER NETWORKS						

COURSE OBJECTIVES:

- To provide knowledge on the fundamental concepts of the Computer Networks and problem solving techniques on Networks.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Summarize basic concepts of Data Communication and Networking. [K2]
CO 2: Compare and Contrast OSI and TCP/IP reference models. [K2]
CO 3: Interpret data link layer services and multiple access protocols. [K2]
CO 4: Analyse different routing protocols. [K4]
CO 5: Illustrate the essential principles of different transport layer protocols. [K2]
CO 6: Summarize various application layer protocols. [K2]

SYLLABUS:

UNIT – I
Introduction: OSI Overview, TCP/IP and Other Network Models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies: WAN, LAN, MAN.

UNIT – II
Data Link Layer: Design Issues- Framing, Services Provided to Network Layer, Flow Control, Error Control, Error Detection and Correction-CRC, Checksum-Idea, One's Complement, Hamming code. **IEEE Standards:** 802.3, 802.11.

UNIT – III
Elementary Data Link Layer Protocols: Simplex Protocol, Simplex Stop and Wait, Simplex Protocol for Noisy Channel.
Sliding Window Protocol: One Bit, Go Back N, Selective Repeat-Stop And Wait Protocol, Examples Of Data Link Protocols- HDLC, PPP.
Medium Access Control Sub Layer: Chanel Allocation Problem, ALOHA, Carrier Sense Multiple Access (CSMA), CSMA With Collision Detection, CSMA with Collision Avoidance,

UNIT – IV
Network Layer: Network Layer Design Issues- Store And Forward Packet Switching, Service Provided to Transport Layer, Connection Oriented and Connection Less Service, Comparison of Virtual Circuit and Datagram Subnets.
Routing Algorithms: Optimality Principle, Shortest Path Routing, Flooding, Hierarchical Routing, Broad Cast, Multi Cast, Distance Vector Routing, Link State Routing.
Network Layer in Internet: IP Protocol, IP Address, IPv4 frame format.

UNIT –V

Transport Layer: The Transport Services- Services Provided to the Upper Layer, Transport Service Primitives, Elements of Transport Protocol-Addressing, Connection Establishment, Connection Release.

The Internet Transport Protocols: TCP and UDP.

Application Layer: DNS (Domain Naming System)-DNS Namespace, Name Servers, Electronic Mail-Architecture And Services, Message Format-MIME, Sending and Receiving E-mail, Message Transfer- SMTP.

The World Wide Web- Architecture Overview, URL, HTTP.

TEXT BOOKS:

1. Andrew S Tanenbaum, "Computer Networks, Pearson Education/PHI, 4th Edition.
2. Behrouz A.Forouzan, "Data Communications and Networks", TMH, Third Edition,

REFERENCE BOOKS:

1. S.Keshav, "An Engineering Approach to Computer Networks", Pearson Education 2nd Edition,
2. W.A. Shay, Thomson, "Understanding Communications and Networks", 3rd Edition.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc18_cs38.
2. https://in.udacity.com/course/computer-networking--ud436.
3. https://www.class-central.com/subject/computer-networking.
4. https://www.youtube.com/watch?v=3DZLItfbqtQ&list=PL32DBC269EF768F74.

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3105	**COMPILER DESIGN**						

COURSE OBJECTIVES:

- Understand the process involved in a Compiler.
- Create an overall view of various types of translators, linkers, loaders, and phases of a compiler.
- Understand the Syntax Analysis, Various types of Parsers, like the Top-Down approach, and the Bottom-Up approach parsers.
- Gives a view of Intermediate Code Generation, Type Checking,
  Understand the role of Symbol Table and its organization.
- Describe Code Generation, Machine Independent Code Optimization and Instruction Scheduling.

COURSE OUTCOMES:
After successful completion of this course, students will be able to:

CO 1: Summarize different phases and passes of a compiler. [K2]

CO 2: Compare and Contrast various Top-Down and Bottom-Up Parsing techniques. [K2]

CO 3: Interpret different types of Intermediate Code representations. .[K2]

CO 4: Illustrate the effective usage of register allocation and various Code-generation techniques. .[K2]

CO 5: Apply different code-optimization techniques to optimize the target code. .[K3]

SYLLABUS:

UNIT–I
Overview of Language Processing: Pre-processor, compiler, assembler, interpreter, linker & loader and phases of a compiler.
Lexical Analysis: Role of the lexical analysis, lexical analysis vs. parsing, token, patterns and lexemes, lexical errors. Regular expressions: Regular definitions for the language constructs, strings, sequences, transition diagram for recognition of tokens, reserved words and identifiers with examples.

UNIT–II
Syntax Analysis: Discussion on CFG, LMD, RMD, ambiguity, parse tree, role of the parser, Classification of Parsing Techniques: Brute Force approach, left recursion, left factoring. Top-down parsing: FIRST and FOLLOW, LL (1) grammars, non-recursive predictive parsing and error recovery in predictive parsing.

UNIT–III
Types of Bottom-Up Approaches: Introduction to bottom-up parser, Why LR Parsers?, model of an LR parsers, operator precedence parser, shift- reduce parser, difference between LR and LL Parsers, Construction of SLR Table. More Powerful LR parsers: Construction of CLR (1), LALR parsing table, dangling ELSE ambiguity, and error recovery in LR parsing and comparison of all bottom-up approaches with all top-down approaches.

UNIT–IV

Semantic analysis: SDT schemes, evaluation of semantic rules, intermediate codes, three address codes - quadruples, triples, abstract syntax trees, types and declarations, type checking.

Symbol Table: Use and need of symbol tables, runtime environment storage organization, stack allocation, access to non-local data, heap management.

UNIT–V

Code Generation: Issues, target machine, basic blocks and flow graphs, simple code generator, peep-hole optimization

Machine Independent Code Optimization: Semantic preserving transformations, global common sub expression elimination, copy propagation, dead code elimination, constant folding, strength reduction, loop optimization, instruction scheduling and inter procedural optimization.

TEXT BOOKS:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers – Principles, Techniques & Tools", Pearson, Second edition, 2007.
2. K. Muneeswaran, "Compiler Design", Oxford University Press, 2013.

REFERENCE BOOKS:

1. Keith D. Cooper, & Linda Torczon, "Engineering a Compiler", Morgan Kaufman publications, Second edition, 2011.
2. V. Raghavan, "Principles of Compiler Design", TMH, Second edition, 2011.
3. Kenneth C. Louden, "Compiler Construction - Principles and Practice", Cengage Learning publications, First edition,1997.
4. Yunlin Su, Song Y. Yan, "Implementations of Compiler - A new approach to Compilers including the Algebraic Methods", Springer publications, 2011.

WEB REFERENCES:

1. http://www.diku.dk/hjemmesider/ansatte/torbenm/Basics/
2. http://nptel.ac.in/courses/106108052/1
3. https://www.geeksforgeeks.org/compiler-design-tutorials/
4. https://link.springer.com/article/10.1007/s10766-005-3590-6

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3101	**OPERATING SYSTEMS**						

COURSE OBJECTIVES:

• To gain knowledge about the Operating Systems concepts such as process, main memory management, secondary memory management, Deadlocks, CPU and disk scheduling etc.,

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO 1: Classify various operating system functionalities and generations. [K2]
CO 2: Interpret process management and exemplify the process synchronization techniques. [K2]
CO 3: Apply various process scheduling algorithms. [K3]
CO 4: Distinguish various memory management techniques and apply various deadlock techniques. [K4]
CO 5: Compare and contrast various disk scheduling algorithms and can interpret the file system implementations. [K2]

SYLLABUS:

UNIT - I

Computer System and Operating System Overview: Overview of Operating System - What operating systems do, User view, System view, defining operating systems; Operating Systems functions- Process Management, Memory Management, Storage Management, File-System Management, Mass-Storage Management, Caching, Protection and security; Distributed systems, Special purpose systems, Real-Time Embedded Systems, Multimedia Systems, Handheld Systems, Operating Systems Structures, Simple Structure, Layered Approach, Micro Kernels, Modules; Systems Calls- Process control, File management, Device management, Information maintenance, Communication; Operating systems generation.

UNIT - II

Process Management: Process, Process States, Process Control Block, Process Scheduling- Scheduling Queues, Schedulers; Operations- Process Creation, Process termination; Inter process communication- Shared-Memory Systems, Message-Passing Systems, Naming, Synchronization, Buffering; Multi Thread programming models- Many to one, One to one, Many to Many model;
Process Scheduling Criteria- CPU scheduler, Preemptive scheduling, Dispatcher, Scheduling Criteria; CPU Scheduling Algorithms- First Come First Serve, Shortest job first, Priority Scheduling, Round robin scheduling.

UNIT - III

Concurrency: Process Synchronization, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware. Semaphores- Usage, Implementation, Deadlock and Starvation; Classic Problems of Synchronization- Bounded buffer problem, Readers writers' problem, Dining-Philosophers problem; Monitors-Usage, Dining-Philosophers solution using monitors.

Memory Management: Swapping, Contiguous Memory Allocation- Memory Allocation, Fragmentation; Paging- Basic Method, Hardware Method, Protection, shared pages; Structure of the Page table- Hierarchical Paging, Hashed Page Tables. Segmentation- Basic Method, hardware.

UNIT - IV

Virtual Memory Management: Virtual Memory. Demand Paging- Basic concept, copy on write; Page-Replacement Algorithms- Basic page replacement, FIFO page replacement, optimal page replacement, LRU page replacement, LFU page replacement; Thrashing- Cause of Thrashing, Working set model, Page fault frequency

Principles of Deadlock: Deadlock System Model. Deadlock Characterization- Necessary Conditions, Resource allocation graph; Deadlock Prevention- Mutual exclusion, Hold and wait, No preemption, Circular wait; Deadlock Detection and Avoidance- Resource allocation Graph algorithm, Banker's algorithm, Single instance of each resource type, several instances of each resource type; Recovery Form Deadlock- Process termination, Resource preemption

UNIT - V

File System: The Concept of a File- file attributes, file operations, file types, file structures; Access Methods- sequential access, direct access, other access methods; Directory Structure- single level directory, two level directories, tree structured directory, general graph directory; File Sharing- multiple users, remote file systems; Protection- types of access, access control.

Implementing File System: File System Structure. File System Implementation- overview, partitions and mounting, virtual file systems; Allocation Methods- contiguous allocation, linked allocation, indexed allocation; Free-Space Management- linked list, grouping, counting. **Disk Scheduling**- FCFS scheduling, SSTF scheduling, SCAN scheduling, C-SCAN scheduling, LOOK scheduling.

TEXT BOOKS:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", John Wiley, 7/e, 2016.

REFERENCE BOOKS:

1. William Stallings, "Operating Systems – Internal and Design Principles", Pearson Education, 6/E, 2005.
2. D.M.Dhamdhere, "Operating Systems – A Concept based Approach" –, TMH, 2/e, 2005.
3. Crowley, "Operating System a Design Approach", TMH, 1/e, 2005.
4. Andrew S Tanenbaum , "Modern Operating Systems", PHI, 3/e, 2013.

WEB REFERENCES:

1. nptel.ac.in/courses/106108101
2. nptel.ac.in/courses/106106144

III B. TECH I SEMESTER (PE-I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3102				**DATA WAREHOUSING AND DATA MINING**			

COURSE OBJECTIVES:

- Identify the scope and necessity of Data Mining & Warehousing for the society.
- Describe the design of Data Warehousing so that it can be able to solve the root problems.
- Categorize and carefully differentiate between situations for applying different data mining techniques: mining frequent patterns, association, correlation, classification, prediction, and cluster analysis.
- Evaluate the performance of different data mining algorithms.
- To develop further interest in research and design of new Data Mining Techniques.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Interpret the data mining terminology and types of data to be mined. [K2]
CO 2: Outline the need and importance of pre-processing techniques and apply them.[K2]
CO 3: Interpret data warehousing concepts and operations. [K2]
CO 4: Compare and contrast different dominant Data Mining Algorithms for Classification
    and Clustering and apply them. [K4]
CO 5: Analyze the performance of Association Rules. [K4]

SYLLABUS
UNIT– I
Introduction to data mining: -What Is Data Mining, -Motivating Challenges, -The Origins of Data Mining, -Data Mining Tasks, -Types of Data: Attributes and Measurement, Types of Data Sets, -Data Quality: Measurement and Data Collection Issues, Issues Related to Applications.

UNIT–II
Data:- Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature Creation, Discretization and Binarization, Variable Transformation, -Measures of similarity and dissimilarity: Basics, Similarity and Dissimilarity between Simple Attributes, Dissimilarities between Data Objects, Similarities between Data Objects, Examples of Proximity Measures.
Exploring data: -The Iris Data set, -Summary Statistics: Frequencies and the Mode, Percentiles, Measures of Location: Mean and Median, Measures of Spread: Range and Variance, Multivariate Summary Statistics, Other Ways to Summarize the Data.

UNIT–III
Data Warehouse and OLAP Technology for Data Mining: -What is a Data Warehouse, -A Multidimensional Data Model: From tables to data cubes, Stars, snowflake, and fact constellations(schemas for multidimensional databases), Examples for defining star, snowflake, and fact constellation schemas, Measures(their categorization and computation), Introducing concept hierarchies, OLAP operations in the multidimensional data model, A starnet query model for querying multidimensional databases, -Data Warehouse Architecture: Steps for the design and construction of data warehouses, A three-tier data warehouse architecture, OLAP server

architectures: ROLAP vs. MOLAP vs. HOLAP, SQL extensions to support OLAP operations, Data Warehouse implementation: Efficient computation of data cubes, Indexing OLAP data, Efficient processing of OLAP queries, Metadata repository, Data warehouse back-end tools and utilities, -Further development of data cube technology: Discovery-driven exploration of data cubes, Complex aggregation at multiple granularities (Multifeature cubes), -From data warehousing to data mining: Data warehouse usage, From online analytical processing to online analytical mining.

UNIT-IV

Classification: Basic Concepts, Decision Trees, and Model Evaluation: -Preliminaries, - General Approach to Solving a Classification Problem, Decision Tree Induction: How a Decision Tree Works, How to Build a Decision Tree, Methods for Expressing Attribute Test Conditions, Measures for Selecting the Best Split, Algorithm for Decision Tree Induction, -Model Overfitting: Overfitting Due to Presence of Noise, Overfitting Due to Lack of Representative Samples, Evaluating the Performance of a Classifier: Holdout Method, Random Subsampling, Cross Validation, Bootstrap.

Classification: alternative techniques: -Bayesian classifier: Bayes Theorem, Using Bayes theorem for classification, Naïve Bayesian classifier.

UNIT-V

Association Analysis: Basic Concepts and Algorithms: -Problem Definition, -Frequent Itemset Generation: The Apriori principle, Frequent Itemset Generation in the Apriori Algorithm, Candidate Generation and Pruning, Support Counting, -Rule Generation: Confidence-Based Pruning, -Compact Representation of Frequent Itemsets: Maximal Frequent Itemsets, Closed Frequent Itemsets, -FP-Growth algorithms: FP-Tree Representation, Frequent Itemset Generation in FP-Growth Algorithm.

Cluster Analysis: Basic Concepts and Algorithms: -Overview: What is Cluster Analysis? Different Types of Clustering, Different Types of Clusters, -K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, K-means and Different Types of Clusters, Strengths and Weaknesses, -Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm, Specific Techniques, -DBSCAN: Traditional Density (center based approach), The DBSCAN algorithm, Strengths and Weaknesses.

TEXT BOOKS:
1. Pang-Ning tan, Michael Steinbach, Vipin kumar, "Introduction to Data Minin", Addision- Wesley.
2. Jiawei Han, Micheline Kamber, "Data Mining, Concepts and Techniques", Elsevier, 2/e, 2006.

REFERENCE BOOKS:
1. Margaret H Dunham, "Data Mining: Introductory and Advanced Topics", Pearson, 2008.
2. GK Gupta, "Introduction to Data Mining with Case Studies", Prentice Hall.
3. Jarke, Lenzerini, Vassiliou, Vassiliadis, "Fundamentals of data warehouses", 2/e, Springer. 4. Soman, Diwakar, Ajay, "Data Mining Theory and Practice", PHI, 2006.

WEB REFERENCES:
1. https://onlinecourses.nptel.ac.in/noc18_cs14
2. www.oracle.com/Data/Warehousing
3. www.databaseanswers.org/data_warehousing.html
4. https://www.wileyindia.com/data-warehousing-data-mining.html

III B.TECH I SEMESTER (PE-I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3106	COMPUTER GRAPHICS						

COURSE OBJECTIVES:

- Provide foundation in graphics applications programming
- Introduce fundamental concepts and theory of computer graphics
- Give basics of application programming interface (API) implementation based on graphics pipeline approach

COURSE OUTCOMES:
At the end of this course student will be able to:
CO 1: Summarize graphics applications, architectures, and open GL program structure. [k2]
CO 2: Apply basic transformations on objects. [k3]
CO 3: Apply line and polygon clipping algorithms. [k3]
CO 4: Identify different projections. [k3]
CO 5: Design interactive programs using openGL. [k6]

SYLLABUS:
UNIT- I
Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; the synthetic camera model; the programmer‟s interface; Graphics architectures. Graphics Programming: The Sierpinski gasket; Programming two- dimensional applications. The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program.
UNIT- II
Input and Interaction: Interaction; Input devices; Clients and servers; Display lists; Display lists and modeling; Programming event-driven input; Menus; Picking; Animating interactive programs; Logic operations..

UNIT- III
Geometric Objects and Transformations: Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Modeling a colored cube; Affine transformations; Rotation, translation and scaling. Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices.
UNIT- IV
Viewing: Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Parallel-projection matrices; Perspectiveprojection matrices.

UNIT- V
Implementation: Basic implementation strategies; Clipping; Cohen-Sutherland Line-segment clipping; Polygon clipping; Clipping of other primitives; Clipping in three dimensions; Rasterization; Bresenham‟s algorithm; Polygon rasterization.

TEXT BOOKS:
1. Interactive Computer Graphics A Top-Down Approach with OpenGL, Edward Angel, 5th Edition, Pearson, 2009.

2. Computer Graphics through OpenGL: From Theory to Experiments, Sumantha Guha, Chapman and Hall/CRC, 2011 (For OpenGL and related examples).

REFERENCE BOOKS:

1. Computer Graphics with OpenGL, Hearn & Baker, 3rd Edition, Pearson 2004.

2. Computer Graphics Using OpenGL, F.S. Hill, Jr, and M. Kelley, Jr., 3rd Edition, Pearson/PHI, 2009.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106/103/106103224/
2. http://www.svecw.edu.in/Docs%5CCSECGLNotes2013.pdf
3. https://www.ncertbooks.guru/computer-graphics-notes/

III B.TECH I SEMESTER (PE-I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3107	**SOFTWARE TESTING METHODOLOGY**						

COURSE OBJECTIVES:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Outline the software testing terminology. [K2]

CO 2: Compare and contrast various behavioural testing methodologies. [K2]

CO 3: Summarize various dynamic testing techniques. [K2]

CO 4: Summarize the importance of validation activities. [K2]

CO 5: Interpret software testing and quality management. [K2]

SYLLABUS:

UNIT - I

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, Definition, Model for testing, Effective Vs Exhaustive Software Testing, Software Failure Case Studies.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle.

