NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

B.Tech.

Computer Science and Engineering

(Cyber Security)

(4 Year Program)

(Applicable for the Batches admitted from 2022-23)

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Kotappakonda Road, Yellamanda (Post), Narasaraopet – 522601, Guntur District, AP
Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada, Code: 47,
Accredited by NBA & NAAC A+, RTA Approved Pollution test Centre, ISO 9001: 2015 Certified Institution
Phone: 08647-239905   Website: www.nrtec.in

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. **PROGRAMS 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(Daga 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 EAMCET 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 fulfils 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
6. Regular lifestyle and professional discipline
7. 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 Mini Project/Practical Training/Internship/ Research Project/ Community Service Project. The Project Work shall be evaluated for 200 marks.

THEORY

For all theory subjects consisting of 5 units 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 **Cycle** 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 test each student will be given two questions at random. A1 will be evaluated for 05 marks.

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

After the first two and half Units of syllabus is over along with the descriptive test, 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. One 10 marks question from unit 1, one 10 marks question from unit 2, and one 5 marks question from 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)

Q2 and D2 will be conducted after 5th unit is over. For D2, one 5 marks question will be given from second half of 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 consist of five questions carrying 14 marks each. Each of these questions is from one unit 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 and

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 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.

The syllabus for the subject "**Machine drawing using Auto CAD**" consists of two major portions:

      1. Unit I to III –Conventional drawing pattern.
      2. Unit IV to VI-Computer lab pattern using any drafting packages

The distribution of internal and external marks is 30 and 70 marks respectively.

Internal Evaluation: Max Marks: 30

The total internal evaluation marks are distributed in the following two components:

      1. Day-to-day work   : 15 Marks (Evaluation of Charts)

      2. Descriptive Test   : 15 Marks

Cycle–I Examination – Conventional drawing pattern

In Cycle-I examination the 30 marks will be awarded as follows:

      Day-to-day evaluation   - 15 Marks

      Descriptive Test   - 15 Marks

In the Descriptive Test of duration 2 hours, 3 questions will be given to the student and he has to answer all the three questions (3x05M = 15M).

Cycle–II Examination – Computer lab pattern using any drafting packages for duration of 2 hours.

In Cycle-II examination the 30 marks will be awarded as follows:

Record   - 10 Marks

Execution   - 10 Marks

Paper Work   - 10 Marks

Of two cycle examinations conducted during the semester, sum of 80% of the best and 20% of the least of two cycle examinations shall be considered for the award of internal marks.

End semester Examination (Total Duration: 4 hours, Max, marks: 70)

Conventional drawing pattern (Duration: 2 Hours, Marks: 35)

Computer lab pattern using any drafting packages (Duration: 2 Hours, Max:35)

(Note: Both Conventional drawing pattern and Computer lab pattern using any drafting packages are compulsory and are to be conducted in separate sessions)

Mandatory Course (M.C): Environmental Sciences/NSS/NCC, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge 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 internships for a minimum of six 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 fulfil 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.

- **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.

Mini Project/Practical Training/ Internship/ Research Project/ 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 6 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.

Mini Project/Practical Training/ Internship/ Research Project/ Community Service Project will be evaluated at the end of the semester for 50 marks (Record/Report: 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 Mini Project/Practical Training/ Internship/ Research Project/ 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 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 4_{th} semester provided that the student must have acquired a minimum of 8.0 SGPA upto the end of 2_{nd} semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4_{th} 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 recommended 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 programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

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

2. 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.

3. 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.

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

5. 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.

6. 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.

7. 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.

8. 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).

9. 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.

10. 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.

11. Student can opt for the Industry relevant minor specialization as approved by the concerned Departmental committee. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The 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.

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

13. 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.

14. 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.

15. 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	Miniproject/Internship/Industrial Training /Skill development courses/ Research project/ 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 competitive 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 fulfils the minimum attendance requirements.

b) A student will be promoted from II year to III year if he fulfils 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 fulfils 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 'Si' 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	≥ 4.75 & < 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. Student can submit the application for revaluation, along with the prescribed fee for revaluation evaluation 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).

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 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 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	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

	practical) in which the candidate is appearing.	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	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject

	or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	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 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 connected with the college indulges in any malpractice or improper conduct mentioned in clause 6to 8.	Student of the college expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject 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 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 6 months 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.

- TheCommunity 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 –

○ 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.

○ 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-university 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 & Communicative English-I	HS	30	70	100	3	0	0	3
2	R20CC1102	Linear Algebra & 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	R20CC1111	Electronic Devices and Logic Design	ES	30	70	100	3	0	0	3
6	R20CC11L1	Soft Skills and Communication Skills Lab	HS	15	35	50	0	0	3	1.5
7	R20CC11L2	Problem Solving Using C Lab	ES	15	35	50	0	0	3	1.5
8	R20CC11L4	Applied Physics Lab	BS	15	35	50	0	0	3	1.5
9	R20CC11MC1	Environmental Studies	MC	-	-	-	2	0	0	0
				TOTAL						**19.5**

I B.TECH – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC1201	Differential Equations & Vector Calculus	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	R20CC1218	Technical and Communicative English-II	BS	30	70	100	3	0	0	3
5	R20CC12L2	Engineering Chemistry Lab	BS	15	35	50	0	0	3	1.5
6	R20CC12L12	Problem Solving using PYTHON Lab	ES	15	35	50	0	0	3	1.5
7	R20CC12L15	IT Workshop	ES	15	35	50	0	0	3	1.5
8	R20CC1216	Unix Programming Lab	ES	15	35	50	0	0	3	1.5
9	R20CC12L14	Engineering Graphics	ES	15	35	50	0	0	3	1.5
TOTAL										19.5

II B.TECH - I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC2106	Probability & Statistics	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	R20CC2101	Computer Organization	PC	30	70	100	3	0	0	3
5	R20AC2105	Software Engineering	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	Software Engineering and UML Lab	PC	15	35	50	0	0	3	1.5
9	R20CC21SC1	Data Science Lab	SOC	-	50	50	0	0	4	2
10	R20CC21MC2	Constitution of India	MC	-	-	-	2	0	0	0
Total										**21.5**

II B.TECH – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC2211	Mathematical Foundations of Computer Science	BS	30	70	100	3	0	0	3
2	R20CC2203	Database Management Systems	PC	30	70	100	3	0	0	3
3	R20CC2210	Numerical Methods & Transformations	BS	30	70	100	3	0	0	3
4	R20CC2205	Computer Networks	PC	30	70	100	3	0	0	3
5	R20CC2204	Operating Systems	PC	30	70	100	3	0	0	3
6	R20CC22L1	Database Management Systems Lab	PC	30	70	100	0	0	3	1.5
7	R20CY22L3	Computer Networks & Operating Systems Lab	PC	15	35	50	0	0	3	1.5
8	R20AC22L4	Front End Web Technologies Lab	PC	15	35	50	0	0	3	1.5
9	R20CC22SC3	Mobile Application Development Lab	SOC	-	50	50	0	0	4	2
		TOTAL								**21.5**
10		**Honors/Minors Course**		30	70	100	4	0	0	4

III B.TECH. – I SEMESTER

S.No.	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CY3101	Cryptography and Network Security	PC	30	70	100	3	0	0	3
2	R20CC3103	Design and Analysis of Algorithms	PC	30	70	100	3	0	0	3
3	R20CC3110	Principles of Machine Learning	PC	30	70	100	3	0	0	3
4	R2CC3107 R20CY3102 R20CC3109 R20CS3105	Professional Elective - I • Software Testing Methodologies • Data Analytics& Visualization • Devops • Compiler Design	PE	30	70	100	3	0	0	3
5	Open Elective – I		OE	30	70	100	3	0	0	3
6	R20CY31L1	Cryptography and Network Security Lab	PC	15	35	50	0	0	3	1.5
7	R20CC31L4	Machine Learning Lab	PC	15	35	50	0	0	3	1.5
8	R20CY31SC1	Data Analytics & Visualization Lab	SC	-	50	50	0	0	4	2
9	R20CSP	Community Service Project	PR	-	-	50	0	0	0	1.5
10	R20CC31MC01	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

S.No.	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CY3201	Introduction to Cyber Security	PC	30	70	100	3	0	0	3
2	R20CY3202	Malware Analysis & Reverse Engineering	PC	30	70	100	3	0	0	3
3	R20CY3203	Ethical Hacking	PC	30	70	100	3	0	0	3
4	R20CY3204 R20CY3205 R20CC3206 R20CY3207	Professional Elective - II • Data analytics for fraud detection • Block Chain Technologies • Big data Analytics • Secure Coding	PE	30	70	100	3	0	0	3
5	**Open Elective – II ((Mean Stack)**		OE	30	70	100	3	0	0	3
6	R20CY32L1	Cyber Security Lab	PC	15	35	50	0	0	3	1.5
7	R20CY32L2	Malware Analysis and Reverse Engineering Lab	PC	15	35	50	0	0	3	1.5
8	R20CY32L3	Mean Stack Technologies Lab	ES	15	35	50	0	0	3	1.5
9	R20CC32SC1	English Employability Skills	SC	-	-	50	0	0	4	2
10	R20CC32MC1	Essence of Indian Traditional Knowledge	MC			-	2	0	0	0
TOTAL										**21.5**
11		**Honors/Minor Course**		30	70	100	4	0	0	4
Community Service Project / Internship to be evaluated in IV-I										

IV YEAR - I SEMESTER

S.No.	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CY4102 R20CY4103 R20CY4104 R20CC4121	Professional Elective – III • Cyber Crime Investigation & Digital Forensics • Mobile and Wireless Security • Distributed Systems • Reinforcement Learning	PE	30	70	100	3	0	0	3
2	R20CY4106 R20CY4107 R20CY4108 R20CY4109	Professional Elective -IV • Cloud Security • Incident Response and Threat Detection • Vulnerability Analysis and Penetration Testing • Information Coding Techniques	PE	30	70	100	3	0	0	3
3	R20CY4110 R20CY4111 R20CY4112 R20CY4113	Professional Elective - V • Cyber Laws • Intrusion Detection Systems • Data Privacy • Information Security Management	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	R2CY41SC1	Cyber Crime Investigation & Digital Forensics Lab	SC	-	50	50	0	0	4	2
8	R20INTERN	Summer Internship/Community Service Project	PR	-	50	50	0	0	0	1.5
9	R20CC41MC	MOOCS								1.5
TOTAL										**23**
10		**Honors/Minors Course**		30	70	100	4	0	0	4

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: ADVANCED CYBER SECURITY

S.No.	HONOR Subject Title	Sub Code	No.of periods per week			No.of Credits
			L	T	P	C
1	Web & Database Security	20CYHN01	4	0	0	4
2	Social Media Security	20CYHN02	4	0	0	4
3	Digital Watermarking and Steganography	20CYHN03	4	0	0	4
4	Authentication Techniques	20CYHN04	4	0	0	4
5	Mobile Application Security	20CYHN05	4	0	0	4

Pool 2: 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

Minors:

S.No.	Minor Title	Dept. Offering Subject	Sub Code	No. of Periods per week			No. of credits
				L	T	P	C
1	Cryptography and Network Security	CSE (CS)	R20CCMN49	4	0	0	4
2	Introduction to Cyber Security	CSE (CS)	R20CCMN50	4	0	0	4
3	Ethical Hacking	CSE (CS)	R20CCMN51	4	0	0	4
4	Secure Coding	CSE (CS)	R20CCMN52	4	0	0	4
5	Cyber Crime Investigation & Digital Forensics	CSE (CS)	R20CCMN53	4	0	0	4
6	Data Privacy	CSE (CS)	R20CCMN54	4	0	0	4
In addition to any of the four subjects, MOOC/NPTEL courses for 04 credits (2 8-weeks courses @ 2 credits each) are compulsorily in the domain of Cyber Security							

List of Open Electives offered by Department

S.No.	Open Elective -1 Subject Code	Subject Title	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CC10E21	Mean Stack Technologies	30	70	100	3	0	0	3
2	R20CC10E22/ R20CY3101	Cryptography and Network Security	30	70	100	3	0	0	3

S.No.	Open Elective -2 Subject Code	Subject Title	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CC20E16	Cloud Computing	30	70	100	3	0	0	3
2	R20CC20E20/ R20CY3203	Ethical Hacking	30	70	100	3	0	0	3

S.No.	Open Elective -3 Subject Code	Subject Title	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CC30E21/ R20CY3201	Introduction to Cyber Security	30	70	100	3	0	0	3
2	R20CC30E22	Malware Analysis & Reverse Engineering	30	70	100	3	0	0	3

S.No.	Open Elective -4 Subject Code	Subject Title	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CC40E16/ R20CC4104	e-Commerce	30	70	100	3	0	0	3
2	R20CC4OE19/ R20CY4112	Data Privacy	30	70	100	3	0	0	3

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 & Communicative English-I	HS	30	70	100	3	0	0	3
2	R20CC1102	Linear Algebra & 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	R20CC1111	Electronic Devices and Logic Design	ES	30	70	100	3	0	0	3
6	R20CC11L1	Soft Skills and Communication Skills Lab	HS	15	35	50	0	0	3	1.5
7	R20CC11L2	Problem Solving Using C Lab	ES	15	35	50	0	0	3	1.5
8	R20CC11L4	Applied Physics Lab	BS	15	35	50	0	0	3	1.5
9	R20CC11MC1	Environmental Studies	MC	-	-	-	2	0	0	0
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-newdelhi/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,CSC,CSD&CSM)						

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
4. University press, 2nd edition, 2010.
5. Sanjay D Jain and Girish G Sahasrabudhe "Engineering Physics", University Press ISBN: 8173716781,1st edition, 2010.
6. 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	-	-	30	70	100	3
SUBCODE: R20CC1111	**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, DeMorgan'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 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-helpedme-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
7. Shiv Khera, You can Win, Bloomsbury Publication, 2014
8. 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-newdelhi/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,CAI,CSC,CSD,CSM,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
	2	-	-	-	-	-	0
SUBCODE: R20CC11MC1	**ENVIRONMENTAL STUDIES** **(COMMON TO ALL BRANCHES)**						

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

I B.TECH – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC1201	Differential Equations & Vector Calculus	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	R20CC1218	Technical and Communicative English-II	BS	30	70	100	3	0	0	3
5	R20CC12L2	Engineering Chemistry Lab	BS	15	35	50	0	0	3	1.5
6	R20CC12L12	Problem Solving using PYTHON Lab	ES	15	35	50	0	0	3	1.5
7	R20CC12L15	IT Workshop	ES	15	35	50	0	0	3	1.5
8	R20CC1216	Unix Programming Lab	ES	15	35	50	0	0	3	1.5
9	R20CC12L14	Engineering Graphics	ES	15	35	50	0	0	3	1.5
TOTAL										19.5

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Sub Code: R20CC1201	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (Common to Civil, EEE, ME, ECE, CSE(AI-ML), CSE(DS) and CSE(CS))						

COURSE OBJECTIVES:

1. To formulate and solve first order ordinary differential equations.
2. To solve second order differential equations of various kinds.
3. To find the solution of first order linear and non-linear partial differential equations.
4. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

COURSE OUTCOMES:

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

1. Apply first order ordinary differential equations to real life situations.   [K3]
2. Identify and apply suitable methods in solving the higher order differential equations. [K3]
3. Solve the partial differentiation equations. **[K3]**
4. Interpret the physical meaning of different operators as gradient, curl and divergence. [K2]
5. Estimate the work done against a field, circulation and flux using vector calculus. [K5]

SYLLABUS:

UNIT I: DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE: (10 hours)
Linear-Bernoulli's-Exact equations and equations reducible to exact form.
Applications: Newton's Law of cooling, Law of natural growth and decay, Orthogonal trajectories, Electrical circuits.

UNIT-II: LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER: (10 hours)
Finding the complementary functions, Inverse operator, Rules for finding the particular integrals, Method of variation of parameters. Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients.
Application: L-C-R Circuit problems.

UNIT – III: FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS: **(10 hours)**
Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange's) equations.

UNIT- IV: VECTOR DIFFERENTIATION: **(8 hours)**
Scalar and vector point functions, vector operator del, del applies to scalar point functions- Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT- V: VECTOR INTEGRATION: **(10 hours)**
Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

TEXT BOOKS :
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.
3. Bhavanari Satyanarayana, Pradeep Kumar T.V. & Srinivasulu D, "Linear Algebra and Vector Calculus", Studera Press, New Delhi, 2017.

REFERENCES:
1. Kreyszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
2. Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
3. Peter V. O'Neil, *"Advanced Engineering Mathematics"*, 7th Edition, Cengage Learning, 2011.
4. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*Engineering Mathematics*", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.

