VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS):: BHIMAVARAM

Approved by AICTE, Accredited by NAAC-A++, NBA & Affiliated to JNTUK

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABUS

For UG-R20

B.TECH-COMPUTER SCIENCE AND ENGINEERING

(*Applicable for batches admitted from 2020-2021*)

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS):: BHIMAVARAM

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ACADEMIC REGULATIONS (R20) FOR B. TECH (REGULAR)

Applicable for the students of B.Tech from the Academic Year 2020 – 21 onwards

1.Award of B. Tech. Degree

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

➢ Pursues a course of study in not less than four and not more than eight academic years.

➢ After eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.

➢ Registers for 160 credits and must secure all the 160 credits.

➢ 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 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.**

2. Courses of Study: The following courses of study are offered at present as specializations for the B. Tech. Courses

S. No.	Branch	Branch Short Form	Branch Code
1	Civil Engineering	CIV	01
2	Electrical and Electronics Engineering	EEE	02
3	Mechanical Engineering	MEC	03
4	Electronics and Communication Engineering	ECE	04
5	Computer Science and Engineering	CSE	05
6	Information Technology	IT	12
7	Computer Science and Business Systems	CSBS	57
8	Artificial Intelligence and machine Learning	AI&ML	42
9	Artificial Intelligence and Data Science	AI&DS	45

3. **Medium of Instruction:** The medium of instruction of the entire B. Tech undergraduate programme in Engineering & Technology (including examinations and project

4. reports) will be in English only.

5. **Admissions:** Admission to the B. Tech Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or on the basis of any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

6. **Structure of the Undergraduate Engineering program:** Every course of B. Tech. Program shall be placed in one of the nine categories as listed in table below:

S.No.	Category	Breakup of Credits
1	Humanities and social science including Management courses	7.5
2	Basic Science courses	25.5
3	Engineering science courses	18
4	Professional core Courses	55.5
5	Open Elective Courses	12
6	Professional Elective Courses	15
7	Internship, seminar, project wok	16.5
8	Mandatory courses	NC
9	Skill Oriented Courses	10
	Total Credits	160

** Breakup of Credits based on AICTE /APSCHE

Assigning of Credits

- ➢ Hr. Lecture (L) per week   - 1 credit
- ➢ Hr. Tutorial (T) per week   - 1 credit
- ➢ Hr. Practical (P) per week   - 0.5 credits

7. Programme Pattern

i.   Total duration of the of B. Tech (Regular) Programme is four (three for lateral entry) academic years

ii.   Each Academic year of study is divided in to two semesters.

iii.   Minimum number of instruction days in each semester is 90.

iv.   Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

v.   The total credits for the Programme are 160.

vi.   A three-week induction program is mandatory for all first year UG students (Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc.,) and shall be conducted as per AICTE/UGC/APSCHE guidelines.

vii.   Student is introduced to "Choice Based Credit System (CBCS)".

viii.   A pool of interdisciplinary and job-oriented mandatory skill courses which are relevant to the industry are integrated into the curriculum of concerned branch of engineering (total five skill courses

ix.   A student has to register for all courses in a semester.

x.   All the registered credits will be considered for the calculation of final CGPA.

xi.   Each semester has - Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.

xii.   A mandatory internship during the summer vacation and also in the final semester to acquire the skills required for job and make engineering graduates to connect with the needs of the industry and society at large.

xiii.   Courses like Environmental Sciences, Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

xiv.   College shall assign a faculty advisor/mentor after admission to each student or group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies / GATE / other competitive exams etc.

xv.   Departments may swap some of the courses between first and second semesters to balance the work load.

xvi.   The concerned Board of studies can assign tutorial hours to such courses wherever it is necessary, but without change in the total number of credits already assigned for semester.

8. Registration for Courses

i. The college shall invite registration forms from the students at the beginning of the semester for the registration for courses each semester. The registration process shall be closed within one week. If any student wishes to withdraw the registration, he/she shall submit a letter to the principal through the class teacher/instructor and HOD. The principal shall communicate the registration and withdraw details courses of each student in a consolidated form to the college examination section and University without fail.

ii. There are four open elective/job elective course in each branch. All these courses are offered to students of all branches in general. A student shall choose this course , by consulting the HOD/advisor, 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.

iii. Two summer internships each with a minimum of six weeks duration shall be mandatorily done/completed respectively at the end of second and third years (during summer vacations). The internship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs. After completing the summer internship, the students shall register in the immediate respective odd semester and it will be evaluated at the end of the semester as per norms of the autonomy. The student has to produce the summer internship satisfactory report and certificate taken from the organization to be considered for evaluation. The College shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

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

v. Curricular Framework for Skill oriented courses

   a. There are five (05) skill-oriented courses shall be offered during III to VII semesters and students must register and pass the courses successfully.

   b. For skill oriented/skill advanced course, one theory and 2 practical hours (1-0-2) or two theory hours (2-0-0) may be allotted as per the decision of concerned BOS.

   c. Students may register the interdisciplinary job-oriented skill courses based on the prerequisites and eligibility in consultation with HoD of the college.

   d. 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. However, the department has to assign mentors in the college to monitor the performance of the students.

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, then the department shall mark overall attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate. However, the student is deemed to have fulfilled the attendance requirement of the course, if the external agency issues a certificate with satisfactory condition. If the certificate issued by external agency is marked with unsatisfactory condition, then the student shall repeat the course either in the college or at external agency. The credits will be awarded to the student upon producing the successful course completion certificate from the agency/professional bodies and after passing in the viva-voce examination conducted at college as per BoS norms at the end of the semester.

9. Attendance Requirements:

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

ii.   Shortage of Attendance below 65% in aggregate shall in NO case be condoned. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end semester examination of that class and their registration shall stand cancelled.

iii. Condonation for shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

iv.   A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that semester when offered next.

v.   A student will be promoted to the next semester if he satisfies the(a) attendance requirement of the present semester and (b) minimum required credits (from V^{th} Semester onwards).

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

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

viii. For non-credit mandatory courses the students shall maintain the attendance similar to credit courses.

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

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

viii. For non-credit mandatory courses the students shall maintain the attendance similar to credit courses.

11. Evaluation-Distribution and Weightage of marks

Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Academic Council of the institute from time to time.

i. A student is deemed to have satisfied the minimum academic requirements if he/she has earned the credits allotted to each theory/practical design/drawing subject/ project etc. by securing not less than 35% of marks in the end semester exam and minimum 40% of marks in the total of the internal marks and end semester examination marks together.

ii. For non-credit mandatory courses, like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, the student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

iii. **Distribution and Weightage of marks:** The assessment of the student's performance in each course will be based on Continuous Internal Evaluation (CIE) and Semester-End Examination (SEE). The performance of a student in each semester shall be evaluated subject–wise with a maximum of 100 marks for theory subject, 50 marks for practical subject/Mini Project/Internship/Industrial Training/ Skill Development programmes /Research Project, and 200 marks for end Project Work.

iv. **Guide lines for Continuous Internal Evaluation (CIE)**

a. For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one objective examination (ii) one descriptive examination and (iii) one assignment. The objective examination shall be 10 marks with duration of 20 minutes, descriptive examination shall be for 15marks with a duration of 1 hour 30 minutes, assignment testshall be 5 marks

b. The first objective examination is set with 20 multiple choice questions for 10 marks (20 questions x 1/2 marks) from first two and half units (50% of the syllabus).

c. The descriptive examination is set with 3 full questions for 10 marks each from first two and half units (50% of the syllabus), the student has to answer all questions.

d. The Assignment Test from first two and half units conducted for 5 Marks. The assignments have to provide broadened exposure to the course. The questions shall include problem solving approach, problem analysis & design, implementation, case studies etc.

f. For the subject having design and / or drawing (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for continuous Assessment (day–to–day work) and 15 marks for internal tests).

g. For practical subjects/Skill oriented courses there shall be continuous evaluation during the semester for 15 marks. The internal 15 marks shall be awarded as follows: day to day work 5 marks, record 5 marks and the remaining 5 marks are to be awarded by conducting an internallaboratory test of 3 hours duration.

h. The mid marks submitted to the examination section shall be displayed in the concerned department notice boards for the benefit of the students. If any discrepancy found in the displayed Mid marks, it shall be brought to the notice of examination section within two working days from the date of display.

i. Internal marks can be calculated with 80% weightage for better of the two mid examinations and 20% Weightage for another mid exam.

Example: Mid-1 marks = Marks secured in (objective examination-1+descriptive examination-1+assignment-1)

Mid-2 marks = Marks secured in (objective examination-2+descriptive examination-2 +assignment-2)

Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)

v. **Semester End Examinations Evaluation:**

a. The semester end examinations for theory subjects will be conducted autonomous examination section 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.

b. For practical subjects shall be conducted for 35 marks by the teacher concerned and external examiner appointed by Chief Superintendent/ Controller of Examinations (CoE), VIT. All the laboratory records and internal test papers shall be preserved in and shall be produced to the Committees as and when they ask for.

c. Evaluation of the summer internships: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme. Students shall pursue this internship during summer vacation just before its offering as per course structure. The minimum duration of this course shall be at least 6 weeks. The student shall register for the internship as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the academic regulations. 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 appointed by Chief superintendent/ CoE; 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. There shall be no internal marks for Summer Internship. A student shall secure 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 by the examination section.

d. The Skill oriented course shall be conducted for 35 marks by the teacher concerned and external examiner appointed by Chief Superintendent/ Controller of Examinations (CoE), VIT The skill Advanced courses 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 (appointed by the Chief superintendent/ CoE) and internal examiner (course instructor or mentor). There are no internal marks for the skill advanced courses.

e. Mandatory Course (M.C): Environmental Sciences, 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. 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. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (P)/Not-completed (N) will be specified.

f. Major Project (Project - Project work, seminar and internship in industry): In the final semester, the student should mandatorily register and undergo internship and inparallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner. 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 appointed by the Chief superintendent/ CoE and is evaluated for 140 marks.

vi. Recounting/ Revaluation/ Revaluation by Challenge in the End Semester Examination: A student can request for recounting/ revaluation/ revaluation by challenge of his/her answer book on payment of a prescribed fee as per autonomous norms.

vii. Supplementary Examinations: A student who has failed to secure the required credits can appear for a supplementary examination, as per the schedule announced by the examination section.

viii. Malpractices in Examinations: Disciplinary action shall be taken in case of malpractices during Mid/End examinations as per the rules framed by the academic council.

ix. If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

12. Promotion Rules:

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

ii. A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of credits up to either II year I-Semester or 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.

iii. A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or 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.

13. Course Pattern

i. The entire course of study is for four academic years; all years are on semester pattern.

ii. A student eligible to appear for the end semester examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject when conducted next.

iii. When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the same semester/year in which he has been detained. However, the academic regulations under which he was first admitted shall continue to be applicable to him.

14. Grading:

The grade points and letter grade will be awarded to each course based on students' performance as per the grading system shown in the following Table.

% of Marks	Letter Grade	Level	Grade Points
≥ 90	**O**	Outstanding	10
80 to 89	**S**	Excellent	9
70 to 79	**A**	Very Good	8
60 to 69	**B**	Good	7
50 to 59	**C**	Fair	6
40 to 49	**D**	Satisfactory	5
<40	**F**	Fail	0
ABSENT	**Ab**	Absent	0

15. Computation of SGPA and 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.

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

where, C_i is the number of credits of the ith subject and G_i is the grade point scored by the student in the ith course

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

i.e.

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

where 'S_i' is the SGPA of the ith semester and C_i is the total number of credits in that semester

iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.While computing the SGPA/CGPA, the subjects in which the student is awarded Zerograde points will also be included.

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

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

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

Equivalent Percentage = (CGPA – 0.75) x 10

vii. Illustration of Computation of SGPA and CGPA

Illustration for SGPA: Let us assume there are 6 subjects in a semester. The grades obtained as follows:

Course	Credit	Grade Obtained	Grade point	Credit x Grade Point
Subject 1	3	A	8	3 X 8 = 24
Subject 2	4	B	7	4 X 7 = 28
Subject 3	3	C	6	3 X 6 = 18
Subject 4	3	O	10	3 X 10 = 30
Subject 5	3	F	5	3 X 5 = 15
Subject 6	4	F	6	4 X 6 = 24
	20			139

Thus, SGPA (S_i) =139/20 =6.95=6.9 (approx.)

Illustration for CGPA:

	Sem-1	Sem-2	Sem-3	Sem-4	Sem-5	Sem-6	Sem-7	Sem-8
Credits	20	22	25	26	26	25	21	23
SGPA	6.9	7.8	5.6	6.0	6.3	8.0	6.4	7.5

$$CGPA = \frac{20 \times 6.9 + 22 \times 7.8 + 25 \times 5.6 + 26 \times 6.0 + 26 \times 6.3 + 25 \times 8.0 + 21 \times 6.4 + 23 \times 7.5}{188}$$

$$= \frac{1276.3}{188} = 6.73$$

16. 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 to be secured
First Class with distinction	≥7.5
First Class	≥6.5 &<7.5
Second Class	≥5.5 &<6.5
Pass Class	≥4 &<5.5
Fail	<4

17. 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 university 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.

18. Transitory Regulations

A candidate, who is detained or discontinued a semester, on re-admission shall be required to pass all the courses in the curriculum prescribed for such batch of students in which the student joins subsequently and the academic regulations be applicable to him/her which are in force at the time of his/her admission. However, exemption will be given to those candidates who have already passed in such courses in the earlier semester(s) and additional courses are to be studied as approved by Board of Studies and ratified by Academic Council.

19. Curricular Framework for Honors Programme

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

   ii. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required

minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

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

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

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

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

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

viii. Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component.

ix. 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 BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.

x. 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.

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

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

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

20. Curricular Framework for Minor Programme

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

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

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

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

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

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

vii. A student shall be permitted to register for Minors program at the beginning of 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) up to 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 up to 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.

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

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

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

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

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

xiii. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the

mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript or None of the courses done under the dropped Minor will be shown in the transcript.

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

xv. 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.

21. Industrial Collaborations (Case Study)

Institution-Industry linkages refer to the interaction between firms and universities or public research centers with the goal of solving technical problems, working on R&D, innovation projects and gathering scientific as well as technological knowledge. It involves the collaboration of Industries and Universities in various areas that would foster the research ecosystem in the country and enhance growth of economy, industry and society at large.

The Institutions are permitted to design any number of Industry oriented minor tracks as the respective BoS feels necessary. In this process the Institutions can plan to have industrial collaborations in designing the minor tracks and to develop the content and certificate programs. Industry giants such as IBM, TCS, WIPRO etc., may be contacted to develop such collaborations. The Institutions shall also explore the possibilities of collaborations with major industries in the core sectors and professional bodies to create specialized domain skills.

22. **Amendments to Regulations:** The college may from time-to-time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of examinations through the Board of Studies with the approval of Academic Council and Governing Body of the college.

23. **Transferred Students:** The students seeking transfer to VVIT from various Universities/ Institutions have to obtain the credits of any equivalent subjects as prescribed by the Academic Council. Only the internal marks obtained in the previous institution will be considered for evaluation of failed subjects.

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

Applicable for the students admitted into II-year B. Tech. from the Academic Year 2021-22 onwards

1. Award of B. Tech. Degree: A student will be declared eligible for the award of B. Tech. Degree if he fulfills the following academic regulations

- A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than three academic years and not more than six academic years
- The candidate shall register for 121 credits and secure all the 121 credits.
- 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 121 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

2. The attendance regulations of B. Tech. (Regular) shall be applicable to B. Tech Lateral Entry Students.

3. **Promotion Rule:**

- A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.
- A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or 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.

4. Award of Class:

After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured
First Class with distinction*	≥7.5
First Class	≥6.5 &<7.5
Second Class	≥5.5 &<6.5
PassClass	≥4 &<5.5
Fail	<4

5. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech Lateral Entry Scheme.

MALPRACTICE RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper conduct	Punishment
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.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
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 practical and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University 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 University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent /Assistant Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his 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	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	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.	
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
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.
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 University for further action to award suitable punishment.	

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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 and 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/-

Ragging

ABSOLUTELY
NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

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Course Structure for B. Tech. (With effect from 2020-2021)

S.No	Category	Subject Code	Subjects	L	T	P	C	I	E
**I YEAR I SEMESTER**
1	BS	20BS1T02	Mathematics-I	3	0	0	3	30	70
2	BS	20BS1T05	Applied Chemistry	3	0	0	3	30	70
3	H&S	20BS1T01	Communicative English	3	0	0	3	30	70
4	ESC	20CS1T01	Computational Thinking and Programming	3	0	0	3	30	70
5	ESC	20EE1T01	Elements of Electrical and Electronics Engineering	3	0	0	3	30	70
6	BS Lab	20BS1P03	Applied Chemistry Lab	0	0	3	1.5	15	35
7	ESC Lab	20CS1P01	Computational Thinking and Programming Lab	0	0	3	1.5	15	35
8	H &S Lab	20BS1P01	English Communication Skills Lab	0	0	3	1.5	15	35
\multicolumn{4}{c}{**Total Credits**}				19.5	195	455
\multicolumn{4}{c}{**Total Marks**}				\multicolumn{3}{c}{650}

S.No	Category	Subject Code	Subjects	L	T	P	C	I	E
**I YEAR II SEMESTER**
1	BS	20BS2T01	Mathematics –II	3	0	0	3	30	70
2	BS	20BS2T03	Applied Physics	3	0	0	3	30	70
3	ESC	20EC2T02	Digital Logic Design	3	0	0	3	30	70
4	ESC	20IT2T01	Programming for Problem Solving	3	0	0	3	30	70
5	ESC	20CS2P03	Computer Engineering Workshop	1	0	4	3	15	35
6	BS Lab	20BS2P02	Applied Physics Lab	0	0	3	1.5	15	35
7	ESC Lab	20CS2P04	Advanced Python Programming Lab	0	0	3	1.5	15	35
8	ESC Lab	20IT2P01	Programming for Problem Solving Lab	0	0	3	1.5	15	35
9	MC	20BS2T08	Constitution of India	2	0	0	0	0	0
\multicolumn{4}{c}{**Total Credits**}				19.5	180	420
\multicolumn{4}{c}{**Total Marks**}				\multicolumn{3}{c}{600}

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S.No	Category	Subject Code	Subjects	L	T	P	C	I	E
II YEAR I SEMESTER									
1	BS / PC	20BS3T04	Discrete Mathematical Structures	3	0	0	3	30	70
2	PC	20CS3T01	Data Structures	3	0	0	3	30	70
3	PC	20IT3T01	Database Management Systems	3	0	0	3	30	70
4	ESC	20IT3T02	Object Oriented Programming through Java	3	0	0	3	30	70
5	PC	20CS3T02	Computer Organization	3	0	0	3	30	70
6	PC Lab	20CS3P01	Data Structures Lab	0	0	3	1.5	15	35
7	PC Lab	20IT3P01	Database Management Systems Lab	0	0	3	1.5	15	35
8	PC Lab	20IT3P02	Object Oriented Programming through Java Lab	0	0	3	1.5	15	35
9	SO	20CS3P02	Skill Oriented Course – I 1) Animations – 2D Animation 2) Web Application Development Using Full Stack – Module - I	0	0	4	2	--	50
10	MC	20BS3A02	Environmental Science	2	0	0	0		
			Total Credits				**21.5**	**195**	**505**
			Total Marks					**700**	

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S.No	Category	Subject Code	Subjects	L	T	P	C	I	E
			II YEAR II SEMESTER						
1	BS	20BS4T02	Probability & Statistics	3	0	0	3	30	70
2	PC	20CS4T01	Fundamentals of Machine Learning	3	0	0	3	30	70
3	PC	20CS4T02	Operating Systems	3	0	0	3	30	70
4	PC	20IT4T01	Software Engineering	3	0	0	3	30	70
5	HS	20HS4T01	Universal Human Values	3	0	0	3	30	70
6	PC Lab	20CS4P02	Operating Systems Lab	0	0	3	1.5	15	35
7	PC Lab	20IT4P01	UML Lab	0	0	3	1.5	15	35
8	PC Lab	20CS4P01	Fundamentals of Machine Learning Lab	0	0	3	1.5	15	35
9	SO	20IT4P03	Skill Oriented Course – II 1) Animations – 3D Animation 2) Web Application Development Using Full Stack – Module - II	0	0	4	2	--	50
10	MC	20HS4A01	Critical Reading & Creative Writing	2	0	0	0		
		Total Credits					21.5	195	505
		Total Marks						**700**	

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S.No	Category	Subject Code	Subjects	L	T	P	C	I	E
			III YEAR I SEMESTER						
1	PC	20CS5T01	Design and Analysis of Algorithms	3	0	0	3	30	70
2	PC	20CS5T02	Computer Networks	3	0	0	3	30	70
3	PC	20IT5T01	Compiler Design	3	0	0	3	30	70
4	OE / JE	20JE5T01	Web Technologies Non-Conventional Energy Sources Principles of Mechanics	3	0	0	3	30	70
5	PE-1	20CS5T03 20CS5T04 20IT5T03 20IT5T04	1. Computer Graphics 2. Software Testing Methodologies 3. Mobile Application Development 4. Network Programming	3	0	0	3	30	70
6	PC Lab	20CS5P01	Web Technologies Lab	0	0	3	1.5	15	35
7	PC Lab	20IT5P02	Computer Networks & Compiler Design Lab	0	0	3	1.5	15	35
8	SAC/Soft Skills	20IT5P03	Quantitative Aptitude & Logical Reasoning	0	0	4	2	--	50
9	MC	20CS5A01	Employability Skills - I (Competitive Coding)	2	0	0	0		
10		20CS5I01	Summer Internship (done after second year to be evaluated)	0	0	0	1.5	-	50
	Total Credits						21.5	180	520
	Total Marks								700

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S.No	Category	Subject Code	Subjects	L	T	P	C	I	E
III YEAR II SEMESTER										
1	PC	20CS6T01	Data Warehousing and Data Mining	3	0	0	3	30	70
2	PC	20CS6T02	Cryptography and Network Security	3	0	0	3	30	70
3	PC	20IT6T01	Internet of Things	3	0	0	3	30	70
4	PE-2	20CS6T03	Human Computer Interaction	3	0	0	3	30	70
		20CS6T04	Software Project Management						
		20IT6T02	DevOps						
		20IT6T03	Distributed Systems						
5	OE / JE	20JE6T01	NoSQL Database	3	0	0	3	30	70
		20OE6T04	Computer Aided Design and Analysis						
6	PC Lab	20CS6P01	Data Warehousing Data Mining Lab	0	0	3	1.5	15	35
7	PC Lab	20IT6P01	Internet of Things Lab	0	0	3	1.5	15	35
8	PC Lab	20CS6P02	NoSQL Databases Lab	0	0	3	1.5	15	35
9	SAC/Soft Skills	20BS6P01	Advanced English Communication Skills Lab	0	0	4	2	--	50
10	MC	20CS6A01	Employability Skills – II (Data Visualization)	2	0	0	0		
Total Credits							21.5	195	505
Total Marks									700

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Course Structure for B. Tech. (With effect from 2020-2021)

S.No	Category	Subject Code	Subjects	L	T	P	C	I	E
IV YEAR I SEMESTER									
1	PE	20CS7T01	Augmented Reality & Virtual Reality	3	0	0	3	30	70
		20CS7T02	Game Development						
		20IT7T01	Soft Computing						
		20IT7T02	E-Commerce						
2	PE	20CS7T03	UML & Design patterns	3	0	0	3	30	70
		20CS7T04	Agile Methodologies						
		20IT7T03	Software Architecture						
		20IT7T04	Artificial Intelligence & Neural Networks						
3	PE	20CS7T05	Big Data Analytics	3	0	0	3	30	70
		20CS7T06	Recommended Systems						
		20IT7T05	Semantic Web & Social Networks						
		20IT7T06	Information Retrieval Systems						
4	OE / JE	20OE7T16	Robotic Process Automation	3	0	0	3	30	70
5	OE	20OE7T17	Information Theory and Coding	3	0	0	3	30	70
		20OE7T06	Green Building Technologies						
6	HS Elective	20HS7T01	Managerial Economics and Financial Analysis	3	0	0	3	30	70
		20HS7T05	Management Science						
8	Skill Advanced Course	20CS7P01	Rust programming Lab	0	0	4	2	--	50
9	PR	20CS7I01	Internship (done after third year to be evaluated)	0	0	0	3		100
Total Credits							23	180	570
Total Marks								750	

S.No	Category	Subjects	L	T	P	C	I	E
IV YEAR II SEMESTER								
1	Project	Major Project Work, Seminar, Internship	-	-	-	8	60	140
Total Credits						8		
Total Marks							200	

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Course Structure for B. Tech. (With effect from 2020-2021)

Regulations:R20

List of Skill Oriented Courses

Skill Oriented Course - I	
Course Code	**Title of the Course**
20CS3P02	Animations-2D Animation
20CS3P02	Web Application Development using Full Stack-Module -I

Skill Oriented Course - II	
Course Code	**Title of the Course**
20IT4P03	Web Application Development using Full Stack-Module - II
20IT4P03	3D Animation

List of Professional Electives

Professional Elective - I	
Course Code	**Title of the Course**
20CS5T03	Computer Graphics
20IT5T02	Software Testing
20IT5T03	Mobile Application Development
20IT5T04	Network Programming

Professional Elective - II	
Course Code	**Title of the Course**
20CS6T03	Human Computer Interaction
20CS6T04	Software Project Management
20IT6T02	Devops
20IT6T03	Distributed Systems

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List of Professional Electives (Cont.)

Professional Elective - III	
Course Code	**Title of the Course**
20CS7T01	Augmented Reality & Virtual Reality
20CS7T02	Game Development
20IT7T01	Soft Computing
20IT7T02	E-Commerce

Professional Elective - IV	
Course Code	**Title of the Course**
20CS7T03	Unified Modeling Language & Design Patterns
20CS7T04	Agile Methodologies
20IT7T03	Software Architecture
20IT7T04	Artificial Neural Networks

Professional Elective - V	
Course Code	**Title of the Course**
20CS7T05	Big Data Analytics
20CS7T06	Recommended Systems
20IT7T05	Semantic Web & Social Network
20IT7T06	Information Retrieval Systems

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Course Structure for B. Tech. (With effect from 2020-2021)

SUBJECTS FOR HONORS

S.No.	Course Title	L-T-P	Credits	Year & Semester
Track – I: AI & ML			
1	Fundamentals of AI	3-1-0	4	II year -II Sem
2	Deep Learning	3-1-0	4	III year -I Sem
3	Natural Language Processing	3-1-0	4	III year -II Sem
4	Web Intelligence	3-1-0	4	IV year -I Sem
In addition to the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Computer Science and Engineering				
Track – II Data Science				
1	Mathematical Essentials for Data Science	3-1-0	4	II year -II Sem
2	Data Analysis using Python	3-1-0	4	III year -I Sem
3	Text and Time-Series Data Analysis	3-1-0	4	III year -II Sem
4	Medical Image Data Processing	3-1-0	4	IV year -I Sem
In addition to the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Computer Science and Engineering				
Track – III : Cyber Security				
1	Cyber Security Essentials	3-1-0	4	II year -II Sem
2	Malware Analysis	3-1-0	4	III year -I Sem
3	Cyber Attack Detection and Preventions Systems	3-1-0	4	III year -II Sem
4	Cyber Crime Investigation and Digital Forensics	3-1-0	4	IV year -I Sem
In addition to the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Computer Science and Engineering				

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Course Structure for B. Tech. (With effect from 2020-2021)

MINOR SUBJETS FOR OTHER BRANCHES

S.No.	Course Title	L-T-P	Credits	Year & Sem
1	Full- Stack Web Development	3-1-0	4	II year -II Sem
	Discrete Mathematical Structures			
2	Computer Networks	3-1-0	4	III year -I Sem
	E-Commerce			
3	Object Oriented Analysis and Design	3-1-0	4	III year -II Sem
	Computer Organization			
4	Web Technologies	3-1-0	4	IV year -I Sem
	Software Project Management			
In addition to the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Computer Science and Engineering				

List of the **OPEN ELECTIVE / JOB ORIENTED ELECTIVES** offered by CSE
Department to other Branches

S.No.	Course Title	L-T-P	Credits	Year & Sem
Open Elective Course/Job oriented elective-I				
1	Object Oriented Programming Thorugh Java	3-1-0	3	III B.Tech - I Sem
2	Web Technologies	3-1-0	3	III B.Tech- I Sem
Open Elective Course/Job oriented elective-II				
1	Data Base Management Systems	3-1-0	3	III B.Tech - II Sem
2	NoSQL Databases	3-1-0	3	III B.Tech- II Sem
Open Elective Course/Job Elective-III				
1	Robotic Process Automation	3-1-0	3	IV B.Tech - I Sem
2	Design Analysis of Algorithms	3-1-0	3	IV B.Tech - I Sem

Syllabus for
I B.Tech - I Semester
(R20)

I Year - I Semester Course Code: 20BS1T02	L	T	P	C
	3	0	0	3
MATHEMATICS-I				

Course Objectives:

To enable the students to

- Know the importance of matrices to solve linear equations using matrices
- Identify and solve various differential equations using corresponding methods
- Apply methods of solving higher order linear differential equations
- Comprehend the theory of maxima and minima of a function of two variables.
- Analyze the techniques of tracing the curves and evaluate the lengths, areas, volumes of objects using multiple integrals.

Course Outcomes:

 After completing this course, the students will be able to

1. Solve linear system of equations in engineering problems
2. Find Eigen-values and Eigenvectors of a matrix in engineering studies.
3. Model engineering problems as differential equations and solve analytically.   .
4. Find out the local /global optimum of functions of several variables.
5. Compute areas and volumes by integrals

UNIT I

Matrices - Linear system of equations

Introduction, Different types of matrices, Rank-Echelon form - Normal form, Solution of a System of Linear Equations – Non-homogeneous and homogeneous equations, Gauss- Jordan method, Gauss – Elimination Method, LU Decomposition,Applications of electric circuits.

UNIT II

Eigen values - Eigen vectors

Eigen values - Eigen vectors – Properties– Cayley-Hamilton Theorem - finding inverse and power of a matrix by using Cayley-Hamilton theorem, Diagonalization of matrices, Spectral Decomposition,Singular Value Decomposition and Principal Component Analysis.

UNIT III

Differential Equations

Differential equations of first order and first degree–Exact and Non– exact differential equations, Linear and Bernoulli differential equations.Orthogonal Trajectories,Newton's Law of cooling, Law of natural growth and decay.

Higher order homogenous and non - homogenous linear differential equations with constant coefficients - Particular integrals for the functions of type e^{ax}, $\sin(ax+b)$, $\cos(ax+b)$, Polynomial of x , $e^{ax}V(x)$, L-C-R Circuits.

UNIT IV

Partial Differentiation

Functions of several variables- Partial derivatives, Total derivative, Chain rule, Change of variables, Jacobians, Functional dependence.Generalized Mean Value theorem –Taylor's theorem and Maclaurin's theorem (without proof) for a function of two variables, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers

UNIT V

Multiple Integrals and Applications

Review of Curve tracing-Cartesian-Polar and Parametric curves.

Multiple integrals - double integrals - change of variables (Cartesian and Polar coordinates), Change of order of integration and Evaluation of triple integrals, computing area and volume.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publishers, New Delhi, 2012
2. Erwin .Kreyszig,Advanced Engineering Mathematics,9th Ed., Wiley, 2012

References:

1. T.K.V.Iyengar, B. Krishna Gandhi, S. Ranganathan and M.V.S.S.N.Prasad, Engineering Mathematics, Volume-I, 12th Ed., S. Chand Publishers, 2014
2. B. V. Ramana, Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009
3. D. S. Chandrasekharaiah, Engineering Mathematics, Volume 1, Prism Publishers, 2010
4. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi

I Year - I Semester Course Code: 20BS1T05	L	T	P	C
	3	0	0	3
APPLIED CHEMISTRY (Common to CSE, IT, EEE, AI&DS)				

Course Objectives:

1. To gain the knowledge on Polymer based materials in household appliances, aerospace and automotive industries.

2. To learn the basic principles and applications of Electrochemistry.

3. Advanced Analytical instrumental techniques are introduced for material characterization. With the increase in demand for power and also with depleting sources of fossil fuels, the demand for alternative sources of fuels is increasing. Some of the prospective fuel sources are introduced.

4. Understanding of crystal structures and preparation of semiconductors and insulators.

5. A wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.

Course Outcomes:

After completing the course, students will be able to

1. Recall the information related to polymers and their application.(Remembering)

2. Distinguish between different parts in electrochemical cell, batteries and fuel cells. (Analyzing)

3. Understand about the different analytical techniques and its applications.(Understanding)
   Design the technologies related to renewable energy sources. (Creating)

4. Understand the conductivity phenomenon and applications of solids. (Understanding)

5. Choose the materials like nano materials, liquid crystals, superconductors, and green synthetic methods to solve the Engineering problems. (Applying)

UNIT I

Polymer Chemistry

Introduction to polymers, functionality of monomers, co-polymerization, Stereospecific polymerization with specific examples.

Plastics - Thermoplastics and Thermosettings, Preparation, Properties and Applications of – Bakelite, Urea-Formaldehyde, Nylon-6,6, Carbon fibres.

Elastomers–Buna-S, Buna-N–Preparation, Properties and Applications.

Conducting polymers - polyacetylene, polyaniline, polypyrroles – Mechanism of conduction and Applications.

UNIT II

Electrochemistry and Applications

Electrodes –Reference electrodes (Hydrogen electrode and Calomel electrode), Electrochemical cell, Nernst equation.Concept of pH, pH meter and applications of pH metry, Potentiometry- Potentiometric titrations (Redox titrations), Concept of Conductivity, Conductivity cell, Conductometric titrations (acid-base titrations), Primary cells – Dry cell - Zinc-air battery, Secondary cells – Lead acid battery, Lithium-ion batteries- working of the batteries including cell reactions, and button cells.

Fuel cells - Hydrogen-Oxygen and Methanol-Oxygen fuel cells – working of the cells.

UNIT III

Instrumental Methods and Non-Conventional Energy Sources

Part-A: Instrumental Methods

Electromagnetic Spectrum. Absorption of radiation: Beer-Lambert's law - Principles of UV-Visible, Infrared (IR) and Nuclear Magnetic Resonance (NMR) spectroscopy.

Basic concepts of Thin Layer Chromatography (TLC), Gas Chromatography (GC) and High-Performance Liquid Chromatography (HPLC), Separation and purification of mixture of compounds.

Part-B: Non-Conventional Energy Sources

Introduction – Renewable and Non –Renewable energy sources - Solar Energy- Introduction, Applications of Solar energy – Photovoltaic cell: design, working and its importance. Hydropower includes setup a Hydropower plant (schematic diagram), Geo-Thermal energy: Introduction-schematic diagram of a Geothermal power plant, Tidal power - Introduction- Design and working, Biomass energy.

UNIT IV

Solid State Chemistry

Types of solids – Crystal defects- Frenkel and Schottky defects – Spinel and Inverse spinel.

Hall Effect and Applications.