UNIT - II

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, How to verify and validate code.

Dynamic Testing I: Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

UNIT - III

Dynamic Testing II: White-Box Testing: need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing

Static Testing: inspections, Structured Walkthroughs, Technical reviews

UNIT - IV

Validation activities: Unit testing, Integration Testing,. Function testing, system testing, acceptance testing

UNIT - V

Efficient Test Suite Management: Test case design, why does a test suite grow, minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite

Software Quality Management: Software Quality metrics, SQA models

TEXT BOOKS:

1. Naresh Chauhan, "Software Testing, Principles and Practices", Oxford
2. Aditya P Mathur, "Foundations of Software testing", 2ed, Pearson
3. Yogesh Singh, "Software Testing", CAMBRIDGE

REFERENCE BOOKS:

1. Baris Beizer, "Software testing techniques", International Thomson computer press, second edition.
2. M G Limaye, "Software Testing, Principles, techniques and Tools", TMH
3. Willian E Perry, "Effective Methods for Software testing", 3ed, Wiley

ONLINE REFERENCES:

1. https://www.youtube.com/watch?v=IhA-EUEjyW0
2. https://www.youtube.com/watch?v=goaZTAzsLMk
3. https://freevideolectures.com/Course/3655/Software-Testing
4. https://www.youtube.com/watch?v=ASzlf-av4v4
5. http://srsstesting.com/

III B.TECH I SEMESTER (PE-I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3108	DISTRIBUTED SYSTEMS						

DISTRIBUTED SYSTEMS

COURSE OBJECTIVES:
- The aim of this subject is to study, learn, and understand the main concepts of distributed systems
- To learn Hardware and software features that supports these systems.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
CO 1. Outline the benefits of distributed systems. [K2]
CO 2. Interpret synchronization techniques in distributed systems. [K2]
CO 3. Summarize process scheduling techniques, threads and fault tolerance in distributed environments. Analyze various distributed deadlock detection and prevention techniques. [K4]
CO 4. Interpret distributed file system implementations and shared memory**.** [K2]
CO 5. Relationship of distributed system functions in MACH. [K4]

SYLLABUS:
UNIT–I
Introduction to Distributed systems: Goals of distributed system, hardware and software concepts, design issues. Communication in Distributed systems: Layered protocols, ATM networks, the Client - Server model, remote procedure call and group communication.

UNIT–II
Synchronization in Distributed systems: Clock synchronization, Mutual exclusion, E-tech algorithms, the Bully algorithm, a ring algorithm, atomic transactions.

UNIT-III
Processes: Processes and Processors in distributed systems: Threads, system models, Processor allocation, Scheduling in distributed system, Fault tolerance and real time distributed systems.
Deadlocks: deadlock in distributed systems, Distributed deadlock prevention, and distributed dead lock detection.

UNIT-IV
Distributed file systems: Distributed file systems design, distributed file system implementation, trends in distributed file systems. Distributed shared memory : What is shared memory, consistency models, page based distributed shared memory, shared variable distributed shared memory, object based DSM.

UNIT-V
Case study MACH: Introduction to MACH, process management in MACH, memory management in MACH, communication in MACH, UNIX emulation in MACH.

TEXT BOOKS:

1. Andrew. S. Tanenbaum, "Distributed Operating System", PHI
2. Stallings, "Operating Systems Internal and Design Principles", Pearson Education / PHI, Fifth Edition– 2005.

REFERENCE BOOKS:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Principles", - 7th Edition, John Wiley.
2. Andrew S Tanenbaum, "Modern Operating Systems", 2nd edition Pearson/PHI.

WEB REFERENCES:

1. http://www.cs.colostate.edu/~cs551dl/externalLinks.php
2. http://www.personal.kent.edu/~rmuhamma/OpSystems/os.html
3. https://www.sanfoundry.com/operating-system-questions-answers-distributed-operating-system/
4. https://link.springer.com/journal/446
5. https://www.ukessays.com/.../the-distributed-operating-system-info...
6. https://www.youtube.com/watch?v=sK9MC5GREXg

III B.TECH- I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CS31L3	DAA AND CD LAB						

COURSE OBJECTIVES:

The course should enable the students to:
- Learn how to analyze a problem and design the solution for the problem.
- Identify and apply the suitable algorithm for the given real world problem.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:
  CO 1: Develop programs for searching a given set of element and analyze its time complexity.
  CO 2: Implement and analyze the complexity using dynamic algorithms.
  CO 3: Solve and analyze the tree traversal techniques.
  CO 4: Demonstrate and Develop Lexical Analyzer for a given language.[K3]
  CO 5: Develop various bottom up parsers for a given language.[K3]

LIST OF PROGRAMS

1. Write a program to perform Binary Search.
2. Write a program to find Optimal solution for a Knap Sack Problem using Greedy Method.
3. Write a program to find Adjacency matrix for a given graph.
4. Write a program to implement Depth First Search.
5. Write a program to implement Breadth First Search.
6. Write a program to find minimum cost of spanning tree using Prims Algorithm.
7. Write a program to implement Dijkstras algorithm
8. Write a program to perform All pairs shortest path problem
9. Write a program to perform Matrix Chain Multiplication
10. Write a program to solve Eight Queens problem using Back Tracking Technique.

11. Write a Program to Tokenizing a file using C
12. Write a program to Design a lexical analyzer for given language which should ignore redundant spaces, tabs, new lines and comments.
13. Write a program to build lexical analyzer. Using Lex tool

14. Develop functions to find FIRST and FOLLOW of all the variables.
15. Develop an operator precedence parser for a given language.
16. Write a program to Build shift reduce parsing algorithm.
17. Write a program to design an LALR bottom up parser for the given language.

TEXT BOOKS
1. Fundamentals of Computer Algorithms, Second Edition – Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Universities Press.
2. Compilers- Principles, Techniques and Tools, Second Edition – Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Pearson Publications.

WEB REFERENCES
1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2. https://www.coursera.org/learn/algorithms-divide-conquer
3. http://nptel.ac.in/courses/106101060/
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/index.html
5. http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/system_deligators/labs/exp2/references.php

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CC31L2	CN AND OS LAB						

COURSE OBJECTIVES:
- To understand the Concept of Data link layer framing Methods and different CRC Polynomials.
- Identify the purpose of Scheduling Algorithms, page replacements and Deadlock Algorithm.
.
COURSE OUTCOMES:
After successful completion of this course, the students will be able to:

CO 1: Implement routing algorithms.

CO 2: Do the error checking by using CRC polynomials.

CO 3: Solve the experiments on scheduling Algorithms and page replacement algorithms.

CO 4: Handle the deadlocks, like prevention and detection.

List of Experiments in CN
1. Implement the data link layer framing methods such as character count, character stuffing and bit stuffing
2. Implement on a data set of characters the three CRC polynomials CRC 12, CRC 16 and CRC CCIP
3. Implement Dijkstra's algorithm to compute the shortest path through a graph
4. Take an example subnet graph with weights indicating delay between nodes
5. Now obtain Routing table art each node using distance vector routing algorithm

List of Experiments in OS
1. Simulate the following CPU scheduling algorithm
   a) FCFS b) SJF c) Round Robin d) Priority
2. Simulate all page replacement algorithms
   a) FIFO b) LRU c)OPTIMAL
3. Simulate all file organization techniques
   a) Single level   b)Two level
4. Simulate Bankers Algorithm for Deadlock Avoidance

REFERENCE BOOKS:

1. An Introduction to Operating Systems, P.C.P Bhatt, 2nd edition, PHI.
2. Modern Operating Systems, Andrew S Tanenbaum, 3rdEdition, PHI
3. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	-	2		-		2
SUBCODE: R20CC31SC1	**ENGLISH EMPLOYABILITY SKILLS** **(Common to All Branches)**						

COURSE OBJECTIVES:

- To train the students to use language effectively in professional situations like group discussions, public speaking, presentations and interviews.
- To make the students understand the importance of body language.
- To expose the students to SWOT Analysis.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Write effective Resume for employment..

CO 2: Make formal presentations using relevant technical style of communication and appropriate strategies for both academic and professional purpose.

CO 3: Participate in Group Discussions using analytical and problem solving skills.

CO 4: Face job interviews confidently and enhance employability.

UNIT– I
Personal Introduction & JAM
SWOT Analysis

UNIT–II
Resume and Video Portfolio
Non Verbal Communication
Professional Etiquette

UNIT–III
Presentation Skills
Emotional Intelligence (How to face ambiguity, uncertainty and cobntingencies)

UNIT-IV
Group Discussion

UNIT-V
Interview skills- Mock Interviews

REFERENCE BOOKS:
1. Rajendra Pal, J S KorlahaHi, *Essentials of Business Communication,* Sultan Chand & Sons
2. Andrea J. Rutherford, *Basic Communication Skills for Technology,* Pearson Education Asia
3. V. Prasad, *Advanced Communication Skills,* Atma Ram Publications
4. Sanjay Kumar, Pushp Lata, *Communication Skills,* Oxford University Press
5. Meenakshi Raman, Sangeeta Sharma, *Fundamentals of Technical Communication,* Oxford University Press

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	-	-	-	-	-	0
SUBCODE: R20CC31MC02	**ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**						

COURSE OBJECTIVES:

The objectives of this course will help the students

- To get necessary knowledge on Indian culture
- To know the Indian languages and Literature in India
- To explore the Indian arts and architecture in India
- To know the education system, science and scientists in India

COURSE OUTCOMES:

After successful completion of the course students will be able to

- Interpret the philosophy of Indian Culture [K2].
- Interpret the Indian languages, Epics Ramayana and Mahabharata [K2].
- Analyze the information about Indian arts and architecture [K4].
- Analyze the spread of cultural exchange in abroad [K4].
- Analyze the contributions of scientists in different eras [K4].

Unit-I. Indian Culture: An Introduction

Characteristics of Indian culture, Significance of Indian culture, Geography of Indian Culture. Society in India through ages- Ancient period- varna and jati, family and marriage in India, position of women in ancient India, Contemporary period; caste system and communalism

Unit-II Indian Languages and Literature

Evolution of script and languages in India: Harappan Script and Brahmi Script. Short History of the Sanskrit literature: The Vedas, The Brahmanas and Upanishads & Sutras, Epics: Ramayana and Mahabharata.

Unit-III. Indian Arts and Architecture

Indian Art & Architecture: Hindu Temple Architecture, Buddhist Architecture, Medieval Architecture. Rise of modern theatre and Indian cinema.

Unit-IV. Spread of Indian Culture Abroad

Causes, Significance and Modes of Cultural Exchange - Through Traders, Teachers, Emissaries, Missionaries and Gypsies. Indian Culture in South East Asia. India, Central Asia and Western World through ages

Unit-V: Education System in India:

Education in ancient, medieval and modern India, aims of education, Science and scientists of ancient India, Science and Scientists of Modern India.

Suggested Readings:

1) Kapil Kapoor, "Text and Interpretation: The indian tradition" ISBN: 81246033375, 2005
2) " Science in Samskrit", Samskrita Bharti Publisher , ISBN 13 : 978- 8187276333,2007
3) NCERT , "Position Paper On Arts ,Music, Dance Theatre", ISBN 81-7450 494-X,200

R20 COURSE STRUCTURE
III B.TECH – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC3204	Machine Learning	PC	30	70	100	3	0	0	3
2	R20CC3205	Advanced Java and Web Technologies	PC	30	70	100	3	0	0	3
3	R20CC3201	Cryptography and Network Security	PC	30	70	100	3	0	0	3
4	R20CC3206 R20CC3202 R20CC3207 R20CS3203	**Professional Elective – II** 5. Big Data Analytics 6. Mobile Computing 7. Design Patterns 8. High Performance Computing	PE	30	70	100	3	0	0	3
5	Open Elective – II		OE	30	70	100	3	0	0	3
6	R20CC32L1	Advanced Java and Web Technologies Lab	PC	15	35	50	0	0	3	1.5
7	R20CC32L2	Machine Learning Lab	PC	15	35	50	0	0	3	1.5
8	R20CC32L3	Software Lab	ES	15	35	50	0	0	3	1.5
9	R20CC32SC4	Internet of Things	SC	-	50	50	0	0	4	2
10	R20CC32MC2	Professional Ethics and Human Values	MC	-	-	-	2	0	0	0
TOTAL										21.5
11	**Honors / Minor Course**			30	70	100	4	0	0	4

III B. TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3204	**MACHINE LEARNING**						

COURSE OBJECTIVES:
- To understand how machine learning algorithms are evaluated.
- To be Familiar with a set of well-known supervised, unsupervised and semi-supervised learning algorithms.
- To be able to implement some basic machine learning algorithms.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Summarize the characteristics of Machine Learning that make it useful to real-world Problems.
CO 2: Evaluate and compare the performance of different supervised algorithms for typical learning problems and apply them.
CO 3: Outline the need and importance of pre-processing techniques and apply them.
CO 4: Analyze the performance of Association Rules
CO 5: Evaluate and compare the performance of different unsupervised algorithms for typical learning problems and apply them.

UNIT– I
Supervised Learning: Learning a Class from Examples, Vapnik Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise, Learning Multiple Classes, Regression: simple linear regression, multiple linear regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm, Bayesian classification

UNIT–II
Parametric Methods: Maximum Likelihood Estimation: (Bernouli density, multinomial density, guassian density), Evaluating an Estimator: (Bias and Variance), The Bayes' Estimator, Parametric Classification, Regression, Tuning Model Complexity: Bias/Variance Dilemma, Model Selection Procedures

UNIT–III
Dimensionality Reduction: Subset Selection, Principal Components Analysis, Factor Analysis, Linear Discriminant Analysis
Association learning: Basics of Association, Apriori Algorithm, FP Growth Algorithm with examples

UNIT-IV
Unsupervised Learning: Expectation Maximization, EM algorithm, Self-Organizing Maps(SOM), learning Process in SOM, Algorithm: SOM, Adaptive Resonance Theory.
Clustering: k-Means Clustering, Expectation Maximization algorithm, Supervised Learning after Clustering, Spectral Clustering, Document Clustering example, Hierarchical Clustering, Choosing the Number of Clusters

UNIT-V

Decision Trees: Univariate Trees: (classification trees, regression trees), Pruning, Rule Extraction from Trees, Learning Rules from Data.

Random Forest: basic Principle, Random Forest Algorithm with Example, Decision Tree vs random Forest

TEXT BOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", The MIT Press
2. Artificial Intelligence and Machine Learning, by Vinod Chandra PHI Learning.
3. Tom M. Mitchell "Machine Learning", MC Graw Hill
4. Aurélien Géron, "Handson machine learning with scikit learn and tensorflow" O'REILLY

REFERENCE BOOKS:

1. Stephen Marsland, "Machine Learning an Algorithmic Perspective", CRC Press, 2009.

III B. TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3205	**ADVANCED JAVA AND WEB TECHNOLOGIES**						

COURSE OBJECTIVES:

- To gain the knowledge of Server-side programming languages and techniques associated with the World Wide Web.
- To make the students get acquainted the skill for developing web apps.
- Understand how to use web-based media-rich programming tools for creating dynamic web pages.

COURSE OUTCOMES:

After the successful completion of this course, the students will be able to:

CO 1: Interpret Servlet Life Cycle and web servers. [K2]

CO 2: Illustrate JSP Life cycle. [K2]

CO 3: Apply Session Management for JSP applications. [K3]

CO 4: Illustrate the usage of JDBC in JSP applications. [K2]

CO 5: Make use of PHP for the development of web-based applications. [K3]

CO 6: Utilize JDBC in PHP web-based applications. [K3]

SYLLABUS:

UNIT-I

Web Servers and Servlets: Tomcat web server, introducing java Servlet, Introducing the servlet API, Lifecycle of a Servlet, Working with Initialization Parameters, Describing the HttpServlet Request & HttpServletResponse interfaces, Cookies, Session Tracking, Security Issues.

UNIT-II

Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC. JSP Application Development: Generating Dynamic Content: directive elements, what is template text, action elements. Using Scripting Elements, Implicit JSP Objects. Conditional Processing: Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods.

UNIT-III

JSP: Error Handling and Debugging, Implicit JSP Objects, Sharing Data between JSP pages, Requests, and Users Passing Control and Data between Pages: passing the control between the pages, passing the data between JSP pages passing the data between JSP pages using session object, Memory Usage Considerations.

UNIT-IV

JDBC: Introduction, Database Programming Using JDBC: How JDBC Works, JDBC Architecture, JDBC Driver Types, Accessing Database From JSP page: Use of Prepared Statement, ResultSet.

UNIT-V

PHP: Introduction to PHP, Creating PHP script, Running PHP script. Working with variables and constants, Data types, Operators. Controlling program flow, Working with Arrays, Built-in functions in PHP, user-defined functions in PHP, recursive, variable, and callback functions. User and Database Interface: Database programming, Working with forms, validating a form, Working with Databases such as MySQL.

TEXT BOOKS:

1. A.A. Puntambekar , "Web Technologies" , Technical Publications, Pune.
2. "Web Technologies Black Book" , Kognent Learning Solutions Inc Sol. DreamTech Press

REFERENCES BOOKS:

1. Wang Thomson, "An Introduction to Web Design and Programming".
2. Wang, Katila, "An Introduction to Web Design + Programming", CENGAGE.
3. Web Technologies A Developer's Perspective, N.P.Gopalan, Akhilandeswari, PHI.

WEB REFERENCES:

1. https://www.coursera.org/learn/html-css-javascript-for-web-developers.
2. https://www.coursera.org/learn/web-applications-php.
3. https://www.udemy.com/javawebtut/.
4. https://www.coursera.org/learn/desenvolvimento-agil-com-java-avancado/lecture/LUXm0/criando-java-servlets.

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3201	**CRYPTOGRAPHY & NETWORK SECURITY**						

COURSE OBJECTIVES:

- The main objective of this course is to teach students to understand and how to address various software security problems in a secure and controlled environment.
- During this course the students will gain knowledge in various kinds of software security problems, and techniques that could be used to protect the software from security threats.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1 : Summarize the fundamentals of Cryptography. [K2]

CO2 : Analyze how security is achieved, and attacks can be countered by using symmetric/asymmetric algorithms. [K4]

CO3 : Apply Number Theoretic concepts in developing cryptographic algorithms to counter attacks. [K3]

CO4 : Interpret the role of hash functions and Digital Signatures in Information Security.[K2]

CO5 : Compare different network security designs using available secure solutions. [k2]

CO6 : Illustrate the use of encryption techniques to secure data in transit across data networks. [K2]

SYLLABUS:

UNIT-I

Introduction: Security Attacks-Passive Attacks, Active Attacks, Security Services-Authentication, Access control, Confidentiality, Integrity, Availability service, Nonrepudiation, Security Mechanisms- Specific Security Mechanisms, Pervasive Security Mechanisms, model for Network Security, Basics of Cryptography - Symmetric Cipher Model, Substitution Techniques- Caesar Cipher, Monoalphabetic Ciphers, Playfair Cipher, Hill Cipher, polyalphabetic Ciphers, One-Time pad. Transposition Techniques-rail fence, Block and Stream Ciphers.