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	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
II SEMESTER	3	-	-	30	70	100	3
SUBCODE: R20CC1206	**PROBLEM SLOVING USING PYTHON** (Common to CSE, IT,CSC,CSD&CSM)						

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, Dictionariesdictionary 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-13:978-0-19948017-3, 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: R20CC1218	**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).**

SYLLABUS
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-2019firstnaukri-prep
9. https://in.usembassy.gov/education-culture/american-spaces/dostihouse-mumbai/libraryservices/
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/

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 **1**

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
	-	-	3	15	35	50	1.5
SUBCODE: R20CC12L12	**PROBLEM SOLVING USING PYTHON LAB** (Common to CSE,IT,CSC,CSD & CSM)						

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:

1. Design a Python script to convert a Binary number to Decimal number and verify if it is a Perfect number.
2. Design a Python script to determine if a given string is a Palindrome using recursion

WEEK-3:

1. Design a Python script to sort numbers specified in a text file using lists.
2. 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:

1. Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.
2. 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.
3. Write a Python program to convert a date of yyyy-mm-dd format to dd-mm-yyyy format.

WEEK-5:
1. Design a Python Script to convert a given number to words
2. Design a Python Script to convert a given number to roman number.

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

WEEK-7:
1. Write a Python program to convert a given tuple of positive integers into an integer.
2. 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:
1 Write a Python program to remove the intersection of a 2nd set from the 1st set.
2 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:
1 Design a Python script to generate statistical reports Minimum, Maximum, Count, Average, Sum etc) on public datasets.
2 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:
1 Write a Python program to replace all occurrences of space, comma, or dot with a colon.

2   Write a Python program to match a string that contains only upper and lowercase letters, numbers, and underscores.

WEEK-11:
1. 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
2. Write a Python program to find the occurrence and position of the substrings within a string.

WEEK-12:
1. Design a Python script on oop's concepts: Class variables and instance variable
    i. Robot ii) ATM Machine

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-13:978-0-19948017-3, 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	15	35	50	1.5
SUBCODE: R20CC12L15	IT 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: Formalize 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
	0	0	3	15	35	50	1.5
SUBCODE: R20CC12L16	**UNIX 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 exist 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 an 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	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Sub Code: R20CC12L14	ENGINEERING GRAPHICS (for AI&ML, Data Science & Cyber Security)						

COURCE OBJECTIVES:

- The students to use drawing instruments and to draw polygons, engineering Curves & engineering scales.
- The students use to make orthographic projections, projections of points, simple lines & projections of the lines inclined to both the lines.
- The students use to draw the projections of the plane inclined to both the plane.
- Develop surfaces of regular solids, and solids inclined to one Axis using drafting software.
- Convert and develop the isometric views onto orthographic views.

COURSE OUTCOMES:

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

CO 1: construct the geometrical shapes of regular polygons, Engineering Curves, and scales.

CO 2: illustrate the orthographic projections, projections of points, and lines.

CO 3: construct the projection of planes inclined to both the planes.

CO 4: construct the projection of solids for engineering applications.

CO 5: construct the conversion of isometric views to orthographic views vice versa.

UNIT– I

THE BASIC CONCEPTS IN ENGINEERING DRAWING: introduction to engineering drawing instruments, lettering and dimensioning practice. Geometrical constructions- Constructing regular polygons by general methods.

CURVES USED IN ENGINEERING PRACTICE: Introduction to conic sections, construction of ellipse, parabola, hyperbola by eccentricity method. Construction of ellipse by - Arcs of circles Method, Concentric Circles Method and Oblong Method, & parallelogram methods.

UNIT–II

ORTHOGRAPHIC PROJECTIONS- introduction to type of projections, first angle and third angle projections. Projection of points: Principles of orthographic projection – Convention – First angle projections, projections of points.

PROJECTIONS OF STRAIGHT LINES: Projections of straight lines parallel to both the planes, parallel to one plane and inclined to the other plane. Lines inclined to both the planes - Projections of straight lines inclined to both the planes- determination of true lengths, angle of inclination and traces.

UNIT–III
PROJECTIONS OF PLANES: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT-IV
INTRODUCTION TO AUTOCAD SOFTWARE: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.

PROJECTIONS OF SOLIDS: introduction to projections of solids, types of solids: prisms, pyramids, cones and cylinders –simple positions and the axis inclined to one of the planes.

UNIT-V
Introduction of isometric views, isometric projections & orthographic projections. Conversion of isometric views to orthographic views and orthographic views to isometric views.

TEXT BOOKS

1. Engineering Drawing by N.D. Butt, Chariot Publications.
2. Engineering Drawing & Graphics by K.Venu gopal, New age international Publishers.
3. Dhananjay A Jolhe, "Engineering Drawing with an introduction to AutoCAD", Tata McGraw- Hill Publishing company limited.
4. D.M. Kulkarni, A.P. Rastogi and A.K.Sarkar; "Engineering Graphics with AutoCAD", PHI Learning Private Limited, New Delhi.

REFERENCE BOOKS:
1. Engineering Graphics for Degree by K.C. John, PHI Publishers.
2. Engineering Drawing by Basant Agarwal & CM. Agarwal, Tata McGraw Hill Publishers.
3. Venugopal. K, "Engineering Drawing and Graphics+ AutoCAD", NewAge International.

Web References:
1. https://nptel.ac.in/courses/112103019/17

E-Books:

1. https://www.pdfdrive.com/textbook-of-engineering-drawing-e28918244.html

II B.TECH - I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	R20CC2106	Probability & Statistics	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	R20CC2101	Computer Organization	PC	30	70	100	3	0	0	3
5	R20AC2105	Software Engineering	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	Software Engineering and UML Lab	PC	15	35	50	0	0	3	1.5
9	R20CC21SC1	Data Science Lab	SOC	-	50	50	0	0	4	2
10	R20CC21MC2	Constitution of India	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
Sub Code: R20CC2106	**PROBABILITY AND STATISTICS** CSE(AI-ML), CSE(Cyber Security)), CSE(Data Science)						

COURSE OBJECTIVES:
1. To familiarize the students with the foundations of probability and statistical methods
2. To impart probability concepts and statistical methods in various applications Engineering

COURSE OUTCOMES:
Upon successful completion of this course, the student should be able to
1. Classify the available data to apply in the domain of data science.   [**Analyzing – K4**]
2. Select the associated characteristics in view of correlation and regression. [**Apply – K3**]
3. Apply discrete and continuous probability distributions.   [**Apply – K3**]
4. Design the components of a classical hypothesis test   [**Creating – K6**]
5. Apply the statistical methods based on small and large sampling tests. [**Apply – K3**]

UNIT I: Descriptive statistics and methods for data science   (10 hours)
Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.

UNIT II: Correlation and Curve fitting: Correlation   (8 hours)
Correlation and Curve fitting: Correlation – correlation coefficient – rank correlation – regression coefficients and properties – regression lines – Method of least squares – Straight line – parabola – Exponential – Power curves.

UNIT III: Probability and Distributions: (10 hours)
Probability and Distributions: Probability – Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT IV: Sampling Theory: (10 hours)
Sampling Theory: Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t,□□ ^{2} and F-distributions – Point, and Interval estimations – Maximum error of estimate.

UNIT V: Tests of Hypothesis: (10 hours)

Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions

Text Books:
1) Miller and Freund's, "**Probability and Statistics for Engineers**",7/e, Pearson, 2008.
2) S. C. Gupta and V.K. Kapoor, "*Fundamentals of Mathematical Statistics*", 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:
1) Shron L. Myers, Keying Ye, Ronald E Walpole, *Probability and Statistics   Engineers and the Scientists*,8th Edition, Pearson 2007.
2) Jay l. Devore, *Probability and Statistics for Engineering and the Sciences*, 8th Edition, Cengage.
3) Sheldon M. Ross, "*Introduction to probability and statistics Engineers and the Scientists",* 4th Edition, Academic Foundation, 2011.
4) Johannes Ledolter and Robert V. Hogg, "*Applied statistics for Engineers and Physical Scientists*", 3rd Edition, Pearson, 2010.

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,CSC,CSD & CSM)						

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, CAI,CSC,CSD,CSM)						

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, CAI,CSC,CSD & CSM)						

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: R20AC2105	**SOFTWARE ENGINEERING**						

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

COURSE OUTCOMES:
After completion of this course, the students will be able to
   CO1 : Compare and contrast basic software engineering methods and practices. [K2].
   CO2 : Analyze the project management essentials [K4].
   CO3 : Analyze the software process models. [K4].
   CO4 : Outline the importance of software testing and quality control approaches [K2].

SYLLABUS:
UNIT - I
Introduction to Software Engineering: Software-Software classification, Engineering Discipline; Software Crisis, Software Engineering definition, Evolution of Software Engineering Methodologies - exploratory, structured, data structure, object oriented, component based development; Software Engineering Challenges- problem understanding, quality and product, cycle time and cost, reliability, change and maintenance, usability and reusability, repeatability and process maturity, estimation and planning.
Software Processes: Software Process- software process model, elements of software process, characteristics of software process; Phased development life cycle- phased life cycle activity; Software Development Process Models- classical waterfall model, iterative waterfall, prototyping, incremental, spiral, agile process, RUP process model.

UNIT - II
Requirements Engineering: Software Requirements- business, user, system, functional and nonfunctional; Requirements engineering Process, Requirements elicitation-fact finding techniques; Requirements Analysis, Structured Analysis - data flow diagram, data dictionary, Structured analysis, pros and cons of structured analysis; Prototyping Analysis- throwaway, evolutionary; Requirements Specification- characteristics, components, structure, requirement specification methods; Requirements Validation- review, inspection, test case generation, reading, prototyping; Requirements Management.

UNIT - III
Software Design: Software Design Process, Characteristics of Good Software Design, Design Principles- abstraction, information hiding, functional decomposition, design strategies, modularity; Modular Design- coupling, cohesion; Design Methodologies-

function oriented design, object oriented design; Structured Design- structure chart, structure vs flow chart; Structured Design Methodology- review and refine data flow diagram, identify boundaries between input process and output segments, apply design principles modularization criteria.

UNIT - IV
Implementation: Coding Principles- information hiding, structure programming, max cohesion and min coupling, code reusability, kiss, simplicity extensibility , code verification, code documentation; Coding Process- traditional coding process, test driven development.
Software Testing: Testing Fundamentals- errors, faults, failures, cost of defects, testing process, role of software testers; Test Planning- create a test plan, design test cases, test stubs and test drivers, test case execution, test summary report, defect tracking and statistics; Black Box Testing- equivalence class partitioning, boundary value analysis, cause effect graphing, error guessing; White Box Testing- control flow based, path, data flow based, mutation; Levels of Testing- unit, integration, system, acceptance.

UNIT - V
Project Planning and Estimation: Project Planning activities, Software Metrics and measurements, Project Size Estimation - lines of code, functional point analysis; Effort Estimation Techniques- COCOMO cost models, analytical estimation.
Software Quality: software quality concept, Software Quality Factors, Verification & Validation, Software Quality Assurance- SQA activities, SQA plan; Capability Maturity Model (CMM) - SEI-CMM vs ISO standard.

TEXT BOOKS:
 1. Ugrasen Suman, "Software Engineering, concepts and practices", Cengage learning, 1/e, 2015.
REFERENCE BOOKS:
 1. W S Jawadekar, "Software Engineering principles and practice", TMH, 2006
 2. Sommerville, "Software Engineering", 8/e, , Pearson.
 3. Roger S. Pressman, "Software Engineering", 7/e, TMH

ADDITIONAL RESOURCES:
 1. nptel.ac.in/courses/106101061

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,CAI,CSC,CSD & CSM)						

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**						

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
	0	0	3	15	35	50	1.5
SUBCODE: R20AC21L3	**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_LVvQ5 G-LdJ8RLqe-ndo7QITYc
3. https://www.youtube.com/watch?v=RRXe1omEGWQ&list=PLD4EF3E3AD0 55F3C7

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 LAB						

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 (MC)**						

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	R20CC2211	Mathematical Foundations of Computer Science	BS	30	70	100	3	0	0	3
2	R20CC2203	Database Management Systems	PC	30	70	100	3	0	0	3
3	R20CC2210	Numerical Methods & Transformations	BS	30	70	100	3	0	0	3
4	R20CC2205	Computer Networks	PC	30	70	100	3	0	0	3
5	R20CC2204	Operating Systems	PC	30	70	100	3	0	0	3
6	R20CC22L1	Database Management Systems Lab	PC	30	70	100	0	0	3	1.5
7	R20CY22L3	Computer Networks & Operating Systems Lab	PC	15	35	50	0	0	3	1.5
8	R20AC22L4	Front End Web Technologies Lab	PC	15	35	50	0	0	3	1.5
9	R20CC22SC3	Mobile Application Development Lab	SOC	-	50	50	0	0	4	2
		TOTAL								**21.5**
10		**Honors/Minors Course**		30	70	100	4	0	0	4

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC2211	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (CSE,IT,CSC,CSD,CSM)						

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. 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,CAI,CSC,CSD & CSM)						

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	0	0	30	70	100	3
Sub Code: R20CC2210	**NUMERICAL METHODS AND TRANSFORMATIONS** (CSE(AI-ML), CSE(DS), CSE(CS))						

COURSE OBJECTIVES:
1. To elucidate the different numerical methods to solve nonlinear algebraic equations.
2. To propagate the use of different numerical techniques for carrying out numerical integration.
3. Explore the use of Laplace transform method to solve with initial value problems of ODE.
4. To acquire fundamental Knowledge of Fourier series and Fourier Transform and able to give Fourier expansions of a given function.

COURSE OUTCOMES:
Upon successful completion of the course, the students should be able to
1. Evaluate approximating roots of polynomials and transcendental equations by different algorithms.   [**K5**]
2. Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals.   [**K3**]
3. Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations.   [**K3**]
4. Select appropriate technique of Laplace transforms in solving differential equations.   [**K3**]
5. Apply Fourier series, integral, transforms techniques in their core.   [**K3**]

SYLLABUS
UNIT –I: ITERATION METHODS: **(6 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: **(8 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: FOURIER SERIES & FOURIER TRANSFORMS: **(12 hours)**

Introduction, Euler's formulae, Periodic functions, Dirichlet's conditions, conditions for a Fourier expansion, functions of any period, functions having points of discontinuity, odd and even functions - half range series. Fourier integral theorem (without proof), Fourier cosine and sine integrals, Fourier transform, Fourier sine and cosine transforms, properties of Fourier Transforms, convolution theorem (without proof).

UNIT-V: LAPLACE & Z- TRANSFORMATIONS: **(12 hours)**

Laplace transform and its properties, Transform of derivatives and integrals, Multiplication by t^n, division by t, Unit step function and unit impulse function. Transform of periodic functions, Evolutions of integrals by Laplace Transforms. Finding inverse transforms by the method of partial fractions, other methods of finding inverse Laplace Transforms, Convolution theorem(without proof), Solutions of Initial and Boundary Value Problems.

z-transform: Introduction, properties, Damping rule, Shifting rule, Initial and Final value theorems, Inverse z-transform, Convolution theorem, Solutions of difference equations.

TEXT BOOK:
1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publisher.
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. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEditiwiley-India. 3. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage Learning, 2011.

II B.TECH. II - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Sub Code: R20IT2205	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.
CO 2: Compare and Contrast OSI and TCP/IP reference models.
CO 3: Interpret data link layer services and multiple access protocols.
CO 4: Analyse different routing protocols.
CO 5: Illustrate the essential principles of different transport layer protocols.
CO 6: Summarize various application layer protocols.

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

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

ONLINE 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

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Sub Code: R20AC2204	**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, Pre-emptive 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, DiningPhilosophers 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 pre-emption, 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 pre-emption.

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

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 Lᴀʙ** (Common to CSE, IT, CAI,CSC,CSD & CSM)						

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:
1. nptel.ac.in/courses/106106093
2. nptel.ac.in/courses/106104135
3. https://www.edx.org/course/databases-5-sql
4. 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
CODE: R20CY22L3	COMPUTER NETWORKS & OPERATING SYSTEMS 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 and obtain Routing table for 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.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	15	35	50	1.5
SUBCODE: R20AC22L4	**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)
         Aboutus.html (Hint: About owner of website)
2.   Contactus.html
3.   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 II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	4		50	50	2
SUBCODE: R20CC22SC3	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

III B.TECH. – I SEMESTER

S.No.	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CY3101	Cryptography and Network Security	PC	30	70	100	3	0	0	3
2	R20CC3103	Design and Analysis of Algorithms	PC	30	70	100	3	0	0	3
3	R20CC3110	Principles of Machine Learning	PC	30	70	100	3	0	0	3
4	R2CC3107 R20CY3102 R20CC3109 R20CS3105	Professional Elective - I • Software Testing Methodologies • Data Analytics& Visualization • Devops • Compiler Design	PE	30	70	100	3	0	0	3
5	Open Elective – I		OE	30	70	100	3	0	0	3
6	R20CY31L1	Cryptography and Network Security Lab	PC	15	35	50	0	0	3	1.5
7	R20CC31L4	Machine Learning Lab	PC	15	35	50	0	0	3	1.5
8	R20CY31SC1	Data Analytics & Visualization Lab	SC	-	50	50	0	0	4	2
9	R20CSP	Community Service Project	PR	-	-	50	0	0	0	1.5
10	R20CC31MC01	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 I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY3101	**CRYPTOGRAPHY AND 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 : 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, John Wiley & 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 I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE:R20CC3103	**DESIGN AND ANALYSIS OF ALGORITHMS**						

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: Analyze fundamental graph traversal techniques to solve various applications using Backtracking, 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 Sanguthevar 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.