Semiconductors:Preparation of pure semiconductors by Zone refining, Distillation and Czochralskicrystal pulling technique, Doping- Epitaxy, Diffusion and Ion-implantation technique-Intrinsic and Extrinsic semiconductors - Applications.

Insulators: Electrical Insulators and their Applications.

UNIT V

Material Chemistry

Nano materials –Introduction- Top-down and Bottom- up approaches, Sol-gel method. Characterization by BET and TEM methods. Carbon nanotubes and fullerenes - Types, Preparation (Arc discharge Laser ablation and ChemicalVapour Deposition methods) Properties and Applications.

Liquid crystals - Introduction – Types – Applications.

Superconductors - Type-I & Type-II, Properties & Applications.

Green chemistry- Principles and Applications.

Text Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publication Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

References:

1. Engineering Chemistry by Prasanta Rath, Cengage Learning, 2015 edition.
2. A text book of Engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition.
3. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
4. A text book of Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Co. 2017

I Year - I Semester	L	T	P	C
Course Code: 20BS1T01	3	0	0	3
COMMUNICATIVE ENGLISH (Common to All branches except CS&BS)				

Introduction

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

Course Objectives

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

Course Outcomes

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

1. Employ suitable strategies for skimming and scanning to get the general idea of a text, recognize paragraph structure and formulate sentences using proper grammatical structures and correct word forms of nouns and pronouns and GRE Words
2. Write well structured paragraphs and understand applying cohesive devices
3. Will be able to read a text in detail and summarize and use verbs, adjectives and adverbs appropriately
4. Make notes of the important information of a text, information transfer
5. Read for comprehension and write formal letters and emails and edit short texts by correcting common errors

Methodology:

1. The classes are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use the lecture method when a completely new concept is introduced in the class.

Detailed Textbook:

Infotech English by Maruthi Publications

Non-Detailed Textbook:

Wings of Fire: APJ Abdul Kalam by University Press

UNIT I   (10 periods)

Detailed: A Drawer Full of Happiness

Non-detailed: APJ Abdul Kalam's Wings of Fire 1-5 Chapters

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Writing: Writing Sentences with proper word order - Basic Sentence Structures

Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) Antonyms and Synonyms, Word applications, Verbal reasoning and sequencing of words.

Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural, pronouns, basic sentence structures; simple question form - wh-questions; word order in sentences.

UNIT II   (10 periods)

Detailed: Nehru's letter to his daughter Indira on her birthday

Non-detailed: APJ Abdul Kalam's Wings of Fire 6-10 Chapters

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters. .

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) Antonyms and Synonyms, Word applications

Grammar: Use of articles and zero article; prepositions

UNIT III   (10 periods)

Detailed: Stephen Hawking-Positivity 'Benchmark'

Non-detailed: APJ Abdul Kalam's Wings of Fire 10-15 Chapters

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) Antonyms and Synonyms, Word applications, Association

Grammar: Verbs - tenses; Subject-verb agreement

UNIT IV   (10 periods)

Detailed: Liking a Tree, Unbowed: Wangari Maathai's Biography

Non-detailed: APJ Abdul Kalam's Wings of Fire 16-20 Chapters

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

Reading forWriting: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) Antonyms and Synonyms, Word applications

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison,

UNIT V   (10 periods)

Detailed: Stay Hungry-Stay foolish from "InfotechEnglish", Maruthi Publications

Non-detailed: APJ Abdul Kalam's Wings of Fire 21-24 Chapters by University Press

Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques

Reading for Writing: Letter writing, E mail writing, email etiquette

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary(20 words) Antonyms and Synonyms, Word applications

Grammar: Direct and indirect speech, reporting verbs for academic purposes, Active Voice- Passive Voice; editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement and conjunctions)

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.

2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.

3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

Sample Web Resources

Grammar/Listening/Writing

1-language.com

http://www.5minuteenglish.com/

https://www.englishpractice.com/

Grammar/Vocabulary

English Language Learning Online

http://www.bbc.co.uk/learningenglish/

http://www.better-english.com/

http://www.nonstopenglish.com/

https://www.vocabulary.com/

BBC Vocabulary Games

Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/

https://www.englishclub.com/reading/short-stories.htm

https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613

http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/

BBC Learning English – Pronunciation tips

Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/

http://www.world-english.org/

http://learnenglish.britishcouncil.org/

Online Dictionaries

Cambridge dictionary online

MacMillan dictionary

Oxford learner's dictionaries

I Year - I Semester Course Code: 20CS1T01	L	T	P	C
	3	0	0	3

COMPUTATIONAL THINKING AND PROGRAMMING

Course Objectives:

- To teach problem solving through Algorithms and Flowcharts
- To elucidate problem solving through Python programming language
- To train in the development of solutions using modular concepts
- To explain the role of data structures in programming
- To introduce object oriented programming paradigm through Python

Course Outcomes: Student should be able to

1. Explain the working principles of various components of a computer.
2. Implement computational thinking principles and apply Python constructs to solve basic problems.
3. Analyze modularization techniques and data structures in Python to optimize code reusability and efficiency.
4. Utilize file handling concepts to effectively manage data in problem-solving scenarios.
5. Design solutions for real-world problems using Object-Oriented Programming concepts.

UNIT I

Knowing the Computer

Definition and Block Diagram of a Computer. Basic parts of a computer (Memory, CPU, Input, and Output), Memory hierarchy, Circuits and Logic, Hardware vs Software, Representation of Data in memory (integer (including negative), floating points etc. to text, images, audio and video), Principle of Abstraction, Operating System, Language Hierarchy - Machine Language to High Level Language, Compiler, Interpreter, The Command Line Interface (basic Linux commands)

UNIT II

Computational Thinking and Introduction to Python

Simple logic building through flowcharting. Flowchart symbols, conditional and repetition blocks. Computational Thinking, Algorithm, Pseudocode, Time/Space complexity. Only Big O notation.

Basic structure of a Python program, Elements of Python programming Language: token, literals, identifiers, keywords, expression, type conversions, Numbers, Variables, Input/Output statements,

basic data types. Operators and their types and precedence, expressions. Control structures in Python - conditionals and loops

UNIT III

Python Data Structures and Modularization

List and List Operations, Using Lists to represent Matrices, Strings, String operations, Tuples, Dictionaries, Sets, Iterators and generators, comprehensions.

Basic math functions, User defined Functions, parameters to functions, positional, keyword and default arguments, Lambda Functions, recursion. Packages, modules and namespaces.

UNIT IV

File Handling

Files, Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules

UNIT V

Object Oriented Programming

Object Oriented Design, Classes and Objects, Polymorphism, Abstraction, Inheritance, Encapsulation, Constructors, Function and operator overloading, Exception Handling.

Text Book:

1. Think Python: How to Think Like a Computer Scientist , <u>Allen B. Downey</u>, 2nd Edition (<u>https://www.greenteapress.com/thinkpython/thinkCSpy.pdf</u>)

Reference Books:

1. Core python programming, W Chun PHI (<u>http://emixam.sevla.free.fr/books/2.PythoProg_softarchive.net.pdf</u>)
2. Python programming a modern approach, VamsiKurama, pearson

Web Resources:

1. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
2. <u>https://snakify.org</u>

I Year - I Semester	L	T	P	C
Course Code: 20EE1T01	3	0	0	3

ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to CSE, IT, AI & DS)

Preamble:

This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines, and electronic components to perform well in their respective fields.

Course Objectives:

- To learn the basic principles of electrical law's and analysis of DC circuits & AC circuits.
- To understand the principles of operation and characteristics of DC machines.
- To understand the principle of operation of a Transformer and Induction motor.
- To study the operation of PN junction diodes, half wave, full wave rectifiers and OP-AMPs.
- To learn the operation of PNP and NPN transistors and various amplifiers.

Course Outcomes:

After completing this course, the students will be

1. Able to analyze the various DC networks & AC circuits..
2. Able to understand the operation and Applications of DC Generators and DC Motor.
3. Able to analyze the performance of Transformer, Induction motor and Synchronous Generator.
4. Able to analyze the operation of half wave, full wave rectifiers and OP- AMPs.
5. Able to explain the operation of transistors and its applications.

UNIT I

DC Circuits: Basic definitions, Electrical circuit elements (R - L and C), Ohm's-Law, Kirchhoff laws, Series and parallel connection of resistances with DC excitation, Mesh Analysis and Nodal Analysis.

AC Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power,reactive power, apparent power, power factor. Introduction to three phases, relation between line and phase voltages and currents.

UNIT II

DC Machines: Principle and operation of DC Generator, EMF equation, Applications. Principle and operation ofDC Motor, Back EMF, Types of DC machines, Performance Characteristics of DC Motors, Speed control of DCMotors, Applications.

UNIT III

AC Machines: Classification of AC machines, Principle and operation of 3-phase Induction Motor and 3-phaseSynchronous Generator.

Transformers: Principle of operation and construction of Single Phase Transformer, OC and SC test on transformer, efficiency.

UNIT IV

Rectifiers & Linear ICs : PN junction diodes, Applications -Half wave and Bridge rectifiers. Characteristics ofOperation Amplifiers (OP- AMPs), Applications of OP-AMPs -Inverting, Non-Inverting, Integrator andDifferentiator.

UNIT V

Transistors : PNP and NPN junction transistor, transistor as an amplifier, Transistor Configurations-CE,CB,CCconfigurations, CE Amplifier Characteristics, Application of Transistors.

TEXT BOOKS:

1. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 10th edition, PEI/PHI2006
2. Theory and performance of Electrical Machines ,J.B.Gupta,3rd edition,Kataria.S.K& Sons
3. Electrical Circuit Theory and Technology by John Bird, 6th Edition Routledge Taylor & Francis Group

REFERENCE BOOKS:

1. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications.
2. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition.
3. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition.
4. Industrial Electronics by G.K. Mittal, PHI.
5. Electrical Technology by SurinderPalBali, Pearson Publications.
6. Principles of Basic Electrical Engineering by T.N. Nagsarkar, M.S. Sukhija, Oxford UniversityPress.

I Year - I Semester	L	T	P	C
Course Code: 20BS1P03	0	0	3	1.5
APPLIED CHEMISTRY LAB				

Course Objectives:

The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus, at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Course Outcomes:

After completing this course, the students will be

1. Ability to find the Fe^{+2}, Ca, Mg, Cu and Cl- present in unknown samples/ores using titrimetric and instrumental methods.

2. CO2The students will get the ability to identify any unknown chemical and its nature according to   its functionality.

3. Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially.

4. Understand the principles of Stoichiometric, Potentiometric and Conductometric measurements.

5. Understand the practical way of thinking through the prescribed experiments given to them.

6. They get the knowledge about p^H which influences human health, growth of plants and aquatic bio-components.

List of Experiments:

1. Trial experiment - Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of $KMnO_4$ using standard Oxalic acid solution.
4. Estimation of MnO2 in Pyrolusite.
5. Determination of Copper using standard $K_2Cr_2O_7$ solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.

7. Determination of Vitamin – C.

8. Determination of P^H of the given sample solution using P^H meter.

9. Conductometric titration between strong acid and strong base.

10. Potentiometric titration between strong acid and strong base.

11. Estimation of copper by Colorimetry.

12. Photochemical Reduction of Ferric Salt (Blue-Printing).

13. Adsorption of acetic acid on charcoal.

14. Determination of rate of corrosion.

15. Preparation of a polymer.

16. Thin layer chromatography.

References:

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

2. Dr. JyotsnaCherukuri (2012) Laboratory Manual of Engineering chemistry-II, VGSTechno Series.

3. Chemistry Practical Manual, Lorven Publications.

4. Practical Engineering Chemistry, K. Mukkanti (2009) B.S. Publication.

I Year - I Semester	L	T	P	C
Course Code: 20CS1P01	0	0	3	1.5
COMPUTATIONAL THINKING AND PROGRAMMING LAB				

Course Objectives:

1. Get acquainted with the fundamentals of writing Python scripts.

2. Master core Python scripting elements by solving more number of problems

3. Able to identify right data structure to solve the problem

4. Design Python functions to facilitate code reuse.

5. Gaining familiarity in Python file I/O

Course Outcomes:

After completing this course, the students will be able to

1. Develop and implement algorithms using Python for problem-solving.

2. Apply Python functions, lists, and recursion to manipulate and process data efficiently.

3. Analyze Python strings, tuples, and dictionaries for effective text processing and data organization.

4. Utilize file handling, regular expressions, and exception handling techniques to manage and manipulate data in real-world scenarios.

Experiments:

Week 1-3

● Design algorithms and flowcharts for given problems

● Python programs on decision and loop control statements

  ○ Whether the given number is even or odd

  ○ Maximum of three numbers

  ○ Sum of digits, Palindrome

  ○ Factorial of a number,

  ○ GCD of given numbers

  ○ Sum of first n natural numbers

  ○ Evaluate Cosine and Sine Series etc.

Week 4-6

● Exercise programs on lists and functions

  ○ Finding the sum and average of given numbers using lists.

  ○ To display elements of a list in reverse order.

- ○ Finding the minimum and maximum elements in the lists.

- ○ Using functions to calculate power, factorial etc

- ○ Passing lists as function arguments

- ○ Call by value and call by reference Recursion

Week 7-9

- ● Exercise programs on Strings.

  - ○ Palindrome Checking

  - ○ Count the number of characters, number of vowels etc in the given line of text etc

- ● Exercise programs on Tuples, Dictionaries

Week 10-12

- ● Exercise programs on file handling

- ● Exercise programs on regular expressions

- ● Exercise programs on exception handling

I Year - I Semester Course Code: 20BS1P01	L	T	P	C
	0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LAB				

Course Objectives

1. To sensitize the students' nuances of English speech sounds.
2. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking.
3. To improve the fluency in spoken English in different contexts.
4. To demonstrate the synchronization of verbal and non verbal communication.
5. To speak with clarity and confidence.
6. To enrich the persuasive skills.

COURSE OUTCOMES

The students will be able to:

1. Understand Non Verbal Communication and Identifying the topic, the context and overall idea by listening to short audio texts and answering a series of questions
2. Articulate Vowels and Consonants properly and answering a series of questions about specific information after listening to audio texts
3. Understand stress and intonation and answering a series of questions about main idea and supporting ideas after listening to audio texts
4. Enact Dialogues/Role Plays and listening for global comprehension and summarizing what is listened to.
5. Ask and answer general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

MODULE – I

Listening: Listening to short audio texts and identifying the topic, context and specific pieces of information to answer a series of questions both in speaking and writing.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introduction and introducing others.
Non Verbal Communication

Pronunciation: Introduction to Phonetics-Sounds of English-Phoneme

MODULE – II

Listening: Answering a series of questions about the main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Functional English: Greetings and leave taking, Complaining and Apologizing.

Pronunciation: Vowels and Consonants, Past tense markers, Plural markers

MODULE – III

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

Functional English: Permissions, Requesting, Inviting.

Pronunciation: Syllable, Word Stress: Weak and Strong forms, Stress in compound words, Contrastive Stress

MODULE– IV

Speaking: Just a Minute **(**JAM)

Functional English Asking for and giving Information/Directions; Suggesting/Opinion giving.

Pronunciation: Rhythm & Intonation

MODULE– V

Functional English: Dialogues/Role Plays

Speaking: Formal oral presentations on topics from Science and Technology - with the use of PPT slides.

Pronunciation: Accent Neutralization topics from Science and Technology - using PPT slides and neutralize accent

SUGGESTED READING

1) Infotech English, Maruthi Publications (with Compact Disc).

2) Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.

3) English Pronunciation in use- Mark Hancock, Cambridge University Press.

4) English Phonetics and Phonology-Peter Roach, Cambridge University Press.

5) English Pronunciation in use- Mark Hewings, Cambridge University Press.

6) English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.

7) English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

INFRASTRUCTURE:

1. 60 computer systems for a class of 60 students.
2. LAN facility and English Language Software for self-study by learners.
3. Audio System
4. Projector

SYSTEM REQUIREMENT: Hardware Component

1. P – IV Processor
2. Speed – 2.8 GHZ
3. RAM – 512 MB minimum
4. Hard Disk – 80 GB
5. Headphones of high quality

SUGGESTED SOFTWARE

1. Cambridge Advanced Learners' English Dictionary with CD.
2. Grammar Made Easy by Darling Kindersley
3. Punctuation Made Easy by Darling Kindersley
4. Clarity Pronunciation Power – Part I
5. Clarity Pronunciation Power – part II
6. Oxford Advanced Learner's Compass, 7th Edition
7. DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
8. MELL - K Van Solutions Software
9. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
10. English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge
11. English Pronunciation in Use, Cambridge University Press
12. Technical Communication, OUP
13. Communication Skills, OUP

Syllabus for
I B.Tech - II Semester
(R20)

I Year - II Semester Course Code: 20BS2T01	L	T	P	C
	3	0	0	3
MATHEMATICS –II **(Vector Calculus & Transform Calculus)**				

Course Objectives:

1. Find the vector differentiation and Integration
2. Apply the techniques of Laplace transforms in engineering studies
3. Learn the Fourier series of periodic functions and expand a function in sine and cosine series
4. Solve problems related to engineering applications using integral transform techniques
5. Evaluate the problems to engineering applications using Z- transform techniques

Course Outcomes:

After completing this course, the students will be able to

1. Understand gradient, divergence, curl and their physical significance
2. Compute line, surface and volume integrals and evaluate the work done, flux, potential functions
3. Make use of Laplace transforms in solving the differential equations with the initial and boundary conditions.
4. Compute Fourier series of periodic functions
5. Solve problems related to engineering applications using transform techniques

UNIT-I: Vector Differentiation

Vector Differentiation - Scalar and Vector Fields, Level surfaces, Directional Derivative, Gradient of a Scalar Field, Divergence, Curl of a vector field and applications, Vector Identities

UNIT-II: Vector Integration

Vector Integration - Line integral, work done, areas, Surface integrals.

Vector integral theorems - Green's theorem, Stokes theorem and Gauss Divergence theorem (All theorems without proof) and applications areas, surface areas and volumes.

UNIT-III: Laplace Transforms

Laplace transform-Definition-conditions for existence– Linear Property -Shifting Theorems, Laplace transforms of Standard Functions-Transforms of derivatives and integrals–Unit step function–Dirac delta function.

Inverse Laplace transforms by Partial fractions–Convolution theorem (without proof) – inverse by convolution, Solving ordinary differential equations with constant coefficients.

UNIT - IV: Fourier Series

Introduction, Periodic function, Dirichlet's conditions, Fourier series of periodic function, Fourier series at the point of discontinuity, Fourier series of even and odd functions, Half-range Fourier Sine and Cosine series. Fourier series in an arbitrary interval.

UNIT- V: Fourier Transforms and Z-Transforms

Fourier integral theorem (only statement) – sine and cosine integrals, Fourier transforms – sine and cosine transforms –Inverse Formulae-Properties- Finite Fourier Transforms.

Z-transform – properties – Damping rule – Shifting rule – Initial and final value theorems – Inverse Z –transform - Convolution theorem – solving difference equations by using Z-transforms.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publishers, New Delhi, 2012

2. Erwin.Kreyszig,Advanced Engineering Mathematics,9th Ed., Wiley, 2012

References:

1. T.K.V.Iyengar, B. Krishna Ghandhi, S. Ranganathan and M.V.S.S.N.Prasad, Engineering Mathematics, Volume-I, 12th Ed., S. Chand Publishers, 2014

2. B. V. Ramana, Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009

3. D. S. Chandrasekharaiah, Engineering Mathematics, Volume 1, Prism Publishers, 2010

4. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, reprint, 2008

I Year - II Semester Course Code: 20BS2T03	L	T	P	C
	3	0	0	3
APPLIED PHYSICS **(Common to EEE, ECE, CSE, IT, AI & DS)**				

Course Objectives:

1. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications

2. To Understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications. Study of propagation of light through optical fibers and their implications in optical communications

3. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.

4. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application and to know the importance of free electron theory for metals.

5. Enlightenment of the importance of band theory for crystalline solids and metals. To understand the physics of Semiconductors and their working mechanism.

Course Outcomes:

Upon the completion of the course the students will be able to:

1. To interpret the wave nature of light on the basis of interference, diffraction and polarization

2. Study various concepts related to lasers and optical fibres and their applications

3. Summarize various types of polarization of dielectrics and classify the magnetic materials

4. Explain fundamentals of quantum mechanics and free electron theory of metals.

5. Explain the basic principles of semiconductors, including energy bands, charge carriers and uses of hall effect

UNIT I

Wave Optics

Interference: Introduction - Principle of Superposition-Coherence-Conditions for Sustained Interference -Interference in thin films (reflected Geometry)-Newton's Rings-Determination of Wavelength and Refractive Index-Applications of Interference.

Diffraction:

Introduction- Fresnel and Fraunhofer diffraction-Fraunhofer Diffraction due to Single slit, Double slit –N – slits (Qualitative)-Diffraction Grating -Determination of Wavelength-Applications of Diffraction.

Polarization:

Introduction- types of polarized light, Polarization by reflection, refraction and double refraction-Nicol's prism-Half wave and Quarter wave plates

UNIT II

Lasers and Fiber OpticsLasers

Introduction-Characteristics of Laser–Spontaneous and Stimulated emissions of radiation-Einstein's coefficients & Relation between them and their significance – population inversion - Ruby laser – Helium Neon laser –Semiconductor diode laser(Qualitative)- Applications of Lasers.

Fiber Optics:

Introduction to Optical Fibers-Total Internal Reflection- Construction of optical fibers -Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile, modes -Block Diagram of Fiber optic Communication- Applications of optical fibers.

UNIT III

Magnetic Materials & Dielectric Properties

Magnetic Materials:

Introduction -Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment -Classification of Magnetic materials-Weiss theory of ferromagnetism (qualitative)-Hysteresis-soft and hard magnetic materials-Magnetic device applications.

Dielectrics :

Introduction to Dielectrics - Electric polarization - Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations - Electronic and Ionic polarizations with mathematical derivations – Orientational polarization (Qualitative)–Internal field in solids -Claussius -Mosotti equation.

UNIT IV

Quantum Mechanics and Free Electron Theory of Metals

Quantum Mechanics:

Introduction- Dual nature of matter-Matter waves, de-Broglie wavelength, Properties of wave function-time independent and time dependent Schrödinger's wave equation-Particle in a one dimensional infinite potential well.

Free Electron Theory of Meals:

Classical free electron theory (Qualitative with discussion of merits and demerits)-Quantum free electron theory-Equation for electrical conductivity based on quantum free electron theory-Fermi-Dirac Distribution-density of states (3D) - Fermi Energy.

UNIT V

Band Theory of Solids and Semiconductors

Band Theory of Solids:

Bloch Theorem - Kronig-Penny Model (Qualitative)-E vs K and v vs K diagram- Origin of energy bands - Classification of solids based on energy bands – Effective Mass of an Electron-Concept of a Hole

Semiconductors:

Introduction– Intrinsic semiconductors - density of charge carriers-Fermi level – extrinsic semiconductors - P-type & N-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature - Drift and Diffusion currents – Einstein's equation - Hall effect-Hall coefficient - Applications of Hall effect.

Text Books:

1. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics"-S.Chand Publications,2017
2. H.K.Malik&A.K.Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018
3. P.K. Palanisamy, Applied Physics, SciTech Publications.

References:

1. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata Mc GrawHill.

2. Charles Kittel "Introduction to Solid State Physics",Wiley Publications.

3. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley.

4. Halliday, Resnick and Walker, "Fundamentals of Physics", John WileySons.

5. M.R. Srinivasan, Engineering Physics, NewAge International Publishers.

6. AjoyGhatak "Optics' ' Tata Mc GrawHill.

I Year - II Semester Course Code: 20EC2T02	L	T	P	C
	3	0	0	3
DIGITAL LOGIC DESIGN				

Course Objectives:

1. To solve a typical number base conversion and analyze new error coding techniques.

2. Theorems and functions of Boolean algebra and behavior of logic gates.

3. To optimize logic gates for digital circuits using various techniques.

4. Boolean function simplification using Karnaugh maps.

5. To understand concepts of combinational circuits.

6. To develop advanced sequential circuits.

Course Outcomes:

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

1. Classify different number systems and apply to generate various codes.

2. Use the concept of Boolean algebra in minimization of switching functions.

3. Design different types of combinational logic circuits.

4. Apply knowledge of flip-flops in designing of Registers and counters

5. The operation and design methodology for synchronous sequential circuits and algorithmic state machines.

UNIT I

Review of Number Systems & Codes:Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: 8421.

UNIT II

Boolean Theorems and Minimization Functions: Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms, Basic logic gates and Universal gates.

Gate level Minimization: Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, Exclusive-OR Function.

UNIT III

Combinational Logic Circuits: Design of Half adder, Full adder, Half subtractor, Full subtractor, 4-bit binary adder, 4-bit binary subtractor, adder-subtractor circuit, Design of Encoder, Multiplexer, Higher Order Multiplexer, Decoder, Demultiplexer, Higher Order De-Multiplexing, Priority Encoder, 4 bit digital comparator.

UNIT IV

Synchronous Sequential Logic: Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops

UNIT V

Registers and Counters: Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

TEXT BOOKS:

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition.
2. Switching Theory and Logic Design by A. Anand Kumar
3. Digital Design by Mano PHI.
4. Switching and finite automata theory Zvi. KOHAVI, Niraj. K.Jha 3rdEdition,Cambridge University Press, 2009

REFERENCE BOOKS:

1. Modern Digital Electronics by RP Jain, TMH
2. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 2006
3. Microelectronics by Milliman MH edition.

I Year - II Semester Course Code: 20IT2T01	L	T	P	C
	3	0	0	3

PROGRAMMING FOR PROBLEM SOLVING
(Common to EEE, CSE, IT, AIDS)

Course Objectives:

1.To gain knowledge of the operators, data types in C

2.Understanding the branching and iterative statements in C

3.Understanding arrays, pointers, and dynamic memory allocation.

4.Modular programming and recursive solution formulation.

5.Understanding the strings, structures, and the unions

Course Outcomes:

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

1. Understanding the basic elements of a C program.

2. Able to use the control statements for solving the given problem.
3. Able to provide Modular programming and recursive solution formulation.
4. Understanding arrays, pointers and dynamic memory allocation.
5. Understanding Strings, Structures and Unions

UNIT I

Introduction to C Programming- Identifiers, The main () Function, The printf () Function **Programming Style** - Indentation, Comments, Data Types**,** Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization.

Assignment - Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

UNIT II

Control Flow-Relational Expressions - Logical Operators:

Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples. **Repetition**: Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement.

UNIT III

Arrays & Pointers:

Arrays: One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Two-Dimensional Arrays, Larger Dimensional Arrays- Matrices

Pointers: Concept of a Pointer, Initialization of pointer variables, passing by address, Dangling memory, address arithmetic, Dynamic memory management functions, command line arguments.

UNIT IV

Modular Programming: Function and Parameter Declarations, Returning a Value, Classifications of Functions, Recursion - Mathematical Recursion, Recursion versus Iteration, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Array as a Function argument.

UNIT V

Strings & Structures:

Strings: String Fundamentals, String Input and Output, String Processing, Library Functions.

Structures: Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields.

TEXT BOOKS:

1. ANSI C Programming, Gary J. Bronson, Cengage Learning.
2. Let us C Authentic Guide to C Programming Language by yashavantkanetkar.
3. The C Programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

REFERENCE BOOKS:

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, ReemaThareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.

I Year - II Semester Course Code: 20BS2P02	L	T	P	C
	0	0	3	1.5
APPLIED PHYSICS LAB				

Course Objectives:

1. Analyze laws of stretched strings and calculate frequency using a sonometer and Meldes experiment.

2. Determine gravitational acceleration through a compound pendulum experiment.

3. Measure rigidity modulus for various materials.

4. Utilize microscope and Newton 's rings to study light phenomenon like interference, diffraction etc.

5. Demonstrate electronic circuit construction and understand device applications.

6. Investigate charge carrier polarity and electric current-magnetic field interactions.

Course Outcomes: Students will be able to

1. Analyze and understand the concepts of oscillations and standing waves. (Sonometer, Melde's experiment).

2. Know how to determine the acceleration due to gravity at a place using Compound pendulum.

3. Perform experiments on Properties of matter such as the determination of moduli of elasticity viz., Young's modulus, Rigidity modulus of certain materials;

4. Gain hands-on experience of using various optical instruments like spectrometer, and making finer measurements of wavelength of light using Newton Rings experiment, diffraction grating etc.

5. Demonstrate simple electronic circuits consisting of basic circuit elements, and understand

   applications and of various electrical & Electronic devices.

List of Experiments

Conduct 10 out of 15 experiments

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence

2. Newton's rings –Radius of Curvature of Plano Convex Lens.

3. Determination of thickness of a thin object using parallel interference fringes.

4. Determination of Rigidity modulus of a material- Torsional Pendulum.

5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.

6. Melde's experiment – Transverse and Longitudinal modes.

7. Verification of laws of stretched string – Sonometer.

8. Determination of velocity of sound – Volume Resonator

9. L C R Series Resonance Circuit

10. Study of I/V Characteristics of Semiconductor diode

11. I/V characteristics of Zener diode

12. Thermistor characteristics – Temperature Coefficient

13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.

14. Energy Band gap of a Semiconductor p.n junction.

15. Hall Effect for Semiconductors.

REFERENCES:

1. Engineering Physics Lab Manual by Dr.Y. Aparna Dr.K.Venkateswara Rao (V.G.S.Book links)

2. Physics Practical Manual, Lorven Publication

I Year - II Semester Course Code: 20CS2P04	L	T	P	C
	0	0	3	1.5
ADVANCED PYTHON PROGRAMMING LAB				

Course objectives: To enable students

1. Explore basic workflow of learning from data.

2. Apply various NumPy and pandas' concepts to preprocess the data.

3. Understand data visualization techniques and create reports

4. Calculating simple descriptive statistical measures on datasets.

5. Using sklearn to get inference from data.

Course Outcomes: Students will be able to

1. Explore AI concepts, machine learning fundamentals, ethical considerations, and data visualization techniques.

2. Implement and analyze datasets using NumPy and Pandas for data manipulation and preprocessing.

3. Apply Python visualization libraries like Matplotlib and Seaborn for data analysis and pattern recognition.

4. Perform machine learning tasks, including data preprocessing, model training, validation, and evaluation using Scikit-learn.

Laboratory Experiments:

1. Live experiment with The Teachable Machine (https://teachablemachine.withgoogle.com/train/)

2. Three components of AI system (Dataset, learning algorithm, prediction)

3. Introduction to Algorithmic or inductive Bias Experiment on the teachable machine

4. Determining the stakeholders - the ethical bias

5. Various types of machine learning. Exploring live tools

6. Making an AI based Game (brief primer on JavaScript, HTML and CSS)

7. Experimentation on Importance of Data Visualization

8. Experimentation on exploring types of data, and corresponding chart and statistic

9. Experiment - Dashboard in Google Data Studio

10. Practice on Python Numpy Library

i)   Different ways to create NumPy arrays

ii)   Add, remove, modify elements in an array.

iii)   Arithmetic operations on NumPy array

iv)   Slicing and iterating of NumPy arrays

v)   Matrix operations on NumPy arrays

11. Practice on Python Pandas Library

i)   Create a data Frame manually

ii)   Different ways of importing a data frame

iii)   Adding, Deleting, Modifying the rows/columns in a dataframe.

iv)   Apply functions on dataframe.

v)   Iterations on dataframe

vi)   Accessing the elements from a dataframe

vii)   Different ways to deal with NA's in dataframe

viii)   Groupby operations on dataframe

ix)   Merging dataframes

12. Visualization using Python MatplotLib and Seaborn Libraries

i)   Line Graphs ii) Scatter Plots iii) Histograms iv) Subplots v) Join plots vi) Heatmaps

13. Exploratory Data Analysis on a dataset

14. Applying few sklearn functions on the dataset

15. Train test split

16. Evaluation metrics

17. Cross validation

I Year - II Semester Course Code: 20IT2P01	L	T	P	C
	0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING LAB				

Course Objectives:

1. Understand the basic concept of C Programming, and its different modules that includes
2. conditional and looping expressions, Arrays, Strings, Functions, Pointers Structures.
3. Acquire knowledge about the basic concept of writing a program.
4. Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
5. Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
6. Role of functions involving the idea of Modularity.

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

1. Apply and practice logical ability to solve the problem.
2. Understand C programming development environment, compiling, debugging and linking and executing a program using the development environment.
3. Analyzing the complexity of problems, modularize the problems into small modules and then convert them into programs.
4. Understand and apply the inbuilt functions and customized functions for solving the problems.
5. Understand and apply the pointers, memory allocation techniques

Exercise - 1 : Basics

a) What is an OS Command, Familiarization of Editors - vi, Emacs

b) Using commands like mkdir, ls, cp, mv, cat, pwd, and man

c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line

Exercise - 2 Basic Math

a) Write a C Program to Simulate 3 Laws at Motion

b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise - 3 Control Flow – I

a)Write a C Program to Find Whether the Given Year is a Leap Year or not.

b)Write a C Program to Add Digits & Multiplication of a number

Exercise – 4 Control Flow – II

a)Write a C Program to Find Whether the Given Number is i) Prime Number ii) Armstrong

Number

b) Write a C program to print Floyd Triangle

c) Write a C Program to print Pascal Triangle

Exercise – 5 Functions

a) Write a C Program demonstrating parameter passing in Functions and returning values.

b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion **Exercise – 6**

Control Flow – III

a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch...case

b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise – 7 Functions – Continued

Write a C Program to compute the values of sinx and cos x and e^x values using Series expansion. (use factorial function)

Exercise – 8 Arrays Demonstration of arrays

a) Search-Linear. b) Sorting-Bubble, Selection. c) Operations on Matrix.

Exercises - 9 Structures

a)Write a C Program to Store Information of a Movie Using Structure

b)Write a C Program to Store Information Using Structures with Dynamically Memory Allocation

c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function Exercise - 10

Arrays and Pointers a)Write a C Program to Access Elements of an Array Using Pointer

b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 Dynamic Memory Allocations a) Write a C program to find the sum of n elements entered by the user. To perform this program,allocate memory dynamically using malloc () function.

b) Write a C program to find the sum of n elements entered by the user. To perform this program, allocate memory dynamically using calloc () function. Understand the difference between the above two programs

Exercise – 12 Strings a) Implementation of string manipulation operations with library function. i) copy ii) concatenate iii) length iv) compare b) Implementation of string manipulation operations without library function. i) copy ii) concatenate iii) length iv) compare

I Year - II Semester Course Code: 20CS2P03	L	T	P	C
	1	0	4	3
COMPUTER ENGINEERING WORKSHOP				

Course Objectives:

1. Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
2. Demonstrate basic command line interface commands on Linux
3. Teach the usage of Internet for productivity and self-paced lifelong learning
4. Describe about Compression, Multimedia and Antivirus tools
5. Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes:

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

1. Identify and assemble various computer hardware components, peripherals, and networking devices.
2. Set up virtual machines, install operating systems, and execute basic Linux commands.
3. Use networking commands, configure Internet services, and manage system security.
4. Develop basic web pages using HTML & CSS and create documents using office tools and LaTeX.