UNIT-II

Symmetric Key Cryptography: Fiestel Cipher Structure, Block Cipher Design Principles- Design Criteria, Number of Rounds, Design of Function F, Data Encryption Standard (DES), Strength of DES, Triple DES, International Data Encryption algorithm(IDEA), AES- Structure, Transformation functions, Key Expansion, Block Cipher Modes of Operation- ECB, **CBC**, OFB,CFB,CTR Modes.

UNIT-III

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems-Proof and Examples, Euler's Totient Function, Primitive root and Discrete Logarithms.

Public Key Cryptography: Principles of Public key Cryptosystems-Public-Key Cryptosystems, Applications for Public-Key Cryptosystems, Requirements for Public-Key Cryptography, Public-Key Cryptanalysis, RSA Algorithm: Description of the Algorithm, The Security of RSA, Diffie-Hellman Key Exchange Algorithm, Elgamal encryption & decryption,

UNIT-IV
Cryptographic Hash Functions: Message Authentication Requirements and Functions-Message Encryption, Message Authentication Code, Hash Function, Message Authentication Codes (MAC)-Requirements, Hash Functions-Requirements, Applications of MAC and hash functions, Secure Hash Algorithm (SHA-512), HMAC.
Digital Signatures: Digital Signature Schemes, Authentication Protocols- Mutual Authentication, One-Way Authentication, Digital Signature Standards-The DSS Approach, The digital Signature Algorithm.

UNIT-V
Authentication Applications: Kerberos: Motivation, Version 4, X.509 Directory Authentication service, E-Mail, PGP, S/MIME.
Web Security: Web Security Considerations, Secure Sockets Layer- SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol, Transport Layer Security, Secure Electronic Transactions (SET), Firewalls.

TEXTBOOKS:
1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education, 6th Edition, 2011.
2. Chwan Hwa Wu, J.David Irwin, "Introduction to Computer Networks & Cyber Security", CRC Press, 2013.

REFERENCE BOOKS:
1. Eric Maiwald, "Fundamentals of Network Security", Dreamtech press.
2. Withman , Thomson, "Principles of Information Security".
3. Buchmann, Springer, "Introduction to Cryptography".
4. Bruce Schneier, Johnwiley&Sons, "Applied Cryptography", 2nd Edition.
5. Benard Menezes, "Network Security Essentials and Cryptography", Cengage Learning,2011.
6. Behrouz A.Fourouzan and Debdeep Mukhopadhyay, "Cryptography and Network, 2nd Edition", McGraw-Hill, 2010.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc18_cs07/preview
2. https://www.coursera.org/learn/cryptography
3. https://www.coursera.org/specializations/computer-network-security
4. https://www.youtube.com/watch?v=Q-HugPvA7GQ&list=PL71FE85723FD414D7

III B.TECH II SEMESTER (PE – II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3206	**BIG DATA ANALYTICS**						

COURSE OBJECTIVES:
- Introducing Java concepts required for developing map reduce programs.
- Optimize business decisions and create competitive advantage with Big Data analytics.
- Derive business benefit from unstructured data.
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm.
- To introduce programming tools PIG & HIVE in Hadoop echo system.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Interpret the architectural elements of big data and Hadoop framework. [K2]
CO 2: Analyse various big data applications using map reduce programming module. [K4]
CO 3: Analyse Spark capabilities such as distributed datasets, in-memory caching, and the
interactive shell. [K4]
CO 4: Summarize Spark's powerful built-in libraries, including Spark SQL, Spark
Streaming. [K2]
CO 5: Analyze Hadoop data with PIG and Hive. Interpret the applications and architecture
of Mobile Computing and multiplexing techniques. [K4]

SYLLABUS:

UNIT– I
Starting Hadoop: -Google File System, -The building blocks of Hadoop: Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker. -Setting up SSH for a Hadoop cluster: Define a common account, Verify SSH installation, Generate SSH key pair, Distribute public key and validate logins. - Running Hadoop: Local (standalone) mode, Pseudo-distributed mode, Fully distributed mode.

UNIT–II
MapReduce: -A Weather Dataset: Data Format, -Analyzing the Data with Hadoop: Map and Reduce, Java MapReduce: A test run, The old and the new Java MapReduce APIs.
Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner.

UNIT–III
Programming with RDDs: What Is Apache Spark, RDD Basics, Creating RDDs, RDD Operations, Passing Functions to Spark, Common Transformations and Actions, Persistence (Caching).

UNIT-IV
Pig: Hadoop Programming Made Easier: -Admiring the Pig Architecture, -Going with the Pig Latin Application Flow, -Working through the ABCs of Pig Latin: Uncovering Pig Latin structures, Looking at Pig data types and

syntax. -Evaluating Local and Distributed Modes of Running Pig Scripts, -Checking out the Pig Script Interfaces, -Scripting with Pig Latin

UNIT-V

Applying Structure to Hadoop Data with Hive: -Saying Hello to Hive, -Seeing How the Hive is Put Together, -Getting Started with Apache Hive, -Examining the Hive Clients: The Hive CLI client, The web browser as Hive client, SQuirreL as Hive client with the JDBC Driver. -Working with Hive Data Types, -Creating and Managing Databases and Tables: Managing Hive databases, Creating and managing tables with Hive. -Seeing How the Hive Data Manipulation Language Works: LOAD DATA examples, INSERT examples, Create Table As Select (CTAS) examples. Querying and Analyzing Data: Joining tables with Hive, Improving your Hive queries with indexes, Windowing in HiveQL, Other key HiveQL features.

TEXT BOOKS:
1. Tom White, "Hadoop: The Definitive Guide" 3rd Edition, O'Reilly Media.
2. Matei Zaharia, Holden Karau, Andi Konwinski, Patric Wendell, Learning Spark, O'Reilly Media,2015.
3. by Chuck Lam, "Hadoop in Action" MANNING Publ.
4. Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss, "Hadoop for Dummies"

REFERENCE BOOKS:
1. Alex Holmes, "Hadoop in Practice", MANNING Publ.
2. Srinath Perera, "Hadoop MapReduce Cookbook", Thilina Gunarathne

WEB REFERENCES:
1. https://www.edx.org/learn/big-data
2. https://www.edureka.co/big-data-and-hadoop

III B.TECH II SEMESTER (PE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3202	**MOBILE COMPUTING**						

COURSE OBJECTIVES:

- To make the student understand the concept of mobile computing paradigm, its applications and limitations.
- To understand the typical mobile networking infrastructure through GSM
- To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
- To understand the ad hoc networks and related concepts.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Interpret the applications and architecture of Mobile Computing and multiplexing Techniques. [K2]
CO 2: Analyze the Mobile IP issues. [K4]
CO 3: Analyze the various Mobile TCP Variants. [K4]
CO 4: Analyze the various routing protocols in MANET. [K4]

SYLLABUS:

UNIT–I

Mobile Computing: Architecture of Mobile Computing, Mobile Computing Applications, Limitations of Mobile Computing

GSM: Services, System Architecture, Radio Interfaces, Protocols, Localization& Calling, Handover, Security, New Data Services, GPRS.

UNIT–II

(Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

UNIT–III

Mobile Network Layer: Mobile IP- Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunnelling and encapsulation, optimizations, Dynamic Host Configuration Protocol (DHCP).

UNIT-IV

Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT-V

Mobile Ad hoc Networks (MANETs): Introduction, Characteristics, Applications & Challenges of a MANET, Routing - Proactive, Reactive and Hybrid Routing Algorithms (DSR, AODV, DSDV, OLSR & ZRP).

TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, 2nd edition, 2004.
2. Rajkamal, "Mobile computing" Second Edition ,Oxford University Press

REFERENCE BOOKS:

1. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028.
2. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden ,Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-Hill Professional, 2005.
3. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, second edition, 2003.
4. MartynMallick, "Mobile and Wireless Design Essentials", Wiley DreamTech, 2003

WEB REFERENCES:

1. URL: https://www.youtube.com/watch?v=ohhdNRtDpCY

E-BOOKS:

1. https://www3.nd.edu/~cpoellab/teaching/cse40814/Lecture1-Handouts.pdf

III B.TECH II SEMESTER (PE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3207	**DESIGN PATTERNS**						

COURSE OBJECTIVE:
- Demonstration of patterns related to object oriented design.
- Describe the design patterns that are common in software applications.
- Analyze a software development problem and express it.
- Design a module structure to solve a problem, and evaluate alternatives.
- Implement a module so that it executes efficiently and correctly.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO1 Construct a design consisting of a collection of modules. [K4]
CO2 Exploit well-known design patterns. [K4]
CO3 Distinguish between different categories of design patterns. [K4]
CO4 Apply common design patterns to incremental/iterative development. [K3]
CO5 Identify appropriate patterns for design of given problem. [K3]

SYLLABUS:
UNIT-I
INTRODUCTION TO UML AND PATTERNS: Class Diagram, Collaboration Diagram, Statechart Diagram, Deployment Diagram, Patterns Description, A Brief History of Patterns, The Software Life Cycle-Business Case, Define Requirements Specification, Develop High-Level Essential Use Cases, Object-Oriented Analysis, Object-Oriented Design.

UNIT-II
FUNDAMENTALS AND CREATION OF PATTERNS: Delegation, Interface, Abstract Superclass, Interface and Abstract Class, Immutable, Marker Interface, Proxy, Factory Method, Abstract Factory, Singleton.

UNIT-III
STRUCTURAL PATTERNS: Adapter, Iterator, Bridge, Façade, Flyweight, Dynamic Linkage, Virtual Proxy, Decorator, Cache Management.

UNIT-IV
BEHAVIORAL PATTERNS: Chain of Responsibility, Command, Little Language, Snapshot, Observer, Null Object, Strategy, Template Method, Visitor.

UNIT-V
CONCURRENCY PATTERNS: Single Threaded Execution, Guarded Suspension, Balking, Scheduler, Read/Write Lock, Producer-Consumer, Two-Phase Termination, Asynchronous Processing, Future.

TEXT BOOKS:

1. Mark Grand, "Pattern's in JAVA Vol-I", Wiley, DreamTech.

REFERENCE BOOKS:

1. Erich Gamma, "Design Patterns", Pearson Education.
2. Mark Grand, "Pattern's in JAVA Vol-II", Wiley DreamTech.
3. Mark Grand, "JAVA Enterprise Design Patterns Vol-III", Wiley DreamTech.
4. Eric Freeman-Oreilly-spd, "Head First Design Patterns".

WEB REFERENCES:

1. https://refactoring.guru/design-patterns
2. https://sourcemaking.com/design_patterns
3. https://www.geeksforgeeks.org/software-design-patterns/
4. https://www.amazon.in/design-patterns-object-oriented-addison-wesley-professional/dp/0201633612

III B.TECH II SEMESTER (PE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CS3203	**HIGH PERFORMANCE COMPUTING**						

COURSE OBJECTIVES:

- To learn about approaches used in high performance computing.
- To learn about techniques and methods to scale up scientific applications.
- To design advanced modern computing systems.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Interpret the terminology of high performance computing [K2].

CO 2: Make use of MPI based parallel programs in distributed Memory architectures [K2].

CO 3: Analyze parallel programs using Pthreads and OpenMP [K3]..

CO 4: Summarize the concept of GP-GPU [K2].

SYLLABUS:

UNIT - I

Introduction to Parallel hardware and software, need for high performance systems and Parallel Programming, SISD, SIMD, MISD, MIMD models, Performance issues.

UNIT - II

PThreads, Thread Creation, Passing arguments to Thread function, Simple matrix multiplication using Pthreads.

UNIT - III

Pthreads: Critical sections, mutexes, semaphores, barriers and conditional variables, locks, thread safety, simple programming assignments.

UNIT - IV

Open MP Programming: introduction, reduction clause, parallel for-loop scheduling, atomic directive, critical sections and locks, private directive, Programming assignments, n body solvers using openMP.

UNIT - V

Introduction to MPI programming: MPI primitives such as MPI_Send, MPI-Recv, MPI_Init, MPI-Finalize, etc., Application of MPI to Trepizoidal rule, Parallel Quick sorting algorithm

TEXT BOOKS:

1. An Introduction to Parallel Programming, Peter S Pacheco, Elsevier, 2011

2. Programming Massively Parallel Processors, Kirk & Hwu, Elsevier, 2012

REFERENCE BOOKS:

1. CUDA by example: An introduction to General Purpose GPU Programming, Jason,Sanders, Edward Kandrit, Perason, 2011

2. CUDA Programming, Shame Cook, Elsevier

3. High Performance Heterogeneous Computing, Jack Dongarra, Alexey & Lastovetsky , Wiley

4. Parallel computing theory and practice, Michel J.Quinn, TMH

ONLINE REFERENCES:

1. https://in.udacity.com/course/high-performance-computing--ud281

2. https://www.edx.org/course/high-performance-computing-reproducible-harvardx-ph525-6x-1

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CC32L1	**ADVANCED JAVA AND WEB TECHNOLOGIES LAB**						

COURSE OBJECTIVES:
- Gain the knowledge of Server side programming languages and techniques associated with the World Wide Web.
- Understand how to use Server side scripting for creating dynamic web pages.

COURSE OUTCOMES:
After the successful completion of this course, the students will be able to:
CO 1: Experiment with the installation of Web Servers. [K3]
CO 2: Make use of servlets in dynamic web pages. [K3]
CO 3: Develop web applications using JSP for effective data management. [K3]
CO 4: Construct the web based applications in PHP using effective data base access with rich client interaction. [K3]

LIST OF EXPERIMENTS
1. Install TOMCAT webserver and Apache- MySQL.
2. Write a servlet program which receives data from HTML forms and respond it.
3. Create one Servlet to retrieve "ServletContext Initialization Parameters " which you have given in the web.xml file.
4. Write a servlet program to authenticate four users using cookies.
5. Write a servlet that, on entry of a *student rollno*, displays the full details of that students details(Using student table with rollno,Name,Address,date of birth, course fields).
6. Write JSP program to register a student using registration form using student table.
7. Write JSP program for authenticating user by his password using login form. Create suitable tables.
8. Create table to store the details of book(book name, price, author, publisher) and extract data from table and display all books using JSP and JDBC.
9. Write PHP programs that uses arrays and functions in PHP.
10. Write example PHP program for creating login form and validate users.
11. Write example PHP program for to display all students in cse using student table.
12. Create tables in database which contains the details of book .Extract data from tables and display them using PHP.

WEB REFERENCES:
1. https://www.coursera.org/learn/html-css-javascript-for-web-developers
2. https://www.coursera.org/learn/web-applications-php
3. https://www.udemy.com/javawebtut/
4. https://www.coursera.org/learn/desenvolvimento-agil-com-java-avancado/lecture/LUXm0/criando-java-servlets.

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CC32L2	**MACHINE LEARNING LAB**						

COURSE OBJECTIVES:

- To make the student to get a clear understanding of the core concepts of python like import data in various formats for statistical computing, data manipulation, business analytics, machine learning algorithms and data visualization etc.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Analyse exploratory data analysis. [K4]

CO 2: Analyze the real word datasets presented in different formats using python libraries to Perform exploratory data analysis.[K4]

CO 3: Apply the machine learning algorithms on various real time data sets. [K3]

CO 4: Analyze the data by using visualization tools or libraries. [K4]

LIST OF EXPERIMENTS

1. Perform Basic Visualizations (bar chart, scatter plot, boxplot,histogram etc) for all the columns(numerical data only) on the specified dataset and draw the inferences for the visualizations in excel.
2. Build a prediction model for simple linear regression and do the necessary transformations for input variables for getting better R^2 value for the model prepared.
3. Build a prediction model for multiple linear regression and do the necessary transformations for input variables for getting better R^2 value for the model prepared.
4. Build a prediction model to perform logistic regression.
5. Build a model to generate association rules by using apriori algorithm on the Movies data sets
   i. Try different values of support and confidence. Observe the change in number of rules for different support,confidence values
   ii. Change the minimum length in apriori algorithm Visulize the obtained rules using different plots
6. Perform clustering using k-means clustering algorithm.
7. Perform Principle Component Analysis and then perform clustering.
8. Prepare a Classification model using decision tree Classifier.
9. Prepare a Classification model using Navie Bayes Classifier

TEXT BOOKS:

1. Aurélien Géron, "Handson machine learning with scikit learn and tensorflow"

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc21_cs22/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs23/preview
3. https://onlinecourses.nptel.ac.in/noc21_cs24/preview
4. https://onlinecourses.nptel.ac.in/noc21_cs51/preview

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CC32L3	**BIG DATA ANALYTICS LAB**						

COURSE OBJECTIVES:
- Introducing Java concepts required for developing map reduce programs.
- Optimize business decisions and create competitive advantage with Big Data analytics.
- Derive business benefit from unstructured data.
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm.
- To introduce programming tools PIG & HIVE in Hadoop echo system.

COURSE OUTCOMES:
After successful completion of the course, student will be able to:
CO 1: Experiment with installation of Hadoop and develop applications using MapReduce framework. [K3]
CO 2: Experiment with installation of Spark and develop applications. [K3]
CO 3: Analyze Hadoop data with PIG. [K4]
CO 4: Develop NoSQL structures like Hive for processing and aggregating logs in the database. [K3]

LIST OF EXPERIMENTS

1. (i) Perform setting up and Installing Hadoop in its three operating modes: Standalone, Pseudo distributed, and fully distributed mode.
   (ii) Use web based tools to monitor your Hadoop setup.
2. Implement the following file management tasks in Hadoop:
   - Adding files and directories
   - Retrieving files
   - Deleting files
   Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
4. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
5. (i) Perform setting up and Installing SPARK.
   (ii)Use web based tools to monitor your SPARK setup.
6. Run a basic Word Count Map Reduce program using SPARK.
7. Write a SPARK program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis, since it is semi structured and record-oriented.
8. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
9. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes

WEB REFERENCES:

1. http://hadoop.apache.org/
2. https://cwiki.apache.org/confluence/display/Hive/Home
3. http://pig.apache.org/docs/r0.7.0/tutorial.html

III B.TECH II SEMESTER (SOC)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	4	0	50	50	2
SUBCODE: R20CS32SC4	**Internet of Things (IoT)**						

COURSE OBJECTIVES:
- To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To apply the concept of Internet of Things in the real world scenario.

COURSE OUTCOMES:
After successful completion of this course, students will be able to:
CO1: Analyze the requirements, specifications to design home automation applications [K4].
CO2: Build smart city applications using Arduino[K4].
CO3: Develop agricultural applications using Raspberry pi [K4].
CO4: Utilize AutoBahn, Xively Cloud communication API's to exchange data [K4].

LIST OF EXPERIEMENTS

1.
    a. Indentify the parts of Arduino board.
    b. How to install Arduino board in different operating systems
    c. Blink the LED on and off with 500 ms time delay using Arduino UNO board.

2.
    a. Blink the LED on and off with 200 ms time delay using Arduino UNO board.
    b. Controlling AC light using Arduino UNO with Relay module.

3.
    a. Detecting obstacle with IR sensor and Arduino.

4.
    b. Setup the Dht 11 Humidity sensor on an Arduino.

5.
    a. Find the distance using ultrasonic sensor HC-SR04 and Arduino.
    b. Display the wave on processing IDE console using HC-SR04 sensor.