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

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3110	**PRINCIPLES OF MACHINE LEARNING**						

Course Objectives:
The course is introduced for students to
- Gain knowledge about basic concepts of Machine Learning
- Study about different learning algorithms
- Learn about of evaluation of learning algorithms
- Learn about Dimensionality reduction

Course Outcomes:
CO1: Analyze practical issues in machine learning application. [K4]
CO2: Apply decision tree algorithms for appropriate problem domains. [K3]
CO3: Apply and interpret statistical techniques. [K4]
CO4: Apply ML techniques to solve classification. [K3]
CO5: Apply ML techniques to solve regression problems. [K3]

SYLLABUS:
UNIT-I
Introduction:
Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.
Concept Learning:
Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II
Decision Tree Learning:
Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III
Evaluating Hypothesis:
Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms.

UNIT-IV

Computational Learning Theory:
Models of learnability: learning in the limit; probably approximately correct (PAC) learning. Sample complexity for infinite hypothesis spaces, Vapnik-Chervonenkis dimension.

UNIT-V
Bayesian Learning
Probability theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logistic regression. Bayes nets and Markov nets for representing dependencies.

Instance Based Learning:
Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning,

Text Books:
1) T.M. Mitchell, "Machine Learning", McGraw-Hill, 1997.
2) Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

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

e-Resources:
1.https://www.youtube.com/watch?v=FeGe35iYTXU&list=PL4gu8xQu0_5JBO1FKRO5p20 wc8DprlOgn

III B.TECH I SEMESTER (P.E.- I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3107			**SOFTWARE TESTING METHODOLOGIES**				

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 (P.E.- I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY3102	**DATA ANALYTICS & VISUALIZATION**

COURSE OBJECTIVES
- To understand the importance of analytics in a wide variety of industries
- To understand the various types of data, apply and evaluate the principles of data visualization.
- Acquire skills to apply visualization techniques to a problem and its associated dataset.
- To apply structured approach to create effective visualizations from the massive dataset using various visualization tools.

COURSE OUTCOMES
Upon completion of the course the student will be able to

CO1 : Interpreting the Importance of Data and its importance [K2]

CO2 : Illustrating various ANOVA methods and Regression methods [K2]

CO3 : Analyze various data types and visualization types to extract meaningful insights. [K4]

CO4 : Apply visualization techniques to address specific problems using datasets and derive valuable insights, especially for large datasets.[K3]

CO5 : Make use of powerbi tool for applying various functions. [K3]

SYLLABUS:

UNIT-I

Introduction to Data Analytics: Data and its importance, data analytic and its types, importance of data analytics

Python Fundamentals: Python Language Basics, Jupiter Notebook, Introduction to pandas, Data Structures, Essential Functionality

Central Tendency and Dispersion: Visual Representation of the Data, Measures of Central Tendency, Dispersion

UNIT-II

Analysis of Variance (ANOVA): Introduction to ANOVA, one way ANOVA, two way ANOVA, Post – Hoc test

Regression: Simple Linear Regression, Multiple Linear Regression, Maximum Likelihood Estimation (MLE), Logistic Regression, step-wise methods and algorithms.

UNIT-III Introduction to Data Visualization

Overview of data visualization - Data Abstraction - Task Abstraction - Dimensions and Measures - Analysis: Four Levels for Validation. Statistical charts (Bar Chart - stacked bar chart – Line Chart - Histogram - Pie chart - Frequency Polygon - Box plot - Scatter plot - Regression curves.)

UNIT-IV Visualization Techniques

Introduction to various data visualization tools - Scalar and point techniques - vector visualization techniques -multidimensional techniques - visualizing cluster analysis K-means and Hierarchical Cluster techniques.

UNIT-V Data Visualization Tools:

Power BI – DAX Logical Functions - Date and Time Functions, Time Intelligence Functions, Information Functions, Logical Functions, Mathematical and Trigonometric Functions, Statistical Functions, Text Functions, Parent-Child functions.

TEXT BOOKS

1. McKinney, W. (2012). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. "O'Reilly Media, Inc.".
2. David W. Hosmer, Stanley Lemeshow (2000). Applied logistic regression (Wiley Series in probability and statistics). "Wiley-Interscience Publication".
3. Tamara Munzer, Visualization Analysis and Design, 1st edition, CRC Press, United States, 2015.
4. Michael Fry, Jeffrey Ohlmann, Jeffrey Camm, James Cochran, Data Visualization: Exploring and Explaining with Data, South-Western College Publishing, 2021

REFERENCE BOOKS

1. Dr. Chun-hauh Chen, W. K. Hardle, A. Unwin, Handbook of Data Visualization, 1st edition, Springer publication, Germany, 2008.
2. Ben Fry, Visualizing Data, 1st edition, O'Reilly Media, United States, 2008.
3. Avril Coghlan, A little book of R for multivariate analysis, 1st edition, Welcome Trust Sanger Institute, United Kingdom, 2013.

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1. https://onlinecourses.nptel.ac.in/noc21 cs45/preview
2. https://onlinecourses.nptel.ac.in/noc21 ma74/preview
3. https://onlinecourses.nptel.ac.in/noc23 cs18/preview

III B.TECH I SEMESTER (P.E.- I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE:R20CC3109	**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 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 Micro services.
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

III B.TECH I SEMESTER (P.E.- I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CS3105	**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 parser, 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
	0	0	3	15	35	50	1.5
SUBCODE: R20CY31L1	**CRYPTOGRAPHY AND NETWORK SECURITY LAB**						

COURSE OBJECTIVES:
- To learn different cipher techniques
- To implement the algorithms DES, RSA,MD5,SHA-1
- To use network security tools for scanning the Port and TCP/UDP and Network Analyzer.

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

CO 1: Develop code for classical Encryption Techniques to solve the problems. [K3]

CO 2: Build cryptosystems by applying symmetric and public key encryption algorithms. [K4]

CO 3: Construct code for authentication algorithms. [K3]

CO 4: Develop a signature scheme using Digital signature standard. [K3]

CO 5: Demonstrate the network security using various tools. [K3]

Week 1:
Write a program to implement encryption, decryption using the Caeser Cipher technique.

Week 2:
Perform encryption, decryption using Hill Cipher technique.

Week 3:
Apply DES algorithm for practical applications.

Week 4:
Implement DES algorithm

Week 5:
Implement AES algorithm

Week 6:
Implement RSA algorithm

Week 7:
Implement the Diffie-Hellman Key Exchange algorithm for a given problem.

Week 8:
Simulate the message Authentication Code using Cipher Block Chaining Message Authentication Code (CBC-MAC).

Week 9:
Calculate the message digest of a text using theSHA-1 algorithm.

Week 10:
Implement the Digital Signature Standard scheme.

Week 11:
Calculate the message digest of a text using the MD5 algorithm.

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CC31L4	**MACHINE LEARNING LAB**						

Course Objectives:
This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

Course Outcomes (Cos): At the end of the course, student will be able to
CO1: Implement procedures for the machine learning algorithms [K3]
CO2: Design and Develop Python programs for various Learning algorithms [K6]
CO3: Apply appropriate data sets to the Machine Learning algorithms [K3]
CO4: Develop Machine Learning algorithms to solve real world problems [K6]
CO5: Design and Develop Python programs using predefined libraries [K6]

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

Experiment-1:
Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Experiment-2:
For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Experiment-3:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-4:
Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier

Experiment-5: Develop a program for Bias, Variance, Remove duplicates , Cross Validation

Experiment-6: Write a program to implement Categorical Encoding, One-hot Encoding

Experiment-7:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment-8: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs

Experiment-9:
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-10: Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-11: Exploratory Data Analysis for Classification using Pandas or Matplotlib.

Experiment-12:
Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

Experiment-13:
Write a program to Implement Support Vector Machines and Principle Component Analysis.

Experiment-14:
Write a program to Implement Principle Component Analysis.

III B.TECH I SEMESTER (SOC)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	4	0	50	50	2
SUBCODE: R20CY31SC1	DATA ANALYTICS & VISUALIZATION LAB						

COURSE OBJECTIVES:
- To introduce Tableau and enable to connect different data sources and prepare data for analysis.
- To introduce students to Power BI, enabling them to understand its products, install Power BI Desktop, connect to data sources, and become familiar with the user interface for data analysis and visualization.
- To equip students with the skills to transform and preprocess data effectively using Power BI, including tasks like data summarization, joining data tables.

COURSE OUTCOMES:
By completing the course the students will be able to:
- **CO1 :** Understand the features and architecture of Tableau.[K2]
- **CO2 :** Analyze different data sources, distinguish between live and extract connections. [K4]
- **CO3 :** Demonstrate comprehension of different products within the Power BI Suite and will be able to install Power BI Desktop. [K3]
- **CO4 :** Apply data transformation techniques, create calculated columns, measures, and perform data summarization, joining data tables, and data hierarchy to prepare data for analysis. [K3]
- **CO5 :** Apply their knowledge to visualize data using various chart types, tables, and filtering methods in Power BI, allowing them to present data effectively. [K3]

Data Analytics

EXPERIMENT-I: Introduction to Tableau
  a. Installation of Tableau Desktop/Public
  b. Understanding the Architecture and Features of Tableau, Interface of Tableau (Layout, Toolbars, Data pane, Analytics pane etc.)
  c. Introducing various file type
  d. How to create data visualization using Tableau feature "show me"
  e. Reorder and Remove Visualization Fields
  f. How to create calculated field
  g. How to perform operation using cross tab
  h. Working with workbook data and Worksheet

EXPERIMENT-II: Data Preparation
- Connecting to different Data Source
    - i. Excel
    - ii. CSV
    - iii. SQL Server
- Live vs. Extract Connection
    - **i.** Creating Extract
    - **ii.** Refreshing Extract
    - **iii.** Increment Extract
    - **iv.** Refreshing Live
    - **v.** Data Source Editor
- Pivoting and splitting
- Data Interpreter: Clean Dirty Data

Data Visualization

EXPERIMENT-I: Introduction to Power BI
- **a)** Understanding different types of products in the Power BI Suite
- **b)** Installation of Power BI Desktop
- **c)** Connecting to various common Data Sources
- **d)** Getting familiar with the user interface of Power BI Desktop

EXPERIMENT-II: Data Transformation & Pre-Processing
- **a)** Data Transformation
- **b)** Data summarization using Grouping
- **c)** Joining Data Tables
- **d)** Creating Calculated Columns
- **e)** Creating Measures
- **f)** Grouping Data Categories
- **g)** Applying Data Hierarchy

EXPERIMENT-III: Data Visualization using Charts Part-I
- **a)** Stacked column and Bar Charts
- **b)** Clustered column and Bar Charts
- **c)** Line Chart
- **d)** Area & Stacked Area Charts
- **e)** Pie & Donut Charts
- **f)** Stacked & Column Combined Charts

EXPERIMENT-III: Data Visualization using Charts Part-II
- **a)** Funnel Chart
- **b)** Waterfall chart
- **c)** Tree Map Chart
- **d)** Scatter Plot Chart

EXPERIMENT-IV: Presenting Data in Tables
  a) Data Table
  b) Data Presentation using Matrix Crosstab
  c) Cards & Multi Row Cards

TEXT BOOKS
  1. Pro Tableau: A Step-by-Step Guide By Seema Acharya, Subhashini Chellappan
  2. ommunicating Data with Tableau: Designing, Developing, and Delivering Data By Ben Jone
  3. **Pro Power BI Desktop:** Self-Service Analytics and Data Visualization for the Power User 3rd Edition by Adam Aspin

WEB RESOURCES
  1. https://www.tableau.com/
  2. https://www.youtube.com/watch?v=SPB7JvU3CPY&list=PLNLDEHOJTZSiTiYy-WHFNvOhr8gPgBYeh
  3. https://www.tutorialspoint.com/tableau/index.htmhttps://www.udemy.com/course/power-bi-for-data-visualization/
  4. https://www.tutorialspoint.com/power_bi/power_bi_supported_data_sources.htm
  5. https://learn.microsoft.com/en-us/power-bi/fundamentals/service-get-started

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	4	0	50	50	2
SUBCODE: R20CC31MC01	**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.
2. 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

III B.TECH. – II SEMESTER

S.No.	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CY3201	Introduction to Cyber Security	PC	30	70	100	3	0	0	3
2	R20CY3202	Malware Analysis & Reverse Engineering	PC	30	70	100	3	0	0	3
3	R20CY3203	Ethical Hacking	PC	30	70	100	3	0	0	3
4	R20CY3204 R20CY3205 R20CC3206 R20CY3207	Professional Elective - II • Data analytics for fraud detection • Block Chain Technologies • Big data Analytics • Secure Coding	PE	30	70	100	3	0	0	3
5		**Open Elective – II ((Mean Stack)**	OE	30	70	100	3	0	0	3
6	R20CY32L1	Cyber Security Lab	PC	15	35	50	0	0	3	1.5
7	R20CY32L2	Malware Analysis and Reverse Engineering Lab	PC	15	35	50	0	0	3	1.5
8	R20CY32L3	Mean Stack Technologies Lab	ES	15	35	50	0	0	3	1.5
9	R20CC32SC1	English Employability Skills	SC	-	-	50	0	0	4	2
10	R20CC32MC1	Essence of Indian Traditional Knowledge	MC			-	2	0	0	0
		TOTAL								21.5
11		**Honors/Minor Course**		30	70	100	4	0	0	4
		Community Service Project / Internship to be evaluated in IV-I								

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY3201	**INTRODUCTION TO 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

CO1: Interpret Cyber Security architecture principles [K2].
CO2: Identifying System and application security threats and vulnerabilities [K3].
CO3: Identifying different classes of attacks [K3].
CO4: Cyber Security incidents to apply appropriate response [K3].
CO5: Describing cyber forensics and digital evidence [K3].

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, Identity Theft(ID Theft)

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.

TEXT BOOKS:
1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, 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.

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY3202	**MALWARE ANALYSIS & REVERSE ENGINEERING**						

COURSE OBJECTIVES:
- To learn fundamentals of malware analysis which includes analysis of JIT compilers for malware detection in legitimate code.
- To explore the techniques for detecting, analyzing, reverse engineering and eradicating malware.
- Employ network and system-monitoring tools to examine how malware interacts with the file system, registry, network, and other processes in a Windows environment.
- Assess the threat associated with malicious documents.
- Build an isolated, controlled laboratory environment for analyzing the code and behaviour of malicious program.

COURSE OUTCOMES:
After completion of this course, the students would be able to
- **CO1 :** Demonstrate the concept of malware and reverse engineering. [K2]
- **CO2 :** Apply various tools and techniques of malware analysis to examine malicious software. [K3]
- **CO3 :** Analyse and evaluate various techniques for used in malware analysis & reverse engineering to identify vulnerabilities. [K4]
- **CO4 :** Utilize the python language for development & analysis of anti-malwares. [K4]
- **CO5 :** Setup an environment for malware analysis & recognize common malware characteristics. [K1]

SYLLABUS:

UNIT–I:
Fundamentals of Malware Analysis (MA), Reverse Engineering Malware (REM) Methodology, Brief Overview of Malware analysis lab setup and configuration, Introduction to key MA tools and techniques, Behavioural Analysis vs. Code Analysis, Resources for Reverse-Engineering Malware (REM) Understanding Malware Threats, Malware indicators, Malware Classification, Examining Clam AV Signatures, Creating Custom Clam AV Databases.

UNIT–II:
Malware Forensics Using TSK for Network and Host Discoveries, Using Microsoft Offline API to Registry Discoveries, Identifying Packers using PEiD, Registry Forensics with Reg

Ripper Plu-gins, Bypassing Poison Ivy's Locked Files, Bypassing Conficker's File System ACL Restrictions, Detecting Rogue PKI Certificates.

UNIT–III:

Malware and Kernel Debugging Opening and Attaching to Processes, Configuration of JITDebugger for Shellcode Analysis, Controlling Program Execution, Setting and Catching Breakpoints, Debugging with Python Scripts and Py Commands, DLL Export Enumeration, Execution, and Debugging, Debugging a VMware Workstation Guest (on Windows), Debugging a Parallels Guest (on Mac OS X).

UNIT–IV:

Memory Forensics and Volatility Memory Dumping with MoonSols Windows Memory Toolkit, Accessing VM Memory Files Overview of Volatility, Investigating Processes in Memory Dumps, Code Injection and Extraction, Detecting and Capturing Suspicious Loaded DLLs, Finding Artifacts in Process Memory, Identifying Injected Code with Malfind and YARA.