Computer Hardware:

Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Operating Systems:

Experiment 2: Virtual Machine setup: o Setting up and configuring a new Virtual Machine o Setting up and configuring an existing Virtual Machine o Exporting and packaging an existing Virtual Machine into a portable format

Experiment 2: Operating System installation: o Installing an Operating System such as Linux on Computer hardware.

Experiment 3: Linux Operating System commands: o General command syntax o Basic help commands - Basic File system commands - Date and Time - Basic Filters and Text processing -

Basic File compression commands o Miscellaneous: apt-get, vi editor.

Networking and Internet:

Experiment 4: Networking Commands: - ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, trace route, telnet, host, ftp, arp, wget, route

Experiment 5: Internet Services: - Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins o Antivirus installation, configuring a firewall, blocking pop-ups - Email creation and usage, Creating a Digital Profile on LinkedIn. Productivity Tools:

Experiment 6: Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage,

Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices

Office Tools:

Experiment 7: Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Experiment 8: Demonstration and practice on Microsoft Word, Power Point, Microsoft Excel

Experiment 9: Demonstration and practice on LaTeX and produce professional pdf documents.

Text Books:

1. Computer Fundamentals, Anita Goel, Pearson Education, 2017
2. PC Hardware Trouble Shooting Made Easy, TMH

References Books:

1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Vekateswarlu, S.Chand

I Year - II Semester Course Code: 20BS2T08	L	T	P	C
	2	0	0	0
Constitution of India (Common to EEE, CSE, IT)				

Course Objectives:

1. To train students in understanding the basic structure of Indian Constitution

2. To prepare students to live better and happily with other fellow beings through the application of Fundamental Rights in their lives.

Course Outcomes:

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

1. Understand and explain the significance of Indian constitution as the fundamental law of the land

2. Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building

3. Analyse the Indian political system, the powers and functions of the union ,state and local government in detail

4. Understand the judiciary, executive and legislature and its functions.

5. Understand electoral process, emergency provisions and amendment procedure.

UNIT-I

Introduction to Indian Constitution

Meaning of the term Indian Constitution –Preamble- Constituent Assembly- Salient Features of Indian Constitution

UNIT-II

Fundamental Rights:Fundamental Rights -Fundamental Duties -The Directive Principles of State Policy

UNIT-III

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-IV

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-V

Local Self Governance

Powers and functions of Municipalities, Panchayats, ZP's and Co – Operative Societies

Text Books:

1. Introduction to constitution of India, Durga Das Basu, Lexis Nexis Publications
2. Constitution of India by PROFESSIONAL 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

Syllabus for
II B.Tech - I Semester
(R20)

II Year - I Semester CourseCode: 20BS3T04	L	T	P	C
	3	0	0	3
DISCRETE MATHEMATICAL STRUCTURES				

Course Objectives:
1. Check the validity of arguments by using basic connective and valid rules of inference.
2. Observe various properties of sets and relations.
3. Identify different graphs, isomorphism of graphs, paths, cycles and circuits.
4. Identify different types of trees.
5. To introduce recurrence relations.

Course Outcomes:

After completing this course, the students will be able to

1. Ability to apply mathematical logic to solve problems.
2. Understand sets, relations, functions and discrete structures
3. Apply graph theory concepts to modeling problems in Computer Science using graphs.
4. Able to model and solve real-world problems using trees
5. Solve different recurrence relations.

UNIT I
Mathematical Logic : Propositional Calculus: Statements and Notations, Connectives, Truth Tables, Tautologies, Equivalence of Formulas, Duality law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof. Predicate calculus: Predicate Logic, Statement Functions, Variables and Quantifiers, Inference theory for predicate calculus.

UNIT II
Set Theory : Introduction, Operations on Binary Sets. Relations: Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams.
Functions: Bijective Functions, Composition of Functions.

UNIT III
Graph Theory I : Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, (Problems and Theorems without proofs).

UNIT IV
Graph Theory II Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number, (Problems and Theorems without proofs).

Trees, Directed trees, Binary Trees, Spanning Trees: Properties, Algorithms for Spanning trees and Minimum Spanning Trees.

UNIT V
Recurrence Relations: Generating Functions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.

TEXT BOOKS:
1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rdEdition, Tata McGraw Hill.
3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

REFERENCE BOOKS:
1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon Cutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.

		L	T	P	C
II Year - I Semester **Course Code: 20CS3T01**		3	0	0	3

<div align="center">

DATA STRUCTURES

</div>

Course Objectives:
1. Understand and apply algorithm analysis for various searching and sorting techniques
2. Understand the concept of linked lists and be use it in various applications
3. Be able to use Stacks and Queues in various applications
4. Understand the concept of Trees & Graphs and perform various operations on it
5. Understand the concept of Hashing & different types of Hashing Techniques

Course Outcomes:
By the end of the course, the students should be able to:

1. Use various searching and sorting techniques,and analyze the complexity of various algorithms.
2. Implement various operations on Linked Lists, and its applications.
3. Implement various operations on Stacks and Queues, and its applications.
4. Apply various operations on Trees and Graphs,and its applications.
5. Explain and analyze different types of hashing techniques for efficient data retrieval and storage.

UNIT I

Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big Oh, Omega and Theta notations, Complexity Analysis Examples. Searching and Sorting: Linear and binary search methods. Bubble sort, Insertion sort, Selection Sort, Radix Sort, Comparison of sorting methods.

UNIT II

Data structures-Linear and nonlinear data structures, Linear List, Array representation, Linked representation, singly linked lists -insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular Linked lists-insertion, deletion operations, Applications of Linked Lists – Polynomial Representation, Sparse Matrix Representation

UNIT III
Stacks - Representation of Stacks using arrays and linked lists, Applications of stacks -Expression evaluation - Infix to Postfix Conversion, Evaluating Postfix Expressions, Reversing the list

Queues – Representation of Queues using arrays and linked lists, Applications of Queues, Circular queue, Double Ended Queue -insertion, and deletion.

UNIT IV

Trees- Terminology, Properties of Binary trees, Binary tree representations, recursive and non-recursive binary tree traversals, Priority Queues, Heaps-Max Heap, Min Heap.

Search trees- Binary search tree, Operations of Binary Search Trees - insertion, deletion and search, balanced search trees, AVL trees - Definition, operations.

UNIT V
Graphs- Introduction, Definition, Graph Representation, Elementary Graph Operations – Vertex Insertion, Vertex Deletion, Edge Insertion, Edge Deletion etc, Graph Traversals

Hashing: Definition, Hash table, Hash function, Collision, Collision Resolution Techniques-Chaining, and Open Addressing.

TEXT BOOKS:

1. Data structures and Algorithms in Java, R.Lafore, Pearson education
2. Data Structures, Using C, Second Edition, Reema Thareja, OXFORD Higher Education.
3. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
4. Data structures and Algorithm Analysis in Java, M.A.Weiss, 2nd edition, Addison- Wesley (Pearson Education).

REFERENCE BOOKS:

1. Introduction to Algorithms, Third Edition, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stien.
2. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI
3. Data structures and Algorithm Analysis using C, Mark Allen Weiss, Pearson Education. Ltd.,
4. Second Edition.

II Year - I Semester Course Code: 20IT3T01	R20 Regulation	L	T	P	C
		3	0	0	3
	DATABASE MANAGEMENT SYSTEMS				

Course Objective:

To learn the principles of systematically designing and using Database Management Systems for various applications.

Course Outcomes:

 After completing this course, the students will be able to

1. Explain database concepts and utilize data models for effective database representation.
2. Design, maintain, and manipulate relational databases using SQL.
3. Analyze the importance of schema refinement and implement techniques for schema optimization.
4. Examine how a DBMS manages transaction execution and ensures data integrity.
5. Compare and evaluate various file organization and indexing methods for efficient data storage and retrieval.

UNIT I

Introduction to Database Management System, Data Independence- Relation Systems and Others, Database system architecture, Introduction- The Three Levels of Architecture-The External Level- the Conceptual Level- the Internal Level- Mapping- the Database Administrator, Various Data Models
The ER Model - The Relational Model, Relational Calculus, Introduction to Database Design, Database Design and ER Diagrams-Entities Attributes, and Entity Sets-Relationship and Relationship Sets - Conceptual Design with ER Model

UNIT II

The Relational Model – Basic Concepts, Integrity Constraints Over Relations- Key Constraints – Foreign Key Constraints - Relational Algebra Operations - Selection and Projection- Set Operations, Renaming – Joins- Division
SQL – Various parts of SQL, Basic form of SQL Query, Union, Intersect, and Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers

UNIT III

Schema Refinement (Normalization) : Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF).

UNIT IV
Transaction Management and Concurrency Control
Transaction, properties of transactions, Various concurrency control techniques – lock based, timestamp based, lock granularity, lock types, 2PL for ensuring serializability, deadlocks – dealing with deadlocks, Database Recovery management : Log based recovery

UNIT V
Overview of Storages and Indexing, Data on External Storage- File Organization and Indexing – Clustered Indexing – Primary and Secondary Indexes, Index Data Structures, Tree-Based Indexing – B Trees, B+ Trees, Hash-Based Indexing – Basic idea, Comparison of File Organization

TEXT BOOKS:
1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition
2. Database System Concepts, Abraham Silberschatz, Henry F. Korth

REFERENCES BOOKS:
1. Fundamentals of Database Systems, Elmasri Navate Pearson Education
2. Introduction to Database Systems, C.J.Date Pearson Education
3. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel

II Year - I Semester Course Code: 20IT3T02		L	T	P	C
		3	0	0	3
OBJECT ORIENTED PROGRAMMING THROUGH JAVA					

Course Objectives:

1. To identify Java language components and how they work together in applications
2. To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3. To learn how to extend Java classes with inheritance and dynamic binding.
4. To learn how to perform exception handling in Java programs.
5. To understand how to design applications with threads in Java

Course Outcomes:

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

1. Explain the concepts of Object-Oriented Programming and Java programming constructs.
2. Apply Object-Oriented Programming principles to develop solutions for real-world problems.
3. Design and implement user-defined packages and interfaces for modular programming.
4. Utilize exception handling and streams for robust and efficient Java applications.
5. Develop applications using multithreading and JDBC for concurrent processing and database connectivity.

Unit I

Introduction to OOP: Introduction, Need of OOP, Principles of Object Oriented Languages, Procedural languages vs OOP, Applications of OOP, History of Java, JVM, Java Features, Programming Style, Command Line Arguments, Escape Sequence Comments

Data Types, Variables, Operators and Flow of Control: Variables, Primitive Data types, Constants, Identifiers- Naming Conventions, Keywords, Literals, Operators- Binary, Unary, Ternary, Expressions, Precedence rules and Associativity, Primitive Type Conversion and casting, Flow of Control- Branching, Conditional Loops.

Unit II :

Classes and Objects: Class declaration and Modifiers, Class Members, Declaration of Class Object, Object Creation, Access control for Class Members, Defining methods, Overloaded methods, Recursive methods, Constructor, Constructor overloading, static keyword, this keyword.

Inheritance: Types of Inheritance, Deriving classes using Extends keyword, Method Overloading, super keyword, final keyword, Polymorphism- Abstract classes and methods - Overloading - Overriding - final methods and classes

Unit III

Interface: Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Static methods in interface, functional interfaces.

Packages and Java Library: Defining package, Importing packages and classes into programs, Path and class path, Access control, Java.lang package and its classes, wrapper classes, auto –boxing and auto-unboxing, Java util classes and interfaces.

Unit IV

Exception Handling: Introduction, Exception handling techniques- try…catch, throw, throws, finally block, User defined Exception, checked exception, unchecked exception, custom exception, nested try and catch blocks

Input/Output and String Handling: Files and streams- Byte stream, I/O stream, Character StreamFile Reader and Writer, charArrayReader and Writer, Class String, Methods for Extracting characters from strings, String Methods, String Buffer, Class String Buffer.

Unit V

Mutli- Threading: Introduction, Need for Multiple threads, Mulithreaded Programming, Thread Class, Main thread, Creation of new thread, thread states, thread priority.

Java Database Connectivity: Introduction, JDBC Architecture, Environment Setup, JDBC Database Connections, Resultset Interface, Creating JDBC Applications

TEXT BOOKS:

1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. The complete Reference Java, 8th edition, Herbert Schildt, TMH
3. Cay S. Horstmann, Gary cornell, ―Core Java Volume –I Fundamentals, 9th Edition, Prentice Hall,2013.

REFERENCE BOOKS:

1. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2. Murach's Java Programming, Joel Murach

E-Resources:

1) https://https://nptel.ac.in/courses/106/105/106105191/

2) https://www.w3schools.com/java/java_data_types.asp

II Year - I Semester Course Code: 20CS3T02		L	T	P	C
		3	0	0	3
	COMPUTER ORGANIZATION				

Course Objective:

`Understand the architecture of a modern computer with its various processing units.

Course Outcomes:

After completing this course, the students will be able to

1. Explain the architecture, functional components, and performance aspects of modern computers.

2. Demonstrate instruction sequencing, addressing modes, and their role in executing programs

3. Analyze various I/O techniques, including interrupts, DMA, and bus communication.

4. Evaluate different memory architectures and their impact on system efficiency.

5. Illustrate instruction execution flow, arithmetic operations, and control mechanisms in processors.

UNIT I

Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

UNIT II

Machine Instruction and Programs: Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types, Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equations. Component of Instructions: Logic Instructions, shift and Rotate Instructions, Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT III

Input / Output Organization: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT IV

The Memory Systems: Basic memory circuits, Memory System Consideration, ReadOnly Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Cache Memories: Mapping Functions, INTERLEAVING Secondary Storage: Magnetic Hard Disks, Optical Disks,

UNIT V

Processing Unit: Fundamental Concepts: Register Transfers, Performing An Arithmetic Or Logic Operation, Fetching A Word From Memory, Execution of Complete Instruction, Hardwired Control, Micro programmed Control: Microinstructions, Microprogram Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

TEXT BOOKS:

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.

REFERENCE BOOKS:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int.
4. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy.

II Year - I Semester Course Code: 20CS3P01		L	T	P	C
		0	0	3	1.5
	DATA STRUCTURES LAB				

Course Objectives: The objective of this lab is to demonstrate the different data structures implementation.

Course Outcomes:

By the end of this lab the student is able to

1. Implement various searching and sorting algorithms.
2. Solve data structure problems on arrays and linked lists.
3. Implement various data structures like stacks, queues, trees & graphs, and use them for various applications

List of Experiments:

Exercise -1 (Searching)

a) Write a program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.

b) Write a program that uses both recursive and non-recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I) Write programs to implement various sorting techniques like Bubble sort, Selection sort, Insertion sort, Radix sort

Exercise -3(Singly Linked List)

a) Write a program that uses functions to create a singly linked list

b) Write a program that uses functions to perform insertion operation on a singly linked list

c) Write a program that uses functions to perform deletion operation on a singly linked list

d) Write a program to reverse elements of a single linked list.

Exercise -4 (Stack)

a) Write a program that implement stack (its operations) using arrays

b) Write a program that implement stack (its operations) using Linked list

c) Write a program that uses Stack operations to evaluate postfix expression

Exercise -5 (Queue)

a) Write a program that implements Queue (its operations) using arrays.

b) Write a program that implement Queue (its operations) using linked lists

Exercise -6 (Binary Tree) Write a recursive function for traversing a binary tree in preorder, inorder and postorder.

Exercise -7 (Binary Search Tree)

a) Write a program to Create a BST

b) Write a program to insert a node into a BST.

c) Write a program to delete a node from a BST.

Exercise – 8 (Graphs) – Represent graphs using adjacency matrix and adjacency list

II Year - I Semester **Course Code: 20IT3P01**		L	T	P	C
		0	0	3	1.5
DATABASE MANAGEMENT SYSTEMS LAB					

Course Objectives:

The objective of this lab is to teach the students how to store and retrieve data from database using query languages. In addition, the students should be able to enforce various integrity constraints on the database data.

Course Outcomes:

After completing this course, the students will be able to

1. Perform various database operations in oracle
2. Apply SQL to retrieve data effectively using scalar functions
3. Able to apply exception handling techniques while handling the database
4. Implement the concepts of functions and procedures

List of Experiments:

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSECT, Constraints.
3. Queries using Aggregate functions, GROUP BY, HAVING and Creation and Dropping of Views.
4. Queries using Conversion functions, String functions, Date functions
5. i) Creation of simple PL/SQL program which includes declaration section, executable section and exception –handling

   ii) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL
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, user defined Exceptions, RAISE- APPLICATION ERROR.

8. Program 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

II Year - I Semester Course Code: 20IT3P02		L	T	P	C
		0	0	3	1.5
OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB					

Course Objectives:

1. Practice Programming in the Java
2. Gain knowledge of object oriented paradigm in the java programming language
3. Learn use of java in a variety of technologies and on different platforms.

Course Outcomes:

After completing this course, the students will be able to

1. Apply fundamental Java concepts such as control statements, arrays, classes, objects, and methods to solve programming problems.
2. Implement object-oriented principles, including inheritance, polymorphism, interfaces, and exception handling, for developing modular applications.
3. Utilize Java I/O streams, collections framework, and multithreading to design efficient real-time applications.
4. Develop Java programs using packages and threading concepts to achieve modularity and concurrency.

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA
b) Write a java program that displays the roots of a quadratic equation $ax^2 +bx=0$. Calculate the discriminant D and basing on the value of D, describe the nature of the root.
c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write the programs using the concept of operators, nested loops, recursion, arrays, String and StringBuffer class.

Exercise - 3 (Class, Objects)

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside the main method.
b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)

   a) Write a JAVA program to implement constructor overloading.

   b) Write a JAVA program implementing method overloading.

Exercise - 5 (Inheritance)

   a) Write a JAVA program to implement Single Inheritance

   b) Write a JAVA program to implement multilevel Inheritance

   c) Write a java program for abstract class to find areas of different shapes

   d) Write a JAVA program that uses "super" keyword.

   e) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 6 (Exception)

   a) Write a JAVA program that describes exception handling mechanism

   b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 7 (Runtime Polymorphism)

   a) Write a JAVA program that implements Runtime polymorphism

   b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 8 (User defined Exception)

   a) Write a JAVA program for creation of Illustrating throw

   b) Write a JAVA program for creation of Illustrating finally

   c) Write a JAVA program for creation of Java Built-in Exceptions

   d) Write a JAVA program for creation of User Defined Exception

Exercise – 9 (Threads)

   a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good

   b) Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)

   c) Write a program illustrating isAlive and join ()

   d) Write a Program illustrating Daemon Threads.

   e) Write a JAVA program Producer Consumer Problem

Exercise – 10 (Packages)

   a) Write a JAVA program illustrate class path

b) Write a case study on including in classpath in your os environment of your package.

c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 11 (I/O & JDBC)

a) Write a program that uses the I/O package for reading and writing a text file.

b) Write a program that uses JDBC API for interacting with the database.

II Year - I Semester Course Code: 20CS3P02		L	T	P	C
		0	0	4	2
SKILL ORIENTED COURSE – I **ANIMATIONS – 2D ANIMATION**					

Course Objectives:

This Course will enable students to learn various aspects of animation using a variety of 2-D Software and to implement advance principles of traditional animation in Adobe animate to create high Quality animation for production.

Course Outcomes:

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

1. Learn various tools of digital 2-D animation.

2. Understand the production pipeline to create 2-D animation.

3. Analyze special effects in animation to bring interest and awe in the scenes and backgrounds.

4. Apply the tools to create 2D animation for films and videos.

Perform Experiments related to the following concepts:

2D GRAPHIC DESIGN

Adobe Photoshop:

       1. Create your visiting card

       2. Create Title for any forthcoming film

       3. Digital Matte Paint

       4. Convert Black and White to Color

       5. Convert Day mode to Night mode

       6. Design Image manipulation

       7. Smooth skin and remove blemishes & scars

       8. Create a 3D pop-out effect

       9. Create Textures

       10. Timeline Animation

Adobe Illustrator:

1. Advertisement

2. Digital Illustrations

3. Brochure

4. Packet Design(Toothpaste packet, Soap cover, any Food product)

5. Danglers for display

6. Menu cards

7. Calendar Design

8. Tracing image

9. Vehicle Design

10. Festival

Adobe Indesign:

1. Magazine A4 Size

2. Newspaper layout design & advertisements – Fine arts

3. Special Supplement

4. Different categories of Books

5. Info-graphics

6. Caricatures

Corel DRAW:

1. Create a paper ad for advertising of any commercial agency

2. Package Design

3. Corporate ID

4. Exhibition Layout

5. Oblers

2D ANIMATION

1. Creating Web Banners in Adobe Flash

2. Creating a Logo Animation in Adobe Flash

3. Creating Frame by Frame animation

4. Draw Cartoon Animation using reference.

5. Create Lip Sink to Characters

6. Using filters & Special effects

7. Create a scene by using Mask layers animation

E-Learning Lab:

1. Student Application form
2. Video Controlling
3. Audio Controlling
4. Start Drag and Stop Drag Actions
5. Interactive Keyboard Controls using Flash Action Script.
6. Interactive Flash Game.
7. Creating Character Animation in After Effects

II Year - I **Semester** **Course Code: 20CS3P02**		**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**
	SKILL ORIENTED COURSE – I **WEB APPLICATION DEVELOPMENT USING FULL STACK – MODULE - I**				

Course Objectives:

The objective of this lab is to provide understanding about the core concepts of frontend programming for web application.

Course Outcomes:

By the end of this lab the student is able to

1. Analyze a web page and identify its elements and attributes.
2. Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet.
3. Implement MVC and responsive design to scale well across PC, Tablet and Mobile Phone.
4. Create web pages using HTML and Cascading Style Sheets.

Perform experiments related to the following concepts:

A) HTML

  1) Introduction to HTML

  2) Browsers and HTML

  3) Editor's Offline and Online

  4) Tags, Attribute and Elements

  5) Doctype Element

  6) Comments

  7) Headings, Paragraphs, and Formatting Text

  8) Lists and Links

  9) Images and Tables

B) CSS

  1) Introduction CSS

  2) Applying CSS to HTML

  3) Selectors, Properties and Values

4) CSS Colors and Backgrounds

5) CSS Box Model

6) CSS Margins, Padding, and Borders

7) CSS Text and Font Properties

8) CSS General Topics

C) JavaScript

1) Introduction to JavaScript

2) JS where to, Output and Statements

3) JS Statements, Syntax, Comments and Variables

4) JS Operators, Arithmetic and Assignment

II Year - I Semester		L	T	P	C
Course Code: 20BS3A02		2	0	0	0
	ENVIRONMENTAL SCIENCE				

Objectives:

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

Course Outcomes:

Students will be able to

1. Articulate the basic structure, functions and processes of key societal systems affecting the environment.
2. Explain how Natural Resources should be used.
3. Identify the threats to biodiversity.
4. Understand causes, effects and control measures of Environmental pollution.
5. Knowledge about Watershed management and Environmental ethics and a rigorous foundation in various scientific disciplines as they apply to environmental science such as ecology, evolutionary biology, hydrology and human behavior.

UNIT I

Multidisciplinary nature of Environmental Science and Ecosystems

Definition, Scope and Importance – Sustainability: Need for public awareness-Human population and Environment.

Ecosystems: Concept of an ecosystem. - Structure and function of an Ecosystem. -Types of Ecosystem-Forest, Grassland, Desert and Aquatic Ecosystems– Food chains, food webs and ecological pyramids.

UNIT II

Natural Resources

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Conflicts over water, Dams – benefits and problems.

Mineral resources: Use and exploitation, Environmental effects of extracting and using mineral resources.

Energy resources: Growing energy needs, renewable and non-renewable energy sources.

Food resources: World food problems. Land resources: Wasteland reclamation.

Role of an individual in conservation of natural resources.

UNIT III

Biodiversity and its conservation

Definition, Genetic, species and ecosystem diversity- classification - Value of biodiversity: Consumptive use, Productive use, Social use. Biodiversity at national and local levels. Hot-spots of biodiversity - Threats to biodiversity - Endangered and endemic species of India – Conservation of biodiversity

UNIT IV

Environmental Pollution

Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. Pollution case studies.

Solid Waste Management: Sources, effects and control measures of urban and industrial solid wastes. Bio medical and e-waste management.

Global Environmental Challenges: Global warming and climate change-Acid rains, Ozone layer depletion.

UNIT V

Social Issues and Environmental Management

Urban problems related to energy -Water conservation, Rain water harvesting-Resettlement and rehabilitation of people. Environmental Protection Act –Air Act –Water Act - Wildlife Protection Act -Forest Conservation Act-Public awareness.

International protocols: Stockholm and Rio Summit, Kyoto protocol and Montreal Protocol.

Impact Assessment and its significance in various stages of EIA, Environmental audit, Ecotourism.

The student should Visit an Industry / Ecosystem.

Text Books

1. A Textbook of Environmental Studies, Shashi Chawla, TMH, NewDelhi.
2. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for

3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford UniversityPress.

References

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers,Vijayawada.
2. Text Book of Environmental Studies, Deekshita Dave & P. Udaya Bhaskar, CengageLearning.
3. Textbook of Environmental Science and Technology – Dr. Anji Reddy, BS Publications.
4. Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers,2014.
5. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education,Chennai.
6. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, NewDelhi.

Syllabus for

II B.Tech - II Semester (R20)

II Year - II Semester Course Code: 20BS4T02		L	T	P	C
		3	0	0	3
	PROBABILITY AND STATISTICS				

Course Objectives:

To enable the students to

1. Familiarize with the foundations of probability and statistical methods
2. Impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon completing this course, the student should be able to:

1. Compute descriptive statistics and interpret in data science problems
2. Compute various linear and non linear regression models to the data
3. Calculate probability distribution and fit problems to data
4. Infer the statistical inferential methods based on small and large sampling tests
5. Design the components of a classical hypothesis test

UNIT I

Descriptive statistics and methods for data science

Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variables: dependent and independent Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance), Skewness, Kurtosis.

UNIT II

Correlation & Regression

Correlation and Regression**:** Simple Bivariate Correlation: Karl Pearson's coefficient of correlation, Spearman's Rank correlation coefficient.

Linear Regression - Regression lines, Regression coefficients, properties.

Non- Linear Regression - Quadratic, Power and Exponential models using Least squares approximations

UNIT III

Probability Distributions

Basic concepts on probability, random variables (discrete and continuous)**,** probability distributions-Binomial, Poisson and Normal distributions and their properties, fitting of Binomial distribution, Poisson distribution

UNIT IV

Sampling Theory:

Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, c^2 and F distributions – Point and Interval estimations – Maximum error of estimate.

UNIT V

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. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

2. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.

3. T.K.V.Iyengar, B. Krishna Ghandhi, S. Ranganathan and M.V.S.S.N.Prasad, Engineering Mathematics, Volume-I, 12th Ed., S. Chand Publishers, 2014

References:

1. T.S.R. Murthy, Probability and Statistics for engineers, 1st edition, BS Publications, 2018. B. V. Ramana, Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009

2. S. Ross, a First Course in Probability, Pearson Education India, 2002.

II Year - II Semester Course Code: 20CS4T01		L	T	P	C
		3	0	0	3

FUNDAMENTALS OF MACHINE LEARNING

Course Objectives:

To enable the students

1. Define ML and understand their relationship with data
2. Understand different types of supervised learning and build various regression and classification models
3. Understand basic math fundamentals of this domain and intuitively understand basic math fundamental behind each technique
4. Understand performance metrics
5. Explain the mechanism of unsupervised learning and practice various clustering techniques in Python.
6. Comprehend text mining and its applications

Course Outcomes:

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

1. Explain the importance and fundamental concepts of Machine Learning.
2. Apply regression and classification techniques to solve machine learning problems.
3. Analyze unsupervised machine learning techniques and their applications.
4. Demonstrate NLP concepts, applications, and preprocessing techniques such as tokenization, TFIDF, Bag of Words, and n-grams using NLTK.
5. Implement neural networks and dimensionality reduction techniques for machine learning applications.

UNIT I

Introduction

Motivation, Applications of Machine Learning - Well-Posed Learning Problems - Designing a Learning System - Issues in Machine Learning - Types of Machine Learning

Supervised Learning - Regression Techniques

Basic concepts and applications of Regression - Simple Linear & Multiple Regression - Gradient Descent - Evaluation Measures for Regression Techniques - overfitting - underfitting - Regularization - Train-test-split, k-fold cross validation - Hyperparameter tuning.

UNIT II

Supervised Learning - Classification Techniques

Basic concepts and applications of classification - Naïve Bayes Classification, Logistic Regression, K-Nearest Neighbors, Classification Trees, Support Vector Machines, Evaluation Measures for Classification Techniques.

UNIT III

Unsupervised Learning

Definition, K-Means, Hierarchical clustering techniques. Dimensionality reduction using PCA. Feature Engineering –selection, factor analysis. Time series modeling (time series data types, stationarity and ARIMA modeling)

UNIT IV

Natural Language Processing / Text mining

Introduction. Applications. Chatbots, virtual agents (Alexa, Google Assistant, Siri). Importance, Applications, NLP Subproblems. Components of Natural Language. Steps to get text data into workable format. Terms Frequency, Inverse Document Frequency, Bag of Words, ngram, One hot encoding. Notion of corpus. Intro to NLTK

UNIT V

Neural Networks

Biological Neurons and Biological Neural Networks, Perceptron Learning, Activation Functions, Multilayer Perceptron, Back-propagation Neural Networks, Convolution Neural Network.

Text Books

1. Tom Mitchell, Machine Learning, TMH
2. C. Bishop, Pattern Recognition and Machine Learning, Springer
3. Stuart J. Russell and Peter Norvig,Artificial Intelligence A Modern Approach

References:

1. Machine Learning for Absolute Beginners : A Plain English introduction (2nd Edition) - Oliver Theorbald

2. Fundamentals of Machine Learning for Predictive Data Analytics by John D. Kelleher

3. Machine Learning with Python and Scikit-Learn - Develop Machine Learning and Deep Learning models with Python - by Sebastian Raschka - Packt

4. Approaching (Almost) Any Machine Learning Problem by Abhishek Thakur.

5. Build   an AI Assistant   with Wolfram Alpha   and   Wikipedia   in Python.https://medium.com/@salisuwy/build-an-ai-assistant-with-wolfram-alpha-and wikipedia-in-python-d9bc8ac838fe2

6. Joseph Howse, Prateek Joshi, Michael Beyeler -Opencv_ Computer Vision Projects with Python-Packt Publishing (2016)

7. Curated Datasets on Kaggle https://www.kaggle.com/datasets4.AurélienGéron,Hands   on Machine   Learning   with   Scikit-Learn   and   TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017

II Year - II Semester Course Code: 20CS4T02		L	T	P	C
		3	0	0	3
	OPERATING SYSTEMS				

Course Objectives :

1. Study the basic concepts and functions of operating systems.

2. Learn about Processes, Threads and Scheduling algorithms.

3. Understand the principles of concurrency and Deadlocks.

4. Learn various memory management schemes.

5. Study I/O management and File systems

Course Outcomes:

After learning, the course the students should be able to:

1. Express the fundamental concepts in operating system types, structures, and system calls.

2. Implement process management techniques such as scheduling and inter-process communication.

3. Analyze concurrency control mechanisms like synchronization, semaphores, and deadlock handling.

4. Apply memory management strategies, including paging, segmentation, and virtual memory.

5. Demonstrate knowledge of file system structures, disk scheduling algorithms, and system protection mechanisms.

UNIT I

Introduction to Operating System Concept: Types of operating systems, operating systems concepts, Structure of operating System, operating systems services, Introduction to System call, Types of system calls.

UNIT II

Process Management – Process concept, The process, Process State Diagram, Process control block, Process Scheduling- Scheduling Queues, Schedulers, Operations on Processes, Inter-process Communication, Threading Issues, Scheduling-Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

UNIT III

Concurrency: Process Synchronization, The Critical- Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Principles of deadlock – System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

UNIT IV

Memory Management: Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation.

Virtual Memory Management: Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing.

UNIT V

File system Interface- The concept of a file, Access Methods, Directory structure, File system mounting.

File System implementation- File system structure, allocation methods, free-space management, Mass-storage structure overview of Mass-storage structure, Disk scheduling.

System Protection: Goals of protection, Principles and domain of protection, Access Matrix, Access Control, Revocation of access rights.

TEXT BOOK:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.
3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016.

REFERENCES:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education", 1996.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, Tata Mc Graw-Hill Education, 2007.

II Year - II Semester Course Code: 20IT4T01		L	T	P	C
		3	0	0	3
	SOFTWARE ENGINEERING				

Course Objectives:

This course is designed to:

1. To help students to develop skills that will enable them to construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain.

2. This course introduces the concepts and methods required for the construction of large software intensive systems. It aims to develop a broad understanding of the discipline of software engineering.

3. Represent classes, responsibilities and states using UML notation

4. Capable of team and organizational leadership in computing project settings, and have a broad understanding of ethical application of computing-based solutions to societal and organizational problems.

5. Apply their foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes

Course Outcomes:

Students taking this subject will gain software engineering skills in the following areas:

1. Define and develop a software project from requirement gathering to implementation.

2. Obtain knowledge about principles and practices of software engineering.

3. Represent classes, responsibilities and states using UML notation

4. Focus on the fundamentals of modeling a software project.

5. Obtain knowledge about estimation and maintenance of software systems

UNIT I

Software and Software Engineering: The Nature of Software, The Unique Nature of WebApps , Software Engineering, Software Process, Software Engineering Practice, Software Myths.

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models

UNIT II

Requirements Analysis and Specification: Requirements Gathering and Analysis, Software Requirement Specification (SRS), Formal System Specification.

Software Design: Overview of the Design Process, How to Characterize of a Design? Cohesion and Coupling, Layered Arrangement of Modules, Approaches to Software Design, Developing the DFD Model of a System

UNIT III

Unified Modeling Language (UML): Introduction to UML, why we model, Standard Diagrams: Structural Diagrams- Class diagram, Object diagram, Component diagram, Deployment diagram, Behavioural Diagrams- Use case diagram, Sequence diagram, Collaboration diagram, State chart diagram, Activity diagram.

UNIT IV

Coding And Testing: Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-Box Testing, White-Box Testing, Debugging, Program Analysis Tool, Integration Testing, Testing Object-Oriented Programs, System Testing, Some General Issues Associated with Testing.

UNIT V

Software Reliability and Quality Management: Software Reliability, Statistical Testing, Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity Model.

Software Maintenance: Software maintenance, Maintenance Process Models, Maintenance Cost, Software Configuration Management.

Text Books:

1. Software Engineering a Practitioner's Approach, Roger S. Pressman, Seventh Edition McGrawHill International Edition.
2. Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI.
3. Software Engineering, Ian Sommerville, Ninth edition, Pearson education
4. The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, 12th Impression, 2012, PEARSON.

Reference Books:

1. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008

2. Software Engineering, A Precise Approach, PankajJalote, Wiley India,2010.

3. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

4. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer

International edition, 2006.

E-Resources:

1) https://nptel.ac.in/courses/106/105/106105182/

II Year - II Semester Course Code: 20HS4T01		L	T	P	C
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	UNIVERSAL HUMAN VALUES				

Course Objectives

This introductory course input is intended:

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.