6. Blink the LED using LDR sensor.

7. Smoke detection using MQ-2 gas sensor.

8. Motion detection using PIR sensors.

9. Display the text using 16 X 2 LCD display module.

10. Controlling LED with Raspberry Pi 3.

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	0	0	0	0
SUBCODE: R20CC32MC2	**PROFESSIONAL ETHICS AND HUMAN VALUES**						

COURSE OBJECTIVES:
- To equip the student with the basic knowledge relating to the ethical behaviour in engineering discipline and to make the students understand the rules and regulation relating to intellectual property rights (Patents, copyrights, trademarks etc.,)

COURSE OUTCOMES:
After completion of this course, the students would be able to

CO1 : Learn necessary behavioural skills relating to the Ethics at industrial sector and to gain fundamental knowledge [K2].

CO2 : Acquaint with basic human values, responsibilities and rights of engineers which are very much necessary today [K2].

CO3 : Equip with knowledge on basics of intellectual property rights and cyber law [K2].

CO4 : Gain knowledge on the patents, trademark and copy rights [K2].

SYLLABUS

UNIT - I
Human Values: Ethics, Morals, Values, Integrity, Work Ethics, Service Learning, Civic Virtue, Respect for Others, Living Peacefully, Caring, Sharing, Honesty, Courage, Value of Time, Cooperation, Commitment, Empathy, Self-Confidence, Spirituality, Character.

UNIT - II
Engineering Ethics: Professional Roles to Be Played By Engineer - Engineers Role as Managers, Consultants and Leaders; Ethical Theories and its uses.

UNIT - III
Engineers Responsibilities and Rights: Professional Rights and Responsibilities, Whistle Blowing, Cross Cultural Issues and Occupational Crimes, Industrial Espionage.

UNIT - IV
Introduction to Intellectual Property Law : The Evolutionary Past, The IPR Tool Kit, Legal Tasks in Intellectual Property Law, Ethical obligations in Intellectual Property Law, Introduction to Cyber Law, Cybercrimes, Innovations and Inventions Trade related Intellectual Property Right.

UNIT - V
Intellectual property Rights : Basics, Types of Intellectual Property, Copy Rights – Principles- Subject Matter of Copy Rights; Copy Right Formalities and Registration, Patent Law - Rights and Limitations, Patent Requirements, Patent Registration Process.

UNIT - VI
Trademark: Trademark Registration Process - Post Registration Process, Transfer of Rights, Trade Secrets – Maintaining Trade Secrets; Physical Security, Employee Confidentiality Agreement.

TEXT BOOK:

1. Professional Ethics and Morals, Prof. A.R.Aryasri, Dharanikota Suyodhana, 1/e, Maruthi Publications.

1. Intellectual property , Deborah e. Bouchoux, 1/e, Cengage learning, New Delhi.

REFERENCES:

1. Kompal Bansal & Parishit Bansal" Fundamentals of IPR for Engineers BS Publications.

2. Cyber Law. Texts & Cases, South- western's special topics collections.

3. M. Ashok kumar and mohd. Iqbal Ali: "Intellectual property right" serials pub.

4. "Engineering Ethics and Human Values" by M. Govindarajan, S. Natarajan and V.S. Senthil kumar- PHI Learning PVT. Ltd-2009

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106102064/1

2. nptel.ac.in/courses/106103069

R20 COURSE STRUCTURE
IV B.TECH – I SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CS4107 R20CS4108 R20CC4103 R20CS4109	**Professional Elective – III** 1. Cyber Security 2. Mobile Adhoc and Sensor Networks 3. Service Oriented Architecture 4. Web and Micro Services	PE	30	70	100	3	0	0	3
2	R20CC4110 R20CC4111 R20CS4112 R20CC4104	**Professional Elective – IV** 1. Deep Learning 2. DevOps 3. Inter-Networking With Tcp/Ip 4. E- Commerce	PE	30	70	100	3	0	0	3
3	R20CS4113 R20CC4106 R20CS4114 R20CC4105 R20CC4102	**Professional Elective – V** 1. Social Media Analytics 2. Natural Language Processing 3. Software Defined Networks 4. Software Project Management 5. Human Computer Interaction	PE	30	70	100	3	0	0	3
4		**Open Elective – III**	OE	30	70	100	3	0	0	3
5		**Open Elective – IV**	OE	30	70	100	3	0	0	3
6	R20CC4101 R20CC4117	1. Business Management Concepts for Engineers 2. Entrepreneurship and Innovation	HS	30	70	100	3	0	0	3
7	R20CC41SC1	Agile with SCRUM	SC	-	50	50	0	0	4	2
8	R20CC41IN	Summer Internship / Community Service Project	PR	-	50	50	0	0	0	1.5
9	R20CC41MC	MOOCS								1.5
TOTAL										23

IV B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CS4107	**CYBER SECURITY**						

COURSE OBJECTIVES:

- The Cyber security Course will provide the students with foundational Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

COURSE OUTCOMES:

After completion of this course, the students would be able to

C01: Interpret Cyber Security architecture principles [K2].

C02: Identifying System and application security threats and vulnerabilities [K3].

C03: Identifying different classes of attacks [K3].

C04: Cyber Security incidents to apply appropriate response [K3].

C05: Describing risk management processes and practices [K3].

C06: Evaluation of decision-making outcomes of Cyber Security scenarios [K4].

SYLLABUS

UNIT- I

Introduction to Cybercrime:

Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens.

Cyber offenses: How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT –II

Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT –III

Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft:Introduction, Phishing, IdentityTheft(IDTheft)

UNIT –IV

Cybercrimes and Cyber security:

Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program, Continuing Strategies.

UNIT –V

Understanding Computer Forensics:

Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics.

TEXT BOOKS:

1.Cyber Security: Understanding Cyber Crimes, Computer Forensics and LegalPerspectives, Nina Godbole, SunitBelapure, Wiley.
2.Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCE BOOK:

1. Information Security, Mark Rhodes, Ousley, MGH.

IV B.TECH	L	T	P	INTERNAL	EXTERNAL	TOTAL	CREDITS

I SEMESTER				MARKS	MARKS	MARKS	
	3	0	0	30	70	100	3
SUBCODE: R20CC4108	**MOBILE ADHOC & SENSOR NETWORKS**						

COURSE OBJECTIVES:

- To make the student understand the concepts of MOBILE AD HOC NETWORKS (MANET) as well as Wireless Sensor Networks (WSN), their characteristics, novel applications, and technical challenges.
- To understand the issues and solutions of various layers of MANETs, namely MAC layer, Network Layer &
- Transport Layer in MANETs and WSN.
- To understand the platforms and protocols used in MANETs and WSN.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO 1: Analyse the routing protocols in MANET. [K4]

CO 2: Interpret the TCP over Ad-hoc Networks. [K2]

CO 3: Interpret the data transmission and data acquisition in WSN. [K2]

CO 4: Design and Develop the various heterogeneous architectures. [K6]

SYLLABUS:

UNIT- I

Introduction to Ad Hoc Networks: Characteristics of MANETs, applications of MANETs, and challenges of MANETs.

Routing in Adhoc Networks: Introduction, Topology based versus Position based approaches, Topology based routing Protocols and Position based routing Protocols

UNIT- II

TCP over Ad Hoc: TCP protocol overview, TCP and MANETs and Solutions for TCP over Ad hoc

UNIT- III

Basics of Wireless Sensors and applications: Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors. Applications of Sensor Networks.

UNIT- IV

Data Retrieval in Sensor Networks: MAC layer, Routing layer, High-level application layer support

UNIT- V

Integrating MANETs, WLANs, and Cellular Network: Introduction, Ingredients of a Heterogeneous Architecture, Protocol stack, Comparison of the Integrated Architectures

TEXTBOOK:

1. Carlos Cordeiro and Dharma P. Agrawal, "Ad hoc and Sensor Networks - Theory

and Applications", World Scientific Publications, March 2006, ISBN 981-256-681- 3.

3. Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks: An Information Processing Approach", Elsevier Science ISBN: 978-1-55860-914-3, (Morgan Kauffman)

WEB REFERENCES:

1. https://scholar.google.co.in/scholar?q=MOBILE+ADHOC+%26+SENSOR+NETWORKS&hl=en&as_sdt=0&as_vis=1&oi=scholart

2. https://link.springer.com/book/10.1007/978-3-540-77024-4

3. https://en.wikipedia.org/wiki/Wireless_ad_hoc_network

IV B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC4103	**SERVICE ORIENTED ARCHITECTURE**						

COURSE OBJECTIVES:

- Understand the concepts of Service Oriented Architecture along with the evolution of SOA

- Be aware of the key issues facing many organizations, especially dealing with integration among systems and providing architectural abstractions to them

- Integrate SOA technologies with Web Services paradigms.

- Know related technologies and implementation basics of SOA

COURSE OUTCOMES:

After the completion of this course student will be able to

CO 1: Summarize primary concepts of SOA. [K2]

CO 2: Identify the integration of SOA technological points with Web Services. [K3]

CO 3: Implement of SOA in development cycle of Web Services. [K3]

SYLLABUS:

UNIT - I

Introducing SOA: Fundamental SOA, Characteristics of contemporary SOA, Misperception about SOA, Tangible benefits of SOA.

UNIT - II

The Evolution of SOA: An SOA timeline, Continuing evolution of SOA, Roots of SOA.

UNIT - III

Web Services and Primitive SOA: Web Services framework, Services (Web services: Definition, Architecture and standards), Service descriptions with WSDL, Messaging with SOAP, UDDI.

UNIT - IV

Web Services and Contemporary SOA (I: Activity Management and Composition): Message exchange patterns, Coordination, Atomic transactions, Business activities, Orchestration, Choreography.

UNIT – V

Web Services and Contemporary SOA (II: Advanced Messaging, Metadata, and Security): Addressing, Reliable messaging, Correlation, Polices

TEXT BOOK:

1. Thomas Erl, "Service Oriented Architecture: Concepts, Technology, and Design", Pearson education.

REFERENCES:

1. Mark D Hansen, "SOA using Java Web Services", Prentice Hall Publication.
2. Michael Rosen & et el., "Applied SOA", Wiley Publication.
3. Roshen, " SOA based Enterprise Integration", TMH Publication.
4. Muninder Singh & Michael Huhns, "Service Oriented Computing". Wiley Publication.
5. B. V. Kumar, Prakash Narayan & Tony Ng, "Implementing SOA Using Java EE".

WEB REFERENCES:

1. https://studentsfocus.com/it6801-soa-notes-service-oriented-architecture-lecture-handwritten-notes-cse-7th-sem-anna-university/
2. https://lecturenotes.in/subject/493/service-oriented-architecture
3. http://www.sasurieengg.com/e-course-material/CSE/IV-Year%20IT%20Sem%207%209/IV%20%20IT%20SOA.pdf

IV B.TECH I SEMESTER (PE-III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CS4109	**WEB AND MICRO SERVICES**						

COURSE OBJECTIVES:

- Understand the usage of web services, operational model of web services and architecture.
- Enable the Service registry and Service discovery.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Compare and Contrast various web services [K2].
CO 2: Make use of web services in web applications [K2].
CO 3: Analyze SOAP web services in web applications [K4].
CO 4: Interpret the usage of WSDL and UDDI data model in the world of web service [K3].
CO 5: Analyze the REST based web services [K4].

SYLLABUS:

UNIT - I

Evolution and Emergence of Web Services: Evolution of distributed computing, Core distributed computing technologies, client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services: The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

UNIT - II

Web Services Architecture: Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services, developing web services enabled applications.

UNIT - III

Core fundamentals of SOAP: SOAP Message Structure, SOAP Encoding , SOAP message exchange models, SOAP communication and messaging, SOAP security. Developing Web Services using SOAP: Building SOAP Web Services, developing SOAP Web Services using Java, limitations of SOAP.

UNIT - IV

Describing Web Services: WSDL, WSDL in the world of Web Services, Web Services life cycle, anatomy of WSDL definition document, WSDL bindings, WSDL Tools, limitations of WSDL.

UNIT - V

Discovering Web Services: Service discovery, role of service discovery in a SOA, service discovery mechanisms, UDDI: UDDI Registries, uses of UDDI Registry, Programming with UDDI, UDDI data structures, support for categorization in UDDI Registries, Publishing API,

Publishing information to a UDDI Registry, searching information in a UDDI Registry, deleting information in a UDDI Registry, limitations of UDDI.

UNIT - VI

RESTful Web Services: The Client Side, A Perl Client against a Java RESTful Web Service, a Client Against the Amazon E-Commerce Service , a Standalone JAX-B Example, JSON for JavaScript Clients , JSONP and Web Services 135 ,A Composed RESTful Service with jQuery.

TEXT BOOKS:

1. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India, rp 2008.
2. Developing Enterprise Web Services, S. Chatterjee, J. Webber,Pearson Education, 2008.

REFERENCE BOOK:

1. J2EE Web Services, Richard Monson-Haefel, Pearson Education.

ONLINE REFERENCES:

1. http://course-catalog-api-guide.readthedocs.io/en/latest/authentication/
2. https://www.youtube.com/watch?v=oTzNRv6X51o&list=PLhW3qG5bs-L9E2KV6vVdB-YTk-sRxmRAB
3. https://www.coursera.org/learn/ruby-on-rails-web-services- mongodb/lecture/7MHzi/introduction-to-web-services

IV B.TECH I SEMESTER (PE-IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CS4110	**DEEP LEARNING**						

COURSE OBJECTIVES:

- To present the mathematical, statistical and computational challenges of building neural Networks
- To study the concepts of deep learning
- To introduce dimensionality reduction techniques
- To enable the students to know deep learning techniques to support real-time applications
- To examine the case studies of deep learning techniques

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Summarize the characteristics of Machine Learning and Deep Learning that make it useful to real-world Problems. [K2]

CO 2: Realign high dimensional data using reduction techniques. [K3]

CO 3: Analyze optimization and generalization in deep learning. [K4]

CO 4: Implement various deep learning models. [K3]

SYLLABUS:

UNIT– I

Machine Learning Basics Learning

Algorithms, Capacity, Over fitting and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Estimation Bayesian Statistics. Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning.

UNIT–II

Deep Feedforward Networks

Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

Regularization for Deep Learning

parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multitask Learning.

UNIT-III

Optimization for Training Deep Models

How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT-IV

Convolutional Networks

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks.

UNIT–V
Sequence Modeling:
Recurrent and Recursive Nets Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Optimization for Long-Term Dependencies, Explicit Memory.

TEXT BOOKS:
1. Goodfellow, I., Bengio, Y., Courville, A., & Bengio, Y. "Deep Learning,Vol.1. Cambridge", MIT press.
2. François Duval , "Deep Learning: Deep Learning for Beginners. Practical Guide with Python and Tensorflow", Data Sciences Publishing.

REFERENCE BOOKS:
1. Sebastian Raschka, Vahid Mirjalili, "Python Machine Learning: Machine. Learning and Deep Learning with Python", scikit-learn and TensorFlow, 2nd Edition, Packt Publishing.

WEB REFERENCES:

1. https://buomsoo-kim.github.io/learning/2020/03/25/Data-science-study-materials.md/

2. https://www.kaggle.com/getting-started/37999

3. https://drive.google.com/file/d/1DXdl4iPzYy7GEFRUROUv8cZRSxgUmu1E/view?usp=drivesdk

4. https://mega.nz/folder/NmQRlaBa#0FKTDkkHYBmkSmcEu0kGoQ

IV B.TECH I SEMESTER (PE-IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CS4111	**DevOps**						

COURSE OBJECTIVES:

- DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

COURSE OUTCOMES:

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

CO 1: Demonstrate the phases of software development life cycle. [K2]

CO 2: Outline the basic Fundamentals of DevOps. [K2]

CO 3: Adopt the DevOps technology into the project. [K6]

CO 4: Evaluate the CI/CD concepts and metrics to track CI/CD practices. [K5]

CO 5: Summarize the importance of DevOps maturity models. [K2]

SYLLABUS:

UNIT- I

Phases of Software Development life cycle. Values and principles of agile software development.

UNIT- II

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of Applications, DevOps delivery pipeline, DevOps eco system.

UNIT- III

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT- IV

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices

UNIT- V

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity Model, DevOps maturity Assessment.

TEXT BOOKS:

1. Gene Kim , John Willis , Patrick Debois, "The DevOPS Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations" Jez Humb,O'Reilly Publications
2. Mike Loukides, "What is Devops? Infrastructure as code" O'Reilly publications.
3. Jez Humble and David Farley, "Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation",
4. Dave Harrison, Knox Lively, "Achieving DevOps: A Novel About Delivering the Best of

Agile, DevOps, and Microservices.
5. Joakim Verona , Packt, "Practical Devops"

REFERENCE BOOKS:

1. Mandi Walls, "Building a DevOps Culture", O'Reilly publications
2. Viktor Farcic, "The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Micro services"

WEB REFERENCES:

1. https://www.youtube.com/watch?v=hQcFE0RD0cQ

2. https://www.youtube.com/watch?v=YSkDtQ2RA_c

3. https://www.svrtechnologies.video/courses/devops-training-free/lectures/10955807

4. https://www.youtube.com/watch?v=MOZMw5_fBFA

IV B.TECH I SEMESTER (PE-IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CS4112	INTER-NETWORKING WITH TCP/IP						

COURSE OBJECTIVES:
- Understand the architecture of the Internet protocols as a layered model.
- Describe the functions implemented by each protocol, the design of the protocol and the characteristics of typical implementations.
- Analyze the relationships and dependencies between the protocols.

COURSE OUTCOMES:
at the end of this course student will be able to:
CO1 : Describe the architecture, design and behaviours of the internet [K2].
CO2 : Analyze the performance of TCP/IP suite of protocols [K3].
CO3 : Describe the concepts and techniques that have been used to design and implement the TCP/IP Internet technology [K2].
CO4 : Describe the issues that are driving the development of new protocols to broaden and enhance the operation of the Internet [K2].

SYLLABUS

UNIT I
INTRODUCTION: Introduction to internetworking, Overview of OSI Model TCP/IP protocol suite, Basics of switching technologies and switches, Comparisons of different models, Gateways.

UNIT II
INTERNET PROTOCOL: Purpose of Internet Protocol, Internet datagram, Options, Checksum, ARP and RARP, Routing Methods: Routing Table and Routing module, ICMP, IGMP. **IP Addresses:** Introduction, Address Classification, A sample internet with classful addressing, Subnetting, Supernetting, Classless addressing, Security at the IP Layer, IPSec, IPv4 and IPv6 packet formats.

UNIT III
ROUTING PROTOCOLS: UNICAST ROUTING PROTOCOLS Interior and Exterior routing, RIP, OSPF, BGP,
Multicasting: Introduction, Multicast Routing, Multicast Routing Protocols, Multicast Trees, DVMRP, MOSPF,CBT,PIM, MBONE.

UNIT IV
TRANSPORT CONTROL PROTOCOL: TCP: TCP operation, Segment, Sliding window, Silly window, Options, TCP state machine, Karn's Algorithm, Congestion control- Leaky bucket and Token bucket algorithms. **UDP:** User Datagram, UDP operations, Checksum calculation.

UNIT V

TCP/IP OVER ATM NETWORKS: ISDN and B-ISDN, ATM reference model, ATM Switch, Interconnection Network, Virtual circuit in ATM, Paths, Circuits and identifiers, ATM cell transport and adaptation layers, packet type and multiplexing, IP Address binding in an ATM Network, Logical Subnet Concept and Connection Management.