UNIT–V:

Researching and Mapping Source Domains/IPs Using WHOIS to Research Domains, DNS Hostname Resolution, Querying Passive DNS, Checking DNS Records, Reverse IP Search New Course Form, Creating Static Maps, Creating Interactive Maps.

TEXT BOOKS:
1. Sikorski, M., & Honig, A. (2012). Practical malware analysis: the hands-on guide to dissecting malicious software. No starch press.
2. Eilam, E. (2005). Reversing, Secrets of Reverse Engineering Wiley Publishing.
3. Malin, C. H. (2013). Linux Malware Incident Response: A Practitioner's Guide to Forensic Collection and Examination of Volatile Data: An Excerpt from Malware Forensic Field Guide for Linux Systems. Elsevier.

REFERENCE BOOKS:
1. Shashidhar, N., & Cooper, P. (2016, April). Teaching malware analysis: The design philosophy of a model curriculum. In 2016 4th International Symposium on Digital Forensic and Security (ISDFS) (pp. 119-125). IEEE.
2. Singh, A. (Ed.). (2009). Identifying malicious code through reverse engineering (Vol. 44). Springer Science & Business Media.

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY3203	**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: Analyze network protection system and hacking web servers. [K4]
CO5: Apply Ethical hacking techniques and understand the Ethical Hacking Laws [K3]

SYLLABUS:
UNIT - I:
Ethical hacking: 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.

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.

III B.TECH II SEMESTER (P.E.- II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY3204	**DATA ANALYTICS FOR FRAUD DETECTION**						

COURSE OBJECTIVES:
- Discuss the overall process of how data analytics is applied
- Discuss how data analytics can be used to better address and identify risks
- Help mitigate risks from fraud and waste for our clients and organizations

COURSE OUTCOMES:
After completion of this course, the students would be able to:
CO 1: Explain the reason behind the utilization of data analysis as a method of fraud detection. [K2]
CO 2: Assess the completeness of data by describing the characteristics and components of data relevant to fraud detection. [K3]
CO 3: Analyze data to identify both known fraud symptoms and previously unidentified fraud symptoms through the use of digital analysis. [K4]
CO 4: Evaluate and apply automation techniques to streamline the fraud detection process. [K5]
CO 5: Create a process to verify the accuracy of results. [K6]

SYLLABUS
UNIT – I
Introduction: Defining Fraud, Anomalies versus, Fraud, Types of Fraud, Assess the Risk of Fraud, Fraud Detection, Recognizing Fraud, Data Mining versus Data Analysis and Analytics, Data Analytical Software, Anomalies versus Fraud within Data, Fraudulent Data Inclusions and Deletions
UNIT - II
The Data Analysis Cycle, Evaluation and Analysis, Obtaining Data Files, Performing the Audit, File Format Types, Preparation for Data Analysis, Arranging and Organizing Data, Statistics and Sampling, Descriptive Statistics, Inferential Statistics
UNIT - III
Data Analytical Tests : Benford's Law, Number Duplication Test , Z-Score, Relative Size Factor Test, Same-Same-Same Test , Same-Same-Different Test
UNIT - IV
Advanced Data Analytical Tests Correlation, Trend Analysis, GEL-1 and GEL-2, Skimming and Cash Larceny, **Billing schemes:** and Data Familiarization, Benford's Law Tests, Relative Size Factor Test, Match Employee Address to Supplier data.
UNIT - V
Payroll Fraud, Expense Reimbursement Schemes, Register disbursement schemes
TEXTBOOK: 1. Fraud and Fraud Detection: A Data Analytics Approach by Sunder Gee, Wiley

III B.TECH II SEMESTER (P.E.- II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY3205	**BLOCK CHAIN TECHNOLOGIES**						

COURSE OBJECTIVES:
- Introduces the fundamental concepts and functionalities of Blockchain.
- Provide conceptual understanding of methods in securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.

COURSE OUTCOMES:
Upon the completion of the course, the students will be able to:
CO 1: Summarize the fundamentals of Blockchain. [K2]
CO 2: Analyze the working of Blockchain. [K4]
CO 3: Interpret how business can be easily made with Blockchain. [K4]
CO 4: Summarize how Block Chain can be integrated with various current technologies. [K2]
CO 5: Get familiarity about the Blockchain strength in providing solutions. [K3]

SYLLABUS:
UNIT-I:
Grasping Blockchain Fundamentals:
Tracing Blockchain's Origin, The shortcomings of current transaction systems, the emergence of bitcoin, the birth of blockchain, revolutionizing the Traditional Business Network, Exploring a blockchain application, recognizing the jey business benefits, Building trust with blockchain.

UNIT-II:
Taking a Look at How Blockchain Works:
Why It's Called "Blockchain", what makes a Blockchain Suitable for Business? Shared ledger, Permissions, Consensus, Smart Contracts, Identifying Participants and their Roles.

UNIT-III:
Propelling Business with Blockchains:
Recognizing Types of Market Friction, Information frictions, Interaction frictions, Innovation frictions, Moving Closer to Friction-Free Business Networks, Reducing information friction, Easing interaction friction, Easing innovation friction, Transforming Ecosystems through Increased Visibility.

UNIT-IV:
Block chain in Action: Use Cases:

Financial Services, Commercial financing, Trade finance, Cross-border transactions, Insurance, Government, Supply Chain Management, Healthcare, Electronic medical records Healthcare payments preauthorization.

UNIT-V:
Hyperledger, a Linux Foundation Project:
Hyperledger Vision, Hyperledger Fabric, How Can IBM Help Developers Innovate with Blockchain? Offering an easily accessible cloud and development platform, Individualized attention and industry Expertise, **Problems with Blockchain:** Security and Safeguards, Protection from attackers, Hacks on exchanges, what is stopping adoption? Scalability problems, Network attacks to destroy bitcoin, Case Study: Failed currencies & Blockchain.

TEXTBOOKS:
1. Blockchain for Dummies®, IBM Limited Edition, Manav Gupta, John Wiley & Sons, Inc. 111 River St, Hoboken, NJ 07030-5774

REFFERENCE BOOKS:
1. Swan, Melanie. Blockchain: Blueprint for a new economy. "O'Reilly Media, Inc.", 2015.
2. Gupta, M. "Blockchain for Dummies."(2017).

III B.TECH II SEMESTER (P.E.- 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 (P.E.- II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY3207	**SECURE CODING**						

COURSE OBJECTIVES:
1. To understanding of the various security attacks and knowledge to recognize and remove common coding errors that lead to vulnerabilities.
2. It gives an outline of the techniques for developing a secure application.

COURSE OUTCOMES:
Upon the completion of the course, the students will be able to:
CO 1: Implement security as a culture and show mistakes that make applications vulnerable to attacks. [K5]
CO 2: Understand various attacks like DoS, buffer overflow, web specific, database specific web-spoofing attacks. [K2]
CO 3: Analyze and demonstrate skills necessary to address common programming errors that lead to security issues and to learn how to develop secure applications. [K4]
CO 4: Analyze the nature of the threats to software and incorporate secure coding practices throughout the planning and development of the product. [K4]
CO 5: Apply proper techniques for handling application faults, implement secure authentication, authorization and data validation controls used to prevent common vulnerabilities. [K3]

SYLLABUS

UNIT–I:
Introduction: Security, CIA Triad, Viruses, Trojans, and Worms In a Nutshell, Security Concepts- exploit, threat, vulnerability, risk, attack. Malware Terminology: Rootkits, Trapdoors, Botnets, Key loggers, Honeypots. Active and Passive Security Attacks. IP Spoofing, Tear drop, DoS, DDoS, XSS, SQL injection, Smurf, Man in middle, Format String attack. Types of Security Vulnerabilities- buffer overflows, Invalidated input, race conditions, access-control problems, weaknesses in authentication, authorization, or cryptographic practices. Access Control Problems.

UNIT–II:
Need for secure systems: Proactive Security development process, Secure Software Development Cycle (S-SDLC) , Security issues while writing SRS, Design phase security, Development Phase, Test Phase, Maintenance Phase, Writing Secure Code – Best Practices SD3 (Secure by design, default and deployment), Security principles and Secure Product Development Timeline

UNIT–III:

Threat modelling process and its benefits: Identifying the Threats by Using Attack Trees and rating threats using DREAD, Risk Mitigation Techniques and Security Best Practices. Security techniques, authentication, authorization. Defense in Depth and Principle of Least Privilege.

UNIT–IV:

Secure Coding Techniques: Protection against DoS attacks, Application Failure Attacks, CPU Starvation Attacks, Insecure Coding Practices in Java Technology. ARP Spoofing and its countermeasures. Buffer Overrun- Stack overrun, Heap Overrun, Array Indexing Errors, Format String Bugs. Security Issues in C Language: String Handling, Avoiding Integer Overflows and Underflows and Type Conversion Issues- Memory Management Issues, Code Injection Attacks, Canary based countermeasures using StackGuard and Propolice. Socket Security, Avoiding Server Hijacking, Securing RPC, ActiveX and DCOM

UNIT–V:

Database and Web-specific issues: SQL Injection Techniques and Remedies, Race conditions, Time of Check Versus Time of Use and its protection mechanisms. Validating Input and Interprocess Communication, Securing Signal Handlers and File Operations. XSS scripting attack and its types – Persistent and Non persistent attack XSS Countermeasures and Bypassing the XSS Filters. Testing Secure Applications: Security code overview, secure software installation. The Role of the Security Tester, Building the Security Test Plan. Testing HTTP-Based Applications, Testing File-Based Applications, Testing Clients with Rogue Servers

TEXT BOOKS:

1. Writing Secure Code, Michael Howard and David LeBlanc, Microsoft Press, 2nd Edition, 2004.

REFERENCE BOOKS:

1. Buffer Overflow Attacks: Detect, Exploit, Prevent by Jason Deckar, Syngress, 1st Edition, 2005.
2. Threat Modeling, Frank Swiderski and Window Snyder, Microsoft Professional, 1st Edition, 2004.

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CY32L1	**CYBER SECURITY LAB**						

COURSE OBJECTIVES:
- Student to get the knowledge about audit and information security management, which makes the student to get the real world experience.
- To learn and implement Data leakage in a website database

COURSE OUTCOMES:
Upon the completion of the course, the students will be able to:

CO 1: Analyse and implement Audit security policy in windows environment, create a Demilitarized zone creation in Network environment [K3]

CO 2: Apply knowledge and illustrate the Resource harvesting attack and mitigation, Window Patch management policy, Trojans and mitigation strategies. [K3]

CO 3: Apply the knowledge of metasploit, Access control list creation and content filtering limiting the traffic. [K3]

CO 4: Understand the concept of data leakage in a website database, Password policy and verification, Patch management using MBSA tool on windows machine. [K2]

CO 5: Analyze audit records by log analysis. [K4]

EXPERIMENTS:

Exercise – 1:
Audit security policy implementation in windows environment.

Exercise – 2:
Create a Demilitarized zone creation in Network environment for information security.

Exercise – 3:
Implement Resource harvesting attack and mitigation.

Exercise – 4:
Implement Window Patch management policy.

Exercise – 5:
Knowing the Behaviour of Trojans and mitigation strategies.

Exercise- 6
Create a metasploit and make it to implement.

Exercise-7
Access control list creation and content filtering limiting the traffic.

Exercise-8
Data leakage in a website database and preventive measures.

Exercise-9
Password policy implementations and verification.

Exercise-10
Patch management implementation using MBSA tool on windows machine

Exercise-11
Audit Policy management for users and computers log analysis.

Exercise-12
Media handling policy implementation and event log analysis.

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CY32L2	**MALWARE ANALYSIS AND REVERSE ENGINEERING LAB**						

COURSE OBJECTIVES:
- This course provides students a foundational knowledge about reverse engineering and malware analysis, through the study of various cases.
- This course provides students a hand-on analysis of malware samples.
- It covers fundamental concepts in malware investigations so as to equip the students with enough background knowledge in handling malicious software attacks.

COURSE OUTCOMES:
Upon the completion of the course, the students will be able to:
CO 1: Demonstrate the cyber security challenges posed by malicious software attacks. [K2]
CO 2: Analyze security risks, threats and potential vulnerabilities in enterprise networks environment. [K3]
CO 3: Independently to conduct in-depth analysis of modern malware samples using behavioural, code analysis and memory forensic techniques. [K3]
CO 4: Apply the techniques learned to proactively protect computer systems and networks, reduce security risks and mitigate the potential for malicious software attacks. [K5]
CO 5: Apply immunity debugger for reverse engineering [K3]

EXPERIMENTS:

WEEK-1: Malware analysis lab environment setup

WEEK-2: Building malwares using tools

WEEK-3: Static Malware Analysis

1. Upload the files to http://www.VirusTotal.com/ and view the reports. Does either file match any existing antivirus signatures?
2. When were these files compiled?
3. Are there any indications that either of these files is packed or obfuscated? If so, what are these indicators?
4. Do any imports hint at what this malware does? If so, which imports are they?
5. Are there any other files or host-based indicators that you could look for on infected systems?

6. What network-based indicators could be used to find this malware on infected machines?
7. What would you guess is the purpose of these files?

WEEK-4: Static Malware Analysis
1. Upload the Lab01-02.exe file to http://www.VirusTotal.com/. Does it match any existing antivirus definitions?
2. Are there any indications that this file is packed or obfuscated? If so, what are these indicators? If the file is packed, unpack it if possible.
3. Do any imports hint at this program's functionality? If so, which imports are they and what do they tell you?
4. What host- or network-based indicators could be used to identify this malware on infected machines

WEEK-5: Dynamic Malware Analysis
1. How can you get this malware to install itself?
2. What are the command-line options for this program? What is the password requirement?
3. How can you use OllyDbg to permanently patch this malware, so that it doesn't require the special command-line password?
4. What are the host-based indicators of this malware?
5. What are the different actions this malware can be instructed to take via the network?
6. Are there any useful network-based signatures for this malware?

WEEK-6: Dynamic Malware Analysis
1. What strings do you see statically in the binary?
2. What happens when you run this binary?
3. How can you get this sample to run its malicious payload?
4. What is happening at 0x00401133?
5. What arguments are being passed to subroutine 0x00401089?
6. What domain name does this malware use?
7. What encoding routine is being used to obfuscate the domain name?
8. What is the significance of the Create Process A call at 0x0040106E?

WEEK-7: Automated Malware Analysis

WEEK-8: Android malware analysis using tools

WEEK-9: Malware hunting Techniques using 1.Backdoors 2.Ransomware

WEEK-10: Malware hunting Techniques using 1.Credential stealers
             2. Persistence mechanisms

WEEK-11: Host exploitation and forensic analysis

WEEK-12:
1. Reverse Engineering with Immunity Debugger
2. Software Cracking with Hex Editor Tool
3. Rebuilding the software after cracking

TEXT BOOKS:
1. Sikorski, M., & Honig, A. (2012). Practical malware analysis: the hands-on guide to dissecting malicious software. No starch press.
2. Eilam, E. (2005). Reversing, Secrets of Reverse Engineering Wiley Publishing.
3. Malin, C. H. (2013). Linux Malware Incident Response: A Practitioner's Guide to Forensic Collection and Examination of Volatile Data: An Excerpt from Malware Forensic Field Guide for Linux Systems. Elsevier.

REFERENCE BOOKS:
1. Sikorski, M., & Honig, A. (2012). Practical malware analysis: the hands-on guide to dissecting malicious software. No starch press.
2. Shashidhar, N., & Cooper, P. (2016, April). Teaching malware analysis: The design philosophy of a model curriculum. In 2016 4th International Symposium on Digital Forensic and Security (ISDFS) (pp. 119-125). IEEE.
3. Singh, A.(Ed.). (2009). Identifying malicious code through reverse engineering (Vol. 4). Springer Science & Business Media.

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CY32L3	**MEAN STACK TECHNOLOGIES LAB**						

COURSE OBJECTIVES:
- To develop the skills and practical experience with the MEAN Stack.