3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

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

Course Outcomes:

After completing this course, the students will be able to

1. Develop the ability to reflect on one's beliefs, values, and purpose in life through self-exploration.

2. Gain insights into harmony at the levels of the individual, family, society, and nature for a holistic worldview.

3. Cultivate ethical reasoning and moral responsibility in personal, social, and professional life.

4. Promote environmental sustainability and responsible decision-making for a balanced and fulfilling life.

5. Apply UHV principles to foster meaningful relationships, ethical leadership, and social contribution.

Salient Features of the Course

The salient features of this course are:

1. It presents a universal approach to value education by developing the right understanding of reality (i.e. a worldview of the reality "as it is") through the process of self-exploration.

2. The whole course is presented in the form of a dialogue whereby a set of proposals about various aspects of the reality are presented and the students are encouraged to self-explore the proposals by verifying them on the basis of their natural acceptance within oneself and validate experientially in living.

3. The prime focus throughout the course is toward affecting a qualitative transformation in the life of the student rather than just a transfer of information.

4. While introducing the holistic worldview and its implications, a critical appraisal of the prevailing notions is also made to enable the students discern the difference on their own right.

Course Methodology

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.

2. The course is in the form of 28 lectures (discussions) and 14 practice sessions.

3. It is free from any dogma or value prescriptions.

4. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation – the whole existence is the lab and every activity is a source of reflection.

5. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution.

6. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

COURSE TOPICS

UNIT - I

Introduction to Value Education:

Understanding Value Education, Self-exploration as the Process for Value Education, Continuous, Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations.

Tutorial 1: Practice Session *PS*1 *Sharing about Oneself*

Tutorial 2: Practice Session PS2 *Exploring Human consciousness*

Tutorial 3: Practice Session PS3 *Exploring Natural Acceptance*

Expected outcome:

The students start exploring themselves: get comfortable with each other and with the teacher; they start appreciating the need and relevance for the course.

The students start finding that technical education without study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of most of the present-day problems; and a sustained solution could emerge only through understanding of value-based living. Any solution brought out through fear, temptation of dogma will not be sustainable.

The students are able to see that verification on the basic of natural acceptance and experiential validation through living is the only way to verify right or wrong, and referring to any external source like text or instrument or any other person cannot enable them to verify with authenticity; it will only develop assumptions.

The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to overcome this disharmony.

The students are able to see that lack of right understanding leading to lack of relationship is the major cause of problems in their family and not the lack of physical facility in most of the cases, while they have given higher priority to earning of physical facility in their life giving less value to or even ignoring relationships and not being aware that right understanding is the most important requirement for any human being.

UNIT - II

Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, , Harmony of the Self with the Body, Programme to ensure self-regulation and Health

Tutorial 4: Practice Session PS4 *Exploring the difference of Needs of Self and Body*

Tutorial 5: Practice Session PS5 *Exploring Sources of Imagination in the Self*

Tutorial 6: Practice Session PS6 *Exploring Harmony of Self with the Body*

Expected outcome:

The students are able to see that they can enlist their desires and the desires are not vague. Also they are able to relate their desires to 'I' and 'Body' distinctly. If any desire appears related to both, they are able to see that the feeling is related to I while the physical facility is related to the body. They are also able to see that 'I' and Body are two realities, and most of their desires are related to 'I' and not body, while their efforts are mostly centered on the fulfillment of the needs of the body assuming that it will meet the needs of 'I' too.

The students are able to see that all physical facility they are required for a limited time in a limited quantity. Also they are able to see that in case of feelings, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable even for a single moment.

The students are able to see that activities like understanding, desire, though and selection are the activities of 'I' only the activities like breathing, palpitation of different parts of the body are fully the activities of the body with the acceptance of 'I' while the activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs etc. are such activities that require the participation of both 'I' and body.

The students become aware of their activities of 'I' and start finding their focus of attention at different moments. Also they are able to see that most of their desires are coming from outside (through preconditioning or sensation) and are not based on their natural acceptance

The students are able to list down activities related to proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing different diseases.

UNIT- III – Harmony in the Family and Society

Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Understanding Harmony in the Society, Vision for the Universal Human Order

Tutorial 7: Practice Session PS7 *Exploring the Feeling of Trust,*

Tutorial 8: Practice Session PS8 *Exploring the Feeling of Respect*

Tutorial 9: Practice Session PS9 *Exploring Systems to fulfil Human Goal*

Expected outcome:

The students are able to note that the natural acceptance (intention) is always for living in harmony, only competence is lacking! We generally evaluate ourselves on the basis of our intention and others on the basis of their competence! We seldom look at our competence and others' intention as a result we conclude that I am a good person and other is a bad person.

The students are able to see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship. Many present problems in the society are an outcome of differentiation(lack of understanding of respect), like gender biasness, generation gap, caste conflicts, class struggle, dominations through power play, communal violence, clash of isms and so on so forth. All these problems can be solved by realizing that the other is like me as he has the

same natural acceptance, potential and program to ensure a happy and prosperous life for them and for others through he may have different body, physical facility or beliefs.

The students are able to use their creativity for education children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the existing model.

UNIT - IV – Harmony in the Nature/Existence

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence

Tutorial 10: Practice Session PS*10*   *Exploring the Four Orders of Nature*

Tutorial 11: Practice Session PS*11*   *Exploring Co-existence in Existence*

Expected outcome:

The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them. They are also able to see that human being s are not fulfilling to other orders today and need to take appropriate steps to ensure right participation(in terms of nurturing, protection and right utilization) in the nature.

The students feel confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different

courses of study relate to the different units and levels. Also they are able to make out how these courses can be made appropriate and holistic.

UNIT - V

Implications of the Holistic Understanding – a Look at Professional Ethics

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

Tutorial 12: Practice Session PS*12*

Exploring Ethical Human Conduct

Tutorial 13: Practice Session PS*13*

Exploring Humanistic Models in Education

Tutorial 14: Practice Session PS*14*

Exploring Steps of Transition towards Universal Human Order

Expected outcome:

The students are able to present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.

The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/Management/any other area of study to ensure mutual fulfilment. E.g.mutually enriching production system with rest of nature.

The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for the happy and prosperous family and society.

Guidelines and Content for Practice Sessions (Tutorials)

In order to connect the content of the proposals with practice (living), 14 practice sessions have been designed. The full set of practice sessions is available in the Teacher's Manual as well as the website.

TEXT BOOK:

Text Book and Manual

a. The Textbook

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

b. The Manual

Manual for *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-53-2

Reference Books

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

OUTCOME OF THE COURSE:

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Teaching-Learning Material:

Handouts

https://drive.google.com/drive/folders/16eOka8AoBpLGlCDajRvk4MXgfXQWzFCB?usp=sharing

Presentations

http://www.fdp-si.aicte-india.org/download.php

#1 Recording of English 5-Day Online UHV

FDP

https://www.youtube.com/playlist?list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZlGC4

Recording of UHV-II lectures (including some FAQs)

https://www.youtube.com/playlist?list=PLKDfuUlbRCEbe1oj21ih9ECA78R_l8d3-

II Year - II Semester Course Code: 20CS4P02		L	T	P	C
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	OPERATING SYSTEMS LAB				

Course Objectives:

1. To understand the design aspects of operating system.
2. To study the process management concepts & Techniques.
3. To study the concurrency and dead lock concepts.
4. To study the storage management concepts.
5. To study the file management and disk management concepts.

Course Outcomes:

Students are able to

1. Implement and analyze CPU scheduling and memory management techniques
2. Demonstrate deadlock avoidance and interprocess communication mechanisms
3. Analyze page replacement and file allocation strategies
4. Implement and evaluate disk scheduling techniques for efficient storage management

List of Lab Experiments

1. Simulate the following CPU Scheduling Algorithms

    (a) FCFS (b) SJF (c) Priority (d) Round-Robin

2. Simulate the following

    (a) Multiprogramming with a Fixed number of Tasks (MFT)

    (b) Multiprogramming with a Variable number of Tasks (MVT)

3. Simulate Bankers Algorithm for Dead Lock Avoidance.

4. Write a program to implement the producer-consumer problem using semaphores.

5. Write a program to implement IPC using shared memory.

6. Simulate the following Page Replacement Algorithms

(a) FIFO   (b) LRU   (c) LFU

7. Write a program to simulate the following contiguous memory allocation techniques

   a) Worst-fit b) Best-fit c) First-fit

8. Write a program to implement Paging technique for memory management.

9. Simulate the following File Allocation Strategies

   (a) Sequenced   (b) Indexed   (c) Linked

10. Simulate the following Disk Scheduling Algorithms

   (a) FCFS   (b) SSTF   (c) SCAN

		L	T	P	C
II Year - II Semester **Course Code: 20IT4P01**		0	0	3	1.5
UNIFIED MODELING LANGUAGE (UML) LAB					

Course Objectives:

1. Construct UML diagrams for static view and dynamic view of the system.

2. Generate creational patterns by applicable patterns for given context.

3. Create refined model for given Scenario using structural patterns.

4. Construct behavioral patterns for given applications.

Course Outcomes:

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

1. Analyze case studies and design appropriate models.

2. Apply design patterns to solve complex design problems.

3. Develop design solutions using creational patterns.

4. Construct design solutions utilizing structural and behavioural patterns.

Week 1: Familiarization with Rational Rose or Umbrella For each case study:

Week 2, 3 & 4:

For each case study:

        a) Identify and analyse events

        b) Identify Use cases

        c) Develop event table

        d) Identify & analyse domain classes

        e) Represent use cases and a domain class diagram using Rational Rose

        f) Develop CRUD matrix to represent relationships between use cases and problem

domain classes

Week 5 & 6:

For each case study:

 a) Develop Use case diagrams

 b) Develop elaborate Use case descriptions & scenarios

 c) Develop prototypes (without functionality)

 d) Develop system sequence diagrams

Week 7, 8, 9 & 10:

For each case study:

 a) Develop high-level sequence diagrams for each use case

 b) Identify MVC classes / objects for each use case

 c) Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects

 d) Develop detailed design class model (use GRASP patterns for responsibility assignment)

 e) Develop three-layer package diagrams for each case study

Week 11 &12:

For each case study:

 a) Develop Use case Packages

 b) Develop component diagrams

 c) Identify relationships between use cases and represent them

 d) Refine domain class model by showing all the associations among classes

Week 13 onwards:

For each case study:

 Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams

II Year - II Semester Course Code: 20CS4P01		L	T	P	C
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FUNDAMENTALS OF MACHINE LEARNING LAB					

Course objectives:

This course will enable students to

1. Make use of Data sets in implementing the machine learning algorithms

2. Implement the machine learning concepts and algorithms in any suitable language of choice

Course outcomes:

The students should be able to:

1. Explain the implementation procedures for various machine learning algorithms.

2. Develop Java/Python programs for different machine learning algorithms.

3. Apply appropriate datasets to machine learning algorithms for effective learning and prediction.

4. Identify and implement suitable machine learning algorithms to solve real-world problems.

Note : For every Machine Learning model students should calculate the performance metrics and calculate the predictions on the test set.

1. Build a simple linear regression model and perform predictions on the test dataset. Consider a company's data, where there is the amount spent on different types of advertisements and its subsequent sales

2. Build a Multiple Linear Regression model on a dataset (eg: 50_startups)

3. Cross validate the above two models

4. Design a naive Bayes classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets

5. Build a Logistic Regression classifier by considering a suitable dataset.

6. Implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

7. Design a classifier using Support vector machine on a suitable dataset

8. Build a Decision Tree Classifier on a suitable dataset (eg. Pima Indians Diabetes dataset)

9. Practice K-Means clustering by generating your own data using the make_blobs function from sklearn.datasets module.

10. Perform K-Means clustering on the hand-written digits dataset.

11. Time series modeling - Predict number of air passengers per month. (Dataset : AirPassengers)

12. Create an N-gram language model by using Reuters corpus of the NLTK library

13. Write python implementations for the following activation functions

1. Sigmoid

2. Tanh

3. Relu

4. Softmax

14. Implement perceptron algorithm from scratch and test it on a sample dataset (eg. breast cancer dataset from sklearn)

Weblinks for Datasets:

1. Company Dataset : https://www.kaggle.com/rahulrky/company-data
   https://github.com/Kaushik-Varma/linear_regression_model_python/blob/main/Company_data.csv

2. 50_startups Dataset : Link to dataset : https://www.kaggle.com/farhanmd29/50-startups

3. Pima Indian Diabetes Dataset : https://www.kaggle.com/uciml/pima-indians-diabetes-database

4. Air Passengers : https://www.kaggle.com/rakannimer/air-passengers

		L	T	P	C
II Year - II Semester **Course Code: 20IT4P03**		0	0	4	2

SKILL ORIENTED COURSE - II **WEB APPLICATION DEVELOPMENT USING FULL STACK – MODULE II**

Course Objectives:

The objective of this lab is

1. To build strong foundation of JavaScript which will help developer

2. To apply JavaScript concepts for responsive web frontend development

Course Outcomes:

By the end of this lab the student is able to

1. Explain the principles and tools used to develop and access dynamic websites using HTML5, CSS3, and advanced JavaScript.

2. Implement functions and events for user input handling and validation.

3. Design and develop Single Page Applications (SPA) using AngularJS.

4. Utilize basic React components and manage data effectively using State and Props.

Perform experiments related to the following concepts:

1) Introduction to JavaScript

2) Applying JavaScript (internal and external)

3) Understanding JS Syntax

4) Introduction to Document and Window Object

5) Variables and Operators

6) Data Types and Num Type Conversion

7) Math and String Manipulation

8) Objects and Arrays

9) Date and Time

10) Conditional Statements

11) Switch Case

12) Looping in JS

13) Functions

Additional Experiment:

1. Develop a simple AngularJS Calculator Application that can perform basic mathematical operations based on user input.

2. Create a react component that receives a student name list via props.Use state to count and display how many times the list is refreshed with a button.

3. Build a shopping cart item component that takes name and price as props.Use state to manage quantity and calculate total price with increment/decrement buttons

II Year - II Semester Course Code: 20HS4A01		L	T	P	C
		2	0	0	0
	CRITICAL READING AND CREATIVE WRITING				

COURSE OBJECTIVES:

The students will have the ability to:

1. Understand how to identify, analyze, interpret and describe critical ideas, themes and values in literary texts

2. List the elements of a Short Story

3. Apply critical and theoretical approaches to the reading and analysis of literary texts in multiple genres

COURSE OUTCOMES:

Upon the completion of the course, the student will be able to:

1. Understand and explain the characteristics of a literary text

2. Critically analyze the quality of a Short Story

3. Produce essays like personal essay or descriptive essay applying the principles of good writing

4. Identify facts, themes and critical ideas in a passage

5. Articulate an awareness of the basic elements of a speech

UNIT – I:

Essentials of Good Writing

1. Focus, Development, Unity, Coherence and Correctness

2. Imagery

   A. Figurative Language- Simile, Metaphor, Personification, Hyperbole, Oxymoron,Paradox, Alliteration, Assonance

   B. Sensory details

3. Point of View

UNIT – II:

Elements of a Short story

1. Plot, Setting, Character, Theme
2. Analysis of given short stories: 2 stories
   A. Good Sees the Truth but Waits by Leo Tolstoy
   B. The Cop and the Anthem by O. Henry

UNIT – III

Prose Writing:

      Reflective Writing – Personal Essay

      Descriptive Writing: Person/Place/Thing

UNIT – IV

Reading Comprehension:

      Reading for facts, contextual vocabulary, tone and inference

UNIT – V

Speech Analysis

    A. Tryst with Destiny-

       https://www.youtube.com/watch?v=lrEkYscgbqE

    B. Stay Hungry, Stay Foolish –

       https://www.youtube.com/watch?v=UF8uR6Z6KLc

References

1. The Cambridge Companion to Creative Writing (South Asian Edition)
2. Creative Writing: A Beginner's Manual (Paper Back Edition)
3. Teaching and Developing Reading Skills: Cambridge Handbooks for Language Teachers

Web References:

- https://www.skillsyouneed.com/learn/critical-reading.html
- https://englishforeveryone.org
- http://sixminutes.dlugan.com/speech-evaluation-1-how-to-study-critique-speech/
- http://www.homeofbob.com/literature/genre/fiction/ficElmnts.html

		L	T	P	C
II Year - II Semester **Course Code: 20IT4P03**		0	0	4	2
	Animations-3D Animation **(Skill Oriented Course-II)**				

Course Objectives:

1. To learn the fundamentals ofcomputer based animation.
2. To make use of Max tool for animation.
3. To understand how simulation, effects, lightening & camera, texturing can be performed with Max tool.
4. To understand how to perform Rendering of the objects using V-Ray

Course Outcomes:

After completing this course, the students will be able to

1. Able to explain the animation basics and working of Max tool.
2. Able to develop animations by applying 3-d effects such as polygons, graphites, Xrefs, patches & NURBS.
3. Able to apply Key-Frames, simulations and effects for the animation.
4. Able to explain how lightening and camera motions can be captured along with texturing using Max tool.
5. Able to develop animations with rendering using V-Ray light setup

Unit – I:

Computer-basedAnimation: Definition of Computer-Based Animation, Basic Types of Animation: RealTime, Non-real-time ,Definition of Modelling, Creation of 3D objects.

GettingStartedwithMax: Exploring the Max Interface, Controlling & Configuring the Viewports, Customizing the Max Interface & Setting Preferences, Working with Files ,Importing & Exporting, Selecting Objects & Setting Object Properties, Duplicating Objects, Creating & Editing Standard Primitive & extended Primitives objects, Transforming objects, Pivoting, aligning etc.

Unit – II:

3DModelling: Modeling with Polygons, using the graphite, working with XRefs, Building simple scenes, Building complex scenes with XRefs, using as sets tracking, deforming surfaces & using the mesh modifiers, modeling with patches & NURBS.

KeyframeAnimation: Creating Keyframes, Auto Keyframes, Move & Scale Key frame on the

timeline, Animating with constraints & simple controllers, animation Modifiers & complex controllers, function curves in the track view, motion mixer etc.

Unit – III

Simulation&Effects: Bindto Space Warpobject, Gravity, wind, displace force object, deflectors, FFD spacewarp, wave, ripple, bomb, Creating particle system through parray, understanding particle flow user interface, how to particle flow works, hair & furmodifier, cloth & garment maker modifiers etc.

Unit – IV:

Lighting & Camera: Configuring & Aiming Cameras, camera motion blur, camera depth of field, camera tracking, using basic lights & lighting Techniques, working with advanced lighting, Light Tracing, Radio sity, video post, mental ray lighting etc.

Texturing with Max: Using the material editor & the material explorer, creating & applying standard materials, adding material details with maps, creating compound materials & material modifiers, un wrapping UVs & mapping texture, using atmospheric & render effects etc.

Unit V:

RenderingwithV-Ray:V-raylight setup,V-ray rendering settings, HDR IIllumination, Fine tuning shadows, Final render setting etc.

TEXT BOOKS:

1. 3Ds Max7 Fundamentals, TedBoardman, NewRiders 2005.
2. Modelrig,Animatewith3d'smax6, Michelebousquet, Many World Production
3. 3DModelling, Animation, and Rendering, ―MichaelE.Mortenson, Createspace August 2010.

REFERENCE BOOKS:

1. 3DModellingandAnimation, MichaelG., Igi Publishing
2. BeginningBlender: Open Source3DModelling, Animation, and Game Design, LanceFlavell, Apress

E-Resources:

1. https://www.classcentral.com/course/udemy-3ds-max-architecture-25618
2. https://www.classcentral.com/course/udemy-3ds-max-modeling-38785

Syllabus for
III B.Tech - I Semester
(R20)

III Year - I Semester **Course Code: 20CS5T01**		L	T	P	C
		3	0	0	3
	DESIGN AND ANALYSIS OF ALGORITHMS				

COURSE OBJECTIVES

1. Analyze the asymptotic performance of algorithms.

2. Write rigorous correctness proofs for algorithms.

3. a familiarity with major algorithms and data structures.

4. Apply important algorithmic design paradigms and methods of analysis.

5. Synthesize efficient algorithms in common engineering design situations.

COURSE OUTCOMES

Students who complete the course will have demonstrated the ability to do the following:

1. Explain algorithm design concepts, performance analysis, and complexity.

2. Apply the Divide and Conquer approach to efficiently solve sorting and searching problems.

3. Solve optimization problems using the Greedy method.

4. Implement Dynamic Programming techniques for real-world problem-solving.

5. Apply Backtracking and Branch & Bound techniques to solve combinatorial problems.

UNIT-I

Introduction: What is an Algorithm, Algorithm Specification, Pseudocode Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities, Performance Measurement.

UNIT-II

Divide and Conquer: General Method, Defective Chessboard, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement, Randomized Sorting Algorithms (Quick Sort).

UNIT-III

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, An Optimal Randomized Algorithm, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT-IV

Dynamic Programming: All - Pairs Shortest Paths, Single – Source Shortest paths General Weights, String Editing, 0/1 Knapsack, Reliability Design.

UNIT-V

Backtracking: The General Method, The 8-Queens Problem, Sum of Subsets, Graph Coloring. Branch and Bound: The Method, Least cost (LC) Search, Control Abstraction for LC-Search, Bounding, FIFO Branch-and-Bound, LC Branch and Bound, 0/1 Knapsack Problem, LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salesperson.

TEXT BOOKS:

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, University Press
2. Introduction to Algorithms, Thomas H. Cormen, PHI Learning

REFERENCE BOOKS

1. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman
2. Algorithm Design, Jon Kleinberg, Pearson.

III Year - I Semester **Course Code: 20CS5T02**		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
COMPUTER NETWORKS					

Course Objectives:

1. Understand state-of-the-art in network protocols, architectures, and applications.

2. Process of networking research

3. Constraints and thought processes for networking research

Course Outcomes:

After completing this course, the students will be able to

1. Explain OSI and TCP/IP models and analyze physical layer design issues.

2. Evaluate MAC layer protocols and LAN technologies.

3. Analyze routing and congestion control algorithms.

4. Describe the functionality of the Transport, Session, and Presentation layers.

5. Examine various Application layer protocols and their use cases.

UNIT-I

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model-
the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models.

Physical Layer: Guided Transmission Media, Digital Modulation and Multiplexing: Frequency
Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing, Wavelength Division
Multiplexing.

UNIT-II

The Data Link Layer: Design issues, error detection and correction, elementary data link protocols,
sliding window protocols, example data link protocols - HDLC, the data link layer in the internet.

The Media Access Sub Layer: Channel allocation problem, multiple access protocols.

UNIT-III

Network Layer: Network layer design issues

Routing algorithms: Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector

Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing.
Congestion control algorithms.

UNIT-IV

The Transport Layer: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP

Session Layer: Design issues, remote procedure call (RPC)

Presentation Layer: Design issues, Data compression techniques

UNIT V

The Application Layer: Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http.

Application Layer Protocols: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet

TEXT BOOKS:

1. Tanenbaum and David J Wetherall, Computer Networks, 6th Edition, Pearson Edu, 1 April 2022 (Publication Date)

2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education

REFERENCE BOOKS:

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks - A Systems Approach" (5th ed), Morgan Kaufmann/ Elsevier, 2011

2. James F.Kurose and Keith W.Ross,"Computer Networking: A Top Down Approach" (8th ed), Pearson, 2022.

III Year - I Semester Course Code: 20IT5T01		L	T	P	C
		3	0	0	3
COMPILER DESIGN					

Course Objectives:

Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.

Course Outcomes:

After completing this course, the students will be able to

1. Analyze the different phases in the compilation process.
2. Compare top down with bottom up parsers, and develop appropriate parser to produce parse tree representation of the input.
3. Construction of LR parse tables, various forms of intermediate code & Syntax directed translation.
4. Explain the role of runtime environment & issues in Code Generation..
5. Apply optimization techniques to intermediate code and generate machine code for high level language program.

UNIT I

Introduction: Language Processing, Structure of a compiler, the evaluation of Programming language, Programming Language Basics.

Lexical Analysis: The role of lexical analyzer, specification of tokens. Recognitions of tokens the lexical analyzer generator lexical

UNIT II

Syntax Analysis: The Role of a parser, Context free Grammars Writing A grammar, top down parsing bottom up parsing, Introduction to LL Parser & LR Parsers.

UNIT III

More Powerful LR parser (LR1, LALR) Using Ambiguous Grammars Equal Recovery in LR parser Syntax Directed Transactions Definition, Evolution order of SDTS Application of SDTS. Syntax Directed Translation Schemes.

Intermediated Code : Generation Variants of Syntax trees 3 Address code, Types and Deceleration, Translation of Expressions, Type Checking, Back patching.

UNIT IV

Runtime Environments, Stack allocation of space, access to Non Local data on the stack Heap Management

Code Generation - Issues in design of code generation the target Language Address in the target code Basic blocks and Flow graphs. A Simple Code generation.

UNIT V

Machine Independent Optimization: The principal sources of Optimization peephole Optimization, Introduction to Data flow Analysis.

TEXT BOOKS:

1. Compilers, Principles, Techniques and Tools. Alfred V Aho, Monical S. Lam, Ravi Sethi, Jeffery D. Ullman, 2nd edition,Pearson,2007

2. Compiler Design K.Muneeswaran, OXFORD

3. Principles of compiler design, 2nd edition, Nandhini Prasad, Elsevier.

REFERENCE BOOKS:

1. Compiler Construction, Principles and practice, Kenneth C Louden, CENGAGE

2. LEX & YACC Tutorial, Tom Niemann, epaperpress.com

3. Implementations of Compiler, A new approach to compilers including the algebraic methods, Yunlinsu, SPRINGER

III Year - I Semester Course Code: 20JE5T01		L	T	P	C
		3	0	0	3
WEB TECHNOLOGIES					

Course Objectives:

The course enables students to:

1. Describe the fundamentals of concepts of web and xml schemes

2. Acquire server side scripting language concepts using PHP and Nodejs

3. Creation of databases using MongoDB and integration using PHP and Nodejs.

4. Understand the basic knowledge of servlets and jsp in building dynamic web applications.

Course Outcomes:

The student will be able to:

1. Enumerate the Basic Concepts of Web, Markup Languages and XML Schemas.

2. Develop web applications using Scripting Languages

3. Design and develop web application using Node JS to connect MongoDB

4. Implement java and server side servlets to develop web applications.

5. Build interactive web applications using JSP by applying MVC framework.

UNIT I - Introduction to Web & XML

Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. HTML5 concepts, CSS3, Anatomy of web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

UNIT II - PHP

Introduction to PHP, Create and run PHP script, working with variables, constants, data types, operators, conditional statements, control statements, arrays, functions, cookies, session tracking, working with forms and MySQL databases.

UNIT III - Node.js & MongoDB

Node.JS: Introduction to Node.js, Features of Node.js, Advantages, Node.js Process Model, Node.js Built-in Modules, Node.js HTTP Module, Node.js NPM, Node.js File System Module and Node.js Events.

MongoDB: Introduction to NoSQL, create and manage MongoDB, Migration of Data into MongoDB, MongoDB with PHP, MongoDB with Nodejs.

UNIT IV – Java Servlets

Java Servlets: Introduction to Servlets: Lifecycle of a Servlet, The Servlet API, The javax.servlet Package, Reading Servlet parameters, and Reading Initialization parameters. javax.servlet HTTP package, Handling Http Request & Responses, Using Cookies, Session Tracking, Security Issues.

UNIT V – Java Server Pages

Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing, JSP scripting, declarations, expression tag, JSP directives, Implicit JSP Objects, JSP action elements, cookies and session tracking, connecting to mysql database in JSP and MVC in JSP.

Text Books:

1. Programming the World Wide Web - Robert W. Sebesta - 7th edition – Pearson, 2013.
2. Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.
3. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill, July 2017.
4. Pro Mean Stack Development, 1st Edition, ELad Elrom, Apress O'Reilly, 2016.

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2009.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, engage Learning, 2003.
3. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.
4. Core Servlets and Java Server Pages: Volume 1: Core Technologies by Marty Hall and Larry brown Pearson, 2003.
5. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia.

III Year - I Semester Course Code: 20CS5T03		L	T	P	C
		3	0	0	3
	PROFESSIONAL ELECTIVE-I COMPUTER GRAPHICS				

Course Objectives:

1. To understand the importance of and describing the diversity of application areas of computer graphics and exploring basic features of graphics hardware components and software packages.

2. To understand output primitives (point, line, circle etc) and describing fundamental algorithms to display 2-D shapes.

3. To illustrate methods for filing an object with colors.

4. To Explore the need of visible surface area detection.

5. To give importance and need of animation in different fields, exploring the animation techniques.

Course Outcomes:

Upon successful completion of this course, student will be able to:

1. Describe the basics of computer graphics, different graphics systems and applications of computer graphics.

2. Discuss various output primitives and algorithms for scan conversion, filling of basic objects and their comparative analysis.

3. Apply 2D basic geometric primitive algorithms to compute transformations and viewing techniques for producing custom shaped objects.

4. Apply 3D basic geometric primitive algorithms to compute transformations and viewing techniques for producing custom shaped objects and Interpret 3D object representations by different projection methods.

5. Demonstrate visible surface detection algorithms, ray tracing and various animation sequences of motion.

UNIT I

INTRODUCTION: Application areas of computer graphics, overview of graphics systems, video-display devices and raster-scan systems, random scan systems, graphics monitors, work stations and input devices, graphics standards.

UNIT II

OUTPUT PRIMITIVES: Points and lines, line drawing algorithms, midpoint circle and ellipse algorithms. Filled area primitives - scan line polygon fill algorithm, boundary fill and flood fill algorithms.

UNIT III

2D - GEOMETRICAL TRANSFORMS: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms transformations between coordinate systems.

2D - VIEWING: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland– Hodgeman polygon clipping algorithm.

UNIT IV

3D - GEOMETRIC TRANSFORMATIONS: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

3D - VIEWING: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

3D - OBJECT REPRESENTATION: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curves, Bezier and B-spline surfaces.

UNIT V

VISIBLE SURFACE DETECTION METHODS: Classifications, back face detection, depth buffer, scan line and depth sorting.

COMPUTER ANIMATION: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.

TEXT BOOKS:

1. Donald Hearn, M. Pauline Baker (2011), Computer Graphics with Open GL, 3rd edition, Pearson Education, India.

REFERENCE BOOKS:

1. David F. Rogers (1998), Procedural elements for Computer Graphics, 2nd edition, Tata Mc Graw Hill, New Delhi, India.

2. Steven Harrington (1987), Computer Graphics, 2nd edition, Tata Mc Graw Hill, New Delhi, India.

3. Zhigand xiang, Roy Plastock (2000), Computer Graphics, 2nd edition, Schaum's outlines

III Year - I Semester Course Code:20CS5T04		L	T	P	C
		3	0	0	3
	PROFESSIONAL ELECTIVE - I **SOFTWARE TESTING METHODOLOGIES**				

Course Objectives:

1. Teach fundamentals of various testing methodologies.
2. Describe the principles and procedures for designing test cases.
3. Provide support for debugging methods.
4. Acts as the reference for software testing techniques and strategies.

Course Outcomes:

After completing this course, the students will be able to

1. Explain the basic testing procedures and their significance in software quality assurance.
2. Discuss the software testing process and various methodologies, including Transaction Flow and Data Flow testing.
3. Design effective test cases for software validation before delivery to the customer.
4. Demonstrate a wide range of testing techniques for efficient software evaluation.
5. Apply software testing tools to solve real-time problems in various environments.

UNIT-I

Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs, Taxonomy of Bugs.

Flow graphs and Path testing: Introduction to Path Testing, Control Flow Graphs, Path Testing-Paths, Nodes and Links, Loops, Predicates, Path Predicates, Predicate Interpretation, Path predicate Expressions, Predicate Coverage, Path Sensitizing, Path Instrumentation.

UNIT-II

Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques.
Dataflow testing: Data flow testing basics,DATA FLOW graphs,data flow model,slicing,dicing.

UNIT-III

Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing

Paths, Path products and Regular expressions: Path Products & Path Expression, Reduction Procedure.

Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, Don't care terms.

UNIT-IV

State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, Equivalent States, State Testing.

Graph Matrices and Applications: -Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.

UNIT-V

Software Testing Tools: Introduction to Testing, Automated Testing, Introduction to About Win Runner ,Using Win runner, Mapping the GUI, Recording Test, Working with Test, Enhancing Test, Checkpoints, Test Script Language, Putting it all together,Running and Debugging Tests, Analyzing Results, Batch Tests, Rapid Test Script Wizard.

TEXT BOOKS:

1. Software testing techniques – Boris Beizer, Dreamtech, second edition.
2. Software Testing- Yogesh Singh, Camebridge

REFERENCE BOOKS:

1. The Craft of software testing - Brian Marick, Pearson Education.
2. Software Testing, 3rd edition, P.C. Jorgensen, Aurbach Publications (Dist.by SPD).
3. Software Testing, N.Chauhan, Oxford University Press.
4. Introduction to Software Testing, P.Ammann&J.Offutt, Cambridge Univ.Press.
5. Effective methods of Software Testing, Perry, John Wiley, 2nd Edition, 1999.
6. Software Testing Concepts and Tools, P.NageswaraRao, dreamtech Press
7. Win Runner in simple steps by Hakeem Shittu, 2007Genixpress.
8. Foundations of Software Testing, D.Graham& Others, Cengage Learning.

III Year - I Semester Course Code: 20IT5T03		L	T	P	C
		3	0	0	3
	PROFESSIONAL ELECTIVE-I MOBILE APPLICATION DEVELOPMENT				

Course objectives:

With this course, students will be able to:

1. Describe those aspects of mobile programming that make it unique from programming for other platforms
2. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces
3. Program mobile applications for the Android operating system that use basic and advanced phone features
4. Deploy applications to the Android marketplace for distribution

Course Outcomes:

Upon successful completion, students should be able to:

1. Demonstrate the architecture, the ecosystem, features and tools to design mobile applications.
2. Create effective user interfaces that leverage evolving mobile device capabilities.
3. Design, customize and enhance mobile applications with widgets.
4. Develop user friendly mobile applications with application components.
5. Build database applications to provide comprehensive mobile development solutions.