TEXT BOOKS:
1. Internetworking with TCP/IP by Comer (Vol. 1)(PHI Pub.)
2. TCP/IP Protocol suite by Behrouz A. Forouzan.(TMH Pub.)

REFERENCE BOOKS:
1. Computer Networking by James F. Kurose, Keith W. Ross (Pearson Education)
2. TCP/IP Illustrated By Wright and Stevens (Vol.2) (Pearson Education)
3. An Introduction to Computer Networks by Kenneth C. Mansfield Jr. James L. Antonakes (PHI)

IV B.TECH I SEMESTER (PE-VI)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC4104	E - COMMERCE						

COURSE OBJECTIVES:

- To introduce the fundamental principles of e-business, e-commerce, and the role of management.
- To introduce the application of tools and services to the development of small-scale e- commerce applications

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:
CO 1: Interpret the E-commerce applications and Process Model. [K2]
CO 2: Compare and contrast various electronic Payment Systems. [K3]
CO 3: Interpret the Intra Organizational Commerce. [K2]
CO 4: Outline the corporate digital library and marketing research. [K2]
CO 5: Analyze resource discovery and information filtering. [K4]

SYLLABUS:
UNIT – I
Electronic Commerce-Framework, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

UNIT – II
Consumer Oriented Electronic commerce - Mercantile Process models.
Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

UNIT – III
Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT – IV
Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses.
Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research.

UNIT – V
Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering. Digital Video and electronic Commerce

TEXT BOOKS :
1. Kalakata, Whinston, "Frontiers of electronic commerce", Pearson.

REFERENCE BOOKS :

1. Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley, "E-Commerce fundamentals and applications"
2. S.Jaiswal – Galgotia, "E-Commerce".
3. Efrain Turbon, Jae Lee, David King, H.Michael Chang, "E-Commerce".
4. Gary P.Schneider, "Electronic Commerce", Thomson.
5. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol Guyerico Traver.

WEB REFERENCES:

1. https://www.slideshare.net/kamalgulati7/full-notes-on-ecommerce-study-material-for-ecommerce
2. http://www.vssut.ac.in/lecture_notes/lecture1428551057.pdf
3. https://www.geektonight.com/e-commerce-notes/

IV B.TECH I SEMESTER (PE-VI)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CS4113	**SOCIAL MEDIA ANALYTICS**						

COURSE OBJECTIVES

This course enables the students:

- To understand the concepts of social media concepts and enlisting the python
- To conceive the Harnessing Social Data - Connecting, Capturing, and Cleaning:
- To familiarize various Twitter Using Sentiment Analysis and Entity Recognition, Scope and process To develop systems for various NLP problems with moderate complexity.
- To learn various Social Data Analytics at Scale

COURSE OUTCOMES

After the completion of this course, students will be able to:

CO1: Describe the concepts of social media concepts and enlisting the python [K2].

CO2: Analyze the Harnessing Social Data - Connecting, Capturing, and Cleaning [K4].

CO3: Analyzing Twitter Using Sentiment Analysis and Entity Recognition, Scope and process [K4].

CO4: Analyze the Demystifying Pinterest through Network Analysis of Users Interests, Scope and process [K4].

CO5: Evaluate Social Data Analytics at Scale – Spark and Amazon Web Services [K4].

UNIT - I:
Introduction to the Latest Social Media Landscape and Importance:
Introducing social graph, Delving into social data, Understanding the process, Working environment, Defining Python, Selecting an IDE, Illustrating Git, Getting the data, Defining API, Scraping and crawling, Analyzing the data, Visualizing the data, Getting started with the toolset.

UNIT - II:
Harnessing Social Data - Connecting, Capturing, and Cleaning:
APIs in a nutshell, Different types of API, RESTful API, Stream API, Advantages of social media APIs, Limitations of social media APIs, Connecting principles of APIs,
Introduction to authentication techniques, Parsing API outputs: Twitter, Facebook, GitHub, YouTube, Pinterest. Basic cleaning techniques, MongoDB to store and access social data, MongoDB using Python.

UNIT -III:
Analyzing Twitter Using Sentiment Analysis and Entity Recognition, Scope and process, Getting the data, Getting Twitter API keys, Data extraction, REST API Search endpoint, Rate Limits, Streaming API, Data pull,

Data cleaning, Sentiment analysis, Customized sentiment analysis, Labeling the data, Creating the model, Model performance evaluation and cross-validation, Confusion matrix, K-fold cross-validation, Named entity recognition, Installing NER, Combining NER and sentiment analysis, Summary.

UNIT - IV:

Demystifying Pinterest through Network Analysis of Users Interests, Scope and process, Getting the data, Pinterest API and Steps, Scraping Pinterest search results, Building a scraper with Selenium, Scraping time constraints, Data pull and pre-processing, Pinterest API data, Bigram extraction, Building a graph, Pinterest search results data, Bigram extraction, Building a graph, Data analysis, Understanding relationships between our own topics, Finding influencers, Conclusions, Community structure

UNIT - V:

Social Data Analytics at Scale – Spark and Amazon Web Services, Different scaling methods and platforms, Parallel computing, Distributed computing with Celery, Celery multiple node deployment, Distributed computing with Spark, Text mining With Spark, Topic models at scale, Spark on the Cloud – Amazon Elastic Map Reduce.

PRESCRIBED TEXT BOOK:

1. Python Social Media Analytics, Siddhartha Chatterjee Michal Krystyanczuk by Packet Publishing Ltd.
2. Social Media Analytics,Techniques and Insights for Extracting Business Value Out of Social Media, By Matt Ganis, Avinash Kohirkar · 2016

REFERENCE BOOKS:

1. Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics
2. Mining The Social Web: Data Mining Facebbok, Twitter, Linkedin, Instagram, Github and More, Third Edition by Mathew A. Russell (Author), Mikhail Klassen (Author)

YOU TUBE LINKS:

1. https://www.youtube.com/watch?v=OOorJb1AfYA
2. https://www.coursera.org/learn/social-media-analytics-introduction

IV B.TECH I SEMESTER (PE-V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
SUBCODE: R20CS4106	**NATURAL LANGUAGE PROCESSING**						

COURSE OBJECTIVES

This course enables the students:

* To understand the algorithms available for the processing of linguistic Information and computational properties of natural languages.
* To conceive basic knowledge on various morphological, syntactic and Semantic NLP tasks.
* To familiarize various NLP software libraries and data sets publicly available.
* To develop systems for various NLP problems with moderate complexity.
* To learn various strategies for NLP system evaluation and error analysis.

COURSE OUTCOMES

After the completion of this course, students will be able to:

CO1: Describe the concepts of morphology, syntax, semantics, discourse &pragmatics of natural language. [K2].

CO2: Demonstrate understanding of the relationship between NLP and statistics &machine learning. [K4].

CO3: Discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis. [K4].

CO4: Develop systems for various NLP problems with moderate complexity [K4].

CO5: Evaluate NLP systems, identify shortcomings and suggest solutions for these shortcomings [K4].

SYLLABUS

UNIT-I

Introduction to NLP

NLP – introduction and applications, NLP phases, Difficulty of NLP including ambiguity;Spelling error and Noisy Channel Model; Concepts of Parts-of-speech and Formal Grammar of English.

UNIT-II

Language Modelling: N-gram and Neural Language Models Language Modelling with N-gram, Simple N-gram models, Smoothing (basic techniques),Evaluating language models; Neural Network basics, Training; Neural Language Model, Case study: application of neural language model in NLP system development

UNIT-III

Parts-of-speech Tagging Parts-of-speech Tagging: basic concepts; Tagset; Early approaches: Rule based and TBL; POS tagging using HMM, Introduction to POS Tagging using Neural Model.

UNIT-IV

Parsing Basic concepts: top down and bottom up parsing, treebank; Syntactic parsing: CKY parsing; Statistical parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs.

UNIT-V

Semantics Vector Semantics; Words and Vector; Measuring Similarity; Semantics with dense vectors; SVD and Latent Semantic Analysis; Embeddings from prediction: Skip-gram and CBOW; Concept of Word Sense; Introduction to WordNet.

TEXT BOOKS:

1. Jurafsky Dan and Martin James H. "Speech and Language Processing", 3rd Edition, 2018.

REFERENCE BOOKS:

1. Jurafsky D. and Martin J. H., "Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.

2. Goldberg Yoav "A Primer on Neural Network Models for Natural Language Processing".

IV B.TECH I SEMESTER (PE-V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
SUBCODE: R20CS4106	**SOFTWARE DEFINED NETWORKS**						

COURSE OBJECTIVES:

• To learn the fundamentals of software defined networks.

• To understand the separation of the data plane and the control plane.

• To study about the SDN Programming.

• To study about the various applications of SDN

COURSE OUTCOMES:

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

CO1: Analyze the evolution of software defined networks [K4].

CO2: Express the various components of SDN and their uses [K4].

CO3: Explain the use of SDN in the current networking scenario [K2].

CO4: Design and develop various applications of SDN [K4].

UNIT I

INTRODUCTION : History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Date Planes

UNIT II

OPEN FLOW & SDN CONTROLLERS: Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor- Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts

UNIT III

DATA CENTERS:Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE

UNIT IV

SDN PROGRAMMING : Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications

UNIT V

SDN : Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration

TEXT BOOKS:

1. Paul Goransson and Chuck Black, ―Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.
2. Thomas D. Nadeau, Ken Gray, ―SDN: Software Defined Networks, O'Reilly Media, 2013.

REFERENCES

1. Siamak Azodolmolky, ―Software Defined Networking with Open Flow, Packet Publishing, 2013.
2. Vivek Tiwari, ―SDN and Open Flow for Beginners‖, Amazon Digital Services, Inc., 2013.
3. Fei Hu, Editor, ―Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

IV B.TECH I SEMESTER (PE-V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
SUBCODE R20CC4102	**SOFTWARE PROJECT MANAGEMENT**						

COURSE OBJECTIVES:

- To study about the concepts of object-oriented software engineering.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Illustrate the conventional software Management and economics [K2].

CO 2: Outline the software life cycle phases and artifacts [K2].

CO 3: Illustrate the various workflows, check points and iterative process planning [K2].

CO 4: Analyze the project organizations, responsibilities and control [K4].

UNIT – I:

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:
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.
Model based software architectures: A Management perspective and technical perspective.

UNIT – III:
Work Flows of the process: Software process workflows, Iteration 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:
Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Process Automation: Automation Building blocks, The Project Environment.

UNIT – V: Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.
Tailoring the Process: Process discriminants.

TEXT BOOK:

1. Software Project Management, Walker Royce: Pearson Education, 2005.

REFERENCES:

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill
   Edition.

2. Software Project Management, Joel Henry, Pearson Education.

3. Software Project Management in practice, Pankaj Jalote, Pearson

Web References:
1.URL: https://www.youtube.com/watch?v=eOTcPOvT-H4
2.URL: https://www.youtube.com/watch?v=IdBSLvoP6uY
2.URL: https://www.youtube.com/watch?v=SkQzQCAWf8M

E-Books:

1. http://www.cs.ox.ac.uk/people/michael.wooldridge/teaching/soft-eng/lect05.pdf
2. http://www.mbaexamnotes.com/software-project-management.html

IV B.TECH I SEMESTER (PE-V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE R20CC4102	**HUMAN COMPUTER INTERACTION**						

COURSE OBJECTIVES:

- The main objective is to get student to think constructively and analytically about how to design and evaluate interactive technologies.

COURSE OUTCOMES:

CO 1: Outline knowledge about user interface design. [K2]

CO 2: Summarize the importance of Graphical User Interface. [K2]

CO 3: Apply the strategies used in design process. [K3]

CO 4: Summarize the importance of screen designing. [K2]

CO 5: 5.Apply the various operations of Windows. [K3]

SYLLABUS

UNIT – I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.

UNIT – II

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT – III

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds.

UNIT – IV

Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics.

UNIT – V

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls.

Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Goryd, Abowd, Russell Beal, "Human Computer Interaction", PEA, 3/e, 2004.
2. Wilbert O Galitz, "The Essential guide to user interface design", Wiley Dream tech, 2/e.

REFERENCE BOOKS:

1. Dan R.Olsan, "Human Computer", Interaction Cengage ,2010.
2. Ben Shneidermann , "Designing the user interface", 4/e, PEA.
3. Soren Lauesen, "User Interface Design", PEA.
4. Prece, Rogers, Sharps, "Interaction Design", Wiley.

WEB REFERENCES:

1. https://scholar.google.co.in/scholar?q=human+computer+interaction&hl=en&as_sdt=0&as_vis=1&oi=scholar

2. https://www.interaction-design.org/literature/topics/human-computer-interaction

3. https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction

4. https://www.tutorialspoint.com/human_computer_interface/human_computer_interface_introduction.htm

IV B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC4101	**BUSINESS MANAGEMENT CONCEPTS FOR ENGINEERS**						

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Summarize fundamentals of Managerial economics for decision making. [K2)]

CO2: Apply concepts of Financial Accounting and BEP for business decisions. [K3].

CO3: Evaluate fundamental concepts and principles of management [K5].

CO4: Discuss functional areas of management like HR, marketing and finance [K6].

CO5: Apply project management techniques for project planning and evaluation [K3].

UNIT-I: INTRODUCTION TO MANAGERIAL ECONOMICS

Definitions, - Nature And Scope- Relation With Other Subjects- Demand Definition- Determinants-Law of Demand and Its Exceptions- Concept of Elasticity of Demand- Cost Concepts- CVP Analysis (With Simple Problems), Significance- Limitations.

UNIT-II: MARKET STRUCTURES AND FINANCIAL ACCOUNTING

Introduction to Markets – Features of various markets-Perfect competition, Monopoly and Oligopoly. Definition – Importance, limitations and basic books of financial accounting, Preparation of basic books of accounting: journal, ledger and trail balance.

UNIT-III: INTRODUCTION TO MANAGEMENT

Concept, Nature, Importance- Functions of Management- Henry Fayols Principles of Management-F.W.Taylors Scientific Management- Douglas Mc Gregors Theory X and Y.

UNIT-IV: FUNCTIONAL AREAS OF MANAGEMENT

Concept of HRM, Functions of HR Manager- Marketing Management- Functions of Marketing Manager- Production Management-Functions of Production Management – Financial Management and functions of Financial Management.

UNIT-V: PROJECT MANAGEMENT: (PERT/CPM) : Development of Network – Difference between PERT and CPM- Problems on Critical Path- Problems on PERT Analysis.

TEXT BOOKS

1. Dr. N. APPARAO Dr. P. Vijay Kumar: "Managerial economics and financial analysis" Cengage publication's, New Delhi-2011.
2. Dr. A. R. Aryasri- Managerial Economics and Financial Analysis, TMH2011.
3. V. Maheswari: Managerial Economies, Sultan Chand.
4. Suma Damodaran: Managerial Economics, Oxford 2011.
5. Koontz & Weihrich: Essentials of Management" TMH 2011.

REFERENCES:

1. Managerial economics theory & applications, DM Mithani, Himalaya Publishing House, 2013. **Unit-1, 2**
2. Accounting For Managers, G. Prasad, Jaibharath Publishers, 2016. - **Unit-3**
3. Dr. P. Vijaya Kumar & Dr. N. Appa Rao," Management Science" cengage. Delhi, 2012. **Unit-4, 5**
4. Project Planning & Control with PERT & CPM, BC Punmia & KK Khandelwal, Lakshmi Publications, New Delhi, 4th Edition – 2016. -**Unit-6**

UNIT -IV

PROJECT PLANNING AND FEASIBILITY STUDIES

Project Identification - Project Formulation - Project Appraisal - Selection- Project Report preparation, Feasibility Studies: Economic, Technical, Financial, and Market feasibility.

UNIT -V

SMALL AND MICRO ENTERPRISES

Meaning and definitions of small scale- Role of small Enterprises in Economic Development - MSME Act 2006. Problems of small scale industries- concept, Characteristics and objectives of micro enterprises-Venture capital, Entrepreneurial motivation.

TEXT BOOKS:

1. Entrepreneurship Development and small business Enterprises, Poornima M Charantimath, Pearson Education, 2006.
2. Entrepreneurship Development, S.S. Khanka, S.Chand & Company Ltd.

REFERENCE BOOKS:

1. Fundamentals of Entrepreneurship, Mohanty, PHI
2. Entrepreneurship Development, Dr. S.L. Gupta, Arun Mittal, Sultan Chand.
3. Entrepreneurship Development, Vasanth Desai, Himalaya Publishing House.

UNIT –IV

PROJECT PLANNING AND FEASIBILITY STUDIES

Meaning of a project, Project identification – Sources of new Ideas, Methods of generating ideas, Project selection, - Project Feasibility Study -Project evaluation and Techniques (PBP, ARR, NPV, IRR & PI).

UNIT –V

SMALL AND MICRO ENTERPRISES

Importance, definitions, MSME's Development Act 2006 – policies and their support to MSMEs - Growth of Firm and growth strategies, Factors inducing growth – sickness in small business and remedies.

TEXT BOOKS:
1. Arya Kumar , "Entrepreneurship", Pearson, Publishing House, New Delhi, 2012.
2. VSP Rao, Kuratko, "Entrepreneurship', Cengage Learning, New Delhi,2012
3. ShoimoMaital, DVR Seshadri, "Innovation Management", Response Books 2007

REFERENCE BOOKS:
1. B.Janakiram, M Rizwana , "Entrepreneurship Development", Excel Books, ND, 2011
2. P.C.Shejwalkar , "Entrepreneurship Development", Everest Publishing House, ND, 2011
3. Vinnie Jauhari& Sudhanshu Bhushan, "Innovation Management". Oxford University Press, 2014.

WEB REFERENCES:

1. https://www.sciencedirect.com/science/article/abs/pii/S0362331900000604
2. https://www.emerald.com/insight/content/doi/10.1108/ET-02-2013-0018/full/html
3. https://openpress.usask.ca/entrepreneurshipandinnovationtoolkit/chapter/chapter-9-innovation-and-entrepreneurship/

IV B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	4	0	50	50	2
SUBCODE: R20CC41SC1	**AGILE WITH SCRUM**						

COURSE OBJECTIVES:
- To understand this fundamentals of Agile.
- To build a Agile Scrum Frame work
- To apply the concept of Agile Frame Work into the Industry

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Outline the concepts of Agile. [K2]
CO 2: Analyze the requirements, specifications to design Agile Scrum Framework. [K4]
CO 3: Summarize the benefits of different tools of Agile Testing. [K2]
CO 4: Illustrate the Agile practices with respective principles to design and development. [K2]
CO 5: Apply the Agile scenarios in terms of industry trends. [K3]

SYLLABUS:

UNIT-I
Fundamentals of Agile: The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools (6)

UNIT-II
Agile Scrum Framework: Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management . (8)

UNIT-III
Agile Testing: The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester. (8)

UNIT-IV
Agile Software Design and Development: Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation

Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control. (10)

UNIT-V

Industry Trends Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies. (4)

TEXT BOOKS:

1. Ken Schawber, Mike Beedle , "Agile Software Development with Scrum", Pearson
2. Agile Software Development, Principles, Patterns and Practices By Robert C. Martin Publisher: Prentice Hall

REFERENCE BOOKS:

1. Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams", Addison Wesley
2. Alistair Cockburn, "Agile Software Development: The Cooperative Game", Addison Wesley
3. Mike Cohn, "User Stories Applied: For Agile Software".