COURSE OUTCOMES:
CO1: Build a component-based application using Angular components and enhance their functionality using directives.[K3]
CO2: Utilize data binding for developing Angular forms and bind them with model data. [K3]
CO3: Apply Angular built-in or custom pipes to format the rendered data. [K3]
CO4: Develop a single page application by using synchronous or asynchronous Angular routing. [K6]
CO5: Make use of MongoDB queries to perform CRUD operations on document database. [K3]

LIST OF EXERCISES:

1.A COURSE NAME: ANGULAR JS
Module Name: Angular Application Setup
Observe the link http://localhost:4200/welcome on which the mCart application is running. Perform the below activities to understand the features of the application.
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_013119686969622528709_shared?collectionType=Course&collectionId=lex_20858515543254600000_shared&pathId=lex_10972884065759318000_shared

1.B COURSE NAME: ANGULAR JS
Module Name: Components and Modules
Create a new component called hello and render Hello Angular on the page
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_20054046883477630000_shared?collectionType=Course&pathId=lex_16242264358499643000_shared&collectionId=lex_20858515543254600000_shared

1.C COURSE NAME: ANGULAR JS
Module Name: Elements of Template
Add an event to the hello component template and when it is clicked, it should change the course Name.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19226434057992030000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

1.D COURSE NAME: ANGULAR JS
Module Name: Change Detection
Progressively building the PoolCarz application
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_25609816371207711000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

2.A COURSE NAME: ANGULAR JS
Module Name: Structural Directives - ngIf
Create a login form with username and password fields. If the user enters the correct credentials, it should render a "Welcome <<username>>" message otherwise it should render "Invalid Login!!! Please try again..." message
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012763740226043904259_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

2.B COURSE NAME: ANGULAR JS
Module Name: ngFor
Create a courses array and rendering it in the template using ngFor directive in a list format.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32795774277593590000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

2.C COURSE NAME: ANGULAR JS
Module Name: ngSwitch
Display the correct option based on the value passed to ngSwitch directive.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_23388127475984175000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

2.D COURSE NAME: ANGULAR JS
Module Name: Custom Structural Directive
Create a custom structural directive called 'repeat' which should repeat the element given a number of times.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24073319904331424000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

3.A COURSE NAME: ANGULAR JS
Module Name: Attribute Directives - ngStyle
Apply multiple CSS properties to a paragraph in a component using ngStyle.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24037156998765367000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

3.B COURSE NAME: ANGULAR JS
Module Name: ngClass
Apply multiple CSS classes to the text using ngClass directive.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_34596102970741820000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

3.C COURSE NAME: ANGULAR JS
Module Name: Custom Attribute Directive
Create an attribute directive called 'show Message' which should display the given message in a paragraph when a user clicks on it and should change the text color to red.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14783742359773809000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

4.A COURSE NAME: ANGULAR JS
Module Name: Property Binding
Binding image with class property using property binding.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_89519647091536190000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

4.B COURSE NAME: ANGULAR JS
Module Name: Attribute Binding
Binding colspan attribute of a table element to the class property.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_71542528831806250000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

4.C COURSE NAME: ANGULAR JS
Module Name: Style and Event Binding
Binding an element using inline style and user actions like entering text in input fields.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_74174010211038220000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

5.A COURSE NAME: ANGULAR JS
Module Name: Built in Pipes
Display the product code in lowercase and product name in uppercase using built-in Pipes.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_11810543990912035000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

5.B COURSE NAME: ANGULAR JS
Module Name: Passing Parameters to Pipes
Apply built-in pipes with parameters to display product details.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21187073707540988000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

5.C COURSE NAME: ANGULAR JS
Module Name: Nested Components Basics
Load CourseslistComponent in the root component when a user clicks on the View courses list button.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24231999287700136000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

6.A COURSE NAME: ANGULAR JS
Module Name: Passing data from Container Component to Child Component
Create an App Component that displays a dropdown with a list of courses as values in it. Create another component called the Courses List component and load it in AppComponent which should display the course details. When the user selects a course from the
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15758356947336235000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

6.B COURSE NAME: ANGULAR JS
Module Name: Passing data from Child Component to Container Component
Create an AppComponent that loads another component called the CoursesList component. Create another component called Courses List Component which should display the courses list in a table along with a register .button in each row.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24949806899916818400_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

6.C COURSE NAME: ANGULAR JS
Module Name: Shadow DOM
Apply Shadow DOM and None encapsulation modes to components.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10312243404892470000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

6.D COURSE NAME: ANGULAR JS
Module Name: Component Life Cycle
Override component life-cycle hooks and logging the corresponding messages to understand the flow.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10818939635948007000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

7.A COURSE NAME: ANGULAR JS

Module Name: Template Driven Forms
Create a course registration form as a template-driven form.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2810668513603024400_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

7.B COURSE NAME: ANGULAR JS
Module Name: Model Driven Forms or Reactive Forms
Create an employee registration form as a reactive form.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33704702617536004000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

7.C COURSE NAME: ANGULAR JS
Module Name: Custom Validators in Reactive Forms
Create a custom validator for an email field in the employee registration form (reactive form)
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33728128192769250000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

8.A COURSE NAME: ANGULAR JS
Module Name: Custom Validators in Template Driven forms
Create a custom validator for the email field in the course registration form.
https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_27688491925133280000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

8.B COURSE NAME: ANGULAR JS
Module Name: Services Basics
Create a Book Component which fetches book details like id, name and displays them on the page in a list format. Store the book details in an array and fetch the data using a custom service.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32584403823635940000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

8.C COURSE NAME: ANGULAR JS
Module Name: RxJS Observables
Create and use an observable in Angular.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6209609363905256000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

9.A COURSE NAME: ANGULAR JS
Module Name: Server Communication using HttpClient
Create an application for Server Communication using HttpClient
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_0127637395317063682615_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

9.B COURSE NAME: ANGULAR JS

Module Name: Communicating with different backend services using Angular

R-20 Syllabus for CSE, JNTUK w. e. f. 2020 – 21

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

HttpClient

Create a custom service called Product Service in which Http class is used to fetch data stored in the JSON files.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_4266333361795059700_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

10.A COURSE NAME: ANGULAR JS

Module Name: Routing Basics, Router Links

Create multiple components and add routing to provide navigation between them.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3782024852517635000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

10.B COURSE NAME: ANGULAR JS

Module Name: Route Guards

Considering the same example used for routing, add route guard to Books Component. Only after logging in, the user should be able to access Books Component. If the user tries to give the URL of Books component in another tab or window, or if the user tries

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30303325731876470000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

10.C COURSE NAME: ANGULAR JS

Module Name: Asynchronous Routing

Apply lazy loading to Book Component. If lazy loading is not added to the demo, it has loaded in 1.14 s. Observe the load time at the bottom of the browser console. Press F12 in the browser and click the Network tab and check the Load time

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9878739890118246000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

10.D COURSE NAME: ANGULAR JS

Module Name: Nested Routes

Implement Child Routes to a sub module.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012768043900444672140_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

11.A COURSE NAME: MONGODB ESSENTIALS
A Complete MongoDB Guide
Module Name: Installing MongoDB on the local computer, Create MongoDB Atlas Cluster
Install MongoDB and configure ATLAS
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821437313024030083_
shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course

11.B COURSE NAME: MONGODB ESSENTIALS
A Complete MongoDB Guide
Module Name: Introduction to the CRUD Operations
Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(),
remove()
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821874166169630118_
shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course

12.A COURSE NAME: MONGODB ESSENTIALS
A Complete MongoDB Guide
Module Name: Create and Delete Databases and Collections
Write MongoDB queries to Create and drop databases and collections.
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821654119219230121_
shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course

12.B COURSE NAME: MONGODB ESSENTIALS
A Complete MongoDB Guide
Module Name: Introduction to MongoDB Queries
Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate().
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01328908162645519682505_s
hared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course

TEXT BOOKS:
1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow, O'Reilly

SOFTWARE CONFIGURATION AND INSTALLATION:
1. **Angular: Setup details:** Angular Application Setup - Internal - Viewer Page | Infosys Springboard (onwingspan.com)
2. **MongoDB:** TOC - MongoDB Essentials - A Complete MongoDB Guide | Infosys Springboard (onwingspan.com)

WEB LINKS:
1. https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/over view (Angular JS)
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/over view (MongoDB)

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	-	2		50	50	2
SUBCODE: R20CC32SC1	**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: R20CC32MC1	**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

CO1 : Interpret the philosophy of Indian Culture [K2].

CO2 : Interpret the Indian languages, Epics Ramayana and Mahabharata [K2].

CO3 : Analyze the information about Indian arts and architecture [K4].

CO4 : Analyze the spread of cultural exchange in abroad [K4].

CO5 : Analyze the contributions of scientists in different eras [K4].

SYLLABUS

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

IV YEAR - I SEMESTER

S.No.	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CY4102 R20CY4103 R20CY4104 R20CC4121	Professional Elective – III • Cyber Crime Investigation & Digital Forensics • Mobile and Wireless Security • Distributed Systems • Reinforcement Learning	PE	30	70	100	3	0	0	3
2	R20CY4106 R20CY4107 R20CY4108 R20CY4109	Professional Elective -IV • Cloud Security • Incident Response and Threat Detection • Vulnerability Analysis and Penetration Testing • Information Coding Techniques	PE	30	70	100	3	0	0	3
3	R20CY4110 R20CY4111 R20CY4112 R20CY4113	Professional Elective - V • Cyber Laws • Intrusion Detection Systems • Data Privacy • Information Security Management	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	R2CY41SC1	PE Lab	SC	-	50	50	0	0	4	2
8	R20INTERN	Summer Internship/Community Service Project	PR	-	50	50	0	0	0	1.5
9	R20CC41MC	MOOCS								1.5
		TOTAL								**23**
10		**Honors/Minors Course**		30	70	100	4	0	0	4

IV B.TECH I SEMESTER (P.E.III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY4102	**CYBER CRIME INVESTIGATION & DIGITAL FORENSICS**						

COURSE OBJECTIVES:
To analyze how to conduct a digital forensics investigation and validate forensics data.

COURSE OUTCOMES:
CO1: Understand the fundamentals of cybercrime and issues.[K2]
CO2: Understand different investigation tools for cybercrime. [K2]
CO3: Apply investigation techniques in practical case studies. [K3]
CO4: Analyze different laws, ethics and evidence handling procedures. [K4]
CO5: Apply and analyze legal policies and ethical considerations while prosecuting cybercrimes. [K4]

SYLLABUS:
UNIT - I
Introduction: Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

UNIT - II
Cyber Crime Issues: Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation, Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses.

UNIT - III
Investigation: Introduction to Cyber Crime Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT - IV
Digital Forensics: Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

UNIT - V

Laws and Acts: Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and CrPC, Electronic Communication Privacy ACT, Legal Policies.

TEXT BOOKS:
1. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
2. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2006.

REFERENCE BOOKS:
1. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005.
2. Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004.
3. "Understanding Forensics in IT ", NIIT Ltd, 2005

IV B.TECH I SEMESTER (P.E.III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY4103	**MOBILE AND WIRELESS SECURITY**						

COURSE OBJECTIVES:
- This course equips the system Administrators with the skills required to protect & recover the computer systems & networks from various security threats.

COURSE OUTCOMES:
CO1: Understand the fundamental concepts of wireless networks and mobile networks. [K2]
CO2: Analyze the security aspects of wireless networks. [K4]
CO3: Examine security issues in telecommunication systems and wireless sensor networks. [K4]
CO4: Evaluate the security measures in mobile applications and mobile networks. [K5]
CO5: Apply the knowledge gained to understand the limitations of wireless networks and their security. [K3]

SYLLABUS

UNIT I
Introduction to Wireless Networks and Mobile Networks: Wireless Networks and its Architectures, Mobile Networks, Introduction to 2G, 3G and 4G networks, Wireless Algorithms, 6LOWPAN Network, Mobile System Architectures.

UNIT II
Wireless Network Security: Introduction to Wireless Networks Security, Overview of Cellular Systems, GSM and MTS Security & Attacks, Analysis of Threats and Application Requirements, WLAN security, Attacks on 802.11 networks.

UNIT III
Security in Telecommunication Systems and Wireless Sensor Networks: Security in Cellular VoIP Services, SPIT Detection, Vulnerabilities in Cellular Services, Mobile Application Security, Ad-hoc networks, Wireless Networks Security Components, 3G and 4G security, Securing Sensor Motes and Network.

UNIT IV
Security in Mobile Application and Mobile Networks: Secure MANET Routing, Security Infrastructure for Wireless Mobile Networks: Keys and Certificate Management, Security of Mobile Codes, Malicious Mobile Applications, And Mobile BOTS.

UNIT V

Limitations of Wireless Networks and its Security: Location Based Security & Privacy, Security in Hybrid System, WIFI Vs LTE, Introduction to LiFi Security.

TEXT BOOKS:
1. K. Makki, S. Makki, P. Reiher et al., Mobile and Wireless Network Security and Privacy, Springer (1st Edition), Springer US, 2007. ISBN 978-0387710587.
2. Jones Barlett, Sean Phillip, Wireless and Mobile Device Security (1st Edition), Jones & Bartlett Learning, 2015. ISBN 978-1284059274.

REFERENCE BOOKS:
1. H. Chaouchi, M. Laurent, Wireless and Mobile Network Security, (1st Edition), Wiley, 2009. ISBN 978-1848211179.

IV B.TECH I SEMESTER (P.E.III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY4104				**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

IV B.TECH I SEMESTER (P.E.III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC4121	**REINFORCEMENT LEARNING**						

OBJECTIVES:
- Good understanding of various types of algorithms for Reinforcement Learning
- Be able to design an RL system

COURSE OUTCOMES:
  Upon completion of this course, the students should be able to:
CO 1: Summarize the relevance of Reinforcement Learning and how does it complement other ML Techniques. [K2]
CO 2: Analyze various RL algorithms. [K4]
CO 3: Formulate a problem as a Reinforcement Learning problem and solve it [K3]
CO 4: Implement RL algorithms using Python [K3]
CO 5: Analyze high confidence policy improvement. [K4]

SYLLABUS:

UNIT – I
Introduction: Notation, what is Reinforcement Learning (RL)? , 687-Gridworld: A Simple Environment, Describing the Agent and Environment Mathematically, Creating MDPs, Planning and RL, Additional Terminology, Notation, and Assumptions.

UNIT – II
Black-box optimization for rl: Hello Environment! , Black-Box Optimization (BBO) for Policy Search, Evaluating RL Algorithms.
VALUE FUNCTIONS: State-Value Function, Action-Value Function, The Bellman Equation for v, the Bellman Equation for q π, Optimal Value Functions, Bellman Optimality Equation for v *

UNIT – III
Policy iteration and value iteration: Policy Evaluation, Policy Improvement, Value Iteration, the Bellman Operator and Convergence of Value Iteration.
MONTE CARLO METHODS: Monte Carlo Policy Evaluation, Gradient-Based Monte Carlo Algorithm.

UNIT-IV
Temporal difference (td) learning: Function Approximation, Maximum Likelihood Model of an MDP versus Temporal Difference Learning, Sarsa: Using TD for control, Q-Learning: Off-Policy TD-Control.

UNIT – V
High-confidence policy improvement: Off-Policy Policy Evaluation, High-Confidence Off-Policy Evaluation (HCOPE), High-Confidence Policy Improvement, λ-Return Algorithm.

TEXT BOOKS:
1. Sutton and Barto, Reinforcement Learning: An Introduction, the MIT Press Cambridge, Massachusetts London, England, 2015.
2. Csaba Szepesvari, Algorithms for Reinforcement Learning, Morgan & Claypool, United States, 2010.

REFERENCES:
1. Anand Raja Raman, Jure Leskovec and J.D.Ullman, "Mining of Massive Data Sets"' ebook, Publisher, 2014.
2. Kevin P. Murphey, "Machine Learning, a Probabilistic Perspective", the MIT Press Cambridge, Massachusetts, 2012.
3. Tomasz Drabas, Denny Lee,"Learning Pyspark", Packt, February 2017.
4. Jeff M. Philips, "Coresets", arXiv:1601.00617,20

WEB REFERENCES:
1. https://elearning.dl.unipi.it/course/view.php?id=227
2. https://mrcet.com/downloads/digital_notes/IT/R17A1201%20

IV B.TECH I SEMESTER (P.E.- IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY4106	**CLOUD SECURITY**						

COURSE OBJECTIVES:
- To understand the fundamentals concepts of cloud computing.
- To understand the cloud security and privacy issues.
- To understand the Threat Model and Cloud Attacks.
- To understand the Data Security and Storage.
- To analyze Security Management in the Cloud.

COURSE OUTCOMES:
Upon completion of the course students will be
CO 1: Understand fundamental concepts of cloud computing. [K2]
CO 2: Understand the various cloud security and privacy issues. [K2]
CO 3: Analyze the threat model in cloud computing including various types of cloud attacks. [K4]
CO 4: Analyze cloud software security requirements and identify the raising security threats in cloud computing. [K4]
CO 5: Analyze variations in using standard security algorithms in clod computing. [K4]

SYLLABUS:

UNIT - I
Overview of Cloud Computing: Introduction, Definitions and Characteristics, Cloud Service Models, Cloud Deployment Models, Cloud Service Platforms, Challenges Ahead.
Introduction to Cloud Security: Introduction, Cloud Security Concepts, CSA Cloud Reference Model, NIST Cloud Reference Model, NIST Cloud Reference Model.

UNIT - II
Cloud Security and Privacy Issues: Introduction, Cloud Security Goals/Concepts, Cloud Security Issues, Security Requirements for Privacy, Privacy Issues in Cloud.
Infrastructure Security: The Network Level, the Host Level, the Application Level, SaaS Application Security, PaaS Application Security, IaaS Application Security.