UNIT I

A brief history of Mobile, Types of mobile phone generations, The Mobile Ecosystem, Types of Mobile Applications, Mobile Information Architecture

Android Versions, Features of Android, Android Architecture, Installing Android SDK Tools, Configuring Android in Eclipse IDE, Android Development Tools (ADT), Creating Android Virtual Devices (AVD)

UNIT II

Creating first android application, Anatomy of android application, Deploying Android app on USB connected Android device, Android application components, Activity life cycle, Understanding activities, Exploring Intent objects, Intent Types, Linking activities using intents

UNIT III

Fragments life cycle, Interaction between fragments, Understanding the components of a screen (Layouts), Adapting to display orientation, Managing changes to screen orientation, Utilizing the Action Bar, Working with Views(UI Widgets)-Button, Toast, ToggleButton, CheckBox, RadioButton, Spinner, WebView, EditText, DatePicker, TimePicker, ListView, ProgressBar, Analog and Digital clock, Handling UI events, List fragment, Dialog fragment

UNIT IV

Working with Menus-Option menu, Context menu, Popup menu, Working with images-ImageView, ImageSwitcher, AlertDialog, Alarm manager, SMS messaging, Sending E-mail, Media Player, Using camera for taking pictures, recording video, Handling Telephony Manager

UNIT V

Storing the data persistently-Introducing the Data Storage Options: The preferences, The Internal Storage, The External Storage, The Content Provider , The SQLite database, Connecting with the SQLite database and operations-Insert, Delete, Update, Fetch, Publishing android applications-preparing for publishing, Deploying APK files

Text Books:

1. Wei-Meng Lee(2011),Beginning Android 4 Application Development, Wiley Publishing, Inc.
2. Pradeep Kothari(2014), "Android Application Development(with KitKat support) Black Book", DreamTech Press

Reference Books:

1. James C.Sheusi(2013), "Android Application Development for Java Programmers", Cengage Learning
2. Mark L Murphy(2009), "Beginning Android", Wiley India Pvt Ltd
3. Sayed Y Hashimi and Satya Komatineni(2009), "Pro Android", Wiley India Pvt Ltd
4. Reto Meier, Professional Android 4 Application Development, Wiley India Pvt Ltd

III Year - I Semester **Course Code: 20IT5T04**		L	T	P	C
		3	0	0	3
	PROFESSIONAL ELECTIVE-I **NETWORK PROGRAMMING**				

Course Objectives:

Having successfully completed this course, the student will be able to:

1. Demonstrate mastery of main protocols comprising the Internet.

2. Develop skills in network programming techniques.

3. Implement network services that communicate through the Internet.

4. Apply the client-server model in networking applications.

5. Practice networking commands available through the operating system

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

1. Identifying different models and sockets

2. Demonstrate different TCP Echo server functions and I/O models

3. Rationalize IPV4 and IPV6 Socket options

4. Identifying daemon processing and Advanced input and output functions

5. Analyze Broadcasting and multicasting

UNIT I:

Introduction to Network Programming: Introduction to Network Programming: OSI model, UNIX standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application Elementary Sockets: Sockets introduction, Elementary TCP sockets.

UNIT II:

TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host. I/O Multiplexing: I/O Models, the select and poll functions, Batch input and buffering, shutdown function.

UNIT III:

UDP and Socket options: Elementary UDP sockets: Introduction UDP Echo server functions, lost datagram, summary of UDP example, Lack of flow control with UDP. Socket options: getsockopt and setsockopt functions. Socket states, Generic socket options IPV4 socket options, IPV6 socket options, ICMPV6 socket options and TCP socket options, SCTP socket options, fcntl function.

UNIT IV:

Advanced Sockets and Daemon Processes: IPV4 and IPV6 interoperability, introduction, IPV4 client: IPV6 server, IPV6 client: IPV4 Server, IPV6 Address-testing macros. Daemon Processes and inetdSuperserver –Introduction, syslogd Daemon, syslog Function, daemon_init Function, inetd Daemon, daemon_inetd. Advanced I/O functions: Socket timeouts, recv and send functions, ready and writev functions, recvmsg and send msg functions, Ancillary data.

UNIT V:

Broadcasting and Multicasting: Broadcasting introduction, broadcast addresses, unicast versus Broadcast, dg_cli function using broadcasting, race conditions, Multicasting addresses, multicasting versus broadcasting on a LAN, multicasting on a WAN, source-specific multicast, multicast socket options. Raw Sockets: Introduction, Raw Socket Creation, Raw Socket Output, Raw Socket Input, Ping Program, Traceroute Program

Text Books:

1. UNIX Network Programming, by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Pearson Education
2. UNIX Network Programming, 1st Edition, W. Richard Stevens. PHI.

Reference Books:

1. UNIX Systems Programming using C++ T CHAN, PHI.
2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education
3. Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education

III Year - I Semester		L	T	P	C
Course Code: 20OE5T06		3	0	0	3
	NON-CONVENTIONAL ENERGY SOURCES **(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-I)**				

Course Objectives: The main objectives of this course are

1. Solar radiation data, extra-terrestrial radiation, radiation on earth's surface.

2. Maximum power point techniques in solar pv and wind.

3. Wind energy conversion systems, Betz coefficient, tip speed ratio.

4. Basic principle and working of hydro, tidal systems.

5. Basic principle and working biomass, fuel cell and geothermal systems.

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

1. Analyze solar radiation data, extraterrestrial radiation, radiation on earth's surface.

2. Develop maximum power point techniques in solar PV and wind.

3. Explain wind energy conversion systems, Betz coefficient , tip speed ratio.

4. Explain basic principle and working of hydro, tidal systems.

5. Explain the basic principle of biomass ,fuel cell and geothermal systems.

Unit –I: Fundamentals of Energy Systems

Energy conservation principle, Energy scenario (world and India), Solar radiation: Outside earth's atmosphere, Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surface, Numerical problems.

Unit –II: Solar Thermal Systems Liquid flat plate collections:

Performance analysis, Transmissivity, Absorptivity, Product collector efficiency factor, Collector heat removal factor, Numerical problems, Introduction to solar air heaters, Concentrating collectors and solar pond.

Unit –III: Solar Photovoltaic Systems

Balance of systems, I-V & P-V characteristics, System design, Storage sizing, PV system sizing, Maximum power point techniques, Perturb and observe (P&O) technique.

Wind Energy

Wind patterns, Types of turbines, Kinetic energy of wind, Betz coefficient, Tip speed ratio, efficiency, Power output of wind turbine, Maximum power point tracking.

Unit –IV: Hydro and Tidal power systems

Basic working principle, Classification of hydro systems: large, small, micro, Measurement of head and flow, Energy equation, Types of turbines, Numerical problems.

Unit –V: Biomass, fuel cells and geothermal systems

Biomass Energy: Fuel classification – Pyrolysis – Direct combustion of heat– Different digesters and sizing. Fuel cell: classification – Efficiency – V-I characteristics–Geothermal: classification – Dry rock and acquifer –Energy analysis.

Text Books:

1. S. P. Sukhatme and J. K. Nayak, Solar Energy: Principles of Thermal Collection and Storage, TMH, New Delhi,

3rd Edition, 2009.

2. John Twidell and Tony Weir, Renewable Energy Resources, Routledge, 3rd Edition, 2015.

3. John Andrews and Nick Jelly, Energy Science: Principles, Technologies and Impacts, Oxford, 2nd Edition, 2013.

Reference Books:

1.Ramesh & Kumar, Renewable Energy Technologies, Narosa, 1997.

2. Chetong Singh Solanki, Renewable energy technologies, A practical guide for beginners, PHI, 2008.

III Year - I Semester Course Code: 20OE5T09		L	T	P	C
		3	0	0	3
	PRINCIPLES OF MECHANICS (OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-I)				

Course Objectives: The main objectives of this course are

1. Understand and apply principles of force systems to analyze equilibrium of rigid bodies.
2. Apply concepts of moments and couples to determine resultant forces and positions in systems of coplanar forces.
3. Analyze frictional forces and their effects on equilibrium of bodies on inclined planes.

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

1. Understand and analyze the various types of forces acting on a body, their unit's conversion from one to another and draw free body diagrams.
2. Calculate resultant force and moment to maintain equilibrium.
3. Calculate the co-efficient of friction for different types of surfaces.
4. Determine the centroid /centre of gravity of plain and composite laminar and solid bodies.
5. Determine velocity ratio, mechanical advantage and efficiency of simple machines

UNIT-I: FORCE

Different force systems, principle of transmissibility of forces, law of superposition. Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, triangle law of forces, polygon law of forces, resolution of forces, resolving a force into two rectangular components, Free body diagram, Lami's theorem, Type of Load, supports, Beams, analysis for simply supported, cantilever beams.

UNIT-II: MOMENT

Moment of a force, Varignon's theorem, Principle of moment and its applications (Levers, simple and compound), Parallel forces (like and unlike parallel forces), calculating their resultant, Concept of couple, its properties and effects, General conditions of equilibrium of bodies under coplanar forces, Position of resultant force by moment.

UNIT-III: FRICTION

force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction, angle of repose and coefficient of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction. Equilibrium of bodies on level plane, external force applied horizontal and inclined up and down. Equilibrium of bodies on inclined plane, external forces is applied parallel to the plane, horizontal and incline to inclined plane.

UNIT-IV: CENTER OF GRAVITY

Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies, Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion, Determination of center of gravity of solid bodies, cone, cylinder and sphere; composite bodies.

UNIT-V: Simple Machines

Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines, Simple and compound machine, Definition of ideal machine, reversible and self, locking machine, Effort lost in friction, Load lost in friction, System of pulleys, simple screw jack, worm and worm wheel, single and double winch crab.

Textbooks:

1. S Ramamurtham, Engineering Mechanics, DhanpatRai Publishing Co. Ltd., Rev. Edition, 2016.

2. RK Rajput, Applied Mechanics, Laxmi Publications, 3rd Edition, 2016. REFERENCE BOOKS: 1. RS Khurmi, A Text Book of Engineering Mechanics, S Chand and Co. Ltd.,

References:

1. RS Khurmi, A Text Book of Engineering Mechanics, S Chand and Co. Ltd., Rev. Edition, 2010.

2. AK Upadhya, Applied Mechanics, SK Kataria& Sons, 5th Edition, 2013..

III Year - I Semester Course Code: 20CS5P01		L	T	P	C
		0	0	3	1.5
WEB TECHNOLOGIES LAB					

Course Objectives:

1. Practice Programming in the Java

2. Gain knowledge of object oriented paradigm in the java programming language

3. Learn use of java in a variety of technologies and on different platforms.

Course Outcomes:

The student will be able to:

1. Develop web applications using Scripting Languages (PHP)

2. Develop applications to connect MongoDB

3. Implement java and server side servlets to develop web applications.

4. Develop interactive web applications using JSP by applying MVC framework.

List of Experiments

1. Write an XML file which will display the Book information which includes the following:
   a)Title of the book b)Author Name c)ISBN number d) Publisher name e)Edition f) Price
   Write a Document Type Definition (DTD) to validate the above XML file.

2. Write a PHP program that uses arrays and functions in PHP.

3. Write a PHP program for creating login forms and validating users.

4. Write a PHP program to display all students in CSE using the mysql student table.

5. Create a PHP page for the login system using session.

6. Write a PHP program to connect MongoDB.

7. Write a Nodejs program to read and write file systems.

8. Write a Nodejs program to connect MongoDB.

9. Write a servlet program which receives data from HTML forms and responds to it. Create one Servlet to retrieve "ServletContext Initialization Parameters "which you have given in the web.xml file.

10. Write a servlet program to authenticate four users using cookies.

11. Write a servlet that, on entry of a student roll no, displays the full details of that students Details (Using student table with roll no, Name, Address, date of birth, course fields).

12. Write a JSP program to register a student using the registration form using the student table.

13. Write a JSP program for authenticating a user by his password using login form.

14. Create table to store the details of book(book name, price, author, publisher) and extract data from table and display all books using JSP and mysql.

III Year - I Semester Course Code: 20IT5P02		L	T	P	C
		0	0	3	1.5
COMPUTER NETWORKS & COMPILER DESIGN LAB					

Course Objectives:

1. Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

Course Outcomes:

After completing this course, the students will be able to

1. Design and implement reliable data communication protocols through the data link layer, including various routing algorithms for network optimization.

2. Configure and manage internet connectivity using various network management tools and installation procedures.

3. Design lexical analyzers and construct predictive parsing tables for context-free grammars.

4. Apply Lex and Yacc tools to examine LR parser construction, generate SLR parsing tables, and implement intermediate code generation

List of Experiments

1. Study of Network devices in detail and connect the computers in Local Area Network.

2. Write a Program to implement the data link layer farming methods such as
   a. Character stuffing
   b. Bit stuffing.

3. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.

4. Write a Program to implement Dijkstra's algorithm to compute the Shortest path through a graph..

5. Write a program for congestion control using leaky bucket algorithm

6. Wireshark

   a. Starting Wire shark

   b. Packet Capture Using Wire shark

   c. Viewing Captured Traffic

   d. Analysis and Statistics & Filters.

7. How to run Nmap scan and detect Operating system.

Course Objectives:

1. To enlighten the student with knowledge base in compiler design and its applications

Course Outcomes:

The end of the course student will be able to

   1. Design simple lexical analyzers

   2. Determine predictive parsing table for a CFG

   3. Apply Lex and Yacc tools

   4. Examine LR parser and generating SLR Parsing table

   5. Implement Intermediate code generation.

List of Experiments:

   1. Write a C program to identify different types of Tokens in a given Program.

   2. Write a Lex Program to implement a Lexical Analyzer using Lex tool.

   3. Write a C program to compute the First and Follow Sets for the given Grammar.

   4. Write a C program for eliminating the left recursion and left factoring of a given grammar

   5. Write a C program for implementation of LR parsing algorithm to accept a given input
      string.

   6. Simulate the calculator using the LEX and YACC tool.

   7. Write a C program for generating the three address codes of a given expression/statement.

   8. Write a C program for implementation of a Code Generation Algorithm of a given
      expression/statement.

Text Books & Reference Books :

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam,
   Ravi Sethi, Jeffry D. Ullman, Pearson Publishers, 2007.

2. John R Levine, Tony Mason, Doug Brown, "Lex and Yacc", O'reilly, 2nd Edition, 2009.

3. LEX & YACC Tutorial, Tom Niemann, epaperpress.com

III Year - I Semester **Course Code: 20IT5P03**		L	T	P	C
		0	0	4	2
QUANTITATIVE APTITUDE & LOGICAL REASONING					

Course Objectives:

Enable the students to:

1. Understand divisibility, concepts of LCM & HCF, profit or loss incurred in a transaction.
2. Understand the concepts of SI & CI and the difference between.
3. Know the relation between time, speed & distance and combined work & wages paid for the work.
4. Be familiar with family relations, the techniques of coding.
5. Understand the logic in series, concepts of clocks, identifying day of date.

Course Outcomes:

After completing this course, the students will be able to adopt speed computation techniques and develop logical thinking which are essential for campus recruitment such as

1. Find least and greatest numbers divisible by given numbers and leaving some remainder(s), Identify the profit or loss incurred in a transaction and how cheating is possible by an unfair trader.
2. Able to calculate the simple and compound interest and the EMI repayment for a loan.
3. Evaluate the time taken by a train/car for crossing a static or a moving object and time taken by a person to a row a boat in a river, calculate the time required for individual or combined work, shares of amount for their work and time taken for a tank/cistern to get filled by inlets and outlet.
4. Identify the relation between given persons, Decode the given code pattern and code given word in terms of alphabet, numbers, symbols and mixed
5. Identify missing term in the pattern/series, find angle between hands at given time and vice- versa, find the day of the given date and vice-versa.

UNIT –I: Number Systems -Profit & Loss.

Basic number systems, Divisibility Rules, LCM and HCF.

Cost Price- Selling Price- Marked Price, Discount- Successive Discounts, Profit or Loss Percentage, False Weights- Dishonest Dealer.

UNIT –II: Simple & Compound Interest.

Principal-Interest Rate-Tenure, Simple Interest-Formula-Sum, Compound Interest-Formula-Relation Between Simple & Compound Interest, loan-EMI, Investments-Shares.

UNIT –III: Time & Distance- Time & Work.

Time-Distance-Speed-Relation, Conversion of Speed, Average Speed, Trains-Relative Speed- Same and Opposite –Platform, Races, Boats-Streams-Upstream and Downstream.

Work-Time-Efficiency, Combined Work-Partnership-Division of Wages, Chain Rule, Pipes and Cisterns-Inlet-Outlet.

UNIT –IV: Blood Relations, Coding & Decoding.

Blood relations -family tree, first person narrating type-coded relation-puzzle relation,

Coding and decoding-letter coding, number coding, symbol coding, substitution and mixed type.

UNIT –V: Series, Clocks & Calendars.

Series-number, letter and word type, missing term, odd-man out

Angle between hands - correct or incorrect time, day of a date-repeated calendars.

Text Books:

1. Dr. R.S.Aggarwal, Quantitative Aptitude for competitive Examinations,Sultan Chand Publications, 2017.
2. Dr. R.S. Aggarwal,A Modern Approach to Verbal & Non-Verbal Reasoning Sultan Chand Publications, 2018.

References:

1. Arun Sharma, How to Prepare for Quantitative Aptitude for the CAT, Tata McGrawHillPublishing Company, 2016.
2. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Pearson India, 2016
3. B.S.Sijwali and InduSijwali, A New Approach to Reasoning Verbal & Non-Verbal, Arihant Publishers, 2016.
4. M.K. Pandey, Analytical Reasoning, Bsc Publishing Co. Pvt. Ltd 2009.

III Year - I Semester Course Code: 20CS5A01		L	T	P	C
		2	0	0	0
	EMPLOYABILITY SKILLS-1 **COMPETITIVE CODING**				

Course Objectives:

The development and implementation of advanced algorithms, as well as the skills required for programming competitions.

Course Outcomes:

By the end of the course students will be able to

1. Select appropriate algorithms for a given problem
2. Integrate multiple algorithms for solving a complex problem
3. Design new algorithms, and implement them in Python or Java.
4. Learn skills required for participation in programming contests, which include evaluation of problem difficulty, solving problems in teams, and work under time pressure.
5. Implement dynamic programming to solve complex problems such as the N-Queens problem.

UNIT I

Basics of Array, String, Greedy and Bit Manipulation:

Sum of array elements, Reverse of an array, Maximum and minimum element of an array, counting frequencies of array elements, prefix sum, Kadane algorithm, Activity Selection problem, Sliding Window, Bit manipulation.

UNIT II

Number Theory and Combinatorics:

Prime Number, Sieve of Eratosthenes, Find all divisors of a natural number, Least prime factor of numbers upto N, All prime factors of a number, Prime factorization using Sieve, Sum of all factors of a number, GCD and LCM of two numbers, Euclidean algorithms.

UNIT III

Searching, Sorting, Basic Data Structures:

Linear Search, Binary Search, Merge Sort, Quick Sort, Stack, Queue, Deque, Priority Queue.

UNIT IV

Trees and Graphs:

Tree Traversals, BFS, DFS, Dijkstra's Shortest Path algorithm, Bell-man Ford Algorithm, Floyd's algorithm

UNIT V

Recursion and Dynamic Programming:

Recursion and problems, Backtracking, N-Queens Problem, Dynamic Programming, Minimum-Edit Distance Problem.

Text Books :

- Fundamentals of computer algorithms E. Horowitz S. Sahni, University Press

Reference Books :

1. Competitive Programming in Python: 128 Algorithms to Develop your Coding Skills by by Christoph Dürr, Jill-Jênn Vie

2. Guide to Competitive Programming: Learning and Improving Algorithms Through Contests (Undergraduate Topics in Computer Science) by Antti Laaksonen.

Syllabus for

III B.Tech - II Semester (R20)

III Year - II Semester Course Code: 20CS6T01		L	T	P	C
		3	0	0	3
	DATA WAREHOUSING AND DATA MINING				

Course objective:

1. To understand and implement classical models and algorithms in data warehousing and data mining.
2. To analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
3. To assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

Course Outcomes:

After completing this course, the students will be able to

1. Explain the need for Data Mining and perform data understanding and preprocessing.
2. Analyze warehousing architectures and tools for organizing large databases to support strategic decision-making.
3. Perform Association Analysis to identify frequent patterns in data.
4. Apply classification algorithms to data for making future predictions.
5. Implement data clustering techniques using various algorithms to detect anomalies.

Unit 1: Introduction to Data Mining and Preprocessing

Why Data Mining, what is Data Mining, what kinds of patterns can be mined, which technologies are used, what kind of applications are targeted, Major issues in Data Mining, Data Objects and attribute types, Basic statistical description of Data, Data Visualization, Measuring similarity and Dissimilarity. Overview of Data preprocessing, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Discretization.

Unit 2: Data warehousing and Online Analytical processing

Introduction to data warehouse , features, Difference between Operational database and Data Warehouse, Need for separate warehouse, Data Warehouse Architecture, Data Warehouse models, ETL, Metadata Repository, Data Cube, Schemas for multidimensional data models, OLAP operations.

Unit 3: Mining Frequent patterns, Association and Correlation

Basic Concepts and Algorithms: Problem Definition, Frequent Item Set Generation, Apriori Principle, Apriori Algorithm, Rule Generation, Compact Representation of Frequent Itemsets, FP Growth Algorithm.

Unit 4: Classification

Basic concepts, Decision tree Induction, Bayes classification methods: Bayes theorem, Bayesian Belief networks, Support vector machine, Classification using frequent patterns, Lazy learners, Model Evaluation and selection, Techniques to improve classification accuracy

Unit 5: Cluster and Outlier Analysis

Introduction to clustering, K-Means, K-Medoids, Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm, DBSCAN, STRING, Evaluation of clustering.
Outlier and Outlier Analysis, Outlier Detection methods, statistical approaches, Proximity based approach

Text Books:

1) Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier,
2) Introduction to Data Mining : Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson.

Reference Books:

1) Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning, 2010
2) Data Mining : Introductory and Advanced topics : Dunham, First Edition, Pearson, 2020
3) Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH, 2008
4) Data Mining Techniques, Arun K Pujari, Universities Press, 2001

Web Resources:

1. NPTEL Online Course on Data Mining : https://onlinecourses.nptel.ac.in/noc18_cs14/preview

III Year - II Semester Course Code: 20CS6T02		L	T	P	C
		3	0	0	3
CRYPTOGRAPHY AND NETWORK SECURITY					

Course Objectives:

The main objectives of this course are

1. To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, public key
2. Algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and SSL/TLS.

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

1. Explain different security concepts, threats, attacks, and countermeasures.
2. Classify the basic principles and operations of symmetric key algorithms.
3. Analyze the principles and working mechanisms of public key and asymmetric key algorithms.
4. Implement hash algorithms, digital signatures, and key management techniques for secure communication.
5. Examine Transport Layer and Network Layer security protocols for data protection.

UNIT I

Fundamental of Security Concepts: Cryptography, Security Goals, Services, Mechanisms,

Attacks: Active and Passive, ARP Attack, Phishing Attack, Substitution and transposition Cipher

SQL Injection. TCP, UDP session hijacking,

UNIT II

Block Cipher: Block Cipher Principles, Block Cipher Modes of Operations.

Symmetric Encryption: Feistel Cipher, Data Encryption Standard (DES), Advanced Encryption Standard(AES), IDEA, CAST, Blowfish

UNIT III

Mathematics of Cryptography: Binary operation, Integer division, Modular Arithmetic,Additive inverse, Multiplicative inverse, Euclidean algorithm, Fermat's Theorem, Euler's Phi Function, Chinese Remainder Theorem.

Asymmetric Encryption: Diffie Hellman Key Exchange, RSA, Elliptic Curve Cryptography, Elgamal Cryptography

UNIT IV

Data Integrity, Digital Signature Schemes & Key Management: Message Integrity, Message Authentication Code, SHA-512, Digital Signatures, Symmetric Key Distribution, Kerberos, Public key Distribution. Security at application layer: PGP and S/MIME

UNIT V

Security at the Transport Layer: SSL and TLS, Security at the Network Layer: IPSec,System Security Intrusion Detection System: Host Based, Network Based, Audit Records, Virus and its types, Firewalls.

Text Books:

1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep
   Mukhopadhyay, McGraw Hill,2015

2. Cryptography and Network Security,4th Edition, William Stallings, (6e) Pearson,2006

3. Everyday Cryptography, 1st Edition, Keith M.Martin, Oxford,2016

Reference Books:

1. Network Security and Cryptography, 1st Edition, Bernard Meneges, Cengage Learning,2018.

III Year - II Semester Course Code: 20IT6T01		L	T	P	C
		3	0	0	3
	INTERNET OF THINGS				

Course Objectives
1. To understand the fundamentals of the Internet of Things and to know the physical design, logical design and various IoT level models.
2. To teach a student how to design IoT applications and to know the various communication models and protocols.
3. To understand the fundamentals of 8051 Microcontroller and various IoT Platforms.
4. To build a real time IoT application and deploy using Arduino, NodeMCU 8266 and Raspberry Pi.
5. To understand various Cloud Computing platforms and Big Data analytics applied in IoT.

Course Outcomes:

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

1. Explain the IoT basics and compare various IoT levels
2. Compare different wireless communication protocols for IoT.
3. Illustrate the various microcontrollers and compare different IoT development boards
4. Implement interfacing of various sensors with Arduino/NodeMCU & Raspberry Pi and connect to various IoT cloud platforms.
5. Build real time case study projects using IoT.

UNIT I: **Introduction to IoT**

Introduction to IoT-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs..

UNIT II: **IoT Design and Wireless Communication Protocols**

IoT Design Methodology , IoT Components, IoT Design Methodology using home automation and

Weather monitoring, Wireless Communication Protocols : 6LoWPAN, Zigbee, WIFI, , Bluetooth and BLE ,LPWANs, Cellular 4G,5G,RFID, Lifi, Widi.

UNIT III: 8051 Microcontroller and IoT Platforms

Introduction to Microcontrollers, the 8051 Instruction Set, AT89S8253 Microcontroller, Assembly Language, IoT Development Boards -NodeMCU, ESP8266, Arduino, Intel Galileo and Raspberry Pi.

UNIT IV: IoT Protocols and Raspberry Pi IoT Platform

MQTT, UDP, MQTT brokers, publish subscribe modes, HTTP, COAP, XMPP and gateway protocols, IEEE 802.15.4 protocols. Building IOT with RASPBERRY PI- IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python

UNIT V: Building IoT using NodeMCU and Arduino & Cloud Computing

Introduction to NodeMCU, Arduino and working example. Cloud Computing: Clouds types and their features, open source IoT platforms, AWS cloud for IoT, Thing Speak, Firebase, Python Web Application Framework Django, AWS web services for IoT. Case study: Lighting as a service, Intelligent Traffic systems , Smart Parking , Smart water management.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, Internet of Things A hands-on approach,Universities Press, 2015 .

2. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things,David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017

3. Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner, "Enabling things to talk – Designing IoT solutions with the IoT Architecture Reference Model", Springer Open, 2016

References:

1. Jan Holler, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things   Introduction   to   a   New Age of Intelligence", Elsevier, 2014.

2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key

applications and Protocols, Wiley, 2012.

3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978- 9386873743).

III Year - II Semester Course Code: 20CS6T03		L	T	P	C
		3	0	0	3
	PROFESSIONAL ELECTIVE-II **HUMAN COMPUTER INTERACTION**				

Course Objective:

The main objective is to get students to think constructively and analytically about how to design and evaluate interactive technologies.

Course Outcomes:

After completing this course, the students will be able to

1. Understand the capabilities of both humans and computers from the viewpoint of human information processing.

2. Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.

3. Apply an interactive design process and universal design principles to designing HCI systems.

4. Describe and use HCI design principles, standards and guidelines.

5. Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.

6. Discuss tasks and dialogs of relevant HCI systems based on task analysis and dialog design.

UNIT I

Introduction: Usability of Interactive Systems- introduction, usability goals and measures, usability motivations, universal usability, goals for our profession Managing Design Processes: Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories

UNIT II

Menu Selection, Form Fill-In and Dialog Boxes: Introduction, Task- Related Menu Organization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data entry with Menus: Form Fill-in, dialog Boxes, and alternatives, Audio Menus and menus for Small Displays

UNIT III

Command and Natural Languages: Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in Computing Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays-Small and large.

UNIT IV

Quality of Service: Introduction, Models of Response-Time impacts, Expectations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences Balancing Function and Fashion: Introduction, Error Messages, Non-anthropomorphic Design, Display Design, Web Page Design, Window Design, Color.

User Documentation and Online Help: Introduction, Online Vs Paper Documentation, Reading from paper Vs from Displays, Shaping the content of the Documentation, Accessing the Documentation, Online tutorials and animated documentation, Online communities for User Assistance, The Development Process.

UNIT V:

Information Search: Introduction, Searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces Information Visualization: Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization

TEXT BOOKS:

1. Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs, Pearson
2. The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley DreamaTech.

REFERENCE BOOKS:

1. Human Computer, Interaction Dan R.Olsan, Cengage ,2010.

2. Designing the user interface. 4/e, Ben Shneidermann , PEA.

3. User Interface Design, Soren Lauesen , PEA.

4. Interaction Design PRECE, ROGERS, SHARPS, Wiley.

III Year - II Semester Course Code: 20CS6T04		L	T	P	C
		3	0	0	3
PROFESSIONAL ELECTIVE-II **SOFTWARE PROJECT MANAGEMENT**					

Course Objectives:

At the end of the course, the student shall be able to:

1. To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project

2. To compare and differentiate organization structures and project structures

3. To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to

1. Explain the processes followed in various Software Development Life Cycle (SDLC) models.

2. Describe the key concepts of project management and planning.

3. Select and apply appropriate project plans by managing people, communication, and change effectively.

4. Discuss the essential activities required to successfully complete and close software projects.

5. Implement communication, modeling, and construction & deployment practices in software development.

UNIT I

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

UNIT II

The Old Way and The New: The principles of conventional software Engineering, Principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

UNIT III

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows. Checkpoints of the Process: Major milestones, Minor Milestones, Periodic status assessments.

UNIT IV

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, pragmatic Software Metrics.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique.

Text Books:

1. Software Project Management, Walker Royce, Pearson Education, 2005.
2. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

Reference Books:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.

3. Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

III Year - II Semester Course Code: 20IT6T02		L	T	P	C
		3	0	0	3
	PROFESSIONAL ELECTIVE-II **DevOps**				

Course Objective:

1. DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance.

Course Outcomes (COs):

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

1. Identify the DevOps Concepts and Tools for effective project management.
2. Utilize GIT to keep track of different versions of the source code.
3. Build and Automate Test using Jenkins.
4. Implement containerization with Docker.
5. Use ANSIBLE, Kubernetes for automation and deployment.

UNIT-I

Introduction to Devops: Introduction to SDLC, Agile Model. Introduction to Devops, DevOps Features, DevOps Architecture, DevOps Lifecycle, Understanding Workflow and principles, Introduction to DevOps tools, Build Automation, Delivery Automation, Understanding Code Quality, Automation of CI/CD.

UNIT-II

Source Code Management (GIT): What is Version Control and GIT, GIT Installation, GIT features. GIT workflow, Working with remote repository, GIT commands, GIT branching, GIT staging and collaboration.

UNIT-III

Build Automation – Continuous Integration(CI): Build Automation, What is CI , Why CI is Required ,CI tools, Introduction to Jenkins (With Architecture), jenkins workflow, jenkins master slave architecture, Jenkins Pipelines, Pipeline Basics – Jenkins Master, Node, Agent, and Executor, Freestyle Projects & Pipelines, Jenkins for Continuous Integration, Create and Manage Builds,User Management in Jenkins, Schedule Builds, Launch Builds on Slave Nodes.

UNIT-IV

Continuous Delivery: Importance of Continuous Delivery, Continuous Deployment: CD Flow, Containerization with Docker: Introduction to Docker, Docker installation, Docker commands, Images & Containers, DockerFile, Running containers, Working with containers and publish to Docker Hub.

UNIT-V

Configuration Management – ANSIBLE: Introduction to Ansible, Ansible tasks, Roles, Jinja2 templating, Vaults, Deployments using Ansible. Containerization Using Kubernetes (OPENSHIFT): Introduction to Kubernetes Namespace & Resources , CI/CD, Deploying Apps on Openshift Container Pods.

Text Books:
1. Joyner, Joseph., Devops for Beginners: Devops Software Development Method Guide for Software Developers and It Professionals, 1st Edition, Mihails Konoplovs, 2015.
2. Alisson Machado de Menezes., Hands-on DevOps with Linux, 1st Edition, BPB Publications, India, 2021.

Reference Books:
1. Gene Kim, Jez Humble, Patrick Debois, John Willis. The DevOps Handbook, 1st Edition, , IT Revolution Press, 2016.
2. Verona, Joakim., Practical DevOps, 1st Edition, Packt Publishing, 2016.

III Year - II Semester		L	T	P	C
Course Code: 20IT6T03		**3**	**0**	**0**	**3**
	PROFESSIONAL ELECTIVE-II **DISTRIBUTED SYSTEMS**				

Course Objectives:

To understand the foundations of distributed systems.

1. To learn issues related to clock Synchronization and the need for global state in distributed systems
2. To learn distributed mutual exclusion and deadlock detection algorithms
3. To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
4. To learn the characteristics of peer-to-peer and distributed shared memory systems

Course Outcomes:

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

1. Elucidate the foundations and issues of distributed systems
2. Illustrate the various synchronization issues and globalstate for distributed systems
3. Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
4. Describe the agreement protocols and fault tolerance mechanisms in distributed systems
5. Describe the features of peer-to-peer and distributed shared memory systems

UNIT I

Distributed Systems: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges. A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications.

Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

UNIT II

Message Ordering & Snapshots: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

UNIT III

Distributed Mutex & Deadlock: Distributed mutual exclusion algorithms: Introduction, Preliminaries, Lamport's algorithm, Ricart-Agrawala algorithm, Maekawa's algorithm, Suzuki–Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Knapp's classification, Algorithms forthe single resource model, the AND model and the OR model.

UNIT IV

Recovery & Consensus: Check pointing and rollback recovery: Introduction, Background and definitions, Issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, Coordinated check pointing algorithm, Algorithm for asynchronous check pointing and recovery. **Consensus and agreement algorithms:** Problem definition, Overview of results, Agreement in a failure, free system, Agreement in synchronous systems with failures.

UNIT V

Peer-to-peer computing and overlay graphs: Introduction, Data indexing and overlays, Chord –Content addressable networks, Tapestry.

Distributed shared memory: Abstraction and advantages, Memory consistency models, Shared Memory Mutual Exclusion.

Text Books:

1. Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012.
2. Distributed computing: Principles, algorithms, and systems, Ajay Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.

Reference Books:

1. Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall ofIndia, 2007.

2. Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri, McGrawHill, 1994.

3. Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,Pearson Education, 2007.

E-Resources:

1. https://nptel.ac.in/courses/106/106/106106168

III Year - II Semester Course Code: 20JE6T01		L	T	P	C
		3	0	0	3
	Job Oriented Elective NoSQL DATABASES				

Course Objectives:

1. Understand the fundamentals of NoSQL Databases

2. Understand various NoSQL databases and their uses.

3. Perform various operations on NoSQL databases.

Course Outcomes:

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

1. Discuss about Aggregate Data Models and NoSQL Databases.

2. Analyze about distribution models including Master-Slave Replication, Peer-to-Peer replication and implement and evaluate Key- Value Databases.

3. Demonstrate the detailed architecture and performance tune of Column-oriented NoSQL databases.

4. Develop applications using Document-Oriented NoSQL databases (MongoDB) and optimize performance for real-world datasets.

5. Apply Graph databases (Neo4j) to model and query real-world data efficiently using CQL.

UNIT-I

Introduction, Overview and History of NoSQL Databases, SQL vs NOSQL, Advantages over RDBMS, Limitations, Different Types of NoSQL Databases, Attack of the Clusters, The Emergence of NoSQL. Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation.