WEB REFERENCES:

1. https://www.youtube.com/watch?v=ZLrJVksmVfs
2. https://ocw.mit.edu/courses/comparative-media-studies-writing/cms-611j-creating-video-games-fall-2014/lecture-videos/lecture-5-agile-software-development/
3. https://freevideolectures.com/course/3679/pmi-acp/8
4. https://www.youtube.com/watch?v=5E4O4NQCb68

IV B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	0	0	0	0	1.5
SUBCODE: R20CC41MC	**MASSIVE OPEN ONLINE COURSES (MOOCs)**						

COURSE OBJECTIVES:

- The majority of MOOCs require that the learner be self-directed and proactive in the learning process. In addition to engaging in the course material, they provide learners with an opportunity to develop or expand their personal learning networks (PLN). Learner success is enhanced by learner actions before, during, and after the MOOC.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Identify suitable course required for their carrier. [K3]

CO2: Adapt effectively for changing conditions. [K5]

CO3: Develop and refine oral communication skills. [K3]

CO4: Take part in lifelong learning. [K3]

EVALUATION OF MOOC's COURSE

Student has to complete an on-line course to fulfil the academic requirement of B.Tech course. The on-line Course should be offered by any reputed organization like NPTEL, COURSERA, edX, Udacity, SWAYAM etc., approved by Departmental Committee constituted by HOD. . Student has to submit the progress of the MOOC's course (such as assignment submission etc.,) to the departmental committee. The B.Tech degree shall be awarded only upon submission of MOOC's certificate. If a student fails to submit in that semester, he/she has to submit the certificate in the subsequent semesters for getting the degree awarded.

R20 COURSE STRUCTURE

IV B.TECH – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC42PW	Major Project & Internship	PR	60	140	200	-	-	-	12
TOTAL										12

IV B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	60	140	200	12
SUBCODE: R20CC42PW	**MAJOR PROJECT & INTERNSHIP**						

COURSE OBJECTIVES:
- To offer students a glimpse into real world problems and challenges that need IT based solutions.
- To enable students to create very precise specifications of the IT solution to be designed.
- To enable students to use concepts of IT in creating a solution for a problem
- To improve the team building, communication and management skills of the students.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO1: Acquire practical knowledge within the chosen area of technology for project development.[K3]
CO2: Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach.[K4]
CO3: Contribute as an individual or in a team in development of technical projects.[K3]
CO4: Develop effective communication skills for presentation of project related activities.[K3]

1. BATCH FORMATION:
The same batch of Mini Project – II will continue for the Main Project also. If any student wants to change the batch he/she can request project review committee (PRC). If possible project review committee can take required action.

2. GUIDE ALLOTMENT:
If any guide who was allotted for Mini Project-II is not available, the batch can select a new guide with the consent of HOD.

3. I MID SEMINAR:
 Generally I Mid seminar is conducted after completing the literature survey. For this I Mid seminar the evaluation committee consists of guide, coordinator and HOD .This seminar is conducted for 40 marks. Out of 40 marks ,20 marks are awarded by guide based on the performance ,work and attendance of the student and 20 marks are awarded by the coordinator based on presentation ,work quality, analysis etc. during this seminar the students are supposed to deliver the proposed work and work completed so far.

4. II MID SEMINAR:
Like I Mid seminar, for II Mid seminar the evaluation committee consists of guide, coordinator & HOD. This seminar is conducted for 40 marks. Out of 40 marks, 20 marks are awarded by guide based on the performance, work and attendance of the student. The remaining 20 marks are awarded by the coordinator based on presentation, work quality and result discussions. In this seminar the students are supposed to deliver the complete project work with final results.

5. EXTERNAL SEMINAR & VIVA VOCE:
For external viva the evaluation committee consists of university nominated external examiner, guide & HOD. This viva is conducted for 120 marks.

LIST OF HONORS

1. The subjects opted for Honors should be advanced type which are not covered in regular curriculum.

2. Students has to acquire 16 credits with minimum one subject from each pool.

3. Concerned BoS can add or delete the subjects as per the decision of the board.

4. Pre requisites to be defined by the board for each course.

5. Compulsory MOOC / NPTEL Courses for 04 credits (02 courses@ 2 credits each)

POOL – 1
DATA SCIENCE AND ADVANCED SOFTWARE ENGINEERING

S.No.	HONOR Subject Title	Sub Code	No.of periods per week			No.of Credits
			L	T	P	C
1	Data Analytics and Visualization	R20CSHN02	4	0	0	4
2	DevOps	R20CSHN01	4	0	0	4
3	Deep Learning	R20CSHN03	4	0	0	4
4	Agile with Scrum	R20CSHN04	4	0	0	4
5	Computer Vision	R20CSHN05	4	0	0	4
6	Natural Language Processing	R20CSHN06	4	0	0	4

POOL – 2
ADVANCED SOFTWARE ENGINEERING

S.No.	HONOR Subject Title	Sub Code	No.of periods per week			No.of Credits
			L	T	P	C
1	DevOps	R20CSHN01	4	0	0	4
2	Agile with Scrum	R20CSHN04	4	0	0	4
3	Software Quality Assurance and Testing	R20CSHN07	4	0	0	4
4	Software Version Control	R20CSHN08	4	0	0	4

POOL – 3

CYBER SECURITY

S.No.	HONOR Subject Title	Sub Code	No.of periods per week			No.of Credits
			L	T	P	C
1	Digital Forensics	R20CSHN09	4	0	0	4
2	Cyber Laws	R20CSHN10	4	0	0	4
3	Crypto Currency	R20CSHN11	4	0	0	4
4	Ethical Hacking	R20CSHN12	4	0	0	4

POOL – 4

CLOUD COMPUTING AND VIRTUALIZATION TECHNOLOGY

S.No.	HONOR Subject Title	Sub Code	No.of periods per week.			No.of Credits
			L	T	P	C
1	Introduction to IT Infrastructure Landscape	R20CSHN13	4	0	0	4
2	Cloud Computing Virtualization	R20CSHN14	4	0	0	4
3	Cloud Computing Architecture	R20CSHN15	4	0	0	4
4	Cloud Computing Security & Management	R20CSHN16	4	0	0	4

POOL – 1
DATA SCIENCE AND ADVANCED SOFTWARE ENGINEERING

S.No.	HONOR Subject Title	Sub Code	No.of periods per week			No.of Credits
			L	T	P	C
1	Data Analytics and Visualization	R20CSHN02	4	0	0	4
2	DevOps	R20CSHN01	4	0	0	4
3	Deep Learning	R20CSHN03	4	0	0	4
4	Agile with Scrum	R20CSHN04	4	0	0	4
5	Computer Vision	R20CSHN05	4	0	0	4
6	Natural Language Processing	R20CSHN66	4	0	0	4

POOL-1	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CSHN02	**DATA ANALYTICS ANDVISUALIZATION**						

COURSE OBJECTIVE:
- This course provides a comprehensive knowledge of data science and analytics techniques using Python. With this students will learn the essential concepts of Python programming and gain deep knowledge in data analytics and data visualization.

COURSE OUTCOMES:
After completion of this course, the students will be able to:
CO 1: Apply principles of NumPy and Pandas to the analysis of data. [K3]
CO 2: Make use of various file formats in loading and storage of data. [K3]
CO 3: Identify and apply the need and importance of pre-processing techniques [K3].
CO 4: Show the results and present them in a pictorial format [K2].
 SYLLABUS:
UNIT-I
Introduction to Data Analytics, A data scientist role, NumPy Basics: The NumPy ndarray: A Multidimensional Array Object(Creating ndarrays ,Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing.
UNIT-II
Getting Started with pandas: Introduction to pandas Data Structures (Series,DataFrame), Essential Functionality(Reindexing, Dropping entries from an axis, Indexing, selection, and filtering, Arithmetic and data alignment, Sorting and ranking), Handling Missing values.

UNIT-III
Data Loading, Storage, and File Formats : Reading and Writing Data in Text Format(Reading Text Files in Pieces, Writing Data Out to Text Format, Manually Working with Delimited Formats, JSON Data, Binary Data Formats(Using HDF5 Format, Reading Microsoft Excel Files).
UNIT-IV
Data Wrangling: Merge, Reshape: Combining and Merging Data Sets(Database- style DataFrame Merges, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap), Reshaping (Reshaping with Hierarchical Indexing, Data Transformation(Removing Duplicates).
UNIT-V
Plotting and Visualization: A Brief matplotlib API, Steps involved in visualization (Figures and Subplots,Colors, Markers, andLine Styles, Ticks, Labels, and Legends, Drawing on a Subplot, Saving Plots to File), Data Aggregation and Group Operations: Group By Mechanisms.

TEXT BOOKS:
 1. Wes McKinney, "Python for Data Analysis", O'REILLY, ISBN:978-1-449-31979-3, 1stedition, October 2012.
REFERENCE BOOKS:
 1. Rachel Schutt & O'neil, "Doing Data Science", O'REILLY, ISBN:978-1-449-35865-5, 1stedition, October 2013.
 2. Joel Grus, "Data Science from Scratch", O'REILLY, 1st edition, April 2015

POOL-1	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CSHN01	**DevOps**						

COURSE OBJECTIVES:
- DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

COURSE OUTCOMES:
At the end of the course, student will be able to
CO 1: Demonstrate the phases of software development life cycle. [K2]
CO 2: Outline the basic Fundamentals of DevOps. [K2]
CO 3: Adopt the DevOps technology into the project. [K6]
CO 4: Evaluate the CI/CD concepts and metrics to track CI/CD practices. [K5]
CO 5: Summarize the importance of DevOps maturity models. [K2]

SYLLABUS:
UNIT- I
Phases of Software Development life cycle. Values and principles of agile software development.

UNIT- II
Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of Applications, DevOps delivery pipeline, DevOps eco system.

UNIT- III
DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT- IV
CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices

UNIT- V
Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity Model, DevOps maturity Assessment.

TEXT BOOKS:
1. Gene Kim , John Willis , Patrick Debois, "The DevOPS Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations" Jez Humb,O'Reilly Publications
2. Mike Loukides, "What is Devops? Infrastructure as code" O'Reilly publications.
3. Jez Humble and David Farley, "Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation",

4. Dave Harrison, Knox Lively, "Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and Microservices.
5. Joakim Verona , Packt, "Practical Devops"

REFERENCE BOOKS:

1. Mandi Walls, "Building a DevOps Culture", O'Reilly publications
2. Viktor Farcic, "The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Micro services"

WEB REFERENCES:

1. https://www.youtube.com/watch?v=hQcFE0RD0cQ

2. https://www.youtube.com/watch?v=YSkDtQ2RA_c

3. https://www.svrtechnologies.video/courses/devops-training-free/lectures/10955807

4. https://www.youtube.com/watch?v=MOZMw5_fBFA

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CSHN03	**DEEP LEARNING**						

COURSE OBJECTIVES:
- To present the mathematical, statistical and computational challenges of building neural Networks
- To study the concepts of deep learning
- To introduce dimensionality reduction techniques
- To enable the students to know deep learning techniques to support real-time applications
- To examine the case studies of deep learning techniques

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:

CO 1: Summarize the characteristics of Machine Learning and Deep Learning that make it useful to real-world Problems. [K2]

CO 2: Realign high dimensional data using reduction techniques. [K3]

CO 3: Analyze optimization and generalization in deep learning. [K4]

CO 4: Implement various deep learning models. [K3]

SYLLABUS:
UNIT– I
Machine Learning Basics Learning

Algorithms, Capacity, Over fitting and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Estimation Bayesian Statistics. Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning.

UNIT–II
Deep Feedforward Networks

Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

Regularization for Deep Learning

parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multitask Learning.

UNIT-III
Optimization for Training Deep Models

How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT-IV
Convolutional Networks

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks.

UNIT–V
Sequence Modeling:
Recurrent and Recursive Nets Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Optimization for Long-Term Dependencies, Explicit Memory.

TEXT BOOKS:
1. Goodfellow, I., Bengio, Y., Courville, A., & Bengio, Y. "Deep Learning,Vol.1. Cambridge", MIT press.
2. François Duval , "Deep Learning: Deep Learning for Beginners. Practical Guide with Python and Tensorflow", Data Sciences Publishing.

REFERENCE BOOKS:
1. Sebastian Raschka, Vahid Mirjalili, "Python Machine Learning: Machine. Learning and Deep Learning with Python", scikit-learn and TensorFlow, 2nd Edition, Packt Publishing.

WEB REFERENCES:

1. https://buomsoo-kim.github.io/learning/2020/03/25/Data-science-study-materials.md/

2. https://www.kaggle.com/getting-started/37999

3. https://drive.google.com/file/d/1DXdl4iPzYy7GEFRUROUv8cZRSxgUmu1E/view?usp=drivesdk

4. https://mega.nz/folder/NmQRlaBa#0FKTDkkHYBmkSmcEu0kGoQ

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
SUBCODE: R20CSHN04	**AGILE WITH SCRUM**						

COURSE OBJECTIVES:
- To understand this fundamentals of Agile.
- To build a Agile Scrum Frame work
- To apply the concept of Agile Frame Work into the Industry

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Outline the concepts of Agile. [K2]
CO 2: Analyze the requirements, specifications to design Agile Scrum Framework. [K4]
CO 3: Summarize the benefits of different tools of Agile Testing. [K2]
CO 4: Illustrate the Agile practices with respective principles to design and development. [K2]
CO 5: Apply the Agile scenarios in terms of industry trends. [K3]

SYLLABUS:

UNIT-I
Fundamentals of Agile: The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools.

UNIT-II
Agile Scrum Framework: Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management .

UNIT-III
Agile Testing: The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester.

UNIT-IV
Agile Software Design and Development: Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control.

UNIT-V

Industry Trends Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies.

TEXT BOOKS:

1. Ken Schawber, Mike Beedle , "Agile Software Development with Scrum", Pearson
2. Agile Software Development, Principles, Patterns and Practices By Robert C. Martin Publisher: Prentice Hall

REFERENCE BOOKS:

1. Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams", Addison Wesley
2. Alistair Cockburn, "Agile Software Development: The Cooperative Game", Addison Wesley
3. Mike Cohn, "User Stories Applied: For Agile Software".

WEB REFERENCES:

1. https://www.youtube.com/watch?v=ZLrJVksmVfs
2. https://ocw.mit.edu/courses/comparative-media-studies-writing/cms-611j-creating-video-games-fall-2014/lecture-videos/lecture-5-agile-software-development/
3. https://freevideolectures.com/course/3679/pmi-acp/8
4. https://www.youtube.com/watch?v=5E4O4NQCb68

HONORS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
SUBCODE: R20CSHN05	**COMPUTER VISION**						

COURSE OBJECTIVES

- To introduce students the fundamentals of image formation; To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition; To develop an appreciation for various issues in the design of computer vision and object recognition systems; and To provide the student with programming experience from implementing computer vision and object recognition applications.

COURSE OUTCOMES:

After completing the course you will be able to:

CO1 Identify basic concepts, terminology, theories, models and methods in the field of computer vision[K2]

CO2 Analyze known principles of human visual system[K4]

CO3 Analyze basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition[K4]

CO4 Analyze and Suggest a design of a computer vision system for a specific problem[K4]

UNIT I

Introduction What is computer vision? , A brief history Image Formation Models: Monocular imaging system, Orthographic& Perspective Projection, Camera model and Camera calibration, Binocular imaging systems

UNIT II

Image Processing and Feature Extraction: Image representations (continuous and discrete), Edge detection

UNIT III

Motion Estimation: Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion

UNIT IV

Shape Representation and Segmentation: Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multiresolution analysis

UNIT V

Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition.

TEXT BOOKS:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot   Vision, by B. K. P. Horn, McGraw-Hill.

REFERENCE BOOKS:

1. Computer Vision: Algorithms and Applications by Richard Szeliski. Available for free online.
2. Elements of Statistical Learning by Trevor Hastie, Robert Tibshirani, and Jerome Friedman. Available for free online (Warning: Direct PDF link).
3. Multiple View Geometry in Computer Vision (Second Edition) by Richard Hartley and Andrew Zisserman. Available for free online through the UM Library (Login required).
4. Emanuele Trucco and AllessandroVerri "Introductory Techniques for 3-D Computer Vision", Prentice Hall, 1998.
5. Olivier Faugeras, "Three-Dimensional Computer Vision", The MIT Press, 1993.

POOL-1	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
SUBCODE: R20CSHN06	**NATURAL LANGUAGE PROCESSING**						

COURSE OBJECTIVES

- To understand the algorithms available for the processing of linguistic Information and computational properties of natural languages.
- To conceive basic knowledge on various morphological, syntactic and Semantic NLP tasks.
- To familiarize various NLP software libraries and data sets publicly available.
- To develop systems for various NLP problems with moderate complexity.
- To learn various strategies for NLP system evaluation and error analysis.

COURSE OUTCOMES

After the completion of this course, students will be able to:

CO1: Describe the concepts of morphology, syntax, semantics, discourse &pragmatics of natural language [K2].

CO2: Demonstrate understanding of the relationship between NLP and statistics &machine learning. [K3].

CO3: Discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis [K3].

CO4: Develop systems for various NLP problems with moderate complexity [K4].

CO5: Evaluate NLP systems, identify shortcomings and suggest solutions for these shortcomings [K2].

SYLLABUS

UNIT-I

Introduction to NLP

NLP – introduction and applications, NLP phases, Difficulty of NLP including ambiguity;Spelling error and Noisy Channel Model; Concepts of Parts-of-speech and Formal Grammar of English.

UNIT-II

Language Modelling: N-gram and Neural Language Models Language Modelling with N-gram, Simple N-gram models, Smoothing (basic techniques),Evaluating language models; Neural Network basics, Training; Neural Language Model, Case study: application of neural language model in NLP system development

UNIT-III : Parts-of-speech Tagging Parts-of-speech Tagging: basic concepts; Tagset; Early approaches: Rule based and TBL; POS tagging using HMM, Introduction to POS Tagging using Neural Model.

UNIT-IV

Parsing Basic concepts: top down and bottom up parsing, treebank; Syntactic parsing: CKY parsing; Statistical parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs.

UNIT-V

Semantics Vector Semantics; Words and Vector; Measuring Similarity; Semantics with dense vectors; SVD and Latent Semantic Analysis; Embeddings from prediction: Skip-gram and CBOW; Concept of Word Sense; Introduction to WordNet.