UNIT - III
Threat Model and Cloud Attacks: Introduction, Threat Model- Type of attack entities, Attack surfaces with attack scenarios, A Taxonomy of Attacks, Attack Tools-Network-level attack tools, VM-level attack tools, VMM attack tools, Security Tools, VMM security tools.

UNIT - IV

Information Security Basic Concepts, an Example of a Security Attack, Cloud Software Security Requirements, Rising Security Threats. Data Security and Storage: Aspects of Data Security, Data Security Mitigation, Provider Data and Its Security.

UNIT - V

Evolution of Security Considerations, Security Concerns of Cloud Operating Models, Identity Authentication, Secure Transmissions, Secure Storage and Computation, Security Using Encryption Keys, Challenges of Using Standard Security Algorithms.

TEXT BOOKS:
1. Cloud Security Attacks, Techniques, Tools, and Challenges by Preeti Mishra, Emmanuel S Pilli, Jaipur R C Joshi Graphic Era, 1st Edition published 2022 by CRC press.
2. Cloud Computing with Security Concepts and Practices Second Edition by Naresh Kumar
3. Sehgal Pramod Chandra, P. Bhatt John M. Acken,2nd Edition Springer nature Switzerland AG 2020.
4. Cloud Security and Privacy by Tim Mather, Subra Kumaraswamy, and Shahed Lati First Edition, September 2019.

REFERENCE BOOKS:
1. Essentials of Cloud Computing by K. Chandrasekaran Special Indian Edition CRC press.
2. Cloud Computing Principles and Paradigms by Rajkumar Buyya, John Wiley

IV B.TECH I SEMESTER (P.E.- IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY4107	**INCIDENT RESPONSE AND THREAT DETECTION**						

COURSE OBJECTIVES:
- To understand Incident Response Policy, Plan and Procedure.
- To understand Incident Handling, Coordination and Information Sharing.
- To analyze and build scenarios and incident response.
- To understand handling Malicious Code Incidents
- To understand the Threat Intelligence and its Life Cycle.

COURSE OUTCOMES:
Upon completion of the course students will be
CO1: Understand the fundamental concepts of incident response. [K2]
CO2: Analyze the incident handling process. [K4]
CO3: Apply coordination and information sharing techniques in incident response scenarios. [K3]
CO4: Analyze the procedures for handling malicious code incident. [K4]
CO5: Understand the concept of threat intelligence and its significance in incident response. [K2]

SYLLABUS:

UNIT–I:
Introduction to Incident Response: Events and Incidents, Need for Incident Response, Incident Response Policy, Plan, and Procedure Creation, Incident Response Team Structure, Incident Response Team Services.

UNIT–II:
Incident Handling: Preparation, Detection and Analysis, Containment, Eradication, and Recovery, Post-Incident Activity, Incident Handling Checklist.

UNIT–III:
Coordination and Information Sharing: Coordination, Information Sharing Techniques, Granular Information Sharing. Scenarios in Incidence Response: Domain Name System (DNS), Server Denial of Service (DoS), Compromised Database Server, Worm and Distributed Denial of Service (DDoS) Agent Infestation, Stolen Documents, Unknown Exfiltration, Unauthorized Access to Payroll Records, Disappearing Host, Telecommuting Compromise Anonymous Threat, Peer-to-Peer File Sharing, Unknown Wireless Access Point.

UNIT–IV:
Handling Malicious Code Incidents: Incident Definition and Examples, Preparation, Detection and Analysis, Containment, Eradication, and Recovery, Checklist for Handling Denial of Service Incidents.

UNIT–V:
The Threat Intelligence: The Threat Intelligence and its importance, Types of Threat Intelligence, The Role of Threat Data Feeds Private Channels and the Dark Web, The Threat Intelligence Life Cycle.

TEXT BOOKS:
1. Paul Cichonski, Tom Millar, TimGrance, Karen Scarfone, "Computer Security Incident Handling Guide",National Institute of Standards and Technology Special Publication,2012.
2. Chris Sanders and Jason Smith, "Applied Network Security Monitoring: Collection, Detection, and Analysis", Syngress- Elsevier, 2014.
3. The Threat Intelligence Handbook by Dr.Christopher Ahlberg.
4. Don Murdoch, "Blue Team Handbook: Incident Response Edition: A Condensed Field Guide for the Cyber Security Incident Responder", Create Space Independent Publishing, 2014

REFERENCE BOOKS:
1. Security Operations Center - Analyst Guide: SIEM Technology, Use Cases and Practices by Arun E Thomas.
2. Security Operations Center - Tools & Practices by Arun E Thomas

IV B.TECH I SEMESTER (P.E.- IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY4108	**VULNERABILITY ANALYSIS AND PENTRATION TESTING**						

COURSE OBJECTIVES:
- To learn the tools that can be used to perform information gathering.
- To identify various attacks in various domains of cyber space.
- To learn about exploits in various operating systems and Wireless environment.
- To learn how vulnerability assessment can be carried out by means of Automatic tools or manual investigation.
- To learn the vulnerabilities associated with various network applications And database system.

COURSE OUTCOMES:
CO1: Apply OSINT gathering techniques to gather information relevant to cyber security. [K3]
CO2: Applying attack techniques effectively [K4]
CO3: Analyze and compare wired and wireless networks [K4]
CO4: Analyze common vulnerabilities associated with application protocols [K4]
CO5: Apply various penetration testing tools [K3]

SYLLABUS

UNIT–I:
Information Gathering and Detecting Vulnerabilities- Open Source Intelligence Gathering - Port Scanning - Nessus Policies - Web Application Scanning Manual Analysis- Traffic Capturing.

UNIT–II:
Attacks: Password Attacks Client side Exploitation Social Engineering- Bypassing Antivirus Applications. Exploits: Metasploit Payloads Open php My Admin -Buffer overflow: Windows and Linux, Web scanning exploits, port scanning exploits, SQL exploits

UNIT–III:
Wireless Security: Wired vs. wireless Privacy Protocols - Wireless Frame Generation Encryption Cracking Tools Wireless DoS Attacks.

UNIT–IV:
Network Vulnerability Analysis: Domain Name Server and Dynamic Host Configuration Protocol -Light Weight Directory Access Protocol-Simple Network Management Protocol, Remote Procedural Call.
Common Vulnerability Analysis of Application Protocols: Simple Mail Transfer Protocol File Transfer Protocol- Trivial File Transfer Protocol-Hyper Text Transmission Protocol-ICMP SMURF- UDP-DNS-PING-SYN

UNIT–V:
Penetration Tools and Database Security- Traceroutes, Neotrace, Whatweb. Database Security: Access control in database systems – Inference control- Multilevel database security.

TEXT BOOKS:
1. Georgia Weidman, Penetration Testing: A Hands on Introduction to Hacking, No Startch Press, First Edition 2014.
2. B.Singh, H.Joseph and Abhishek Singh,"Vulnerability Analysis and Defense for the Internet, Springer, 2008 Edition.

REFERENCE BOOKS
1. RafayBaloch,"EthicalHacking and Penetration Testing Guide", CRC Press, 2015
2. Dr.Patrick Engebretson,"The Basics of Hacking and Penetration Testing", Syngress Publications Elsevier, 2013.
3. Prakhar Prasad, Mastering Modern Web Penetration Testing (Kindle Edition),2016, Packt Publishing.
4. Gilberto Najera Gutierrez, Kali Linux Web Penetration Testing Cookbook, 2016.
5. Robert Svensson, FromHacking to Report Writing: An Introduction to Security and Penetration Testing, 2016.

IV B.TECH I SEMESTER (P.E.- IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY4109	**INFORMATION CODING TECHNIQUES**						

COURSE OBJECTIVES:
- The objective of this course is to provide an insight to information coding techniques, error correction mechanism.
- Various compression techniques for text, video and image are covered for thorough knowledge of efficient information conveying systems.

COURSE OUTCOMES:
- **CO1 :** Apply Shannons information concept, channel coding etc. to solve practical problems [K3]
- **CO2 :** Analyze various types of codes and masking techniques. [K4]
- **CO3 :** Apply data compression principles [K4]
- **CO4 :** Apply video and audio compression techniques. [K4]
- **CO5 :** Analyze and compare specific compression techniques and advanced compression methods. [K4]

SYLLABUS

UNIT I
Information and entropy information measures, Shannon's concept of Information. Channel coding, channel mutual information capacity (BW). Theorem for discrete memory less channel, information capacity theorem, Error detecting and error correcting codes.

UNIT II
Types of codes: block codes, Hamming and Lee metrics, description of linear block codes, parity check Codes, cyclic code, Masking techniques.

UNIT III
Compression: loss less and lossy, Huffman codes, LZW algorithm, Binary Image c compression schemes, run length encoding, CCITT group 3 1- D Compression, CCITT group 3 2D compression, CCITT group 4 2DCompression.

UNIT IV
Convolutional codes, sequential decoding. Video image Compression: CITT H 261 Video coding algorithm, audio (speech) Compression. Cryptography and cipher.

UNIT V
Case study of CCITT group 3 1-DCompression, CCITT group 3 2D compression. Case Study of Advanced compression technique and Audio compression.

TEXT BOOKS:
1. Monica Borda, Fundamentals in information theory and coding, Springer, 2011.
2. Singh and Sapre, Communication Systems: Analog and digital, Tata McGraw Hill, 2007.

REFERENCE BOOKS:
1. Fred Halsall, Multimedia Communications, Addition-Wesley, 2001.
2. Ranjan Bose, Information Theory, Coding and Cryptography, Tata McGraw Hill, 2001.
3. Prabhat K Andleigh and Kiran Thakrar, Multimedia system Design, Prentice Hall PTR, 1996

IV B.TECH I SEMESTER (P.E.- V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY4110	**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 [K4].
CO2: Analyze Frauds, loop holes in the law [K4].
CO3: Analyze Indian penal laws in Cyber Crimes [K4].
CO4: Analyze International Cyber Laws in Cyber Crimes [K4].
CO5: Analyze International organizations and their roles. [K4]

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

TEXT BOOKS:
1. Prashant Mali: Cyber Law & Cyber Crimes Simplified, Cyber Infonedia Publisher
2. Justice Yatindra Singh: Cyber Laws, Universal Law Publishing Co., Latest Edition

IV B.TECH I SEMESTER (P.E.- V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY4111	**INTRUSION DETECTION SYSTEM**						

COURSE OBJECTIVES:

- Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise.
- Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion Detection Systems
- Analyze intrusion detection alerts and logs to distinguish attack types from false alarms

COURSE OUTCOMES:

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

CO1 : Understand the historical development of intrusion detection. [K2]

CO2 : Recall and categorize different types of IDS and recognize their significance in protecting against various forms of attacks. [K1]

CO3 : Explore various information sources for Intrusion Detection. [K3]

CO4 : Analyze the concepts and functionalities of IPS. [K4]

CO5 : Analyze intrusion analysis techniques and responses to security incidents, mapping them to policy requirements. [K4]

SYLLABUS

UNIT I:

History of Intrusion detection, Audit, Concept and definition , Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based information sources.

UNIT II:

Intrusion Prevention Systems, Network IDs protocol based IDs ,Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis , techniques Responses requirement of responses, types of responses mapping responses to policy Vulnerability analysis, credential analysis non credential analysis.

UNIT III:

Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes.

UNIT IV:
Working with Snort Rules, Rule Headers, Rule Options, The Snort Configuration File etc. Plug-in, Preprocessors and Output Modules, Using Snort with MySQL

UNIT V:
Using ACID and Snort Snarf with Snort, Agent development for intrusion detection, Architecture models of IDs and IPs.

TEXT BOOKS:
1. Rafeeq Rehman : " Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall , 2003.

REFERENCE BOOKS:
1. Christopher Kruegel,Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition,Springer, 2005.
2. Carl Endorf, Eugene Schultz and Jim Mellander " Intrusion Detection & Prevention", 1st Edition, Tata McGraw-Hill, 2004.
3. Stephen Northcutt, Judy Novak : "Network Intrusion Detection", 3rd Edition, New Riders Publishing, 2002.
4. T. Fahringer, R. Prodan, "A Text book on Grid Application Development and Computing Environment". 6th Edition, KhannaPublihsers, 2012.

IV B.TECH I SEMESTER (P.E.- V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY4112	**DATA PRIVACY**						

COURSE OBJECTIVES:
- To introduce students to the fundamental concepts of security, including cryptography and web security.
- Equip students to identify and address security risks, protect sensitive data, and make informed decisions on data management and privacy strategies.

COURSE OUTCOMES (CO):
At the end of the course, students will be able to –
- **CO1 :** Comprehend the concepts of web security and privacy, hardware and software vulnerabilities and protection mechanisms. [K2]
- **CO2 :** Analyze data privacy challenges. [K4]
- **CO3 :** Apply data protection models and concepts. [K3]
- **CO4 :** Analyze various trade-offs between data availability, storage and collection. [K4]
- **CO5 :** Analyze demographics, data linking and various data privacy attacks to understand the potential threats and vulnerabilities to data privacy. [K4]

SYLLABUS

UNIT I:
Introduction to Security: Cryptography, Web security, Hardware and software vulnerabilities

UNIT II:
Data Privacy: Data localization issues, Managing personally identifiable or sensitive information, Hippocratic databases, Differential privacy, Privacy preserving data analysis .

UNIT III
Basic concepts and definitions, objectives, disclosure control and inference of entities, models of protection like null map, k-map, wrong-map.

UNIT IV
Data Explosion: Availability vs. Storage vs. Collection trade-off, barriers to distribution, mathematical models for sharing practices and policies for computing privacy and risk measurements.

UNIT V
Demographics and Uniqueness, data linking, data profiling, data privacy attacks.

Text Books:
1. Stallings, W. Cryptography and Network Security. Pearson Education India.
2. Giannotti, F., &Pedreschi, D. (Eds.). Mobility, data mining and privacy: Geographic knowledge discovery. Springer Science & Business Media.
3. Bygrave, L. A. Data privacy law: an international perspective (Vol. 63). Oxford: Oxford University Press.
4. Scoble, R., Israel, S., &Benioff, M. R.. Age of context: Mobile, sensors, data and the future of privacy. USA: Patrick Brewster Press.
5. Bendat, J. S., &Piersol, A. G. Random data analysis and measurement procedures.

IV B.TECH I SEMESTER (P.E.- V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CY4113	**INFORMATION SECURITY MANAGEMENT**						

COURSE OBJECTIVES:
- Explore system security related incidents and gain insight on potential defenses and counter measures against common threat/vulnerabilities.
- Install, configure and troubleshoot information security devices.
- Gain experience using tools and common processes in information security audits and analysis of compromised systems.

COURSE OUTCOMES:

CO1: Recognize and recall different IS devices. [K1]
CO2: Apply device configuration and troubleshooting skills for resolving common issues.[K3]
CO3: Make use of procedures, guidelines and checklists to prepare information security audits.[K3]
CO4: Demonstrate effective communication with colleagues and solve problems related to teamwork and communication. [K3]
CO5: Identify and address personal learning and development needs. [K3]

SYLLABUS

UNIT-I:
Information Security Devices: Identify And Access Management (IdAM), Networks (Wired And Wireless) Devices, Endpoints/Edge Devices, Storage Devices, Servers, Infrastructure Devices (e.g. Routers, Firewall Services), Computer Assets, Servers And Storage Networks, Content management, IDS/IPS.

UNIT-II:
Security device management: Different types of information security devices and their functions, Technical and configuration specifications, architecture concepts and design patterns and how these contribute to the security of design and devices.
Device Configuration: Common issues in installing or configuring information security Devices, Methods to resolve these issues, Methods of testing installed/configured information security devices.

UNIT-III:
Information Security Audit Preparation: Establish the nature and scope of information security audits, Roles and responsibilities, Identify the procedures/guidelines/checklists,

identify the requirements of information security, audits and prepare for audits in advance, Liaise with appropriate people to gather data/information required for information security audits.

Security Audit Review -Organize data/information required for information security audits using standard templates and tools, Audit tasks, Reviews, Comply with the organization's policies, standards, procedures, guidelines and checklists, Disaster Recovery Plan.

UNIT-IV:

Team work and Communication: Communicate with colleagues clearly, concisely and accurately , Work with colleagues to integrate their work effectively, Pass on essential information to colleagues in line with organizational requirements, Identify any problems they have working with colleagues and take the initiative to solve these problems.

UNIT-V:

Data and Information Management: Fetching the data/information from reliable sources, Checking that the data/information is accurate, complete and up-to-date, Rule-based analysis of the data/information, Insert the data/information into the agreed formats, Reporting unresolved anomalies in the data/information.

TEXT BOOKS:
1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices,Nina Godbole, Wiley, 2017.
2. Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, Information Security Management: Concepts and Practice. New York, McGraw-Hill, 2013.
3. Christopher J. Alberts, Audrey J. Dorofee , Managing Information Security Risks, Addison-WesleyProfessional, 2004.