UNIT-II

Distribution Models: Single Server, Shading, Master-Slave Replication, Peer-to-Peer Replication, Combining Shading and Replication, the CAP Theorem. **Key-Value Database**s: What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Suitable Use Cases, When Not to Use.

UNIT-III

Column Oriented Databases: What Is a Column-Family Data Store, Cassandra Database: What is Cassandra, Cassandra Architecture, Cassandra Data types, Cassandra Query Language-CQL, Creating, Altering, Dropping a KeySpace, Cassandra CRUD Operations, Suitable Use Cases, and When Not to Use.

UNIT-IV

Document Oriented Databases: What Is a Document Database, Document Database using MongoDB, MongoDB Data Types, JSON, JSON Syntax, Creating JSON Object, MongoDB Data Modelling, MongoDB CRUD Operations, MongoDB Collections: Creating CSV Files, Exploring dataset structures, Using MongoDB , Suitable Use Cases, and When Not to Use.

UNIT-V

Graph Databases: What Is a Graph Database, Graph Database using Neo4j, Advantages of Neo4j, CQL Data Types,Neo4j CQL Operators, Create Nodes, Create Relationships, Index, Constraint, Select data with match, Import data from CSV, Drop an Index, Drop a Constraint, Deleting Nodes, Deleting Relationships. Suitable Use Cases, and When Not to Use.

Text Books:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.

Reference Books:

1. Dan Sullivan, "NoSQLFor Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN13:978-9332557338)

2. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)

3. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)

WEB REFERENCES:

1. https://www.ibm.com/cloud/learn/nosql-databases

2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp

3. https://www.geeksforgeeks.org/introduction-to-nosql/

III Year - II Semester Course Code:20OE6T04		L	T	P	C
		3	0	0	3

(OPEN ELECTIVE/ JOB ORIENTED ELECTIVE-II)
COMPUTER AIDED DESIGN AND ANALYSIS

Course Objectives: The main objectives of this course are

1. To understand the basic fundamentals of computer aided design
2. To learn 2D & 3D transformations of the basic entities like line, circle, ellipse etc.
3. To understand the concepts behind formulation methods in FEM

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

1. Understand the fundamental concepts of CAD and applications of computer graphics.
2. Interpret the geometric techniques and requirements including points and lines.
3. Describe the parametric curves, surfaces and solid modelling techniques using transformation matrix.
4. Understand the virtual environment of 3D modelling and able to modelling the 3D objects.
5. Understand basics of FEM and Able to apply suitable boundary conditions to a global equation for 1D elements.

UNIT –I: Introduction

Introduction to CAD, Elements of CAD, Essential requirements of CAD, Concepts of integrated CAD, Engineering Applications CAD systems, Computer Graphics Input devices cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch panels, Flat Panel display, printers and plotters.

UNIT –II: Computer Graphics

Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm Geometric Transformations: World/device Coordinate Representation, Windowing and clipping, 2D Geometric Transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3D transformations, multiple transformation.

UNIT –III: Curves

Curves representation, Properties of curve design and representation, Interpolation vs approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its

properties, Bezier Curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties.

UNIT –IV: 3D Graphics

Fundamentals of Solid modeling, Boundary representation, Constructive solid geometry, Sweep representation, Color models. Basic application commands for 2D drafting software AutoCAD & 3D solid modeling software Solidworks.

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UNIT –V: Basics of Finite Element Analysis

Basic concept of the finite element method, comparison of FEM with direct analytical solutions; Steps in finite element analysis of physical systems, Finite Element analysis of 1-D problems like spring and bar elements formulation and development of elemental stiffness equations and their assembly, solution and its post processing.

Text Books:

1. Hearn & Baker, Computer Graphics, Prentice Hall of India, 2nd Edition, 1994.

2. Groover and Zimmers, CAD/CAM: Computer-Aided Design and Manufacturing, Prentice Hall India Ltd. 1st Edition, 1984.

Reference Books:

1. Ibrahim Zeid, R Sivasubramanian, CAD/CAM: Theory and Practice, McGraw Hill, 2nd Edition, 2009.

2. Rogers and Adams, Mathematical Elements for Computer Graphics, McGraw Hill, 2nd Edition, 2017.

III Year - II Semester		L	T	P	C
Course Code: 20CS6P01		0	0	3	1.5
	Data Warehousing & Data Mining Lab				

Course Objectives:

The main objective of the course is to

1. Inculcate Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment

2. Design a data warehouse or data mart to present information needed by management in a form that is usable

3. Emphasize hands-on experience working with all real data sets.

4. Test real data sets using popular data mining tools such as WEKA, Python Libraries

5. Develop ability to design various algorithms based on data mining tools.

Course Outcomes:

By the end of the course student will be able to

1. Implement data preprocessing techniques, including handling missing data, categorical variables, feature scaling, and dataset splitting for machine learning models.

2. Apply similarity and dissimilarity measures, classification algorithms, clustering techniques, and association rule mining using Python.

3. Analyze data warehousing concepts, ETL processes, OLAP operations, and SQL-based data management techniques.

4. Utilize WEKA for data mining tasks, including classification, clustering, rule generation, ROC curve analysis, and performance evaluation of machine learning models.

Software Requirements: WEKA Tool/Python/R-Tool/Rapid Tool/Oracle Data mining

List of Experiments:

1. Creation of a Data Warehouse.

- Build Data Warehouse/Data Mart (using open source tools like Pentaho Data Integration Tool, Pentaho Business Analytics; or other data warehouse tools like Microsoft-SSIS, Informatica, Business Objects,etc.,)

- Design multi-dimensional data models namely Star, Snowflake and Fact Constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, manufacturing, Automobiles, sales etc).

- Write ETL scripts and implement using data warehouse tools.

- Perform Various OLAP operations such slice, dice, roll up, drill up and pivot

2. Explore machine learning tool "WEKA"

- Explore WEKA Data Mining/Machine Learning Toolkit.

- Downloading and/or installation of WEKA data mining toolkit.

- Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface,

- Experimenter, command-line interface.

- Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel)

- Study the arff file format Explore the available data sets in WEKA. Load a data set (ex. Weather dataset, Iris dataset, etc.)

- Load each dataset and observe the following:

    1. List the attribute names and they types

    2. Number of records in each dataset

    3. Identify the class attribute (if any)

    4. Plot Histogram

    5. Determine the number of records for each class.

    6. Visualize the data in various dimensions

3. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets

- Explore various options available in Weka for preprocessing data and apply Unsupervised filters like Discretization, Resample filter, etc. on each dataset

- Load weather. nominal, Iris, Glass datasets into Weka and run Apriori

- Algorithm with different support and confidence values.

- Study the rules generated. Apply different discretization filters on numerical attributes and run the Apriori association rule algorithm. Study the rules generated.

- Derive interesting insights and observe the effect of discretization in the rule generation process.

4. Demonstrate performing classification on data sets

- Load each dataset into Weka and run 1d3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic.
- Extract if-then rules from the decision tree generated by the classifier, Observe the confusion matrix.
- Load each dataset into Weka and perform Naïve-bayes classification and k-Nearest Neighbour classification. Interpret the results obtained.
- Plot RoC Curves
- Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

5. Demonstrate performing clustering of data sets

- Load each dataset into Weka and run simple k-means clustering algorithm with different values of k (number of desired clusters).
- Study the clusters formed. Observe the sum of squared errors and centroids, and derive insights.
- Explore other clustering techniques available in Weka.
- Explore visualization features of Weka to visualize the clusters. Derive interesting insights and explain.

6. Demonstrate knowledge flow application on data sets

- Develop a knowledge flow layout for finding strong association rules by using Apriori, FP Growth algorithms
- Set up the knowledge flow to load an ARFF (batch mode) and perform a cross validation using J48 algorithm
- Demonstrate plotting multiple ROC curves in the same plot window by using j48 and Random forest tree

7. Demonstrate ZeroR technique on Iris dataset (by using necessary preprocessing technique(s)) and share your observations

8. Write a java program to prepare a simulated data set with unique instances.

9. Write a Python program to generate frequent item sets / association rules using Apriori algorithm

10. Write a program to calculate chi-square value using Python. Report your observation.

11. Write a program of Naive Bayesian classification using Python programming language.

12. Implement a Java program to perform Apriori algorithm

13. Write a program to cluster your choice of data using simple k-means algorithm using JDK

14. Write a program of cluster analysis using simple k-means algorithm Python programming language.

15. Write a program to compute/display dissimilarity matrix (for your own dataset containing at least four instances with two attributes) using Python

16. Visualize the datasets using matplotlib in python.(Histogram, Box plot, Bar chart, Pie chart etc.,)

III Year - II Semester Course Code: 20IT6P01		L	T	P	C
		0	0	3	1.5
Internet of Things Lab					

Course Objectives:

1. Introduce the fundamentals of IoT and sensor-based applications.

2. Develop hands-on skills in interfacing sensors and actuators with microcontrollers.

3. Implement real-time data acquisition and cloud-based data handling.

4. Apply IoT technologies to automate home and industrial environments.

Course Outcomes (COs):

On completion of this course, students will be able to

1. Develop Arduino programming to interface with various Sensors.

2. Develop Raspberry Pi programming to interface with various Sensors.

3. Develop the IoT application to integrate with the cloud.

4. Develop projects using various sensors and actuators to control the applications

List of Experiments:

1. Digital Input/output

2. Analog Input/output

3. Using IR Sensor to detect objects.

4. Using LDR

5. PWM application to control LED Brightness

6. Create a localhost server

7. Control Home devices from self-hosted webpage on Amazon AWS

8. Controlling Home Appliance using Google Assistant

9. Calculating Distance using Ultrasonic Sensor

10. Fetching Humidity and Temperature using DHT 11 Sensor

   (Using ThingSpeak, Adafruit and Blynk IoT Platforms)

   Note: Below experiments need to be done with NodeMCU on Arduino or RaspberryPi

Project: Home Automation Project

Case Study:

1. Intelligent Traffic systems

2. Smart Parking

3. Smart water management

III Year - II Semester Course Code: 20CS6P02		L	T	P	C
		0	0	3	1.5
	NoSQL DATABASES LAB				

Course Objectives:

1. Install, configure, and perform CRUD operations in MongoDB and Cassandra.
2. Practice querying, indexing, and comparing use cases of MongoDB and Cassandra.

Course Outcomes (COs):

On completion of this course, students will be able to

1. Implement and configure various NoSQL databases, including MongoDB, Cassandra and Neo4j.
2. Deploy and configure a multi-node Cassandra cluster in a distributed database.
3. Perform querying and manipulation techniques specific to each NoSQL database, including CRUD operations, indexing, querying, and aggregation.
4. Design effective data models for graph databases using Neo4j.

List of Experiments

1. Installation and setup of MongoDB client and server
2. Create a database and collection using the MongoDB environment. For example a document collection meant for analyzing Restaurant records can have fields like restaurant_id, restaurant_name, customer_name, locality, date, cuisine, grade, comments. etc. Create a database using INSERT, UPDATE, UPSERTS, DELETE and INDEX.
3. Practice writing simple MongoDB queries such as displaying all the records, display selected records with conditions
4. Experiment with MongoDB comparison and logical query operators - $gt, $gte, $lt, $lte, $in, #nin, $ne, $and, $or, $not
5. Practice exercise on element, array based and evaluation query operators -$exists, $type, $mod, $regex
6. Exercise on MongoDB shell commands and user management
7. Installation and configuration of Cassandra. Find out two use cases where Cassandra is preferred over MongoDB

8. Create a database in Cassandra using – Create, Alter and Drop. Add records using Inset, Update, Delete and Truncate.

9. Exercise based on Cassandra Query Language i.e. selecting records, select records with specific conditions

VISHNU INSTITUTE OF TECHNOLOGY::BHIMAVARAM
(AUTONOMOUS)
Approved by AICTE, Accredited by NAAC-A++, NBA & Affiliated to JNTUK

III Year - II Semester		L	T	P	C
Course Code: 20BS6P01		0	0	4	2
ADVANCED ENGLISH COMMUNICATION SKILLS LAB					

Course Objectives:

1. To expose students to different contexts through right vocabulary
2. To inculcate the habit of reading and understanding any text
3. To enable students to acquire the ability of writing for business purposes
4. To enable students to acquire interview skills and group discussion dynamics

Course Outcomes:

Upon the completion of the course, the student will be able to:

1. Choose vocabulary contextually.
2. Comprehend, analyze and interpret the text in a definite time frame.
3. Write resumes cohesively and coherently.
4. Construct and elaborate on a given topic.
5. Comprehend and practice the dynamics of group discussion.
6. Comprehend the concept and process of interview answering through mock interviews.

UNIT – I

Selected High GRE Words, Idioms & Phrases – Discourse Skills – using visuals – Synonyms and antonyms, word roots, one word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases, collocations.

UNIT – II

Reading Comprehension – General Vs Local Comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning.

UNIT – III

Writing Skills – Structure of Resume writing —Short Report Writing (Business/Technical)

UNIT – IV

Presentation Skills -- Group Discussion – Dynamics of Group Discussion

UNIT – V

Interview Skills – Concept and process – pre-interview planning, opening strategies, answering strategies, interview through teleconference & video-conference and mock interviews.

Suggested Software:

K-Van solutions Software with CD

1. Oxford advanced learner's compass, 7th Edition

Suggested Reading:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.

2. Business and Professional Communication: Keys for Workplace Excellence. Kelly M.Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.

3. English Vocabulary in Use Series, Cambridge University Press 2008.

4. Communication Skills by Leena Sen, PHI Learning Pvt. Ltd., New Delhi, 2009.

5. A Course Book of Advanced Communication Skills Lab published by University Press, Hyderabad.

III Year - II Semester Course Code: 20CS6A01		L	T	P	C
		2	0	0	0
(EMPLOYABILITY SKILLS – II) **DATA VISUALIZATION**					

Course Objectives: At the end of the course, student should be able to:

1. Understand the principles of data visualization, including chart and graph components, axis discrimination of series and category axis, and data labels.

2. Apply advanced visualization techniques in Excel, including dynamic elements like conditional formatting, custom number formatting, sparklines, and macros.

3. Master various charting techniques to create specialized and custom visualizations to specific data sets.

4. Utilize pivot tables and pivot charts to summarize, sort, and filter data effectively.

5. Design interactive dashboards in MS Excel featuring responsive infographics and slicers for enhanced data exploration and analysis.

Course Outcomes:

1. Explain data visualization concepts, basic components of charts and graphs, and differentiate between series, category axes, and data labels.

2. Apply dynamic visualizations using conditional formatting, custom number formatting, sparklines, and macros.

3. Analyze charting techniques and create specialized and custom charts.

4. Summarize and filter data effectively using Pivot Tables and Pivot Charts.

5. Design interactive dashboards in Excel with responsive infographics and slicers.

Unit-I – Introduction

What is data visualization, Why visualization, what to plot (univariate, bivariate and multivariate), Which graph to use for what purpose (basic components of a good chart/graph), Creating Combination Charts, Discriminating Series and Category Axis, Chart Elements and Chart Styles, Data Labels, Quick Layout, Using Pictures in Column Charts

Unit-II- Visualizations using formats

Trend-based conditional formats, Value-based conditional formats, Macros for interactive visualizations, Visualizations with Sparklines and Shapes, Custom number formats

Unit-III - Visualizing Data with Charts

Charting techniques, Bar charts, Pies, doughnuts, Line charts, trendlines, Area charts, Scatter plots, bubble charts, box plots, Specialized charts, Hierarchy charts, Waterfall charts, funnel charts, Geospatial charts, Custom chart techniques - population charts, Creative chart techniques - gauge charts

Unit-IV - Pivot tables

What is pivot table, Summarise data with PivotTables, Customize PivotTables, Group, sort, Filter pivot data, Perform calculations in pivots, PivotCharts and other visualizations.

Unit-V-Creating an Interactive Dashboard

Dashboard planning and layout, Add charts to a dashboard, Create responsive infographics, Slicers for interactive dashboards, Dashboard drilldowns and protection.

TEXT BOOK:

1. Jorge Camões. All of the visuals in Data at Work are built in Excel

Syllabus for

IV B.Tech - I Semester (R20)

IV Year - I Semester Course Code: 20CS7T01		L	T	P	C
		3	0	0	3
	Augmented Reality & Virtual Reality				

Course Objectives: The objective of this course is to provide a foundation to the fast growing field of AR and make the students aware of the various AR devices.

Course Outcomes: On completion of the course, learner will be able to

1. Describe how AR systems work and list the applications of AR.
2. Understand and analyze the hardware requirement of AR.
3. Use computer vision concepts for AR and describe AR techniques
4. Analyze and understand the working of various state of the art AR devices
5. Acquire knowledge of mixed reality

Unit I: Introduction to Augmented Reality (A.R)

What Is Augmented Reality - Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality Augmented Reality Concepts- How Does Augmented Reality Work? Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.

Unit II: Augmented Reality Hardware

Augmented Reality Hardware – Displays – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, Visual Perception , Requirements and Characteristics, Spatial Display Model. Processors – Role of Processors, Processor System Architecture, Processor Specifications. Tracking & Sensors - Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion.

Unit III: Computer Vision for Augmented Reality & A.R. Software

Computer Vision for Augmented Reality - Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking Augmented Reality Software - Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.

Unit IV: AR Techniques- Marker based & Markerless tracking

Marker-based approach- Introduction to marker-based tracking, types of markers, marker camera pose and identification, visual tracking, mathematical representation of matrix multiplication Marker types- Template markers, 2D barcode markers, imperceptible markers. Marker-less approach- Localization based augmentation, real world examples Tracking methods- Visual tracking, feature based tracking, hybrid tracking, and initialisation and recovery.

Unit V: AR Devices & Components

AR Components – Scene Generator, Tracking system, monitoring system, display, Game scene AR Devices – Optical See- Through HMD, Virtual retinal systems, Monitor bases systems, Projection displays, Video see-through systems.

Case study on generating a scene using AR components

Text Books:

1. Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018, ISBN 978-1484236178

2. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016),ISBN-10: 9332578494

Reference Books:

1. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381

2. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0

IV B. Tech/ I Sem **Course Code: 20IT7T02**		L	T	P	C
		3	1	0	3
E-Commerce					

Course Objectives:

1. Identify the major categories and trends of e-commerce applications.
2. Identify the essential processes of an e-commerce system.
3. Discuss the benefits and trade-offs of various e-commerce clicks and bricks alternatives.
4. Understand the main technologies behind ecommerce systems and how these technologies interact.
5. Discuss the various marketing strategies for an online business.
6. Define various electronic payment types and associated security risks and the ways to protect against them.

Course Outcomes:

After completing this course, the students will be able to

1. Explain the fundamental concepts, technologies, and business models used in E-Commerce.
2. Compare and evaluate various electronic payment systems and analyze the functioning of Electronic Data Interchange (EDI).
3. Assess the role of intra-organizational commerce and supply chain integration in business operations.
4. Identify and evaluate digital marketing and advertising strategies, as well as the effectiveness of online information search and retrieval processes.
5. Analyze the role of multimedia in E-Commerce, including web design, interactive media, and user engagement.

UNIT–I: Electronic Commerce- Framework, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. Consumer Oriented Electronic commerce –Mercantile Process models.

UNIT–II: Electronic Payment Systems–Types of Electronic Payment Systems, Risks in Electronic Payment systems. Inter Organizational Commerce - EDI, EDI Software

Implementation.

UNIT–III: Intra Organizational Commerce-WorkFlow Automation and Coordination, Customization and Internal Commerce, Supply chain Management.

UNIT–IV: Advertising and Marketing - Information based marketing, Advertising on Internet, On-line marketing process, Market research.
Consumer Search and Resource Discovery-Information search and Retrieval, Commerce Catalogs, Information Filtering.

UNIT–V: Multimedia-key multimedia concepts, Digital Video and Electronic Commerce, Desktop video processing, Desktop Video Conferencing.

TEXTBOOK:

1. Frontiers of electronic commerce–Kalakata, Whinston, Pearson.

REFERENCE BOOKS:

1. ECommercefundamentalsandapplicationsHendryChan,RaymondLee,TharamDillon, Ellizabeth Chang, John Wiley.
2. E-Commerce,S.Jaiswal–Galgotia.
3. E-Commerce,EfrainTurbon,JaeLee,DavidKing,H.MichaelChang.
4. ElectronicCommerce – GaryP.Schneider–Thomson.

IV B. Tech/ I Sem Course Code:20IT7T03		L	T	P	C
		3	0	0	3

SOFTWARE ARCHITECTURE

Course Objectives:

1. Understand software architectural requirements and drivers
2. Be exposed to architectural styles and views
3. Be familiar with architectures for emerging technologies

Course Outcomes:

1. Describe the fundamental principles of software architecture, various architectural diagrams, and the Architecture Business Cycle (ABC).
2. Assess the role of quality attributes in software architecture and apply techniques to achieve them.
3. Analyse different architectural views, styles, and their applicability in software development.
4. Demonstrate effective documentation of software architecture using UML and Architectural Description Languages (ADLs).
5. Explore future trends in software architecture, including enterprise frameworks and advancements in the field.

UNIT I:

Introduction: Software architecture and requirements, Architecture diagrams, UML Component Diagram, UML Package Diagram, UML Deployment Diagram, UML Activity Diagram, Architecture structure, ABC(Architecture Business Cycle)

UNIT II:

Understanding Quality Attributes And Achieving Quality : Introduction to Quality Attributes, Need of quality attributes, Understanding quality attributes, architecture and quality attributes, achieving quality attributes.

Case study of quality attributes in software architecture templates, Deriving Quality Attributes for software architectures.

UNIT III:

Architecture in the life cycle/Architectural Views: Introduction – Definitions, Structures and views, Representing views, available notations, Standard views, 4+1 view of Rational Unified

Process, Siemens 4 views, SEI's perspectives and views, Case studies Architecture in the agile projects, Architecture reconstruction and conformance.

Architectural Styles: Introduction– Data flow styles, Call-return styles, Shared Information styles, Event styles, Case studies for each style. Architectural styles, Pipes and filters, Data abstraction and object-oriented organization, Event-based, implicit invocation, Layered systems, Repositories, Other familiar architectures, Heterogeneous Architectures.

UNIT IV:

Documenting the architecture: Guidelines and practices, Documenting the Views using UML, Pros and cons of using visual languages, Need for formal languages, Architectural Description Languages, ACME, Designing and documentation, Case studies.

UNIT V:

Advanced Topics: Software Architecture in the future, The Architecture Business Cycle Revisited, Role of architecture in Software Engineering Enterprise Architectures, Zachman's Framework, Opportunities and Advances in Software Architectures.

TEXT BOOKS:

1. Len Bass, Paul Clements, and Rick Kazman, "Software Architectures Principles and Practices", 2nd Edition, Addison-Wesley, 2003.

2. Anthony J Lattanze, "Architecting Software Intensive System. A Practitioner's Guide", Auerbach Publications, 2010.

REFERENCES:

1. Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, Paulo Merson, Robert Nord, and Judith Stafford, "Documenting Software Architectures. Views and Beyond", 2nd Edition, Addison-Wesley, 2010.

2. Paul Clements, Rick Kazman, and Mark Klein, "Evaluating software architectures: Methods and case studies. Addison-Wesley, 2001.

3. Rajkumar Buyya, James Broberg, and Andrzej Goscinski, "Cloud Computing. Principles and Paradigms", John Wiley & Sons, 2011 Mark Hansen, "SOA Using Java Web Services", Prentice Hall, 2007

4. David Garlan, Bradley Schmerl, and Shang-Wen Cheng, "Software Architecture-Based Self-Adaptation," 31-56. Mieso K Denko, Laurence Tianruo Yang, and Yan Zang (eds.), "Autonomic Computing and Networking". Springer Verlag, 2009

IV B. Tech/ I Sem Course Code: 20IT7T05		L	T	P	C
		3	0	0	3
	SEMANTIC WEB AND SOCIAL NETWORKS				

Course Objectives:

1. To explain the analysis of the social Web and the design of a new class of applications that combine human intelligence with machine processing.
2. To describe how the Semantic Web provides the key in aggregating information across heterogeneous sources.
3. To understand the benefits of Semantic Web by incorporating user-generated metadata and other clues left behind by users.

Course Outcomes:

Students will be able to

1. Explain the fundamentals of the Semantic Web and Social Networks.
2. Explore electronic sources for network analysis and compare different ontology languages.
3. Analyze and apply ontology concepts and various ontology languages for knowledge representation.
4. Design and implement models for aggregating and processing social network data.
5. Develop and evaluate social semantic applications using Semantic Web technologies.

UNIT-I: The Semantic web:

Limitations of the current Web, The semantic solution, Development of the Semantic Web, The emergence of the social web.

UNIT-II: Social Network Analysis

What is network analysis?, Development of Social Network Analysis, Key concepts and measures in network analysis

Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks.

UNIT-III: Knowledge Representation on the Semantic Web:

Ontologies and their role in the Semantic Web – Ontology-based Knowledge Representation, Ontologies and ontology languages for the Semantic Web.

Ontology languages for the Semantic Web – The Resource Description Framework (RDF) and RDF Schema, The Web Ontology Language (OWL).

UNIT-IV: Modeling and Aggregating Social Network Data:

State of the art in network data representation, Ontologicl representation of Social individuals, Aggregating and reasoning with social network data.

UNIT-V: Developing social semantic applications:

The generic architecture of semantic web applications, Elmo, Graph Util, Sesame, social networks of the Semantic Web community.

Text Books:

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science, 2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

REFERENCE BOOKS:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)

IV B. Tech/ I Sem Course Code:20OE7T16		L	T	P	C
		3	0	0	3
	Robotic Process Automation (Job Elective)				

Course Objective:

1. Students will learn how robotic processes and automation are used to automate the most repetitive computer-based activities and processes in the workplace, such as text, image automation with a series of actions, keyboard-based automation, and email automation, among others.

Course Outcomes:

After completing this course, the students will be able to

1. Explain the need for automation and its applications across various domains.
2. Analyze the concepts of RPA tools and their applications in business processes.
3. Describe different types of variables, control flow mechanisms, and data manipulation techniques.
4. Identify and implement automation for image, text, and data table processing.
5. Demonstrate email automation and apply strategies for handling different types of exceptions.

UNIT-I

INTRODUCTION TO ROBOTIC PROCESS AUTOMATION:

What is Robotic process automation? History of Automation, Scope and techniques of automation, what can RPA do? Benefits of RPA, Components of RPA, RPA platforms, RPA vs. Automation, The future of automation.

UNIT-II

RPA Concepts: RPA Basics, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated, RPA Advanced Concepts, Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA and emerging ecosystem.

UNIT-III

RPA Tool Introduction & Basics: Introduction to RPA Tool, The User Interface, Variables, Managing Variables, Naming Best Practices, The Variables Panel, Generic Value Variables, Text Variables, True or False Variables, Number Variables, Array Variables, Date and Time Variables, Data Table Variables, Managing Arguments, Naming Best Practices, The Arguments Panel, Using Arguments, About Imported Namespaces, Importing New Namespaces, Control Flow, Control Flow Introduction, If Else Statements, Loops, Advanced Control Flow, Sequences, Flowcharts, About Control Flow, Control Flow Activities, The Assign Activity, The Delay Activity, The Do While Activity, The If Activity, The Switch Activity, The While Activity, The For Each Activity, The Break Activity, Data Manipulation, Data Manipulation Introduction, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data.

UNIT-IV

Advanced Automation Concepts and Techniques: Recording and Advanced UI Interaction, Recording Introduction, Basic and Desktop Recording, Web Recording, Input/output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques, Selectors, Selectors, Defining and Assessing Selectors, Customization, Debugging, Dynamic Selectors, Partial Selectors, RPA Challenge, Image, Text & Advanced Citrix Automation, Introduction to Image & Text Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, Using tab for Images, Starting Apps, Excel Data Tables & PDF, Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, Extracting a single piece of data, Anchors, Using anchors in PDF.

UNIT-V

Email Automation & Exceptional Handling: Email Automation, Incoming Email automation, Sending Email automation, Debugging and Exception Handling, Debugging Tools, Strategies for solving issues, Catching errors.

Text Books:

1. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: Packt Publishing

Reference Books:

1. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute Of Robotic Process Automation.

2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots,Automate Repetitive Tasks & Become An RPA Consultant.

3. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation.

4. https://www.uipath.com/rpa/robotic-process-automation.

IV B. Tech/ I Sem		L	T	P	C
Course Code: 20OE7T06		3	0	0	3
GREEN BUILDING TECHNOLOGIES(Open Elective)					

Course Objectives:

The objective of this course is to enable the students to:

1. Learn the principles of planning and orientation of buildings.

2. Acquire knowledge on various aspects of green buildings.

Course Outcomes:

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

1. Explain the principles of green buildings, their features, benefits, and sustainable site selection for maximizing comfort and efficiency

2. Analyze environmentally friendly building materials and construction technologies that contribute to sustainable development.

3. Evaluate various energy and resource conservation techniques, including embodied energy, water harvesting, and waste-to-energy management.

4. Assess the potential of renewable energy resources such as solar and wind energy and their application in building design.

5. Apply knowledge of green building rating systems, wastewater treatment methods, and building automation for sustainable construction concrete

UNIT – I: Green Buildings: Definition of Green Buildings, typical features of green buildings, benefits of Green Buildings- Sustainable site selection and planning of buildings to maximize comfort, day lighting, ventilation, planning for storm water drainage.

UNIT – II: Environmentally friendly building materials and technologies: Natural Materials like bamboo, timber, rammed earth, stabilized mud blocks, hollow blocks, lime & lime-pozzolana cements, materials from agro and industrial waste, ferro-cement and ferro-concrete, alternative roofing systems, various paints reducing the heat gain of the building, etc.

UNIT – III: Energy and resource conservation: Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and

construction processes- water conservation systems in buildings-water harvesting in buildings – waste to energy management in residential complexes or gated communities.

UNIT – IV: Use of renewable energy resources: Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar appliances, success case studies of fully solar energy-based buildings in India.

UNIT- V: Green Building Rating Systems: Introduction to Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment – Modular wastewater treatment systems for built environment – Building automation and building management systems.

Text Books:
1. Alternative building materials and technologies" by K.S. Jagadish, B.V. Venkatarama Reddyand K.S. Nanjunda Rao.
2. Non-Conventional Energy Resources" by G. D. Rai, Khanna Publishers.

References:
1. MiliMajumdar, "Energy-efficient buildings in India" Tata Energy Research Institute, 2002.
2. TERI "Sustainable Building Design Manual- Volume I & II" Tata Energy Research Institute,2009.

IV B. Tech/ I Sem **Course Code:20OE7T17**		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Information Theory and Coding (Open Elective)					

Course Objectives:

1. To define and apply the basic concepts of information theory (entropy, channel capacity etc.)
2. To learn the principles and applications of information theory in communication systems
3. To study various data compression methods and describe the most common such methods
4. To understand the theoretical framework upon which error-control codes are built

Course Outcomes:

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

1. Explain what is the significance of this quantitative measure of information in the Communication systems.
2. Calculate entropy, joint entropy, relative entropy, conditional entropy, and channel capacity of a system.
3. Differentiate between lossy and lossless compression techniques.
4. Compute and analyze Block codes, cyclic codes and convolution codes.
5. Design a coded communication system.

UNIT I: INFORMATION THEORY:

Discrete messages, Information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties.

UNIT II: SOURCE CODING:

Introduction, Shannon‟s theorem, Shannon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, Gaussian channel capacity, bandwidth –S/N trade off.

UNIT III: LINEAR BLOCK CODES:

Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes

UNIT IV: BINARY CYCLIC CODES:

Polynomial Representation of Codewords, Generator Polynomial, Systematic Codes, Generator Matrix, Syndrome Calculation and Error Detection, Decoding of Cyclic Codes.

UNIT V: CONVOLUTION CODES:

Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

Text Books:

1. T. M. Cover, J. A. Thomas, *Elements of Information Theory*, Wiley
2. Communication Systems, 3/e, by A.B. Carlson, Mc. Graw Hill Publishers
3. R. Togneri, C.J.S deSilva, *Fundamentals of Information Theory and Coding Design*, Taylor and Francis

Reference Books:

1. R. J. McEliece, The Theory of Information and Coding, Cambridge University Press
2. R. Bose, Information Theory Coding and Cryptography, Tata McGraw Hill

IV B. Tech/ I Sem Course Code: 20HS7T01		L	T	P	C
		3	0	0	3
	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS				

Course Objectives:

1. This course is to apply micro economic concepts and techniques in evaluating business decisions.
2. To familiarize with the process of management and to provide basic insight into management practices.

Course Outcomes:

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

1. Gain knowledge in basic economic tools in managerial economics and demand analysis
2. Analyze the production, cost concepts of the firm and markets and pricing in various markets.
3. To outline the different types of business organizations and financial status.
4. Understand the expenditure and capital budgeting in big industries.

UNIT 1: Introduction to Managerial Economics and Demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting.

UNIT 2: Production and Cost Analysis: Concept of Production function- Cobb-Douglas Production function- Law of Variable proportions-Isoquants and Isocosts and least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts, Cost–Volume-Profit analysis-Determination of Break Even point(simple problems) Managerial significance and limitations of Break Even point.

UNIT 3: Introduction to Markets & Pricing Policies: Market structures: Perfect competition, Monopoly and Monopolistic and oligopoly – Features -Price-Output Determination -Methods of Pricing- Limit Pricing, Market Skimming Pricing and Internet Pricing Models.

UNIT 4: Types of Business Organization and Business Cycles: Features and Evaluation of Sole Trader, Partnership, Joint Stock Company State/Public Enterprises and their forms Business Cycles Meaning and Features Phases of a Business Cycle.

UNIT 5: Introduction to Accounting; Double Entry Systems Personal account, Real account, Nominal account GAAP-Preparation of final accounts Trading account, Profit and Loss account, Balance sheet simple problems.

Capital Budgeting-Meaning of Capital budgeting - need for capital budgeting- Techniques of Capital budgeting – Traditional and Modern methods.

TEXT BOOKS:

1. Financial Accounting - S N Maheshwari & S K Maheswari-Vikas Publishing House,New Delhi
2. Essentials of Financial Accounting-Asish K. Bhattacharyya, PHI, New Delhi.
3. Managerial Economics-Theory & Applications-D.M.Mithani, HPH, New Delhi
4. Financial Management-G.Sudharsan Reddy-HPH,New Delhi
5. Dr. N. AppaRao, Dr. P. Vijay Kumar: „Managerial Economics and Financial Analysis‟, Cengage Publications, New Delhi – 2011
6. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
7. Prof. J.V.Prabhakararao, Prof. P. Venkatrao. „Managerial Economics and Financial Analysis‟, RavindraPublication

IV B. Tech/ I Sem Course Code: 20CS7P01		L	T	P	C
		0	0	4	2
	Rust Programming Lab				

COURSE OBJECTIVES:

1. Define and explain key Rust programming concepts, including ownership, borrowing, and lifetimes.
2. Write, compile, and execute basic Rust programs, including applications with user-defined functions and control structures.
3. Create and manipulate variables of different data types in Rust. Use constants and mutable variables appropriately.
4. Define functions with parameters and return values.Organize code into modules and submodules.
5. Understand and apply concepts related to enums, pattern matching, and option/result types.
6. Create and implement traits to define common behavior for types.
7. Read and write files in Rust.