TEXT BOOKS:

1. Jurafsky Dan and Martin James H. "Speech and Language Processing", 3rd Edition, 2018.

REFERENCE BOOKS:

1. Jurafsky D. and Martin J. H., "Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.

2. Goldberg Yoav "A Primer on Neural Network Models for Natural Language Processing".

POOL – 2
ADVANCED SOFTWARE ENGINEERING

S.No.	HONOR Subject Title	Sub Code	No.of periods per week			No.of Credits
			L	T	P	C
1	DevOps	R20CSHN01	4	0	0	4
2	Agile with Scrum	R20CSHN04	4	0	0	4
3	Software Quality Assurance and Testing	R20CSHN07	4	0	0	4
4	Software Version Control	R20CSHN08	4	0	0	4

POOL-2	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CSHN01	**DevOps**						

COURSE OBJECTIVES:

- DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

COURSE OUTCOMES:

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

CO 1: Demonstrate the phases of software development life cycle. [K2]

CO 2: Outline the basic Fundamentals of DevOps. [K2]

CO 3: Adopt the DevOps technology into the project. [K6]

CO 4: Evaluate the CI/CD concepts and metrics to track CI/CD practices. [K5]

CO 5: Summarize the importance of DevOps maturity models. [K2]

SYLLABUS:

UNIT- I

Phases of Software Development life cycle. Values and principles of agile software development.

UNIT- II

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of Applications, DevOps delivery pipeline, DevOps eco system.

UNIT- III

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT- IV

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices

UNIT- V

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity Model, DevOps maturity Assessment.

TEXT BOOKS:

1. Gene Kim , John Willis , Patrick Debois, "The DevOPS Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations" Jez Humb,O'Reilly Publications
2. Mike Loukides, "What is Devops? Infrastructure as code" O'Reilly publications.
3. Jez Humble and David Farley, "Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation",

4. Dave Harrison, Knox Lively, "Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and Microservices.
5. Joakim Verona , Packt, "Practical Devops"

REFERENCE BOOKS:

1. Mandi Walls, "Building a DevOps Culture", O'Reilly publications
2. Viktor Farcic, "The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Micro services"

WEB REFERENCES:

1. https://www.youtube.com/watch?v=hQcFE0RD0cQ

2. https://www.youtube.com/watch?v=YSkDtQ2RA_c

3. https://www.svrtechnologies.video/courses/devops-training-free/lectures/10955807

4. https://www.youtube.com/watch?v=MOZMw5_fBFA

POOL-2	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
SUBCODE: R20CSHN02	**AGILE WITH SCRUM**						

COURSE OBJECTIVES:
- To understand this fundamentals of Agile.
- To build a Agile Scrum Frame work
- To apply the concept of Agile Frame Work into the Industry

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Outline the concepts of Agile. [K2]
CO 2: Analyze the requirements, specifications to design Agile Scrum Framework. [K4]
CO 3: Summarize the benefits of different tools of Agile Testing. [K2]
CO 4: Illustrate the Agile practices with respective principles to design and development. [K2]
CO 5: Apply the Agile scenarios in terms of industry trends. [K3]

SYLLABUS:

UNIT-I
Fundamentals of Agile: The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools (6)

UNIT-II
Agile Scrum Framework: Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management . (8)

UNIT-III
Agile Testing: The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester. (8)

UNIT-IV
Agile Software Design and Development: Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control. (10)

UNIT-V
Industry Trends Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies. (4)

TEXT BOOKS:

1. Ken Schawber, Mike Beedle , "Agile Software Development with Scrum", Pearson
2. Agile Software Development, Principles, Patterns and Practices By Robert C. Martin Publisher: Prentice Hall

REFERENCE BOOKS:

1. Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams", Addison Wesley
2. Alistair Cockburn, "Agile Software Development: The Cooperative Game", Addison Wesley
3. Mike Cohn, "User Stories Applied: For Agile Software".

WEB REFERENCES:

1. https://www.youtube.com/watch?v=ZLrJVksmVfs
2. https://ocw.mit.edu/courses/comparative-media-studies-writing/cms-611j-creating-video-games-fall-2014/lecture-videos/lecture-5-agile-software-development/
3. https://freevideolectures.com/course/3679/pmi-acp/8
4. https://www.youtube.com/watch?v=5E4O4NQCb68

POOL-2	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
SUBCODE: R20CSHN07	**SOFTWARE QUALITY ASSURANCE AND TESTING**						

COURSE OBJECTIVES:

- To develop methods and procedures for software development that can scale up for large systems and that can be used to consistently produce high-quality software at low cost and with a small cycle time.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Outline different aspects of software quality assurance and standards [K2].
CO 2: Apply various software testing strategies [K3].
CO 3: Develop test plans, schedules and testing techniques for software project [K3].
CO 4: Apply features of software testing automation tools [K3].
CO 5: Summarize different steps in software testing process [K2].
CO 6: Identify the status of testing results and testing methodologies. [K2].

SYLLABUS:
UNIT - I
Software Quality Assurance and Standards

The Software Quality challenge, What is Software Quality, Software Quality factors, The components of Software Quality Assurance system, Software Quality Metrics, Costs of Software Quality, Quality Management Standards, Management and its role in Software Quality Assurance, SQA unit and other actors in SQA system.

Quality Standards: ISO 9000 and Companion ISO Standards, CMM, CMMI, PCMM, Malcom Balridge, 3 Sigma, 6 Sigma and other latest quality standards

UNIT - II

Software Testing Strategy and Environment: Minimizing Risks, Writing a Policy for Software Testing, Economics of Testing, Testing-an organizational issue, Management Support for Software Testing, Building a Structured Approach to Software Testing, Developing a Test Strategy

UNIT - III

Building Software Testing Process: Software Testing Guidelines, workbench concept, Customizing the Software Testing Process, Process Preparation checklist

Software Testing Techniques: Dynamic Testing – Black Box testing techniques, White Box testing techniques, Static testing, Validation Activities, Regression testing

UNIT - IV

Software Testing Tools: Selecting and Installing Software Testing Automation and Testing Tools. Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, JMetra, JUNIT and Cactus.

UNIT - V

Testing Process

Seven Step Testing Process – I: Overview of the Software Testing Process, Organizing of Testing, Developing the Test Plan, Verification Testing, Validation Testing.

TEXT BOOKS:

1. Effective Methods for Software Testing, Third edition, William E. Perry, Wiley India, 2009
2. Software Testing – Principles and Practices, Naresh Chauhan, Oxford University Press, 2010.
3. Software Quality Assurance – From Theory to Implementation, Daniel Galin, Pearson Education, 2009.

REFERENCE BOOKS:

1. Testing Computer Software, Cem Kaner, Jack Falk, Hung Quoc Nguyen, Wiley India, rp2012.

2. Software Testing – Principles, Techniques and Tools, M.G.Limaye, Tata McGraw-Hill, 2009.

3. Software Testing - A Craftsman's approach, Paul C. Jorgensen, Third edition, Auerbach Publications, 2010.

4. Foundations of Software Testing, Aditya P. Mathur, Pearson Education, 2008.

5. Software Testing and Quality Assurance – Theory and Practice, Kshirasagar Naik, Priyadashi Tripathy, Wiley India, 2010.

ONLINE REFERENCES:

1. https://www.youtube.com/watch?v=kpT95Jb3t3U
2. https://www.youtube.com/watch?v=T_CkZ1Ej0oY
3. https://www.youtube.com/watch?v=qNg7nzhfYhc
4. https://www.guru99.com/software-testing.html
5. https://freevideolectures.com/course/3655/software-testing

POOL-2	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
SUBCODE: R20CSHN08	**SOFTWARE VERSION CONTROL**						

COURSE OBJECTIVES

- To enable learners to pick up fundamentals of Continuous Integration and Continuous Deployment.
- To enable learners to pick up fundamentals of Agile led software delivery
- To provide the learners understanding of applicability of version control systems.
- To enable students, acquire thorough understanding of difference between version control system and distributed version control system

COURSE OUTCOMES:

At the end of this course student should be able to

CO1. Analyze the technical aspects about Continuous Integration and Continuous Deployment [K4].

CO2. Examine the functionality of Software Version Control Systems [K4].

CO3. Analyze Assess workflows in various version control system like Git ,Sun , Mercurial[K4]

CO4. Inspect and compare between version control system and distributed version control system [K4]

UNIT I

Fundamentals of Software version Control : Introduction to continuous integration and deployment, Version control system, Agile and Scrum Methodologies, DevOps, History of Source Code Management, Need for Software version Control, Repository vs Directory concepts, tools, Git basics and interactive git, Recording commits to local and remote repository.

UNIT II

Source Code Management tools and Git : Study of features of - SVN, Mercury and Git, History - Linux and Git by Linus Torvalds , Branch management, branch workflows, test/dev/prod/feature/hotfix branches, Merge vs Rebase, Reverting the changes.

UNIT III

Version Control System Vs Distributed Version Control System: Local repository, Advantages of distributed version control system, The Multiple   Repositories Model, Completely resetting local environment, Revert - cancelling out changes, Contributing and managing a distributed project on git, Integration manager workflow

UNIT IV

Setting Up a CI environment : Installing a Virtual Machine- Ubuntu, Installing Git, Installing Jenkins on Ubuntu and Windows and configuring Jenkins, Installing SonarQube, Installing PostgreSQL

UNIT V

Version Control with Git: Basics, Branching, Reverting Changes, The branching model

TEXT BOOK :

1. Pro Git – Book by Scott Chacon and Ben Straub (available at https://gitscm.com/book/).
2. Continuous Integration, Delivery, and Deployment: Reliable and Faster Software Releases with Automating Builds, Tests, and Deployment , Sander Rossel, Packt

REFERENCE BOOK :
1. Version Control by Example, Eric Sink, Pearson

POOL – 3

CYBER SECURITY

S.No.	HONOR Subject Title	Sub Code	No.of periods per week			No.of Credits
			L	T	P	C
1	Digital Forensics	R20CSHN09	4	0	0	4
2	Cyber Laws	R20CSHN10	4	0	0	4
3	Crypto Currency	R20CSHN11	4	0	0	4
4	Ethical Hacking	R20CSHN12	4	0	0	4

POOL-3	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
SUBCODE: R20CSHN09	**DIGITAL FORENSICS**						

COURSE OBJECTIVE
- To appreciate the importance of Digital Forensics.
- To use and apply various forensics tools and techniques.
- To understand Forensics Investigation approach and Evidence Presentation.

COURSE OUTCOMES
On completion of this course, the students will be able to
  CO1. Explain Computer and network Forensics, Data Encryption & Compression techniques [K2].
  CO2. Practice installation and use various Live Network forensics tools [K4].
  CO3. Describe and explain Internet Forensics, Email, and Messenger & Web Browser Forensics [K2].
  CO4. Illustrate forensics Investigation & Evidence preservation techniques [K2].
  CO5. Reference about the legal aspects of digital forensics [K4].

SYLLABUS
UNIT I:
Computer Forensics: Computer Forensics and standard procedure, Incident Verification and System Identification, Recovery of Erased and damaged data, Disk Imaging and Preservation, Data Encryption and Compression, Automated Search Techniques, Forensics Software.

UNIT II:
 Network Forensics: Tracking network traffic, Reviewing Network Logs, Network Forensics Tools, Performing Live Acquisitions, Order of Volatility, and Standard Procedure.

UNIT III:
Internet Forensics: Internet & World Wide Web Threats (Email, Chat-rooms, Search Engines, Hacking and Illegal access, Obscene and Incident transmission, Extortion & threats), Domain Name Ownership Investigation, Reconstructing past internet activities and events, e-mail Forensics : e-mail analysis, e-mail headers and spoofing, Laws against e-mail Crime, Messenger Forensics: Yahoo Messenger, Browser Forensics: Cookie Storage and Analysis, Browser Forensics: Analyzing Cache and temporary internet files, Browser Forensics: Web browsing activity reconstruction

UNIT IV:
Forensics Investigation and Evidence Presentation: Authorization to collect the evidence, Acquisition of Evidence, Authentication of the evidence, Analysis of the evidence, reporting on the findings, Testimony.

UNIT V:
Legal aspects of Digital Forensics: Laws & regulations, Information Technology Act, Giving Evidence in court.

TEXT BOOKS
1. Digital Forensics-I (IBM ICE Publication)

REFERENCE BOOKS
1. Digital Evidence and Computer Crime: Forensic Science, Computers and the Internet (Hardcover) by Eoghan Casey.
2. Computer Evidence: Collection & Preservation (Networking & Security) 1st Edition, by Christopher LT Brown.
3. Computer Forensics For Dummies 1st Edition by Linda Volonino.

POOL-3	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
SUBCODE: R20CSHN10	**CYBER LAWS**						

COURSE OBJECTIVE
Student will learn Cyber crimes and its national and International Cyber laws.

COURSE OUTCOMES
On completion of this course, the students will be able to :
CO1: Analyze Cyber Crimes [K3].
CO2: Analyze Frauds, loop holes in the law[K3].
CO3: Analyze Indian penal laws in Cyber Crimes [K3].
CO4: Analyze International Cyber Laws in Cyber Crimes [K3].

SYLLABUS

UNIT - I
Understanding Cyber Crimes and Cyber Offences, Crime in context of Internet, Types of Crime in Internet, Crimes targeting Computers: Definition of Cyber Crime & Computer related Crimes
History, Development and Reasons for Growth of Cyber Crimes, Social Media and its Role in Cyber World, Fake News, Defamation, Online Advertising.

UNIT - II

Prevention of Cyber Crimes & Frauds, Critical analysis & loop holes of The IT Act, 2000 in terms of cyber crimes, Cyber Crimes: Freedom of speech in cyber space & human right issues, International position on Free Speech in Internet

UNIT - III
Indian Penal Law and Cyber Crimes: (i) Fraud, (ii) Hacking, (iii) Mischief, Trespass (iv) Defamation (v) Stalking (vi) Spam, Issues of Internet Governance: (i) Freedom of Expression in Internet (ii) Issues of Censorship (iii) Hate Speech (iv) Sedition (v) Libel (vi) Subversion (vii) Privacy

UNIT - IV
Cyber Law : International Perspective (a) EDI: Concept and legal Issues. (b) UNCITRAL Model Law. (c) Electronic Signature Laws of Major Countries (d) Cryptography Laws (e) Cyber Laws of Major Countries (f) EU Convention on Cyber Crime

UNIT – V :
International Organizations and Their Roles (a) ICANN (b) URDP (c) WTO and TRIPS (d) Interpol & Europol (e) Impact of Cyber warfare on Privacy Identity (f) Net Neutrality and EU Electronic communication Regulatory framework (g) WCAG (h) Social Networking sites Vis – a – Vis Human Right
REFERENCE BOOKS:
1. Prashant Mali: Cyber Law & Cyber Crimes Simplified, Cyber Infonedia Publisher
2. Justice Yatindra Singh: Cyber Laws, Universal Law Publishing Co., Latest Edition

POOL-3	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	3
SUBCODE: R20CSHN11	CRYPTO CURRENCY						

COURSE OBJECTIVE

Student will study Bitcoin Security and Crypto currency usages and it's security attacks.

COURSE OUTCOMES

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

CO1: Analyze Symmetric and public key Cryptography and their applications [K4]

CO2: Analyze bitcoin security and counter attacks [K4]

CO3: Interpret various Crypto currencies, their exchanges and smart Contracts [K2]

CO4: Interpret Crypto economics [K2]

CO5: Analyze the Network attacks in Crypto Currency [K4]

SYLLABUS

UNIT - I

CRYPTOGRAPHY : Information security, Pillars of IT security, Trust in information security, how to decide a CA is trusted and authorized? Public key infrastructure and trust identities, Assumptive trust model, Public key cryptography, RSA decryption, Hash functions in cryptography, Limitation of Message Authentication Code (MAC), Digital signatures, Creation process of digital signature, Digital signatures: Process, What is a Merkle Tree, What is the consensus algorithms? Different types of consensus algorithms, Symmetric cryptography.

UNIT - II

BITCOIN : Bitcoins what is it? Digital currencies: Before the era of bitcoins, Bitcoins: History, Uses of bitcoins, Get started with bitcoins, Introducing bitcoin core, Significance of bitcoins, Applications of bitcoins, Bitcoins: A technical overview, Anonymity of bitcoin transactions, Bitcoin wallets, What are private and public keys? Bitcoin wallets: Types, Proof-of-Work, Bit Minter, Exchanges of bitcoin, Security in bitcoins, Major attacks on bitcoins.

UNIT – III

Cryptocurrencies : Cryptocurrencies, Top 10 cryptocurrencies as per market standards, what is the Commitment Scheme, Spending of Zerocoin, Why Monero: Technical overview, GUI wallets, what are sidechains? Smart contracts, Existing sidechain platforms, RSK blockchains, DECOR+: What is it? Bitcoin 2.0: What is it? Cryptocurrency exchanges, which crypto exchanges are best to buy bitcoin? ERC20 tokens, Funding new ventures with tokens, Security token offerings.

UNIT – IV

Crypto Economics and Proof-of-State : Introduction to crypto economics, Solving the double-spending problem, why peer-to-peer file sharing is a failure model? Crypto economic properties of bitcoins, Cryptographic hash functions, Signatures, Zero- Knowledge Proofs, what is game theory? Incentives with tokens, what is mechanism design? What is ERC-721? Creating tokens using Electron Cash, Introduction to crypto-assets, Technology challenges.

UNIT – V

Game Theory and Network Attacks : Ecosystem of mining, Scalability in blockchain, Layers in blockchain, Forks in blockchain, Alternatives for proof-of-work, Computation and off-chain payments, Challenges in payment challenges, Hash- locking, Interoperability of blockchain, what is arbitrary data exchange? Business model layer, Current State of Interoperability Solutions, the consensus conundrum, the security of sharding, Fixing the Communication Problem on Node, Cryptocurrencies being a consideration for the masses, Concerns rising for IOTA, Understanding corda and its Working, Ripple (cryptocurrency).

TEXT BOOK

1. **Bitcoin and Cryptocurrency Technologies,** by Arvind Narayanan (Author), Joseph Bonneau (Author), Edward Felten (Author), Andrew Miller (Author), Steven Goldfeder (Author)

POOL-3	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CSHN12	**ETHICAL HACKING**						

COURSE OBJECTIVES:

• To develop ability to quantitatively assess and measure threats to information assets
• Evaluate where information networks are most vulnerable and perform penetration tests into secure networks for evaluation purposes
• Critique security plans designed at protecting data assets against attacks from the Internet and investigate and mitigate data risk

COURSE OUTCOMES:
After completion of this course, the students would be able to:
CO1: Classify the elements of information security and its challenges and role of security and penetration testing [K2]
CO2: Analyze different attacks and hacking methods [K4]
CO3: Exemplify different techniques in hacking [K2]
CO4: Apply Ethical hacking techniques and understand the Ethical Hacking Laws [K3]

SYLLABUS:
UNIT - I:
ETHICAL HACKINFG: Types of Data Stolen, Elements of Information Security, Authenticity and Non-Repudiation, Security Challenges, Effects of Hacking, Types of Hackers, Ethical Hacker, Hacktivism - Role of Security and Penetration Tester, Penetration Testing Methodology, Networking & Computer Attacks – Malicious Software (Malware), Protection Against Malware, Intruder Attacks on Networks and Computers, Addressing Physical Security – Key Loggers and Back Doors.

UNIT - II:
FOOT PRINTING AND SOCIAL ENGINEERING: Web Tools for Foot Printing, Conducting Competitive Intelligence, Google Hacking, Scanning, Enumeration, Trojans & Backdoors, Virus & Worms, Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering – shoulder surfing, Dumpster Diving, Piggybacking.