REFERENCE BOOKS:
1. Andrew Vladimirov Michajlowski, Konstantin, Andrew A. Vladimirov, Konstantin V. Gavrilenko, Assessing Information Security: Strategies, Tactics, Logic and Framework, IT Governance Ltd, O'Reilly 2010
2. Christopher J. Alberts, AudreyJ. Dorofee , Managing Information SecurityRisks, Addison-Wesley Professional, 2004
3. Chuck Easttom, System Forensics Investigation and Response, Second Edition, Jones & Bartlett Learning, 2014
4. David Kennedy, Jim O'Gorman, Devon Kearns, and Mati Aharoni, Metasploit The Penetration Tester's Guide, No Starch Press, 2014

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**

IV B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	30	70	100	3
SUBCODE: R20CC4117	**ENTREPRENEURSHIP & INNOVATION**						

COURSE OBJECTIVES:

• Creating awareness among the students about the significance of entrepreneurship and its social relevance.
• Imparting knowledge to the students on institutional support available to start a business venture
• To understand the significance of entrepreneurial training in the development of new and existing entrepreneurs

COURSE OUTCOME

CO 1: : Outline the concepts of Entrepreneurship.[K2]
CO 2: : Create the awareness on creativity and innovation.[K6]
CO 3: : Adopt the Entrepreneurship Development programs[K6]
CO 4: : Evaluate the project planning and feasibility studies.[K5]
CO 5: : Analyze the concept of small and micro enterprises.[K4]

SYLLABUS:

UNIT –I
Entrepreneur and entrepreneurship
Entrepreneur – Definitions, concept of entrepreneur, characteristics of entrepreneur, types of entrepreneurs, concept of entrepreneurship, characteristics of entrepreneurship, role of entrepreneurship in economic development, ethics and social responsibilities of an entrepreneur, Financial institutional support to entrepreneurs(IDBI,SISI,DIC,NIESBUD, Commercial banks etc.,

UNIT-II
Creativity and innovation in entrepreneurship
Meaning and concept of creativity - Nature and characteristics of creativity -Creativity Process-Factors affecting creativity - Meaning and Importance Innovation - Process -Distinguish the Creativity and Innovation.

UNIT –III
Entrepreneurship development programmes
Designing Appropriate Training Programme to inculcate Entrepreneurial Spirit -Training for Entrepreneurs, Entrepreneurship Development Programme (EDP) – Need and objectives of EDP's -Phases and evolution on EDP's existing and new Entrepreneurs.

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: R20CY41SC1	**CYBER CRIME INVESTIGATION & DIGITAL FORENSICS LAB**						

COURSE OBJECTIVES:
- To Provide students with a comprehensive overview of collecting, investigating, preserving, and presenting evidence of cybercrime left in digital storage devices, emails, browsers, mobile devices using different Forensics tools.
- To Understand file system basics and where hidden files may lie on the disk, as well as how to extract the data and preserve it for analysis.
- Understand some of the tools of e-discovery.
- To understand the network analysis, Registry analysis and analyze attacks using different forensics tools.

COURSE OUTCOMES:
After completion of this course students are able to:
CO1: Understand the procedure for investigating data located on digital storage media to potentially uncover evidence of wrongdoing. [K2]
CO2: Apply their knowledge of file system storage mechanisms to retrieve files that are hidden or stored on obscure formats. [K3]
CO3: Apply computer forensics tools effectively for analysis and interpretation of digital data. [K3]
CO4: Analyze and identify data, whether visible or concealed, on computer disks. [K4]
CO5 Make use of different tools for analysis. [K4]

LIST OF EXPERIMENTS:
1. Perform email analysis using the tools like Exchange EDB viewer, MBOX viewer and View user mailboxes and public folders, Filter the mailbox data based on various criteria, Search for particular items in user mailboxes and public folders
2. Perform Browser history analysis and get the downloaded content, history, saved logins, searches, websites visited etc using Foxton Forensics tool, Dumpzilla.
3. Perform mobile analysis in the form of retrieving call logs, SMS log, all contacts list using the forensics tool like SAFT
4. Perform Registry analysis and get boot time logging using process monitor tool
5. Perform Disk imaging and cloning the using the X-way Forensics tools
6. Perform Data Analysis i.e History about open file and folder, and view folder actions using Lastview activity tool
7. Perform Network analysis using the Network Miner tool.
8. Perform information for incident response using the crowd Response tool
9. Perform File type detection using Autopsy tool

10. Perform Memory capture and analysis using the Live RAM capture or any forensic tool

TEXT BOOKS:
1. Real Digital Forensics for Handheld Devices, E. P. Dorothy, Auerback Publications, 2013.
2. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J.
3. Sammons, Syngress Publishing, 2012.

REFERENCE BOOKS:
1. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010.
2. Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides, C. H. Malin, E. Casey and J. M. Aquilina, Syngress, 2012.
3. The Best Damn Cybercrime and Digital Forensics Book Period, J. Wiles and A.Reyes, Syngress, 2007.

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.

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: ADVANCED CYBER SECURITY

S.No.	HONOR Subject Title	Sub Code	No.of periods per week			No.of Credits
			L	T	P	C
1	Web & Database Security	20CYHN01	4	0	0	4
2	Social Media Security	20CYHN02	4	0	0	4
3	Digital Watermarking and Steganography	20CYHN03	4	0	0	4
4	Authentication Techniques	20CYHN04	4	0	0	4
5	Mobile Application Security	20CYHN05	4	0	0	4

Pool 2: 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

Minors:

S.No.	Minor Title	Dept. Offering Subject	Sub Code	No. of Periods per week			No. of credits
				L	T	P	C
1	Cryptography and Network Security	CSE (CS)	R20CCMN49	4	0	0	4
2	Introduction to Cyber Security	CSE (CS)	R20CCMN50	4	0	0	4
3	Ethical Hacking	CSE (CS)	R20CCMN51	4	0	0	4
4	Secure Coding	CSE (CS)	R20CCMN52	4	0	0	4
5	Cyber Crime Investigation & Digital Forensics	CSE (CS)	R20CCMN53	4	0	0	4
6	Data Privacy	CSE (CS)	R20CCMN54	4	0	0	4
In addition to any of the four subjects, MOOC/NPTEL courses for 04 credits (2 8-weeks courses @ 2 credits each) are compulsorily in the domain of Cyber Security							

Pool 1: ADVANCED CYBER SECURITY

S.No.	HONOR Subject Title	Sub Code	No.of periods per week			No.of Credits
			L	T	P	C
1	Web & Database Security	20CYHN01	4	0	0	4
2	Social Media Security	20CYHN02	4	0	0	4
3	Digital Watermarking and Steganography	20CYHN03	4	0	0	4
4	Authentication Techniques	20CYHN04	4	0	0	4
5	Mobile Application Security	20CYHN05	4	0	0	4

Pool 1	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
SUBCODE:20CYHN01	**WEB & DATABASE SECURITY**						

COURSE OBJECTIVES:
- Give an Overview of information security
- Give an overview of Access control of relational databases

COURSE OUTCOMES:
Students should be able to
    CO1: Analyze Web architecture and applications. [K4]
    CO2: Analyze client side and server-side programming. [K4]
    CO3: Understand how common mistakes can be bypassed and exploit the application. [K2]
    CO4: Analyze recovery in data processing systems and its applications. [K4]
    CO5: Apply privacy policies to databases. [K3]

SYLLABUS

UNIT - I
The Web Security, The Web Security Problem, Risk Analysis and Best Practices Cryptography and the Web: Cryptography and Web Security, Working Cryptographic Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification

UNIT - II
The Web's War on Your Privacy, Privacy-Protecting Techniques, Backups and Antitheft, Web Server
Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications

UNIT - III
Database Security: Recent Advances in Access Control, Access Control Models for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems

UNIT - IV
Security Re-engineering for Databases: Concepts and Techniques, Database Watermarking for Copyright Protection, Trustworthy Records Retention, Damage Quarantine and Recovery in Data Processing Systems, Hippocratic Databases: Current Capabilities.

UNIT - V

Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy-enhanced Location based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment

TEXT BOOKS:
1. Web Security, Privacy and Commerce Simson GArfinkel, Gene Spafford, O'Reilly.
2. Handbook on Database security applications and trends Michael Gertz, Sushil Jajodia.

REFERENCE BOOKS:
1. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, O'reilly.
2. Jonathan LeBlanc Tim Messerschmidt, Identity and Data Security for Web Development – Best Practices, O'reilly.
3. McDonald Malcolm, Web Security For Developers, No Starch Press, US.

Pool 1	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
SUBCODE:20CYHN02	**SOCIAL MEDIA SECURITY**						

COURSE OBJECTIVES:
- Give introduction about the social networks, its use, the need of security in social data.

COURSE OUTCOMES:
Students should be able to
CO1: Gain knowledge about the risks associated with web browsers. [K2]
CO2: Understand the risks involved in using social media, and comprehend the guidelines for safe social networking. [K2]
CO3: Apply knowledge to secure various web browsers effectively. [K3]
CO4: Understand the functioning of email systems, identify threats associated with email communication, and comprehend safety measures for secure email usage. [K2]
CO5: Apply policies and privacy blocking users controlling apps. [K3]

SYLLABUS

UNIT – I
Introduction to Social Media, Understanding Social Media, Different Types and Classifications, The Value of Social Media, Cutting Edge Versus Bleeding Edge, The Problems That Come With Social Media, Is Security Really an Issue? Taking the Good With the Bad.

UNIT - II
Dark side Cybercrime, Social Engineering, Hacked accounts, cyberstalking, cyberbullying, predators, phishing, hackers.

UNIT – III
Being bold versus being overlooked Good social media campaigns, Bad social media campaigns, Sometimes it's better to be overlooked, Social media hoaxes, The human factor, Content management, Promotion of social media.

UNIT - IV
Risks of Social media Introduction Public embarrassment, Once it's out there, it's out there False information, Information leakage, Retention and archiving, Loss of data and equipment.

UNIT – V
Policies and Privacy Blocking users controlling app privacy, Location awareness, Security Fake accounts passwords, privacy and information sharing.

TEXT BOOKS:
1. Interdisciplinary Impact Analysis of Privacy in Social Networks, Recognizing Your Digital Friends, Encryption for Peer-to-Peer Social Networks Crowd sourcing and Ethics, Altshuler Y, EloviciY, Cremers A.B, Aharony N, Pentland A. (Eds.).
2. Social media security
   ttps://www.sciencedirect.com/science/article/pii/B97815974998660000

REFERENCE BOOKS:
1. Michael Cross, Social Media Security Leveraging Social Networking While Mitigating Risk.
2. Online Social Networks Security, Brij B. Gupta, Somya Ranjan Sahoo, Principles, Algorithm, Applications, and Perspectives, CRC press.

Pool 1	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
SUBCODE:20CYHN03	**DIGITAL WATERMARKING AND STEGANOGRAPHY**						

COURSE OBJECTIVES:
- To learn about the watermarking models and message coding.
- To learn about watermark security and authentication.
- To learn about steganography. Perceptual models.

COURSE OUTCOMES:
Students should be able to
CO1 : Know the History and importance of watermarking and steganography. [K2]
CO2 : Analyze Applications and properties of watermarking and steganography. [K4]
CO3 : Apply models and algorithms of watermarking to enhance the skills in the field. [K3]
CO4 : Possess the passion for acquiring knowledge and skill in preserving authentication of Information. [K2]
CO5 : Understand the theoretic foundations of steganography and steganalysis. [K2]

SYLLABUS

UNIT - I
Introduction: Information Hiding, Steganography and Watermarking – History of watermarking – Importance of digital watermarking – Applications – Properties – Evaluating watermarking systems.
Watermarking models & message coding: Notation – Communications – Communication based models – Geometric models – Mapping messages into message vectors – Error correction coding – Detecting multi-symbol watermarks.

UNIT - II
Watermarking with side information & analyzing errors: Informed Embedding – Informed Coding – Structured dirty-paper codes - Message errors – False positive errors – False negative errors – ROC curves – Effect of whitening on error rates.

UNIT - III
Perceptual models: Evaluating perceptual impact – General form of a perceptual model – Examples of perceptual models – Robust watermarking approaches - Redundant Embedding, Spread Spectrum Coding, Embedding in Perceptually significant coefficients.

UNIT - IV
Watermark security & authentication: Security requirements – Watermark security and cryptography – Attacks – Exact authentication – Selective authentication – Localization – Restoration.

UNIT - V
Steganography: Steganography communication – Notation and terminology – Information Theoretic Foundations of steganography – Practical steganographic methods – Minimizing the embedding impact – Steganalysis

TEXT BOOK:

1. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, "Digital Watermarking and Steganography", Margan Kaufmann Publishers, New York, 2008.

REFERENCE BOOK:

1. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, "Digital Watermarking", Margan Kaufmann Publishers, New York, 2003.

Pool 1	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
SUBCODE:20CYHN04	**AUTHENTICATION TECHNIQUES**						

COURSE OBJECTIVES:

- Knowledge on concept of authentication types, protocols, physical identification and various authentication algorithms.

COURSE OUTCOMES:

Students should be able to

CO1 : Understand different types of authentication techniques. [K2]
CO2 : Understand text based and voice-based authentication techniques. [K2]
CO3 : Understand significance of authentication algorithms and its standards. [K2]
CO4 : Analyze matching algorithms with authentication standards and methods. [K4]
CO5 : Apply various authentication protocols in multi-server environment and their representation. [K3]

SYLLABUS

UNIT - I:
Definition of Authentication, Identification/verification, Stages and steps of authentication, Authentication Entity : User, Device and Application; Authentication attributes: Source, Location, Path, Time duration etc.; Authentication Types : Direct / Indirect, One Way / Mutual, On demand/ Periodic/ Dynamic/Continuous authentication, Assisted/Automatic; 3 Factors of authentication; Passwords, Generation of passwords of varied length and of mixed type, OTP, passwords generation using entity identity credentials; Secure capture, processing, storage, verification and retrieval of passwords.

UNIT - II:
Physical identification using smart cards, remote control device, proximity sensors, surveillance camera, authentication in Card present / Card Not Present transactions as ATM/ PoS Device, mobile phone, wearable device and IoT device-based authentication; single sign-on; Symmetric Key Generation, Key Establishment, Key Agreement Protocols.

UNIT - III:
Biometrics – photo, face, iris, retinal, handwriting, signature, fingerprint, palm print, hand geometry, voice – Text based and text independent voice authentication, style of talking, walking, writing, keystrokes, gait etc. multi-modal biometrics.

UNIT - IV:

Matching algorithms, Patterns analysis, errors, performance measures, ROC Curve; Authentication Standards – International, UIDAI Standard. Kerberos, X.509 Authentication Service, Public Key Infrastructure, Scanners and Software; Web Authentication Methods: Http based, Token Based, OAuth and API.

UNIT - V:

User authentication protocols in multi-server environment, BAN Logic, Representation of authentication protocols using BAN Logic, Random Oracle Model, Scyther Tools, Proverif tool, Chebyshev Chaotic Map, Fuzzy Extractor.

TEXT BOOKS:
1. Protocols for Authentication and Key Establishment, Colin Boyd and Anish Mathuria, springer, 2021
2. Guide to Biometrics, Ruud M.Bolle, Sharath Pankanti, Nalini K. Ratha, Andrew W. Senior, Jonathan H.

REFERENCE BOOKS:
1. Digital Image Processing using MATLAB, Rafael C. Gonzalez, Richard Eugene Woods, 2nd Edition, Tata McGraw-Hill Education 2010.
2. Biometric System and Data Analysis: Design, Evaluation, and data Mining, Ted Dunstone and Neil Yager, Springer.
3. Biometrics Technologies and verification Systems, John Vacca, Elsevier Inc., 2007.
4. Pattern Classification, Richard O. Duda, David G.Stork,Peter E. Hart, Wiley 2007.

Pool 1	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	30	70	100	4
SUBCODE: 20CYHN05	**MOBILE APPLICATION SECURITY**						

COURSE OBJECTIVES:
- This course provides a thorough understanding of mobile platforms, including attack surfaces, risk landscape & more.

COURSE OUTCOMES:
Students should be able to
CO1 : Apply common mobile application security vulnerabilities. [K3]
CO2 : Apply security controls to multiple mobile operating systems. [K3]
CO3 : Understand and analyze Bluetooth technology. [K4]
CO4 : Analyze overview of SMS security. [K4]
CO5 : Analyze overview of Enterprise security. [K4]

SYLLABUS
UNIT - I
Top Mobile Issues and Development Strategies: Top Issues Facing Mobile Devices, Physical Security , Secure Data Storage (on Disk), Strong Authentication with Poor Keyboards , Multiple-User Support with Security, Safe Browsing Environment , Secure Operating Systems, Application solation, Information Disclosure, Virus, Worms, Trojans, Spyware, and Malware , Difficult Patching/Update Process, Strict Use and Enforcement of SSL, Phishing , Cross-Site Request Forgery (CSRF), Location Privacy/Security, Insecure Device Drivers, Multi Factor Authentication, Tips for Secure Mobile Application Development.