COURSE OUTCOMES:

By the end of this course, students should be able to:

1. Explain the fundamental concepts, strengths, and applications of Rust in modern software development.
2. Develop Rust programs using variables, constants, control flow constructs, functions, and modules with proper documentation.
3. Apply memory management concepts such as ownership, borrowing, and lifetimes, along with error-handling techniques, to write safe and efficient Rust programs.
4. Design and implement reusable and modular Rust applications using structs, enums, pattern matching, traits, generics, collections, and iterators.

PROGRAMS

1. Write a program to display output using print!

2. Write a program to display Output following pattern using Placeholders

    1

    22

    333

    4444

    55555

3. Write a program to do the following

    a. Declare a variable x and store value 1000 in it.

    b. Declare a variable y and store value "Programming" in it

    c. Print the values of x and y

    d. Change the value of x to 1100

    e. Print the values of x and y

4. Write a program to implement the Scope and Shadowing

5. Write a program to implement the following

    a. Implicit type declaration

    b. Explicit type declaration

6. Write Program to Declare an array, arr, of size 6 that has numbers divisible by 2 ranging from 0 to 10 and Print the value of arr.

7. Write a program to create and access a tuple.

8. Write a program to create an array of 10 elements and implement the following

    a. Create a of 2nd and 3rd element

    b. Omit the start index of the slice

    c. Omit the End Index of the Slice

    d. Omit both Start and End Index of the Slice

9. Write a program to create different types of constants print it in the output

10. Declaring String Object and converting String Literal to String Object

11. Write a program to implement Type Casting Operator.

12. Write a program to implement Borrowing and Dereferencing Operators

13. Write a program to check if a number is positive or negative

14. Write a program to determine if a number is even or odd

15. Write a program to make a calculator using Match Expression

16. Write a program to Match a pattern using If Let Expression

17. Write a program to Print First 10 Natural Numbers using Loop

18. Write a program to Multiplication Table using Loop Labels

19. Write a program to Count Iterations of a Loop Until a Condition

20. Write a program to Print the following patterns

    &

    &&

    &&&

    &&&&

    &&&&

    &

21. Write a program to print the values in a collection using iter() method

22. Write a program to Find The Factorial using functions.

23. Write a function test_divisibility_by_3_4 which will check whether a given integer number is divisible by 3 or 4.

    a. If the number is divisible by both return 0

    b. If the number is divisible by 3 only return 1

    c. If the number is divisible by 4 only return 2

    d. If the number is not divisible by both, return -1

24. Write a program to demonstrate the Pass by Value and Pass by Reference

25. Write a function calculate_area_perimeter() that takes x and y(length and width of a rectangle) as a parameter to the function and returns a tuple (area, perimeter).

26. Write a function arr_square() that returns the Array of Squares

27. write a recursive function fibonacci that takes a positive integer number n as a parameter and returns the nth Fibonacci term in that range.

28. Write a program to Creating a String

29. Implement the string manipulation operations using Core Methods of String Objects

    a. str.capacity()

    b. str.contains("sub_str")

    c. str.replace(replace_from, replace_to)

    d. string.trim()

30. Write a program to tokenize and iterate over a string

31. Write a program to push a string into a string.

32. Write a program to find all words starting with a "c" in a string passed as a parameter. Concatenate them together and return the result.

33. Given a vector with an even number of elements, remove the last element from the input vector, and then the middle element. Then insert the sum of the remaining elements to the end of the resulting vector.

34. Write a program to Calculate Distance Between Two Points:
    a. A struct Point is given which has two items, x and y.
    b. The function test is given which has two instances of points initialized with some value of x and y.
    c. The task is to calculate the distance between the two points.
    d. The distance between two points is:

$$\sqrt{(x1 - x2)^2 + (y1 - y2)^2}$$

    e. Return the value of distance

35. Write a program to Invoke a Static Method on Struct

36. Create a struct representing a person with fields such as name, age, and address. Implement methods to perform operations on the person.

37. Create a struct representing a geometric shape and implement methods to calculate its area and perimeter.

38. Write a program to Find If the Day Is a Weekend
    a. An enum Days has been provided to you. It has all the days of the week.
    b. A method is_weekend() is incomplete.
    c. The task is to complete the method
    d. If the day is a weekend it returns 1
    e. If the day is a weekday it returns 0

39. Define an enum representing different types of geometric shapes (e.g., circle, square, triangle). Implement a function that calculates the area of a shape based on its variant.

40. Define an enum representing different types of vehicles and use pattern matching to print their respective characteristics.

41. Write a program that implements Traits

    a. Define a trait named `Animal`

    b. Define a method `make_sound` that needs to be implemented by
       types implementing the

    c. Implement the `Animal` trait for the `Dog` struct which prints "Woof!"

    d. Implement the `Animal` trait for the `Cat` struct which prints "Meow!"

    e. Define A function „animal_sounds" that takes any type implementing the
       `Animal` trait

42. Write a program to Find the Area of a Triangle using modules

43. Write a program that demonstrates ownership transfer by creating variables and passing
    them between functions.

44. Experiment with different scenarios to understand the Rust compiler's behavior in terms
    of ownership and borrowing.

45. Write a program to read data from a file and write the results back to another file using
    Rust's file I/O capabilities.

46. Rust program that demonstrate different error handling techniques

47. Rust program to implement Recoverable Errors with Result

48. Write unit tests for a Rust module, covering various functionalities and edge cases.

49. Develop a program that makes asynchronous HTTP requests using a Rust async
    runtime and processes the responses.

50. Create a program that uses unsafe Rust code to interface with a C library or perform low-
    level memory operations.

IV B. Tech/ I Sem Course Code: 20CS7T02		L	T	P	C
		3	0	0	3
	Game Development (Professional Elective-III)				

Course Objective:

1. This course is designed to understand how to program video games from the ground up and learn how to program and how to use the Unity engine.

Course Outcomes:

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

1. Demonstrate the fundamentals of Game Development.
2. Use various constructs / concepts to write programs in Unity Scripting.
3. Analyze the importance of Physics components of unity in game development.
4. Implements Parent child hierarchy in building games.
5. Apply Design strategies to develop a gaming project.

UNIT–I

An Overview of the Unity Engine: Getting acquainted with the Interface, The Project View, The Hierarchy View, The Inspector, The Toolbar, The Scene View, The Game View, The Animation and Animators Views, The Profiler and Version Control, Customizing the Editor Unity's Basic Concepts.

UNIT–II

Scripting in Unity: Editor, picking a Script Editor—or, Auto completion, Fundamentals of Scripting in Unity, Two Useful Items, Variables, Operators and Comparisons, Conditionals, Loops, Functions, Variable Scope, Naming Conventions. Object-Oriented Concepts- Defining Classes, Creating and Using Classes, Defining Functions, Accessing Game Objects, Constructor and Property Functions.

UNIT–III

Unity Engine Physics Components: Adding a C# Script to Unity Game Project, Rigid body Components, Unity Colliders, Physics Materials, Scripting Collision Events Simple Movement and Input, Simple Movement, Simple Rotation and Scaling, Easy Input Handling in Unit

UNIT–IV

Organizing Game Objects: Parent-Child Objects, Sorting Layers, Tagging Game Objects, Collision Layers Managing Game Objects - Prefabs, Creating and Destroying Objects, Activating and Deactivating Objects, Controlling Object Lifespans with Invoke.

UNIT–V

Game Design Strategies: Game Requirements, Game Mechanics, Storytelling and Progression, Design Documents.

Text Books:

1. Game Programming with Unity and C#, A Complete Beginner's Guide,Casey Hardman, Apress.
2. Game Development with Unity, 2nd edition, Michelle Menard and Bryan Wagstaff, Cengage Learning.

Reference Books:

1. Developing 2D Games with Unity: Independent Game Programming with C#, Jared Halpern, Apress.

IV B. Tech/ I Sem Course Code: 20IT7T01		L	T	P	C
		3	0	0	3
	Soft Computing (Professional Elective-III)				

Course Objectives:

1. Artificial Intelligence, Various types of production systems, characteristics of production systems.

2. Neural Networks, architecture, functions and various algorithms involved.

3. Fuzzy Logic, Various fuzzy systems and their functions.

4. Genetic algorithms, its applications and advances.

Course Outcomes:

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

1. Learn about soft computing techniques and their applications

2. Analyze various neural network architectures

3. Understand perceptrons and counter propagation networks.

4. Define the fuzzy systems

5. Analyze the genetic algorithms and their applications.

UNIT-I

Basics of Artificial Neural Network: Characteristics of Neural Networks, Structure and working of a biological neural network, Artificial neural network: terminology, models of neurons: McCulloc h Pitts model, Perceptron model, Adaline model, topology, Basic learning laws.

Functional Units of ANN for Pattern Recognition Task: Pattern recognition problem, Basic functional units, PR by functional units

UNIT-II

Feed Forward Neural Networks: Supervised Learning - I: Perceptrons - Learning and memory, Learning algorithms, Error correction and gradient decent rules, Perceptron learning algorithms.

SUPERVISED LEARNING - II:

Back propagation, Multilayered network architectures, Back propagation learning algorithm, Example applications of feed forward neural networks.

UNIT-III

Feedback Neural Networks & Self Organizing Feature Map:

Introduction, Associative learning, Hopfield network, Error performance in Hopfield networks, simulated annealing, Boltzmann machine and Boltzmann learning, state transition diagram and false minima problem, stochastic update, simulated annealing, Boltzmann machine bidirectional, Associative memory, bam stability analysis. Self organization, generalized learning laws, Competitive learning, vector quantization, self organizing feature map, applications of self organizing feature map.

UNIT-IV

Fuzzy Logic: Fuzzy set theory, crisp sets, operations on crisp set, fuzzy sets, fuzzy versus crisp, operations, fuzzy relations, crisp relations, properties. Fuzzy logic Application: Fuzzy Control of Blood Pressure.

UNIT-V

Fuzzy Logic in Database and Information Systems: Fuzzy Information, Fuzzy Logic in database Systems, Fuzzy Relational data Models, operations in Fuzzy Relational data Models, Design theory for Fuzzy Relational databases, Fuzzy information Retrieval and Web search, Fuzzy Object Oriented databases.

Genetic Algorithms: Introduction to Genetic Algorithms, Evolutionary Algorithms.

Text Books:

1. Satish Kumar(2004), Neural Networks A classroom Approach Tata McGraw Hill Publication, New Delhi.
2. Lotfi A. Zadeh (1997), Soft computing and Fuzzy Logic, World Scientific Publishing Co., Inc. River Edge,NJ, USA

Reference Books:

1. B.Yegnanarayana(2006),Artificial Neural Networks, Prentice Hall of India, New Delhi, India.
2. JohnYen,RezaLangari(2006),FuzzyLogic, Pearson Education, New Delhi ,India.
3. Rajasekaran, Vijaylakshmi Pari (2003), Neural networks, Fuzzy Logic and Genetic Algorithms Synthesis and Applications, Prentice Hall of India, New Delhi, India

IV B. Tech/ I Sem Course Code: 20CS7T03		L	T	P	C
		3	0	0	3
Unified Modeling Language & Design Patterns (Professional Elective-IV)					

Course Objectives:

1. To understand the fundamentals of object modeling
2. To understand and differentiate Unified Process from other approaches
3. To design with static UML diagrams
4. To design with the UML dynamic and implementation diagrams
5. To improve the software design with design patterns
6. To test the software against its requirements specification

Course Outcomes:

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

1. Illustrate software design with UML diagrams
2. Design software applications using OO concepts
3. Identify various scenarios based on software requirements
4. Apply UML based software design into pattern based design using design patterns
5. Illustrate the various testing methodologies for OO software

UNIT-I

Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, onceptual model of the UML, Architecture, Software Development Life Cycle. Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Advanced classes, advanced relationships, Object diagrams: common modeling techniques.

UNIT-II

Behavioral Modeling: Interactions, Interaction diagrams. Use cases, Use case Diagrams, Activity Diagrams, Events and signals, state machines, state chart diagrams.

UNIT-III

Advanced Behavioral Modeling: Architectural Modeling: Components, Deployment, Component diagrams and Deployment diagrams, Common modeling techniques for component and deployment diagrams

Design Pattern: Introduction, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, Using a Design Pattern.

UNIT-IV

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy.

UNIT-V

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, Strategy, Template Method, What to Expect from Design Patterns

Text Books:

1. The unified Modeling language user guide by Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson.
2. Design Patterns, Erich Gamma, Pearson.

Reference Books:

1. Object Oriented Analysis and Design, Satzinger, CENGAGE

IV B. Tech/ I Sem Course Code: 20CS7T04		L	T	P	C
		3	0	0	3
	Agile Methodologies (Professional Elective-IV)				

Course Objective:

1. This course is designed to give exposure to phases of software development, common process models and hands-on experience with elements of the agile process.

Course Outcomes:

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

1. Utilize the Agile project management approaches including values and principles for a project.
2. Identify the essential roles in a Scrum team for effective development of project working models.
3. Make use of Self Organizing Teams to solve issues during the project.
4. Construct a Product Backlog and perform Backlog Refinement in a given scenario.
5. Examine large projects by using scrum methods.

UNIT-I

Agile Software Development: Basics and Fundamentals of Agile Process Methods, Values of Agile, Principles of Agile, stakeholders, Challenges. Lean Approach: Waste Management, Kaizen and Kanban, add process and products add value. Roles related to the lifecycle, differences between Agile and traditional plans, differences between Agile plans at different lifecycle phases.

UNIT-II

Agile and Scrum Principles: Agile Manifesto, Twelve Practices of XP, Scrum Practices, Applying Scrum. Need of scrum, working of scrum, advanced Scrum Applications, Scrum and the Organization, scrum values.

UNIT-III

Agile Product Management: Communication, Planning, Estimation Managing the Agile approach Monitoring progress, Targeting and motivating the team, managing business involvement, Escalating issue.

UNIT-IV

Agile Requirements: User Stories, Backlog Management. Agile Architecture: Feature Driven Development. Agile Risk Management: Risk and Quality Assurance, Agile Tools. Agile Testing: Agile Testing Techniques, Test-Driven Development, User Acceptance Test.

UNIT-V

Scaling Agile for large projects: Scrum of Scrums, Team collaborations, Scrum; Estimate a Scrum Project, Track Scrum Projects, Communication in Scrum Projects, and Best Practices to Manage Scrum.

Text Books:

1. Robert C. Martin., Agile Software Development, Principles, Patterns, and Practices, Alan Apt Series, 2011.

2. Mike Cohn., Succeeding with Agile: Software Development Using Scrum, Pearson Publications, 2010.

Reference Books:

1. David J. Anderson and Eli Schragenheim Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, 4thEdition, PrenticeHall, 2003.

2. Hazza and Dubinsky, Agile Software Engineering Series: Undergraduate Topics inCompute Science, Springer, 2009.

IV B. Tech/ I Sem **Course Code: 20IT7T04**		L	T	P	C
		3	0	0	3
	Artificial Neural Networks **(Professional Elective-IV)**				

Course Objective:

1. This course is designed to acquire the ability to design intelligent solutions to problems in a variety of domains and business applications such as natural language processing, text mining and robotics.

Course Outcomes:

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

1. Analyze and apply the basics of the concepts of artificial intelligence and the use of agents into the real-world scenario.
2. Identify, analyze, formulate and solve complex problems by using various search techniques.
3. Explore with a better understanding of logic programming skills and resolve problems related to reasoning.
4. Design, construct and evaluate a neural network-based system, with various learning process models.
5. Plan and design an expert system.

UNIT- I

Introduction to Artificial Intelligence: Problem and search- what is AI technique, criteria for success.

Problem Space and Search: Defining the problem as a state space search, production systems problem characteristics.

Heuristic Search Techniques: Generate test, Hill Climbing, BFS, Problem Reduction Constraint Satisfaction.

UNIT- II

Knowledge Representation Issues: Representation and mapping, Issues in knowledge representation.

Representing Knowledge Using Rules: Procedural versus Declarative knowledge, logic programming, Forward and backward, Matching, Control Knowledge.

Symbolic Reasoning Under Uncertainty: Introduction to non-monotonic reasoning, Logic for non-monotonic Reasoning. Implementation Issue, Implementation of DFS, Implementation of BFS, The min-max search Procedure, Adding alpha-beta Cut-offs, Connectionist AI and Symbolic AI.

UNIT – III

Basics of Artificial Neural Network: Characteristics of Neural Networks, artificial neural network: terminology, models of neurons: McCulloch Pitts model, Perceptron model, Adaline model, Functional Units of ANN for Pattern Recognition Task: Pattern recognition problem, Basic functional units, PR by functional units.

Feedforward Neural Networks: Supervised Learning - I: Perceptron's - Learning and memory, Learning algorithms, Error correction and gradient descent rules, Perceptron learning algorithms.

UNIT – IV

Supervised Learning – II : Back propagation and Beyond: Multi-layered network architectures, Back propagation learning algorithm, Example applications of feed forward neural networks.

Attractor Neural Networks: Introduction, Associative learning, Hopfield network, Error performance in Hopfield networks, simulated annealing, Boltzmann machine, bidirectional associative memory, bam stability analysis, error correction in bams .

UNIT – V

Planning: The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.

Expert Systems: An introduction to Expert System, Architecture of Expert System, Knowledge Acquisition, Application Area of Expert System.

Text Books:

1. Rich knight (2002), Artificial Intelligence, 2nd edition, Tata McGraw-Hill, New Delhi.
2. B. Yegnanarayana (2001), Artificial Neural Networks, Prentice Hall of India, New Delhi.
3. Satish Kumar (2004), Neural Networks A classroom Approach, Tata McGraw Hill Publication
4. Peter Jackson(1999), Introduction to Expert Systems, 3rd Edition, Pearson Education Private Limited, India.

Reference Books:

1. S.N. SIVANANDAM, S SUMATHI, S N DEEPA,(2006), Introduction to Neural networks using Matlab-6. Tata McGraw-Hill, New Delhi.
2. Patrick Henry Winston (2001), Artificial Intelligence, 3rd edition, Pearson Education Private Limited, India
3. P. H. Winston, Artificial Intelligence, Third Edition, Pearson Education.
4. G.F. Luger, Artificial Intelligence, Fourth Edition, Pearson Education.

IV B. Tech/ I Sem Course Code: 20CS7T05		L	T	P	C
		3	0	0	3
	Big Data Analytics (Professional Elective-V)				

Course Objectives:

1. To optimize business decisions and create competitive advantage with Big Data analytics
2. To learn to analyze the big data using intelligent techniques
3. To introduce programming tools PIG & HIVE in Hadoop echo system

Course Outcomes:

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

1. Identify the fundamental concepts of big data analytics.
2. Select Hadoop environment and apply HDFS commands on file management tasks.
3. Utilize optimization techniques of MapReduce Programming to process massive amounts of data in parallel.
4. Make use of NoSQL databases like MangoDB and Cassandra to stock log data to be pulled for analysis.
5. Identify appropriate modern tools like Pig and Hive for complex data flow and analysis.

UNIT-I

Introduction to Big Data: Classification of Digital Data, Characteristics of Data, Definition of Big Data, Challenges with Big Data, Definitional Traits of Big Data, Traditional Business Intelligence (BI) versus Big Data, Coexistence of Big Data and Data Warehouse, Realms of Big Data, Big Data Analytics, Classification of Analytics, Challenges of Big Data, Terminologies Used in Big Data Environments, Few Top Analytics Tools.

UNIT-II

The Big Data Technology Landscape: NoSQL (Not Only SQL), Types of NoSQL Databases, SQL versus NoSQL, Introduction to Hadoop, RDBMS versus Hadoop, Distributed Computing Challenges, Hadoop Overview, Hadoop Distributors, HDFS (Hadoop Distributed File System), Working with HDFS commands, Interacting with Hadoop Ecosystem.

UNIT-III

Mapreduce Programming: Processing Data with Hadoop, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression, Managing Resources and Applications with Hadoop YARN.

UNIT-IV

Cassandra: Features of Cassandra, CQL Data Types, Key spaces, CRUD Operations, Collection Types, Table Operations. MONGODB: Features of MongoDB, RDBMS vs MongoDB, Data Types in MongoDB, MongoDB Query Language, CRUD operations, Count, Limit, Sort, and Skip.

UNIT-V

PIG: The Anatomy of Pig, Pig Philosophy, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, Relational Operators, Eval Functions, Word Count using Pig.

HIVE: Introduction to Hive, Hive Architecture, Hive Data Types, Hive File Format, Hive Query Language (HQL): DDL, DML, Partitions, Pig versus Hive.

Text Books:

1. Seema Acharya, Subhashini Chellappan. Big Data and Analytics, 2ndEdition, WileyIndiaPrivate Limited, New Delhi, 2019.

Reference Books:

1. Tom White. Hadoop - The Definitive Guide, 4thEdition, O'Reilly Publications, India,2015.
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman. Big Data forDummies, John Wiley & Sons, Inc., 2013.

IV B. Tech/ I Sem Course Code: 20CS7T06		L	T	P	C
		3	0	0	3
	Recommended Systems (Professional Elective-V)				

Course Objective:

1. To understand the foundations of recommender systems, significance of machine learning and data mining algorithms, performance evaluation. Students can design and implement a recommender system using collaborative filtering.

Course Outcomes:

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

1. Understand the basic concepts of recommender systems
2. Carry out performance evaluation of recommender systems based on various metrics
3. Implement machine-learning and data-mining algorithms in recommender systems data sets
4. Design and implement a simple recommender system.

UNIT-I

Introduction: Introduction and basic taxonomy of recommender systems (RSs), traditional and non-personalized RSs, overview of data mining methods for recommender systems- similarity measures, classification, clustering, SVMs, dimensionality reduction, overview of convex and linear optimization principles

UNIT-II

Content-based recommendation: High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, Discovering features of documents, Obtaining item features from tags, Representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

UNIT-III

Collaborative Filtering (CF)-based RSs: a systematic approach Nearest-neighbor collaborative filtering (CF), user based and item-based CF, and comparison, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection), attacks on collaborative recommender systems.

UNIT-IV

Advanced topics: Network aspects of content RSs Recommender systems for video content distribution. Implications of recommender systems in 5G wireless networks. RSs for optimizing wireless network performance. Case studies (i) Joint content recommendations and content caching in small cells wireless networks (ii) The interplay of RSs and User access point association.

UNIT-V

Applications of RSs: RSs for content media, social media and communities Music and video RSs. Datasets. Group recommender systems. Social recommendations. Recommending friends: link prediction models. Similarities and differences of RSs with task assignment in mobile crowd sensing, social network diffusion awareness in RSs.

Text Books:

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press(2011), 1st ed.
2. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st ed.

Reference Books:

1. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed.
2. C.C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
3. F. Ricci, L Rokach, B. Shapira and P.B. Kantor, Recommender systems handbook, Springer 2010.
4. J. Leskovec, A. Rajaraman and J. Ullman, Mining of massive datasets, 2nd Ed., Cambridge, 2012

IV B. Tech/ I Sem Course Code: 20IT7T06		L	T	P	C
		3	0	0	3
	Information Retrieval Systems **(Professional Elective-V)**				

Course Objectives:

1. Appreciate the capabilities and limitations of information retrieval systems.
2. Understand the design and implementation of retrieval systems for text and other media.
3. Evaluate the performance of an information retrieval system.
4. Identify current research problems in information retrieval.
5. Learn the important concepts, algorithms, and data/file structures that are necessary to specify, design, and implement Information Retrieval (IR) systems.

Course Outcomes:

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

1. Understand the functional processes and effectiveness of information storage and retrieval systems.
2. Implement different data structures and indexing techniques for information retrieval systems.
3. Analyze different clustering and visualization techniques to generate classification among the web pages.
4. Apply appropriate user search techniques and text search algorithms for different database systems.
5. Analyze new models based on existing challenges over multimedia web search and modern digital libraries

UNIT-I

Introduction to Information Retrieval Systems: Definition, Objectives, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses. Information Retrieval System Capabilities: Search, Browse and Miscellaneous

UNIT-II

Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction.

Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hidden Markov Models.

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages.

UNIT-III

Document and Term Clustering: Introduction, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the Internet and Hypertext. Information Visualization: Introduction, Cognition and Perception, Information Visualization Technologies.

UNIT- IV

Text Search Algorithms: Introduction, Software Text Search Algorithms, Hardware Text Search Systems.

Information System Evaluation: Introduction, Measures used in System Evaluation, Measurement Example -TREC results.

UNIT- V

Multimedia Information Retrieval: Models and Languages, Data Modeling Query Languages, Indexing and Searching.

Libraries and Bibliographic Systems: Online IR Systems, OPACs, Digital Libraries.

Text Books:

1. Gerald J. Kowalski, Mark T. Maybury (2000), Information Storage and Retrieval Systems: Theory and Implementation, 2nd edition,Springer International Edition, USA.

2. Ricardo Baeza Yates, Berthier Ribeiro Neto(2009), Modern Information RetrieVal , Pearson Education, India.

Reference Books:

1. Robert R.Korfhage(1997),Information Storage and Retrieval, JohnWiley&Sons, India Edition, India.

2. Frakes   W.B,RicardoBaezaYates(1992),Information   Retrieval   Data   Structures   and Algorithms,Pearson Education/ Prentice Hall of India, NewDelhi, India

IV B. Tech/ I Sem Course Code: 20HS7T05		L	T	P	C
		3	0	0	3
	Management Science				

Course Objectives:

1. To familiarize with the process of management and to provide basic insight into contemporary management practices.
2. To provide conceptual knowledge on functional management and strategic management.

Course Outcome:

1. After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.
2. Knowledge on operational management and material management
3. Will familiarize with the concepts of functional management, project management.
4. Knowledge on various strategic management and contemporary management practices.

UNIT - I

Introduction to Management: Concept –nature and importance of Management –Functions of Management – Henry Fayol's 14 principles of management- Theories of Motivation – Types of Organizational structure.

UNIT - II

Operations Management: Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C-chart) Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

UNIT - III

Functional Management: Functions of HR Manager- Wage payment plans(Simple Problems) – Job Evaluation and Merit Rating - Marketing Management- Marketing Mix Strategies based on product Life Cycle, Channels of distributions.

UNIT - IV

Project Management: (PERT/CPM): Development of Network ,Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems)

UNIT - V

Strategic Management & Contemporary Management Practices: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process – SWOT analysis- Steps in Strategy Formulation and Implementation, Six sigma, Total quality management, Benchmarking and Balanced Scorecard

References:

1. Koontz &Weihrich: 'Essentials of management' TMH 2011
2. L.M.Prasad- Principles and Practice of Management, Sultan Chand & Sons, New Delhi
3. Robbins: Organizational Behavior, Pearson publications, 2011
4. Philip Kotler & Armstrong: Principles of Marketing, Pearson publications
5. Dr. P. Vijaya Kumar &Dr. N. Appa Rao, 'Management Science' Cengage, Delhi, 2012.
6. Dr. A. R. Aryasri, Management Science' TMH 2011.
7. Seth & Rastogi: Global Management Systems, Cengage learning , Delhi, 2011

Syllabus for

HONORS

(R20)

TRACK-1	AI & ML: (HONORS)	L	T	P	C
		3	0	0	3
	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE				

Course Objectives:

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

1. Understand AI foundations, including history, concepts, and applications, and develop problem-solving techniques.

2. Master search strategies like exhaustive searches, heuristics, and game playing.

3. Gain proficiency in logical frameworks and construct semantic tableau systems.

4. Implement knowledge representation methods like semantic networks and frames.

5. Explore expert system construction phases and design rule-based systems effectively.

Course Outcomes: At the end of the course, student should be able to:

1. Understand the AI Foundations, history, and intelligent systems in AI, along with its applications across various domains and general problem solving techniques.

2. Develop The search strategies using exhaustive searches, heuristic search techniques and problem reduction and game playing

3. Understand the various logical frameworks, including propositional calculus, predicate logic, and proportional logic and develop semantic tableau systems.

4. Understand and implement different approaches to knowledge representation using semantic networks, frames, conceptual dependency and scripts.

5. Learn about the phases involved in building expert systems, understand the differences between expert systems and traditional systems, and the rule-based expert systems in various domains.

UNIT I:

Introduction to artificial intelligence: Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends in AI.

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem.

UNIT II:

Search Strategies: exhaustive searches, heuristic search techniques: A* Algorithm and Hill Climbing, constraint satisfaction.Problem reduction and game playing: Introduction, problem reduction, game playing, alpha-beta

pruning.

UNIT III:

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT IV:

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure.

UNIT V:

Expert systems and applications: Introduction, phases in building expert systems, expert system versus traditional systems, rule-based expert systems ,blackboard systems ,truth maintenance systems, application of expert systems, list of shells and tools.

TRACK-1	AI & ML: (HONORS)	L	T	P	C
		3	0	0	3
	Deep Learning				

Course Objectives: At the end of the course, the students will be expected to:

1. Learn deep learning methods for working with sequential data,

2. Learn deep recurrent and memory networks,

3. Learn deep Turing machines,

4. Apply such deep learning mechanisms to various learning problems.

5. Know the open issues in deep learning, and have a grasp of the current research directions.

COURSE OUTCOMES: At the end of the course, student should be able to:

1. Understand the basic concepts and fundamentals of deep learning.

2. Apply different optimization techniques such as gradient descent, RMSprop, and backpropagation to minimize the loss function and update the network parameters.

3. Use convolutional neural networks to build models for image classification.

4. Understand the basic concepts of recurrent and recursive networks.

5. Apply deep learning to a wide range of applications, including image recognition, natural language processing, speech recognition, and reinforcement learning.

UNIT-I

History of Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm and Convergence, Multilayer Perceptrons (MLPs), Representation of MLPs, Sigmoid Neurons, Gradient Descent, Representation of Feedforward Neural Networks.

UNIT II

Deep Neural Network: Loss function, optimization techniques - Gradient descent, RMSprop, backpropagation, training deep models, regularization - Early stopping, augmentation, dropout.

UNIT III

Convolution Neural Network: Convolution operation, Building Blocks of CNN, Pooling, Variants of

basic convolution function.

UNIT IV

Recurrent and Recursive Networks: Recurrent Neural Networks, Bidirectional RNNs, Deep recurrent neural networks, Long Short-Term Memory Networks.

UNIT V

Applications: Object recognition, computer vision, natural language processing.

Introduction to Deep Learning Tools: Tensorflow, Torch.

TEXT BOOKS:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016..

2. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 1st edition-2006.

REFERENCE BOOKS:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, first edition-2009.

2. Matrix Computations, Golub, G., H., and Van Loan,C.,F, JHU Press,3rd edition-2013.

3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 3rd edition-2004**.**

TRACK-1	AI & ML: (HONORS)	L	T	P	C
		3	0	0	3
	Natural Language Processing				

Course Objectives:

1. This course introduces the fundamental concepts and techniques of natural language processing (NLP).
2. Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
3. The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
4. Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes: After completion of this course

1. Demonstrate a given text with basic Language features
2. To design an innovative application using NLP components
3. Explain a rule-based system to tackle morphology/syntax of a language
4. To design a tag set to be used for statistical processing for real-time applications
5. To compare and contrast the use of different statistical approaches for different types of NLP applications.

UNIT I :

Introduction : Origins and challenges of NLP, Empirical Laws, Basics of Text Processing. Words, Corpora, Text Normalization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT II :

Language Modelling : Grammar-based LM, Statistical LM. Probabilistic Language Modelling, N-gram Language Model, Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff. Computational Morphology: Bound and free, affixes, content vs functional, inflectional vs. derivational, Morphological processes, techniques of word formation, processing

morphology.

UNIT III :

Word Level Analysis : Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging, Hidden Markov and Maximum Entropy models .

Syntactic Analysis – 1   : Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar, Syntactic Parsing, Top-down and bottom-up, Ambiguity.

UNIT IV :

Syntactic Analysis – 2 : CKY Parsing -Dynamic Programming approach, Probabilistic CFG, Feature structures, Unification of feature structures.

Dependency Grammars and Parsing: Introduction, Transition Based Parsing – Formulation, MST-based Dependency Parsing

UNIT V :

Distributional Semantics: Introduction, Distributional models of semantics, Applications, Structured Models, Word Embeddings.

Word Senses and WordNet: Word Senses, Relation between Senses, WordNet: A database of Lexical Relations, Word Sense Disambiguation, Novel Word Sense Detection

TEXT BOOKS :

1. Dan Jurafsky and James Martin. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition. Prentice Hall, Second Edition, 2009.

2. Chris Manning and Hinrich Schütze. Foundations of Statistical Natural Language Processing. MIT Press, Cambridge, MA: May 1999.

REFERENCE BOOKS :

1. Breck Baldwin, Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.

2. Richard M Reese, Natural Language Processing with Java, OReilly Media, 2015.

3. Nitin Indurkhya and Fred J. Damerau, Handbook of Natural Language Processing, Second,

4. Chapman and Hall/CRC Press, 2010. Edition

5. Tanveer Siddiqui, U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

Web Resources :

1. Speech and Language Processing - https://web.stanford.edu/~jurafsky/slp3/
2. Natural Language Processing (NPTEL) - https://onlinecourses.nptel.ac.in/noc23_cs80/preview

TRACK-1	AI & ML: (HONORS)	L	T	P	C
		3	0	0	3
	Web Intelligence				

Course objectives

1. Understand the fundamental concepts and principles of web analytics, including data collection, segmentation, and visualization.\

2. Explore the role of web scraping as a complementary technique to traditional web analytics for data collection.

3. Develop proficiency in using web analytics tools and techniques to collect, analyze, and interpret web data effectively.

4. Learn how to create and apply segmentation strategies to analyze user behavior and improve website performance.

5. Gain practical experience in visualizing and reporting web analytics data to communicate insights and recommendations.

6. Explore advanced analytics techniques, including cohort analysis and user exploration, to understand user behavior patterns and trends.

Course Outcomes: Students will be able to

1. Explain the basic concepts of web analytics and understand the role of web scraping as a method for data collection.

2. Gain proficiency in using various methods of web data collection, including web scraping, and be able to determine appropriate metrics and reports for web analytics.

3. Develop the ability to create meaningful segments in web analytics data, visualize insights effectively, and incorporate web scraped data into analytics reports.

4. Learn advanced analytics techniques such as cohort analysis and user exploration, and understand the integration of third-party data sources, enhancing their ability to derive actionable insights.

5. Analyze real-world case studies to understand the practical applications of web analytics and web scraping, and discuss emerging trends and technologies in web intelligence, preparing them for future challenges and opportunities in the field.