UNIT - III:
DATA SECURITY & FIREWALLS: Physical Security – Attacks and Protection, A study on various attacks – Input validation attacks – SQL injection attacks – Buffer overflow attacks - Privacy attacks, Attacks and Measures, Wireless Hacking, Windows Hacking, Linux Hacking.

UNIT - IV:
NETWORK PROTECTION SYSTEM & HACKING WEB SERVERS: Routers, Firewall & Honeypots, IDS & IPS, Web Filtering, Vulnerability, Penetration Testing, Session Hijacking, Web Server, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow, Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobiles Phone Hacking.

UNIT - V:

ETHICAL HACKING LAWS AND TESTS : An introduction to the particular legal, professional and ethical issues likely to face the domain of ethical hacking, ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking – Social Engineering, Host Reconnaissance, Session Hijacking, Hacking - Web Server, Database, Password Cracking, Network and Wireless, Trojan, Backdoor, UNIX, LINUX, Microsoft, NOVEL Server, Buffer Overflow, Denial of Service Attack, Methodical Penetration Testing.

TEXT BOOKS:

1. Michael T. Simpson, Kent Backman, James E. "Corley, Hands-On Ethical Hacking and Network Defense", Second Edition, CENGAGE Learning, 2010.
2. Kenneth C.Brancik, "Insider Computer Fraud", Auerbach Publications Taylor & Francis, Group 2008.
3. Ankit Fadia, "Ethical Hacking", Second Edition Macmillan India Ltd, 2006.

REFERENCE BOOKS:

1. Steven DeFino, Barry Kaufman, Nick Valenteen, "Official Certified Ethical Hacker Review Guide", CENGAGE Learning, 2009-11-01.
2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Syngress Basics Series –Elsevier, August 4, 2011.Whitaker & Newman, "Penetration Testing and Network Defence", Cisco Press, Indianapolis, IN, 2006.

POOL – 4

CLOUD COMPUTING AND VIRTUALIZATION TECHNOLOGY

S.No.	HONOR Subject Title	Sub Code	No.of periods per week.			No.of Credits
			L	T	P	C
1	Introduction to IT Infrastructure Landscape	R20CSHN13	4	0	0	4
2	Cloud Computing Virtualization	R20CSHN14	4	0	0	4
3	Cloud Computing Architecture	R20CSHN15	4	0	0	4
4	Cloud Computing Security & Management	R20CSHN16	4	0	0	4

POOL-4	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CSHN13	**INTRODUCTION TO IT INFRASTRUCTURE LANDSCAPE**						

COURSE OBJECTIVE
- Student will learn Infrastructure requirement for cloud application like Servers, storage, databases, middleware and security aspects.

COURSE OUTCOMES
On completion of this course, the students will be able to
CO1: Analyze the various Server Technologies used in Cloud Architecture [K4].
CO2: Analyze the Storage structure used in Cloud [K4].
CO3: Analyze Network and Security issues in the Cloud [K4].
CO4: Analyze various types of databases and its usage in the Cloud [K4].
CO5: Analyze various Middle ware technologies used in the Cloud [K4].

SYLLABUS:

UNIT - I:

Systems Overview Server Technology, Blade Server, Rack Servers, Enterprise Server, High Performance Server, Operating System, Operating System Features, Tasks of Operating System, Virtualization, Benefits of Virtualization, Types of virtualization, Hypervisor, Types of Hypervisor, Features of Hypervisors, I/O Virtualization, Virtual Machine Types, Partitioning, Server Deployment, Types of Deployment, VirtualServer Deployment, Server Management Console, Server Availability Concepts, Server Availability Concepts and Techniques, Server Workloads, Directory Server Concepts, Directory, LDAP Protocol, LDAP Overview, LDAP Architecture, LDAP Models, Information Model, Naming Model, Functional Model, Security Model, LDAP Replication Topologies, Simple Master-Replica, Master Forward-Replica, Gateway Replication, Peer Replication, LDAP Interchange Format, LDIF File Format, Data Encoding,Creating Directory Entries Using LDIF, Organization Unit Entries, Organization Person Entries.

UNIT - II:

Storage Overview Storage Overview, what is Storage Networking Technology? Types of Storage Systems, Storage Devices and Technologies, RAID Functions, RAID Types, Archiving Data and data policy, Data storage Techniques, Optical Storage, Solid State Drives, Solid State Drives, Big data and its key technologies,Data Retrieval challenges, Network and Online Storage, FC-AL (Fibre Channel Arbitrated Loop), FABRIC, Switched FABRIC, Introduction to Storage Area Networks, Storage Area Network, Storage area network components, Zoning, Zoning is of 2 Types, Storage Virtualization, Types of Storage Virtualization, Advantages of Storage Virtualization, Disadvantages of Storage Virtualization, Types of Virtualization.

UNIT - III:

Network and Security Overview Network Topology, Topologies are either physical or logical, Common Topologies, Bus and Tree topology, Star Topology, Ring Topology, Mesh Topology – Fully Connected, what is a firewall? Firewall, Think Time, IP Addressing, Security zones, switching concepts, Layer 2 Switching, Function at Layer2, What is Routing? IP Routing, Types of Routing, Virtual LAN, Benefits of VLAN, Dynamic vs. StaticVLANs, VLAN Standardization, Security Basics, Basic Components, Cryptography, Key Encryption, Private Key Encryption, Public Key Encryption, Public Key Encryption (Example), Secure Messaging,Data Security, Network Security.

UNIT - IV:

Database Overview Information System, Traditional Approach, Database Approach, Database Terminology, Fields, Records, Database File, Database and Database Management System, Key, Characteristics of Databases, Introduction to DBMS, Advantages of DBMS, Disadvantages of DBMS, Data Models, Types of DBMS, Hierarchical Database, Network Database, Relational Databases, Object oriented database, Data Security Concepts, Data Mining, Data Warehousing and Data Marts, Relational DBMS, Terminology.

UNIT - V:

Application and Middleware Overview Applications and Middleware Overview, Middleware, Message Oriented Middleware, IBM WebSphereMQ, WebSphere MQ Objects, Web Tier Deployment, Applications Servers, Cluster Deployment, LotusNotes – A Messaging Technology, Lotus Notes design principles, Lotus Domino Server Types, Organization in Lotus Notes, Organization Certifier, Documents in Lotus, Services in Lotus Domino, Lotus Notes Client, Certificates and Server Files, Access Control List, Lotus Notes (Domino) - Integration, Warehouse Modeling Approaches, Global data Warehouse Architecture, Independent data mart architecture, Basic Concepts of Dimensional modeling, Basic OLAP Operations.

TEXT BOOKS

1. Pierre Belanger, Landscape as Infrastructure: A Base Primer
2. IT Infrastructure A Complete Guide - 2020 Edition by Gerardus Blokdyk
3. Home Server Components: A quick overview (For the Tech Hobbyist Series Book 2)
   by Ronn Hanley

POOL-4	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CSHN14	CLOUD COMPUTING VIRTUALIZATION						

COURSE OBJECTIVE

- Student will learn storage virtualization, Network virtualization,, application virtualization and their USECASES.

COURSE OUTCOMES

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

CO1: Outline Virtualization [K2].

CO2: Analyze Server and Storage Virtualization [K4].

CO3: Analyze Network and Application Virtualization [K4].

CO4: Analyze cloud development and delivery models [K4].

CO5: Analyze the Cloud workloads [K4].

SYLLABUS

UNIT - I

Introduction to Virtualization

Traditional IT Infrastructures, Shortcomings of physical infrastructures, Benefits of Virtualization, Comparison of traditional IT infrastructures with virtualized infrastructures, Implementing Virtualization, A typical hardware/software server stack, Logical Equivalence, Pre and Post Virtualization Server Stacks, Types of Virtualization, Area and technology based classification, History of Virtualization, Time-sharing systems, IBM Mainframe Virtualization, IBM PowerVM Virtualization, Extending Virtualization to x86, Hardware support for x86 Virtualization, Impact of Virtualization, Cost Impact, Manageability Impact.

UNIT - II

Server and Storage Virtualization

Types of Server Virtualization, Para Virtualization, Simulation, Hardware Assisted Virtualization, Hypervisors, Ring levels on x86 processors, Types of Hypervisors, IBM

PowerVM Hypervisors, Common considerations in server virtualization, Desktop Virtualization, how desktop virtualization works? Benefits of Desktop Virtualization, Constraints in Desktop Virtualization, Types of Desktop Virtualization, Anatomy of server virtualization, Three major layers in Xen Server, Storage Virtualization Overview, Benefits of storage virtualization, Features in the logical layer, Types of Storage Virtualization, Host level storage virtualization, Host based mirroring, Storage level virtualization, Network based storage virtualization.

UNIT - III

Network and Application Virtualization

Network virtualization overview, Virtual Private Network (VPN), How VPN works, Virtual LAN (VLAN), Advantages of VLAN, Application virtualization overview, Challenges in using applications in traditional install, use and update model, Solution for challenges, Architecture, Benefits of application virtualization.

UNIT - IV

Cloud implementation, deployment and delivery models

Cloud deployment models, Private cloud, Public cloud, Hybrid cloud, Pros and cons of each architecture, Cloud deployment decision factors, Business IT control, Business critical applications, Data and transaction security, Compliance and audit, Balance of CAPEX and OPEX, Workload characteristics, Workload lifespan

preferences, Industry segment – SME and Large enterprises, Data freedom, Software characteristics, Time to deploy, Public cloud, Public cloud - Example, Important points about public cloud, Factor Matrix, Public cloud advantages, Public cloud disadvantages, Private cloud, Private cloud – Scenario, Key observations from scenario, Factor matrix, Private cloud advantages, Private cloud disadvantages, Hybrid Cloud, Hybrid cloud scenario, Observations from Hybrid scenario, Factor Matrix, Hybrid cloud advantages, Hybrid cloud disadvantages, Overview of cloud delivery models, Types of cloud delivery models, Cloud delivery infrastructure, IT Layers, IaaS overview, IaaS features, Cloudbursting, Cloudbursting definition, Multi Tenancy, Resource pooling, IaaS examples, PaaS Overview, PaaS example, Platform services infrastructure, PaaS features, PaaS components, Things to consider before choosing PaaS, PaaS examples, Common technologies and solution provided by a web hosting PaaS stack, SaaS, SaaS advantages, SaaS examples.

UNIT - V
Case study on virtualization and cloud workloads
Case study overview, Customer IT landscape, Functions of the data centre, Triggers for virtualization, Preparation for virtualization, Server selection, Server sizing, Server criticality, Provisioning, Proximity and Locality, Transition tools for virtualization, Cost Savings, Cloud Workloads Overview, What is workload? Workload characterization, Factors that influence cloud workload, Workloads most suitable for cloud, Private cloud solution, Types of workload, Temporary non-production workloads, Mission critical production workloads, Advantages, Mission critical workloads, Mixed workloads, Production only workload most suitable for a hybrid cloud, Industry specific cloud workloads, Workloads not suitable for public cloud, Workloads not suitable for private cloud, Workloads made possible by cloud.

TEXT BOOKS:
1. Cloud Computing and Virtualizationby Dac-Nhuong Le , Raghvendra Kumar, et al.
2. Cloud Computing & Virtualization by R Rajeswara Rao and V Subba Ramaiah

POOL-4	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CSHN15	CLOUD COMPUTING ARCHITECTURE						

COURSE OBJECTIVE
- Student will learn different types of Cloud Computing Architectures and its usages.

COURSE OUTCOMES
On completion of this course, the students will be able to
CO1: Analyze evolution of Cloud [K4].
CO2: Analyze various Cloud Architectures [K4].
CO3: Analyze NIST Cloud computing reference Architecture K4].
CO4: Analyze IBM Cloud Computing reference Architecture [K4].
CO5: Analyze AWS Cloud Computing reference Architecture [K4].

SYLLABUS
UNIT – I:
Industry Trends and the Future of Cloud Computing Analysis of industry trends, Evolution from IaaS to PaaS applications, Convergence of IaaS and SaaSproviders, Trends leading from private to hybrid clouds, The future of cloud computing: — Hybrid clouds and cloud brokering, — Application transformation: fully multithreaded, multi provider, dynamically scalable applications, — Self-service administration: consolidated application control panels, -Software-defined networking, — Software-defined datacentre, — Big Data and analytics, — The Internet of Things.

UNIT – II:
Cloud computing architecture Workload distribution architecture, NIST reference architecture mapping, Resource pooling architecture, Dynamic scalability architecture, Elastic resource capacity architecture, Service load balancing architecture, Cloud bursting architecture, Elastic disk provisioning architecture, Redundant storage architecture, Cloud computing patterns, Mechanism audit monitor, Mechanism resource replication, Mechanism of various concept.

UNIT – III:
Cloud Computing Reference Architecture (CCRA) – NIST: NIST Cloud Computing Reference Architecture (CCRA), Objectives of NIST, The conceptual referencemodel, Example: Usage scenarios, Cloud consumer, Cloud provider, Cloud auditor, Cloud broker, Cloud carrier, Scope of control between provider and consumer, CCRA: Architectural components, Service orchestration, Cloud service management, Business support, Provisioning and configurationPortability and interoperability, Security, Privacy, Cloud taxonomy.

UNIT – IV:
Cloud Computing Reference Architecture (CCRA) – IBM : IBM's CCRA, IBM CCRA roles, Cloud service consumer, Cloud service provider, Cloud services, Infrastructure, Common Cloud Management Platform (CCMP), CCMP supports any level of virtualization, Business Support Services (BSS), Operational Support Services (OSS), Security, resilience, performance and consumption, Cloud service creator: Service development tools, IBM CCRA versions or CCRA evolution, Adoption patterns, Adoption pattern in CCRA 3.0, Examples of cloud services.

UNIT – V:

Cloud Computing Reference Architecture – AWS : What is amazon web services, Features of AWS, Web application hosting, Content and media serving, Large scale computing and huge data sets, Disaster recovery for local applications, Media sharing, Financial service grids, Time series data processing, Backup and restore to VMware cloud on AWS, Pilot light on VMware cloud on AWS, Microsoft share point on VMware cloud on AWS, Hybrid active directory trusted domain, Hybrid active directory stretched domain, Oracle RAC on VMware cloud on AWS, Batch processing, Advertisement serving, Asynchronous online gaming, Ecommerce website: Web frontend, Ecommerce website: Checkout service, Marketing and recommendations, Fault tolerance and high availability, File synchronization service, Amazon services, Amazon Simple Storage Service (S3), Amazon services developer tools, Amazon services developer tools, Amazon services security, identity and compliance, Amazon service applications.

TEXT BOOKS

1. Cloud Computing: Concepts, Technology & Architecture, 1e by Erl
2. Service-Oriented Architecture: Concepts, Technology, and Design by Thomas Erl

POOL-4	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CSHN16	**CLOUD COMPUTING SECURITY & MANAGEMENT**						

COURSE OBJECTIVE
- Student will study clod computing security risks, management issues and different encryption decryption techniques.

COURSE OUTCOMES

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

CO1: Analyze Service Management & System Administration in Cloud [K4].

CO2: Analyze Cloud growth planning [K4].

CO3: Analyze various Security risks in Cloud [K4].

CO4: Analyze Identity management issues in Cloud [K4].

CO5: Analyze various Encryption & Decryption techniques used in the Cloud [K4].
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SYLLABUS

UNIT 1.

Service Management & System Administration in Cloud : Concept of service management, Characteristics of Cloud Service Management, Cloud Architecture, Aneka Cloud Architecture, Characteristics of Cloud, Workflows in Cloud, Algorithm Description, Calculating Score of Machine, Deadline Distribution, General Architecture of Cloud Workflow Systems, Cloud Provisioning, Integrate and Automate, Enable elastic applications, Maximize Efficiency, Four dimensions of cloud provisioning, How cloud provisioning works, Cloud provisioning security, Specific provisioning actions, Self service provisioning for cloud computing services, Cloud-based Infrastructure Services Provisioning, Cloud Usage Monitor, Monitoring Agent, Resource Agent, Polling Agent, Key Benefits and Features, Cloud Monitoring Features, Metering and Billing, IaaS Billing and Metering Services, PaaS Billing and Metering Service, SaaS Billing and Metering Service, Up and Coming Service Models

UNIT – II :

Cloud Growth Planning & Managing Security and Resiliency : Forecasting requirements for cloud managed resources, Table January 2011- Estimation Capacity, The cloud service provider business, Competitive Landscape, Entering the cloud computing marketplace, General cloud service provider business models, Application Hosting on Cloud, The IBM Cloud Computing Reference Architecture (CCRA), Support Systems Capabilities, Shared System Capabilities, High Availability and Interoperability, Implementing cloud computing using IBM SmartCloud for Service Providers offerings, Operational Environment, Operational view for cloud management, Operational view for cloud service usage, Solution Integration, Common Integration Points, Service Development and Onboarding,

UNIT – III:

Security Overview and Understanding Security Risks : Security Overview, User Responsibility, The IT security management challenge, Improved requisite for controlling agreement, Improved mixture and gaining activity, Progressively growing user populations, Evolving skills modify the IT security setting, Operating System - Security, Security Imperatives, Authentication, One Time Passwords, Program Threats, System Threats, Computer Security Classifications, Application Security, Application Penetration Testing, Application Code Review, Secure Developer Training, Data Center Security, Data Center - Concept, Data Center – Design Imperatives, Security – Cloud Computing, Security Issues during Cloud Adoption, Solutions for Cloud Security Concerns, Security Framework,

UNIT –IV :
Addressing security risks in cloud & Identity Management

Introduction, Security Risks, Cloud Security Guidance, Effective governance, risk and compliance process, Audit Business and Operational Processes, Manage People, Roles and Identities, Ensure Proper Protection of Data and Information, Enforce Privacy Policies, Assess the security provisions of cloud applications, Ensuring Cloud networks and connections are secure, Evaluate security controls on physical infrastructure and facilities, Manage security terms in the cloud SLA, Understand the security requirements of the exit process, Cloud Security Assessment, Identity Management, Identity Management Models, Authentication and Authorization, Challenges of Identity Management, Evolution of IAM — Moving Beyond Compliance, Identity Access Management Life-cycle Phases, IAM and IT Trends, Case study (Bank) — IAM in practice, TransformingIAM, Key considerations when transforming IAM, IAM Tools, Transforming IAM, Transformation Plan, Detention, Field Acquisition & Analysis.

UNIT – V:
Encryption and Decryption

Introduction, what is Cryptography? Strong Cryptography, how does cryptography work? Conventional Cryptography, Public Key Cryptography, How PGP works, Keys, Digital Signatures, Hash Functions, Digital Certificates, Certificate Distribution and Management, Certificate Formats, PGP Certificate Format, X.509 Certificate Format, Public Key Value, Trust, Trust Models, Levels of trust in PGP, Certificate Revocation and Communication,

TEXT BOOKS

1. Vulnerability Management for Cloud Computing - 2014: A Cloud Computing Security Essential (Disruptive Cloud Computing & IT) by Rajakumar Sampathkumar and Swarnalakshmi Balasubramani
2. Cloud Computing and Security: 4th International Conference, ICCCS 2018, Haikou, China, June 8-10, 2018, Revised Selected Papers, Part II (Lecture Notes in Computer Science Book 11064) by Xingming Sun, Zhaoqing Pan, et al.
3. Cloud Management and Security, Imad M. Abbadi, IBM