UNIT - II
WAP and Mobile HTML Security WAP and Mobile HTML Basics, Authentication on WAP/Mobile HTML Sites, Encryption, Application Attacks on Mobile HTML Sites, Cross-Site Scripting, SQL Injection, Cross-Site Request Forgery, HTTP Redirects, Phishing, Session Fixation, Non-SSL Login, WAP and Mobile Browser Weaknesses, Lack of HTTPOnly Flag Support, Lack of SECURE Flag Support, Handling Browser Cache, WAP Limitations.

UNIT - III
Bluetooth Security Overview of the Technology , History and Standards , Common Uses ,Alternatives, Future, Bluetooth Technical Architecture , Radio Operation and Frequency, Bluetooth Network Topology , Device Identification , Modes of Operation , Bluetooth Stack ,Bluetooth Profiles, Bluetooth Security Features, Pairing , Traditional Security Services in Bluetooth, Security "Non-Features", Threats to Bluetooth Devices and Networks, Bluetooth Vulnerabilities, Bluetooth Versions Prior to v1.2, Bluetooth Versions Prior to v2.1.

UNIT - IV
SMS Security Overview of Short Message Service, Overview of Multimedia Messaging Service, Wireless Application Protocol (WAP), Protocol Attacks, Abusing Legitimate Functionality, Attacking Protocol Implementations, Application Attacks, iPhone Safari, Windows Mobile MMS, Motorola RAZR JPG Overflow, Walkthroughs, Sending PDUs, Converting XML to WBXML.

UNIT - V
Enterprise Security on the Mobile OS Device Security Options, PIN, Remote, 346 Secure Local Storage, Apple iPhone and Keychain, Security Policy Enforcement, Encryption, Full Disk Encryption, E-mail Encryption, File Encryption.

TEXT BOOK:
1. Mobile Application Security, Himanshu Dwivedi, Chris Clark, David Thiel, TATA McGraw Hill.

REFERENCE BOOKS:
1. Mobile and Wireless Network Security and Privacy, Kami S. Makki, et al, Springer.
2. Android Security Attacks Defenses, Abhishek Dubey, CRC Press.

Pool 2: 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-2	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CSHN13	**INTRODUCTION TO IT INFRASTRUCTURE LANDSCAPE**						

COURSE OBJECTIVES:
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, Virtual Server 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 Layer 2, What is Routing? IP Routing, Types of Routing, Virtual LAN, Benefits of VLAN, Dynamic vs. Static VLANs, 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.
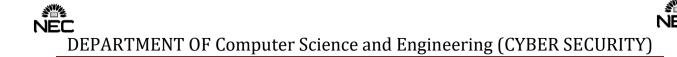
UNIT - IV:

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 WebSphere MQ, WebSphere MQ Objects, Web Tier Deployment, Applications Servers, Cluster Deployment, Lotus Notes – 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)
4. by Ronn Hanley

POOL-2	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CSHN14	CLOUD COMPUTING VIRTUALIZATION						

COURSE OBJECTIVES:
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-2	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CSHN15	**CLOUD COMPUTING ARCHITECTURE**						

COURSE OBJECTIVES:
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 SaaS providers, 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 reference model, 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 configuration Portability 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-2	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: R20CSHN16	**CLOUD COMPUTING SECURITY & MANAGEMENT**						

COURSE OBJECTIVES:
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].
.
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, Transforming IAM, 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

List of Open Electives offered by Department

S.No.	Open Elective -1 Subject Code	Subject Title	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CC10E21	Mean Stack Technologies	30	70	100	3	0	0	3
2	R20CC10E22/ R20CY3101	Cryptography and Network Security	30	70	100	3	0	0	3

S.No.	Open Elective -2 Subject Code	Subject Title	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CC20E16	Cloud Computing	30	70	100	3	0	0	3
2	R20CC20E20/ R20CY3203	Ethical Hacking	30	70	100	3	0	0	3

S.No.	Open Elective -3 Subject Code	Subject Title	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CC30E21/ R20CY3201	Introduction to Cyber Security	30	70	100	3	0	0	3
2	R20CC30E22	Malware Analysis & Reverse Engineering	30	70	100	3	0	0	3

S.No.	Open Elective -4 Subject Code	Subject Title	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R20CC40E16/ R20CC4104	e-Commerce	30	70	100	3	0	0	3
2	R20CC4OE19/ R20CY4112	Data Privacy	30	70	100	3	0	0	3

III B.TECH I SEMESTER Open Elective - 1	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC1OE21	**MEAN STACK TECHNOLOGIES**						

COURSE OBJECTIVES:

- This course is designed to introduce students to learn how to design both the front and back end of web applications. 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 : Apply Angular8 to develop web applications. [K3]
CO2 : Make use of Forms and Services. [K3]
CO3 : Utilize Node.js to create Server Side Applications. [K3]
CO4 : Make use of Express to deploy web applications. [K3]
CO5 : Experiment with NoSQL using MongoDB. [K3]

SYLLABUS:

UNIT-I: Angular8:

Introduction, Installation, Creating First Angular8 Application, Architecture, Angular Components and Templates, Data Binding, Directives, Pipes, Services and Dependency Injection.

UNIT-II: Angular8:

Reactive Programming, Http Client Programming, Angular Material, Routing and Navigation, Forms, Form Validation, CLI Commands.

UNIT-III: Node.js:

Introduction, Git Basic commands, Node.js Process Model, Node.js Console, Node.js Basics, Node.js Modules, Local Modules, Export Module, Node Package Manager, Node.js Web Server.

UNIT-IV: Node.js contd. & Express.js:

Node.js File System, Debugging Node.js, Node Inspector, Node.js EventEmitter, Frameworks for Node.js. **Express.js:** Express.js Web App, Serving Static Resources.

UNIT-V: MongoDB:

Access MongoDB in Node.js, Connecting MongoDB, Insert Documents, Update/Delete Documents, Query Database, Mangoose.

TEXT BOOKS:
1. Node.js, MongoDB and Angular Web Development by Brad Dayley, Brendan Dayley-2nd Edition-Addison-Wesley
2. Getting MEAN with Mango, Express, Angular and Node by Simon Holmes, Clive Harber-2nd Edition-Manning Publications.
3. MEAN Cookbook by Nicholas McClay-Packt

REFERENCES BOOKS:
1. Node.js: Web Development for Beginners by Joseph Conner
2. Mean Stack Developer by Camila Cooper

ADDITIONAL RESOURCES:
1. https://www.edx.org/course/introduction-to-mongodb-using-the-mean-stack
2. http://www.simplilearn.com/full-stack-web-developer-mean-stack-certification-training
3. https://www.tutorialsteacher.com/nodejs/expressjs-web-application.

III B.TECH I SEMESTER Open Elective - 1	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC1OE22 / R20CY3101	**CRYPTOGRAPHY AND 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: 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, John Wiley & 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 Open Elective - 2	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC2OE16	**CLOUD COMPUTING**						

COURSE OBJECTIVES:
- To gain knowledge about Virtualization and Virtual Machines
- To familiarize Cloud Computing and its services.

COURSE OUTCOMES:
After successful completion of this course, the students would be able to:
CO1 : Interpret various types of Virtualization. [K2]
CO2 : Outline the Cloud Computing Architectures and Models. [K2]
CO3 : Analyze the Cloud Infrastructure Management and Migration and Disaster Management in Cloud. [K4]
CO4 : Analyze AWS and MS Azure services. [K4]

SYLLABUS:
UNIT-I: Overview of Cloud Computing:
Essentials of Cloud Computing, History of Cloud Computing, Business and Information, Benefits of Cloud Computing, Limitations of Cloud Computing, Characteristics of Cloud Computing, How to Develop Cloud Infrastructure, Vendors of Cloud Computing.

UNIT-II: Introduction to virtualization and virtual machine:
Types of virtualization: Server virtualization, Application/ desktop virtualization, client virtualization, storage virtualization, Network virtualization service / application infrastructure virtualization, virtual machines & virtualization middleware.
Cloud Computing Architecture: Grid Framework Overview, Grid Architecture, Cloud Computing Architecture, Key Design Aspects of Cloud Architecture, Cloud Services, and Cloud Applications, Similarities and Differences Between Grid and Cloud Computing, Cloud and Dynamic Infrastructure.

UNIT-III: Models of Cloud Computing:
Cloud Service Models, Cloud Computing Sub Service Models, Cloud Deployment Models, Alternative Deployment Models, Cloud Stack, Cloud Storage.

UNIT-IV: Cloud Infrastructure Management and Migration:
Administrating Clouds, Cloud Management Products, Processes in Cloud Service Management, Cloud Providers and Traditional IT Service Providers, How to Access the Cloud, Migrating to Clouds.
Disaster Recovery: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management

UNIT-V:

What is Microsoft Azure? , Types of Azure Clouds, Azure key Concepts, Azure Domains (Components), Traditional vs. Azure Cloud Model, Applications of Azure, Advantages of Azure, Disadvantages of Azure. What is AWS? , History of AWS, Important AWS Services, Amazon Web Services Cloud Platform: Compute & Networking, Storage & Content Delivery Network, Database, Analytics, Application Services, Deployment and Management, Applications of AWS services, Companies using AWS, Advantages of AWS, Disadvantages of AWS, Comparison between Azure and AWS.

TEXT BOOKS:

1. Cloud Computing – Shailendra Singh Oxford University Press.

REFERENCES BOOKS:

1. Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide David S. Linthicum Addison-Wesley Professional.
2. Distribured & Cloud Computing From Parallel Processing to the Internet of Things by Kai Hwang. Geoffrey C. Fox. Jack J. Dongarra

WEB REFERENCES:

1. https://nptel.ac.in/courses/106106129/21
2. http://freevideolectures.com/course/3649/cloud-computing
3. https://www.youtube.com/watch?v=Eg4AAGCE7X4&list=PL2UlrhJ_JwyA5IlOCdE WlNArFke4jgtlg.

III B.TECH II SEMESTER Open Elective - 2	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC2OE20 / R20CY3203	**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: Analyze network protection system and hacking web servers. [K4]
CO5: Apply Ethical hacking techniques and understand the Ethical Hacking Laws [K3]

SYLLABUS:
UNIT - I:
Ethical hacking: 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.

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.

IV B.TECH I SEMESTER Open Elective - 3	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC3OE21 / R20CY3201	**INTRODUCTION TO 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

CO1: Interpret Cyber Security architecture principles [K2].

CO2: Identifying System and application security threats and vulnerabilities [K3].

CO3: Identifying different classes of attacks [K3].

CO4: Cyber Security incidents to apply appropriate response [K3].

CO5: Describing cyber forensics and digital evidence [K3].

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, Identity Theft(ID Theft)

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.

TEXT BOOKS:
1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, 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 I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
Open Elective - 3	3	0	0	30	70	100	3
SUBCODE: R20CC3OE22	**MALWARE ANALYSIS & REVERSE ENGINEERING**						

COURSE OBJECTIVES:
- To learn fundamentals of malware analysis which includes analysis of JIT compilers for malware detection in legitimate code.
- To explore the techniques for detecting, analyzing, reverse engineering and eradicating malware.
- Employ network and system-monitoring tools to examine how malware interacts with the file system, registry, network, and other processes in a Windows environment.
- Assess the threat associated with malicious documents.
- Build an isolated, controlled laboratory environment for analyzing the code and behaviour of malicious program.

COURSE OUTCOMES:
After completion of this course, the students would be able to
- **CO1 :** Demonstrate the concept of malware and reverse engineering. [K2]
- **CO2 :** Apply various tools and techniques of malware analysis to examine malicious software. [K3]
- **CO3 :** Analyse and evaluate various techniques for used in malware analysis & reverse engineering to identify vulnerabilities. [K4]
- **CO4 :** Utilize the python language for development & analysis of anti-malwares. [K4]
- **CO5:** Setup an environment for malware analysis & recognize common malware characteristics. [K1]

SYLLABUS:

UNIT–I:
Fundamentals of Malware Analysis (MA), Reverse Engineering Malware (REM) Methodology, Brief Overview of Malware analysis lab setup and configuration, Introduction to key MA tools and techniques, Behavioural Analysis vs. Code Analysis, Resources for Reverse-Engineering Malware (REM) Understanding Malware Threats, Malware indicators, Malware Classification, Examining Clam AV Signatures, Creating Custom Clam AV Databases.

UNIT–II:
Malware Forensics Using TSK for Network and Host Discoveries, Using Microsoft Offline API to Registry Discoveries, Identifying Packers using PEiD, Registry Forensics with Reg Ripper Plu-gins, Bypassing Poison Ivy's Locked Files, Bypassing Conficker's File System ACL Restrictions, Detecting Rogue PKI Certificates.

UNIT–III:
Malware and Kernel Debugging Opening and Attaching to Processes, Configuration of JITDebugger for Shellcode Analysis, Controlling Program Execution, Setting and Catching Breakpoints, Debugging with Python Scripts and Py Commands, DLL Export Enumeration, Execution, and Debugging, Debugging a VMware Workstation Guest (on Windows), Debugging a Parallels Guest (on Mac OS X).

UNIT–IV:
Memory Forensics and Volatility Memory Dumping with MoonSols Windows Memory Toolkit, Accessing VM Memory Files Overview of Volatility, Investigating Processes in Memory Dumps, Code Injection and Extraction, Detecting and Capturing Suspicious Loaded DLLs, Finding Artifacts in Process Memory, Identifying Injected Code with Malfind and YARA.

UNIT–V:
Researching and Mapping Source Domains/IPs Using WHOIS to Research Domains, DNS Hostname Resolution, Querying Passive DNS, Checking DNS Records, Reverse IP Search New Course Form, Creating Static Maps, Creating Interactive Maps.

TEXT BOOKS:
1. Sikorski, M., & Honig, A. (2012). Practical malware analysis: the hands-on guide to dissecting malicious software. No starch press.
2. Eilam, E. (2005). Reversing, Secrets of Reverse Engineering Wiley Publishing.
3. Malin, C. H. (2013). Linux Malware Incident Response: A Practitioner's Guide to Forensic Collection and Examination of Volatile Data: An Excerpt from Malware Forensic Field Guide for Linux Systems. Elsevier.

REFERENCE BOOKS:
1. Shashidhar, N., & Cooper, P. (2016, April). Teaching malware analysis: The design philosophy of a model curriculum. In 2016 4th International Symposium on Digital Forensic and Security (ISDFS) (pp. 119-125). IEEE.
2. Singh, A. (Ed.). (2009). Identifying malicious code through reverse engineering (Vol. 44). Springer Science & Business Media.

IV B.TECH I SEMESTER (Open Elective – 4)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC4OE16/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 Open Elective - 4	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R20CC4OE19 / R20CY4112	**DATA PRIVACY**						

COURSE OBJECTIVES:
- To introduce students to the fundamental concepts of security, including cryptography and web security.
- Equip students to identify and address security risks, protect sensitive data, and make informed decisions on data management and privacy strategies.

COURSE OUTCOMES (CO):
At the end of the course, students will be able to –
CO1 : Comprehend the concepts of web security and privacy, hardware and software vulnerabilities and protection mechanisms. [K2]
CO2 : Analyze data privacy challenges. [K4]
CO3 : Apply data protection models and concepts. [K3]
CO4 : Analyze various trade-offs between data availability, storage and collection. [K4]
CO5 : Analyze demographics, data linking and various data privacy attacks to understand the potential threats and vulnerabilities to data privacy. [K4]

SYLLABUS

UNIT I:
Introduction to Security: Cryptography, Web security, Hardware and software vulnerabilities

UNIT II:
Data Privacy: Data localization issues, Managing personally identifiable or sensitive information, Hippocratic databases, Differential privacy, Privacy preserving data analysis .

UNIT III
Basic concepts and definitions, objectives, disclosure control and inference of entities, models of protection like null map, k-map, wrong-map.

UNIT IV
Data Explosion: Availability vs. Storage vs. Collection trade-off, barriers to distribution, mathematical models for sharing practices and policies for computing privacy and risk measurements.

UNIT V
Demographics and Uniqueness, data linking, data profiling, data privacy attacks.

Text Books:
1. Stallings, W. Cryptography and Network Security. Pearson Education India.
2. Giannotti, F., &Pedreschi, D. (Eds.). Mobility, data mining and privacy: Geographic knowledge discovery. Springer Science & Business Media.
3. Bygrave, L. A. Data privacy law: an international perspective (Vol. 63). Oxford: Oxford University Press.
4. Scoble, R., Israel, S., &Benioff, M. R.. Age of context: Mobile, sensors, data and the future of privacy. USA: Patrick Brewster Press.
5. Bendat, J. S., &Piersol, A. G. Random data analysis and measurement procedures.