UNIT-I

Introduction to Web Intelligence and Data Collection - Getting Started with Web Intelligence, Understanding How Web Analytics Works – Basic Concepts, Introduction to Web Scraping and its Role in Data Collection, Basic Segmentation in Web Analytics, Overview of Intermediate, Custom, and Calculated Metrics

UNIT-II

Data Collection Methods and Tools - Methods of Web Data Collection: Web Scraping vs. Web Analytics, Introduction to Basic Dashboards, Determining the Type of Reports to Deliver, Introduction to the Web Analytics Ecosystem, Industry Deployment of Web Analytics and Key Metrics to Measure

UNIT-III

Segmentation, Visualization, and Reporting - Creating Segments in Web Analytics, Understanding the Purpose of Segmentation, Visualizing Data in Web Analytics, Tracking Acquisition and Conversions, Reports and Visualizations for Mobile Visitors, Incorporating Web Scraped Data into Analytics Reports

UNIT-IV

Advanced Analytics Techniques and Third-Party Data - Utilizing Third-Party Data Sources such as Comscore, Advanced Techniques: Cohort Analysis and User Explorer, Analyzing Geo-Social Data, Case Studies in Web Analytics and Web Scraping Integration, Capstone Work, Final Discussions, and Assignments.

UNIT-V

Applications, Case Studies, and Future Trends - Applying Web Analytics and Web Scraping in Real-world Scenarios, Analyzing Case Studies of Successful Web Analytics and Scraping Integration, Discussion of Current Trends and Future Directions in Web Intelligence, Review and Presentation of Capstone Projects

Text books

1. Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity. Author: Avinash Kaushik

Reference Books

1. Web Analytics: An Hour a Day. Avinash Kaushik
2. Advanced Web Metrics with Google Analytics. Author: Brian Clifton
3. Web Scraping with Python: Collecting More Data from the Modern Web. Author: Ryan Mitchell
4. Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking. Authors: Foster Provost, Tom Fawcett

Web Resources

1. Google Analytics Academy: https://analytics.google.com/analytics/academy/

2. Moz: https://moz.com/learn/seo

3. Web Scraping with Python:
   https://www.datacamp.com/community/tutorials/web-scraping-using-python

4. Web Analytics Demystified: https://www.webanalyticsdemystified.com/ Analytics Vidhya:
   https://www.analyticsvidhya.com/

TRACK-2	DATA SCIENCE: (HONORS)	L	T	P	C
		3	0	0	3
Mathematical Essentials for Data Science					

Course Objectives:

This course aims at providing knowledge on basic concepts of Statistics, Estimation and testing of hypotheses for large and small samples.

Course Outcomes (CO): Student will be able to

1. Understand the basic concepts of Statistics
2. Analyze data and draw conclusion about collection of data under study using Point estimation
3. Analyze data and draw conclusion about collection of data under study using Interval estimation
4. Analyzing the tests and types of errors for large samples
5. Apply testing of hypothesis for small samples.

UNIT - I

Basic Concepts : Population, sample, parameter and statistic; characteristics of a good estimator; Consistency – Invariance property of Consistent estimator, Sufficient condition for consistency; Unbiasedness; Sufficiency – Factorization Theorem – Minimal sufficiency; Efficiency – Most efficient estimator, likelihood equivalence, Uniformly minimum variance unbiased estimator, applications of Lehmann- Scheffe's Theorem, Rao - Blackwell Theorem and applications

UNIT - II

Point Estimation

Point Estimation- Estimator, Estimate, Methods of point estimation – Maximum likelihood method (the asymptotic properties of ML estimators are not included), Large sample properties of ML estimator(without proof)- applications , Method of moments, method of least squares, method of minimum chi-square and modified minimum chi-square-Asymptotic Maximum Likelihood Estimation and applications.

UNIT - III

Interval Estimation:

Confidence limits and confidence coefficient; Duality between acceptance region of a test and a confidence interval; Construction of confidence intervals for population proportion (small and large samples) and between two population proportions(large samples); Confidence intervals for mean and variance of a normal population; Difference between the mean and ratio of two normal populations.

UNIT - IV

Testing of hypotheses:

Types of errors, power of a test, most powerful tests; Neyman-Pearson Fundamental Lemma and its applications; Notion of Uniformly most powerful tests; Likelihood Ratio tests: Description and property of LR tests - Application to standard distributions.

UNIT - V

Small sample tests: Student's t-test, test for a population mean, equality of two population means, paired t-test, F-test for equality of two population variances,CRD,RBD,LSD; Chi-square test for goodness of fit and test for independence of attributes, $\chi2$ test for testing variance of a normal distribution Sign test, Signed rank test, Median test, Mann-Whitney test, Run test and One sample Kolmogorov – Smirnov test ,Kruskal – Wallis H test(Description, properties and applications only).

Textbooks:

1. Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of Hypotheses, Prentice Hall of India, 2014.
2. Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman, Probability and Statistical Inference,9th edition,Pearson publishers,2013.

Reference Books:

1. S.P.Gupta, Statistical Methods, 33rd Edition, Sultan Chand & Sons.
2. Miller and John E Freund, Probability and Statistics for Engineers, 5th Edition.

Online Learning Resources:

1. https://www.statstutor.ac.uk/resources/uploaded/1introduction3.pdf
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2996198

TRACK-2	DATA SCIENCE: (HONORS)	L	T	P	C
		3	0	0	3
	Data Analysis using Python				

Course Objective:

To provide a comprehensive knowledge of data science using Python.

Course Outcomes:

1. By completing the course the students will be able to:
2. Understand various file formats in loading and storing data.
3. Understand NumPy and Pandas

UNIT I:

NumPy Basics: The NumPy ndarray: A Multidimensional Array Object, Creating ndarrays ,Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Transporting Arrays and Swapping Axes.

UNIT II:

Universal Functions: Fast Element-wise Array Functions, Data Processing using Arrays: Expressing Conditional Logic as Array Operations, Mathematical and Statistical Methods, Methods for Boolean Arrays, Sorting, File Input and Output with Arrays: Saving and Loading Text Files.

UNIT III:

Getting started with pandas: Introduction to pandas: Series, DataFrame, Index Objects, Essential

Functionality: Reindexing, Dropping entries from an axis, Indexing, selection, and filtering,Sorting and ranking, Axis Indexes with Duplicate Values, Summarizing and Computing Descriptive Statistics: Unique Values, Value Counts

UNIT IV:

Handling Missing Data: filtering out missing data, Filling in Missing data, Hierarchical Indexing:

Recording and Sorting Levels, Summary Statistics by Level, Using a DataFrame's Columns,

Data Loading, Storage, and File Formats : Reading and Writing Data in Text Format, Reading Text Files in Pieces, Writing Data Out to Text Format

UNIT V:

Data Wrangling: Combining and Merging Data Sets, Database style DataFrame Merges, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap , Reshaping and Pivoting, Reshaping with Hierarchical Indexing, Data Transformation, Removing Duplicates, Replacing Values.Plotting and **Visualization**: Line Plots, Bar Plots, Histograms and Density Plots, Scatter Plots.

Text Books:

1. Wes McKinney, "Python for Data Analysis", O'REILLY, ISBN:978-1-449-31979-3, 1st edition

Reference Books:

1. Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis,

and Visualization , O'Reilly

Web References:

https://www.coursera.org/learn/data-analysis-with-python

TRACK-2	DATA SCIENCE: (HONORS)	L	T	P	C
		3	0	0	3
	Text and Time-Series Data Analysis				

Course Objectives:

This course will cover the major techniques for mining and analyzing text data to discover interesting patterns, extract useful knowledge, and support decision making, with an emphasis on statistical approaches that can be generally applied to arbitrary text data in any natural language with no or minimum human effort. Develop the skills needed to do empirical research in fields operating with time series data sets. The course aims to provide students with techniques and receipts for the estimation and assessment of quality of economic models with time series data.

Course Outcomes: After completing the course

1. Students will be aware of fundamental concepts of text mining, unsupervised information extraction.
2. Students will be aware of text clustering algorithms like feature selection, distance-based clustering and latent semantic indexing.
3. Students will be aware of Text classification algorithms and text mining techniques.
4. Students should be aware of all the characteristics of time series and measures of dependencies.
5. Students will be able to understand the ARIMA Models.

UNIT I:

Introduction to Text Mining: Introduction, Algorithms for Text Mining, Information Extraction from Text: Introduction, Named Entity Recognition, Relation Extraction, Unsupervised Information Extraction.

Text Summarization Techniques: Extractive Summarization, Topic Representation Approaches, Influence of Context, Indicator Representation and Machine Learning for Summarization.

UNIT II:

Text Clustering Algorithms: Introduction, Feature Selection and Transformation Methods for Text Clustering, Distance-Based Clustering Algorithms, Word and Phrase-based Clustering, Probabilistic Document Clustering and Topic Modelling. Dimensionality Reduction and Topic Modelling: Latent

Semantic Indexing, Topic Models and Dimension Reduction.

UNIT III:

Text Classification Algorithms: Introduction, Feature Selection for Text Classification, Decision Tree Classifiers, Rule-based Classifier, Probabilistic and Naïve Bayes Classifiers, Linear Classifier, Proximity- based Classifier, Meta-Algorithms for Text Classification, Probabilistic Models for Text Mining: Mixture models, Stochastic Processes in Bayesian Nonparametric Models, Graphical Models.

UNIT IV:

Characteristics of Time Series: Introduction, Nature of Time Series Data, Time Series Statistical Models, Measures of Dependence: Autocorrelation and Cross-Correlation, Stationary Time Series, Time Series Regression and Exploratory Data Analysis: Classical Regression, Exploratory Data Analysis, Smoothing.

UNIT V:

ARIMA Models: Introduction, Autoregressive Moving Average Models, Difference Equations, Autocorrelation and Partial Autocorrelation, Building ARIMA Models, Multiplicative Seasonal ARIMA

Models, Spectral Analysis and Filtering: Cyclical Behaviour and Periodicity, Spectral Density, Periodogram and Discrete Fourier Transform, Nonparametric and Parametric Spectral Estimation, Linear Filters, Dynamic Fourier Analysis and Wavelets.

Text Books:

1. Charu C. Aggarwal, Chengxing Zhai, "Mining Text Data", Kluver Academic Publishers, Springer, 2012.
2. Robert H. Shumway and David S. Stoffer, "Time Series Analysis and Its Applications with R Examples", Springer, 2016.

Reference Books:

1. James D. Hamilton, Time Series Analysis, Princeton University Press, 2004.

2. Avishek Pal and PKS Prakash, Practical Time Series Analysis, Birmingham - Mumbai, 2017.

3. Box, G.E.P., G.M. Jenkins and G.C. Reinsel. n Time Series Analysis, Forecasting, and Control,

3rd ed. Englewood Cliffs, NJ: Prentice Hall, 1994.

4. Chan, N.H. Time Series: Applications to Finance. 2002, New York: Wiley.

5. Fuller, W.A. Introduction to Statistical Time Series, 2 nd ed. New York: Wiley, 1996.

TRACK-2	DATA SCIENCE: (HONORS)	L	T	P	C
		3	0	0	3
	Medical Image Data Processing				

Course Objectives:

The course will provide the participants with an up-to-date background in current state-of-the-art in medical imaging and medical image analysis. The aim of the course is to show how to extract, model, and analyze information from medical data and applications in order to help diagnosis, treatment and monitoring of diseases through computer science.

Course Outcomes: At the End of the Course:

1. Student will be able to explain the basic concepts of Medical Imaging Technologies, Systems and Formation Principles.
2. Students will be able to analyze the Medical Image Storage and Processing.
3. Students will be able to visualize the MRI, NMR and Artifacts.
4. Students should expertise the Segmentation and Classification techniques on Medical Image Data.
5. Students will be able to analyze Nuclear Imaging like PET, SPECT and 3D Images.

UNIT I:
Introduction: Introduction to Medical Imaging Technology, Systems, and Modalities. Brief History, Importance, Applications, Trends, Challenges. Medical Image Formation Principles: X-Ray physics, X Ray generation, Attenuation, Scattering, Dose Basic Principles of CT, Reconstruction Methods, Artifacts, CT hardware.

UNIT II:
Storage and Processing: Medical Image Storage, Archiving and Communication Systems and Formats Picture archiving and communication system (PACS);

Formats: DICOM Radiology Information Systems (RIS) and Hospital Information Systems (HIS). Medical Image Processing, Enhancement, Filtering Basic image processing algorithms Thresholding, contrast enhancement, SNR characteristics; filtering; histogram modeling.

UNIT III:
Visualization: Medical Image Visualization Fundamentals of Visualization, Surface and Volume Rendering/Visualization, Animation, Interaction. Magnetic Resonance Imaging (MRI) Mathematics of MR, Spin Physics, NMR Spectroscopy, Imaging Principles and Hardware, Image Artifacts.

UNIT IV:

Segmentation And Classification: Medical Image Segmentation, Histogram-Based Methods, Region Growing and Watersheds, Markov Random Field Models, Active Contours, Model-Based Segmentation. Multi-Scale Segmentation, Semi-Automated Methods, Clustering-Based Methods, Classification-Based Methods, Atlas-Guided Approaches, Multi-Model Segmentation. Medical Image Registration Intensity Based Methods, Cost Functions, Optimization Techniques.

UNIT V:

Nuclear Imaging: PET and SPECT Ultrasound Imaging Methods, Mathematical Principles, Resolution, Noise Effect, 3D Imaging, Positron Emission Tomography, Single Photon Emission Tomography, Ultrasound Imaging, Applications. Medical Image Search and Retrieval Current Technology in Medical Image Search, Content-Based Image Retrieval, New Trends: Ontologies, Applications, Other Applications Of Medical Imaging Validation, Image Guided Surgery, Image Guided Therapy, Computer Aided Diagnosis/Diagnostic Support Systems.

Text Books:

1. Paul Suetens, "Fundamentals of Medical Imaging", Second Edition, Cambridge University Press, 2009.

2. J. Michael Fitzpatrick and Milan Sonka, "Handbook of Medical Imaging, Volume 2. Medical Image Processing and Analysis", SPIE Publications, 2009.

Reference Books:

1. Kayvan Najarian and Robert Splinter, "Biomedical Signal and Image Processing", Second Edition, CRC Press, 2005.
2. Geoff Dougherty, "Digital Image Processing for Medical Applications", First Edition, Cambridge University Press, 2009.
3. Jerry L. Prince and Jonathan Links, "Medical Imaging Signals and Systems", First Edition 1, Prentice Hall, 2005.
4. John L. Semmlow, "Biosignal and Medical Image Processing", Second Edition, CRC Press, 2008.

		L	T	P	C
TRACK-3	**CYBER SECURITY: (HONORS)**	3	0	0	3
	Cyber Security Essentials				

Course objectives:

1. To understand various types of cyber-attacks and cyber-crimes

2. To learn threats and risks within context of the cyber security

3. To have an overview of the cyber laws & concepts of cyber forensics

4. To study the defensive techniques against these attacks

Course Outcomes:

 After completing this course, the students will be able to

1. Analyze and evaluate the cyber security needs of an organization.

2. Understand Cyber Security Regulations and Roles of International Law.

3. Design and develop a security architecture for an organization.

4. Understand fundamental concepts of data privacy attacks

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of

International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics

UNIT - III

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, Organizational security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc

Cybercrime: Examples and Mini-Cases Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. Mini- Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer

Forensics and Legal Perspectives, Wiley

2. B.B. Gupta, D.P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles,

Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335,2018.

REFERENCE BOOKS:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group

		L	T	P	C
TRACK-3	**CYBER SECURITY: (HONORS)**	**3**	**0**	**0**	**3**
	Malware Analysis				

Course Objectives:

1. Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
2. Writing optimized front end code HTML and JavaScript
3. Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
4. Design and implementation of Robust and Scalable Front End Applications

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

1. Enumerate the Basic Concepts of Web & Markup Languages
2. Develop web Applications using Scripting Languages & Frameworks
3. Make use of Express JS and Node JS frameworks
4. Illustrate the uses of web services concepts like restful, react js
5. Apply Deployment Techniques & Working with cloud platform

UNIT I:

Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

UNIT II:

JavaScript: The Basic of JavaScript: Objects, Primitives, Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. Angular Java Script Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.

UNIT III:

Node.js: Introduction, Advantages, Node.js Process Model, Node JS Modules. Express.js: Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing

Template Engines, Using Process Managers, Security & Deployment.

UNIT IV:

RESTful Web Services: Using the Uniform Interface, Designing URIs, Web Linking, Conditional Requests. React Js: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories.

UNIT V:

Mongo DB: Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

TextBooks:

1) Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.

2) Web Technologies, Uttam K Roy, Oxford

3) Pro Mean Stack Development, ELadElrom, Apress

4) Restful Web Services Cookbook, Subbu Allamraju, O'Reilly

5) JavaScript & jQuery the missing manual, David sawyer mcfarland, O'Reilly

6) Web Hosting for Dummies, Peter Pollock, John Wiley Brand

Reference Books:

1) Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006).

2) Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012).

3) Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.

4) An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.

5) Express.JS Guide,The Comprehensive Book on Express.js, Azat Mardan, Lean Publishing.

TRACK-3	**CYBER SECURITY: (HONORS)**	L	T	P	C
		3	0	0	3
CYBER ATTACK DETECTION AND PREVENTIONS AND SYSTEMS					

Course Objectives:

1. To understand the intrusion detection and prevention technologies, various types of network behavior analysis.
2. To understand the honeypots, multiple IDS methods, tools to analyze various types of attacks like wireless attacks and their detection.
3. To understand the the attack source and also provides practical knowledge for dealing with intrusions in real world applications.

Course Outcome:

1. To understand the intrusion detection and prevention technologies, various types of network behavior analysis.
2. To understand the honeypots, multiple IDS methods, tools to analyze various types of attacks like wireless attacks and their detection.
3. To understand the attack source and also provides practical knowledge for dealing with intrusions in real world applications.

UNIT-I

Introduction to IDPS:IDPS Technologies, Components and Architecture Implementation Uses of IDPS Technologies, Key Functions,Common Detection Methodologies Signature, Anomaly and Stateful Protocol Analysis, Types of IDPS Technologies

UNIT-II

Host and Network IDPS: Application, Transport, Network and Hardware Layer attacks, Sniffing Network Traffic, Replay Attacks, Command Injection, Internet Control Message Protocol Redirect, DDoS, Dangers and defenses with Man-in- the Middle, Secure Socket Layer attacks, DNS Spoofing,

Defense- in-Depth Approach, Port Security, Use Encrypted Protocols

UNIT-III

Network Behaviour Analysis: Components and Architecture Typical, Network Architecture, Sensor Locations.

Honeypots: Honeynets- Gen I, II and III, Honeymole, Detecting the Attack - Intrusion Detection, Network Traffic Capture, Monitoring on the box, Setting up the Realistic Environment.

UNIT-IV

Working with SNORT IDS: Introduction to Snort, Snort Alert Modes and Format, Working with Snort Rules, Rule Headers, Rule Options, The Snort Configuration File etc, Plugins, Preprocessors and Output Modules, Using Snort with MySQL.

Multiple IDPS Technologies:

Need for multiple IDPS Technologies, Integrating Different IDPS Technologies -Direct and Indirect, Firewalls, Routers and Honeypots, IPS using IP Trace back - Probabilistic and De- terministic Packet Marking, Marking

UNIT-IV

Wireless IDPS:WLAN Standards, WLAN Components, Threats against WLANs, 802.11 Wireless Infrastruc- ture Attacks, WEP Attacks, Wireless Client Attacks, Bluetooth Attacks, Cellphones, Personal Digital Assistance and Other Hybrid Devices Attack Detection, Jailbreaking.

Text Book(s) and Journals

1.Shui Yu, Distributed Denial of Service Attack and Defense, Springer, 2014 2.Bradd Lhotsky, OOSEC Host based Intrusion detection, PACKT Publication, 2013

Reference Books

1. John Hoopes, Virtualization for Security: Including Sandboxing, Disaster Recovery, High Availability, Forensic Analysis, and Honeypotting, Syngress,2009.
2. Karen Scarfone and Peter Mell, Guide to Intrusion Detection and Prevention Systems (IDPS),

NIST Special Publication 800-94, 2007

TRACK-3	**CYBER SECURITY: (HONORS)**	**L**	**T**	**P**	**C**
		3	0	0	3
	CYBER CRIME INVESTIGATION AND DIGITAL FORENSICS				

Course Objectives: To analyze how to conduct a digital forensics investigation and validate forensics data.

Course Outcomes:

1. Understand the fundamentals of cybercrime and issues.

2. Understand different investigation tools for cybercrime.

3. Understand basics of Forensic Technology and Practices.

4. Analyze different laws, ethics and evidence handling procedures.

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, -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.

Syllabus for

MINORS

(R20)

II B.Tech / II Sem	(Minors)	L	T	P	C
		3	1	0	4
Full Stack - Web Development					

Course Objectives:

The objective of this course is to provide understanding about the core concepts of Full Stack front-end and back-end development for web application.

Course Outcomes:

By the end of this course the student is able to

1. Demonstrate the important HTML tags and forms for designing static pages.
2. Create Web pages using HTML and CSS concepts.
3. Develop Java Script applications that transition between states
4. CreateaserverâsideAPIusingNode.jsanduseReacttobuildtheclientâsideUI
5. Develop and Integrate Mongo DB with Node.js and use it to build scalable, high-performance web applications.

UNIT-I

HTML: Introduction to web, Overview of Web Technologies**,** HTML- Introduction, Basic Syntax, Standard HTML Document Structure, Elements, Attributes, Headings, Paragraphs, Styles,TextFormatting,Frames, Quotation and CitationElements,Comments,Colors,Links, Images, tables, lists, classes and id.

HTML Forms: Form Attributes, Form Elements, Input Types, Input Attributes, Input form Attributes.

UNIT-II

CSS: Introduction to CSS, Applying CSS to HTML, Selectors, Properties and Values, Colors and Backgrounds, Margins, Padding, Borders, Text and Font Properties, Box Model

Advanced CSS: CSS Position, Rounded Corner, CSS Text Effects, CSS Gradients, Pagination, Shadows, CSS Flex box, CSS Animation

Introduction to CSS Grid, Layout, Elements, Grid Rows, Grid Columns, Grid Gaps, Grid Rows, Columns, Grid Template

UNIT-III

Introduction to Responsive Web Design: Viewport, Introduction to Media Queries, Responsive Web Page Design using Media Queries

JavaScript: Introduction to JavaScript, objects, Primitives, Operations and Expressions, Control statements, Arrays, Functions, In-built Events and handlers, Form validations.

UNIT-IV

Introduction to React JS: Introducing JSX, Rendering Elements, DOM and Virtual DOM, Components and Props, State and Lifecycle, Handling Events, Conditional Rendering, Lists and Keys, Forms, Modals, Hooks.

Node.js: Why and What Node.js, How to use Node.js, create a web server in Node.js, Node Package Manager, Modular programming in Node.js, Restarting Node application, File operations.

UNIT-V

Mongo DB: Introduction Module Overview, Document Database Overview, Understanding JSON, Mongo DB Structure and Architecture, Mongo DB Remote Management, Installing Mongo DB on the local computer (Mac or Windows), Introduction to Mongo DB Cloud, Create Mongo DB Atlas Cluster, GUI tools Overview, Install and Configure Mongo DB Compass, Introduction to the Mongo DB Shell, Mongo DB Shell JavaScript Engine, Mongo DB Shell JavaScript Syntax, Introduction to the Mongo DB Data Types, Introduction to the CRUD Operations on documents, Create and Delete Databases and Collections, Introduction to Mongo DB Queries.

TEXTBOOKS:

1. "Web Development with HTML, CSS, and JavaScript" by Jon Duckett
2. "Full Stack JavaScript :Learn Backbone.js, Node.js, and Mongo DB" by AzatMardan
3. "Node.jsWebDevelopment:Createreal-timeserver-sideapplications applications with this practical, step-by-step guide" by David Herron

Reference Books:

1. "Full-Stack JavaScript Development:Develop, Testand, and Deploy with MongoDB, Express, Angular and Node on AWS" by Eric Bush and Colin JIhrig

2. "Learning Node.js: A Hands-On Guide to Building Web Applications in JavaScript" by Marc Wandschneider

II B.Tech / II Sem	(Minors)	L	T	P	C
		3	1	0	4
	DISCRETE MATHEMATICAL STRUCTURES				

Course Objectives:

1. Check the validity of arguments by using basic connective and valid rules of inference.
2. Observe various properties of sets and relations.
3. Identify different graphs, isomorphism of graphs, paths, cycles and circuits.
4. Identify different types of trees.
5. To introduce recurrence relations.

Course Outcomes:

1. Ability to apply mathematical logic to solve problems.
2. Understand sets, relations, functions and discrete structures
3. Apply graph theory concepts to modeling problems in Computer Science using graphs.
4. Able to model and solve real-world problems using trees
5. Solve different recurrence relations.

UNIT I

Mathematical Logic : Propositional Calculus: Statements and Notations, Connectives, Truth Tables, Tautologies, Equivalence of Formulas, Duality law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof. Predicate calculus: Predicate Logic, Statement Functions, Variables and Quantifiers, Inference theory for predicate calculus.

UNIT II

Set Theory : Introduction, Operations on Binary Sets. Relations: Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams.

Functions: Bijective Functions, Composition of Functions.

UNIT III

Graph Theory I : Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, (Problems and Theorems without proofs).

UNIT IV

Graph Theory II Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number, (Problems and Theorems without proofs).

Trees, Directed trees, Binary Trees, Spanning Trees: Properties, Algorithms for Spanning trees and minimum Spanning Trees.

UNIT V

Recurrence Relations: Generating Functions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rdEdition, Tata McGraw Hill.
3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

REFERENCE BOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon Cutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.

III B.Tech / I Sem	(Minors)	L	T	P	C
		3	1	0	4
COMPUTER NETWORKS					

COURSE OBJECTIVES

1. Understand state-of-the-art in network protocols, architectures, and applications.
2. Process of networking research
3. Constraints and thought processes for networking research

COURSE OUTCOMES

1. Understand OSI and TCP/IP models, and physical layer design issues
2. Analyze MAC layer protocols and LAN technologies
3. Learn various routing and congestion control algorithms
4. Understand the functionality of Transport, Session and Presentation layers
5. Differentiate various Application layer protocols

UNIT-I

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models.

Physical Layer: Guided Transmission Media, Digital Modulation and Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing, Wavelength Division Multiplexing.

UNIT-II

The Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet.

The Media Access Sub Layer: Channel allocation problem, multiple access protocols.

UNIT-III

Network Layer: Network layer design issues

Routing algorithms: Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing. Congestion control algorithms.

UNIT-IV

The Transport Layer: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP

Session Layer: Design issues, remote procedure call (RPC)

Presentation Layer: Design issues, Data compression techniques

UNIT V

The Application Layer: Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http.

Application Layer Protocols: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet

TEXT BOOKS:

1. Tanenbaum and David J Wetherall, Computer Networks, 6th Edition, Pearson Edu,

   1 April 2022 (Publication Date)

2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education

REFERENCE BOOKS:

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks - A Systems Approach" (5th ed), Morgan Kaufmann/ Elsevier, 2011
2. James F.Kurose and Keith W.Ross,"Computer Networking: A Top Down Approach" (8th ed), Pearson, 2022.

III B.Tech / I Sem	(MINORS)	L	T	P	C
		3	1	0	4
	E-Commerce				

Course Objectives:

1. Identify the major categories and trends of e-commerce applications.
2. Identify the essential processes of an e-commerce system.
3. Discuss the benefits and trade-offs of various e-commerce clicks and bricks alternatives.
4. Understand the main technologies behind ecommerce systems and how these technologies interact.
5. Discuss the various marketing strategies for an online business.
6. Define various electronic payment types and associated security risks and the ways to protect against them.

Course Outcomes:

1. Understand the basic concepts and technologies used in the field of E-Commerce

2. Compare and Contrast various Electronic Payment systems and understand the working of EDI

3. Understand the basic concepts of Intra Organizational commerce.

4. Identifying different strategies of advertising and to effectively understand the process of information search and retrieval.

5. Understand the basic technologies of multimedia concepts

UNIT–I: Electronic Commerce- Framework, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. Consumer Oriented Electronic commerce –Mercantile Process models.

UNIT–II: Electronic Payment Systems–Types of Electronic Payment Systems, Risks in Electronic Payment systems. Inter Organizational Commerce - EDI, EDI Software Implementation.

UNIT–III: Intra Organizational Commerce-WorkFlow Automation and Coordination,

Customization and Internal Commerce, Supply chain Management.

UNIT–IV: Advertising and Marketing - Information based marketing, Advertising on Internet, On-line marketing process, Market research.Consumer Search and Resource Discovery-Information search and Retrieval, Commerce Catalogs, Information Filtering.

UNIT–V: Multimedia-key multimedia concepts, Digital Video and Electronic Commerce, Desktop video processing, Desktop Video Conferencing.

TEXTBOOK:

1. Frontiers of electronic commerce–Kalakata, Whinston, Pearson.

REFERENCE BOOKS:

1. E Commerce fundamentals and applications Hendry Chan, Raymond Lee,Tharam Dillon, Ellizabeth Chang, John Wiley.
2. E-Commerce, S. Jaiswal– Galgotia.
3. E-Commerce, Efrain Turbon, Jae Lee, David King, H. Michael Chang.
4. Electronic Commerce – Gary P.Schneider–Thomson.

III B.Tech / II Sem	(MINORS)	L	T	P	C
		3	1	0	4
	Object Oriented Analysis and Design				

Course Objectives:

1. Familiarize students with all phases of OOAD.
2. Master the main features of UML.
3. Understand and apply Object Technologies in various domains.
4. Develop the ability to analyze and solve complex problems.

Course Outcomes:

1. Analyze complex systems to propose effective solutions.
2. Utilize UML conceptual models proficiently for class and relationship design.
3. Design class and object diagrams accurately to represent static aspects of software systems.
4. Apply structural modeling concepts effectively for designing real-time applications.
5. Employ state charts and implementation diagrams adeptly to model behavioral aspects and runtime environments of software systems.

UNIT I:

Introduction: The Structure of Complex Systems, The Inherent Complexity of Software, Attributes of Complex Systems, Organized and Disorganized Complexity, Bringing Order to Chaos.

UNIT II:

Introduction to UML: Importance of modeling, principles of modeling, object-oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle.

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.

UNIT III:

Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. **Advanced Structural Modeling:** Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

UNIT IV:

Basic Behavioral Modeling-I: Interactions, Interaction diagrams Use cases, Use case

Diagrams, Activity Diagrams. **Case Study:** Web Application: Vacation Tracking System

UNIT V:

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. **Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams

Case Study: Weather Forecasting

Text Books:

1. Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston , "Object- Oriented Analysis and Design with Applications", 3rd edition, 2013, PEARSON.
2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.

Reference Books:

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

III B. Tech/ II Sem	(MINORS)	L	T	P	C
		3	1	0	4
	Computer Organization				

Course Objective:

`Understand the architecture of a modern computer with its various processing units.

Course Outcomes:

1. Understand the architecture of modern computers.

2. Understanding of different instruction types.

3. Students can calculate the effective address of an operand by addressing modes

4. They can understand how computers store positive and negative numbers.

5. Understanding of how a computer performs arithmetic operation of positive and negative numbers.

UNIT I

Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

UNIT II

Machine Instruction and Programs: Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types, Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equations. Component of Instructions: Logic Instructions, shift and Rotate Instructions, Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT III

Input / Output Organization: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT IV

The Memory Systems: Basic memory circuits, Memory System Consideration, ReadOnly Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Cache Memories: Mapping Functions, INTERLEAVING Secondary Storage: Magnetic Hard Disks, Optical Disks.

UNIT V

Processing Unit: Fundamental Concepts: Register Transfers, Performing An Arithmetic Or Logic Operation, Fetching A Word From Memory, Execution of Complete Instruction, Hardwired Control, Micro programmed Control: Microinstructions, Microprogram Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

TEXT BOOKS:

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.

REFERENCE BOOKS:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int.
4. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy.

IV B. Tech/ I Sem	(MINORS)	L	T	P	C
		3	1	0	4
Web Technologies					

Course Objectives:

The course enables students to:

1. Describe the fundamentals of concepts of web and xml schemes

2. Acquire server side scripting language concepts using PHP and Node js

3. Creation of databases using Mongo DB and integration using PHP and Node js.

4. Understand the basic knowledge of servlets and jsp in building dynamic web applications.

Course Outcomes:

The student will be able to:

1. Enumerate the Basic Concepts of Web, Markup Languages and XML Schemas.

2. Develop web applications using Scripting Languages

3. Design and develop web application using Node JS to connect MongoDB

4. Implement java and server side servlets to develop web applications.

5. Build interactive web applications using JSP by applying MVC framework.

UNIT I - Introduction to Web & XML

Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. HTML5 concepts, CSS3, Anatomy of web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

UNIT II - PHP

Introduction to PHP, Create and run PHP script, working with variables, constants, data types, operators, conditional statements, control statements, arrays, functions, cookies, session tracking, working with forms and MySQL databases.

UNIT III - Node.js & MongoDB

Node.JS: Introduction to Node.js, Features of Node.js, Advantages, Node.js Process Model, Node.js Built-in Modules, Node.js HTTP Module, Node.js NPM, Node.js File System Module and Node.js Events.

MongoDB: Introduction to NoSQL, create and manage MongoDB, Migration of Data into MongoDB, MongoDB with PHP, MongoDB with Nodejs.

UNIT IV – Java Servlets

Java Servlets: Introduction to Servlets: Lifecycle of a Servlet, The Servlet API, The javax.servlet Package, Reading Servlet parameters, and Reading Initialization parameters. javax.servlet HTTP package, Handling Http Request & Responses, Using Cookies, Session Tracking, Security Issues.

UNIT V – Java Server Pages

Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing, JSP scripting, declarations, expression tag, JSP directives, Implicit JSP Objects, JSP action elements, cookies and session tracking, connecting to mysql database in JSP and MVC in JSP.

Text Books:

1. Programming the World Wide Web - Robert W. Sebesta - 7th edition – Pearson, 2013.
2. Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.
3. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill, July 2017.
4. Pro Mean Stack Development, 1st Edition, ELad Elrom, Apress O'Reilly, 2016.

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2009.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, engage Learning, 2003.
3. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.
4. Core Servlets and Java Server Pages: Volume 1: Core Technologies by Marty Hall and Larry brown Pearson, 2003.
5. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia.

IV B. Tech/ I Sem	(MINORS)	L	T	P	C
		3	1	0	4
	Software Project Management				

Course Objectives: At the end of the course, the student shall be able to:

1. To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
2. To compare and differentiate organization structures and project structures
3. To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to

1. Understand the process to be followed in the software development life-cycle models.
2. Describe the concepts of project management & planning.
3. Choose the project plans through managing people, communications and change
4. Discuss various activities necessary to successfully complete and close the Software projects.
5. Implement communication, modeling, and construction & deployment practices in software development.

UNIT I

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

UNIT II

The Old Way and The New: The principles of conventional software Engineering, Principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

UNIT III

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows. Checkpoints of the Process: Major milestones, Minor Milestones, Periodic status assessments.

UNIT IV

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, pragmatic Software Metrics.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique.

Text Books:

1. Software Project Management, Walker Royce, Pearson Education, 2005.
2. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

Reference Books:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3. Effective Software Project Management, Robert K.Wysocki, Wiley,2006.