B.Tech. FOUR YEAR DEGREE COURSE

R20 Regulations

(Applicable for the batches admitted from 2020-2021)

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM

(Autonomous)

Approved by AICTE & Affiliated to JNTUK, Kakinada

Accredited with A++ Grade by NAAC & NBA

Vishnupur, Bhimavaram, West Godavari Dist., Andhra Pradesh, India.

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THE DEGREE OF BACHELOR OF TECHNOLOGY - REGULAR
(With effect from 2020-21)

	TITLE AND DURATION OF THE COURSE
	The course shall be called the degree course in Bachelor of Technology, abbreviated as B.Tech.
	The course shall be of four academic years duration divided into eight semesters, each semester having duration of minimum 16 weeks.
	The calendar of events in respect of the course shall be fixed by the Institute from time to time.
	The external examination in all the subjects shall be conducted at the end of each semester for all the eight semesters.
RB 0.0	Students joining the B.Tech. programme shall have to complete the programme in a stipulated time frame of 8 years from the date of joining and students joining the B.Tech. Programme in the third semester directly through Lateral Entry Scheme (LES) shall have to complete the programme in a stipulated time frame of 6 years from the date of joining. Otherwise, they shall forfeit their seat in B.Tech. Programme and their admission shall stand cancelled.
	When a student is detained for lack of credits / shortage of attendance, he/she may be readmitted into the same semester / year in which he/she has been detained. However, the academic regulations under which he/she was first admitted shall continue to be applicable.
RB 1.0	**ELIGIBILITY FOR ADMISSION**
RB 1.1	Admissions are done as per the norms prescribed by the Government. The Government orders issued from time to time in this regard shall prevail.
RB 1.2	The Candidate shall be an Indian National.
RB 1.3	The Candidate should have passed the qualifying examination, i.e., Intermediate or equivalent on the date of admission.
RB 1.4	Seats in each programme in the college are classified into CATEGORY-A (70% of intake) and CATEGORY – B (30% of intake) besides lateral entry.
RB 1.5	Category 'A' Seats shall be filled by the Convener, EAMCET Admissions. Category 'B' Seats shall be filled by the College as per the guidelines of Andhra Pradesh State Council of Higher Education. 'Lateral Entry' candidates shall be admitted into the Third semester directly based on the rank secured by the candidate in Engineering Common Entrance Test (ECET) in accordance with the instructions given by the Convener, ECET and the Government of Andhra Pradesh.
RB 2.0	**AWARD OF B.TECH. DEGREE**
RB 2.1	A Regular Student shall be declared eligible for the award of the B.Tech. Degree, if he/she pursues a course of study in not less than four and not more than eight academic years. A Lateral Entry Student admitted into III semester shall be declared eligible for the award of the B.Tech. Degree, if he/she pursues a course of study in not less than three and not more than six academic years.

RB 2.2	Each discipline of the B.Tech. programme is designed to have a total of 160 credits and the student shall have to complete the courses and earn all credits as per the requirements for award of the degree. Students joining the B.Tech. programme in the third semester directly through Lateral Entry Scheme (LES) shall have to complete the courses, excluding first year courses and credits as per the requirements for award of the degree.
RB 2.3	The B.Tech. Degree shall be conferred on a candidate who has satisfied the following requirements. A Regular student (four year programme) should register for 160 credits. In order to become eligible for the award of B.Tech. Degree, the student must obtain 160 credits. A Lateral Entry student should register for [160 Minus (first Year credits)] credits and should obtain all the credits. However, it is mandatory for the students to complete the noncredit courses
RB 3.0	**MINIMUM INSTRUCTION DAYS**
RB 3.1	The minimum instruction days for each semester shall be 90 working days.
RB 4.0	**COURSES OF STUDY**
	Branch Code- Branch Abbreviation 01-CE (Civil Engineering) 02-EEE (Electrical and Electronics Engineering) 03-ME (Mechanical Engineering) 04-ECE (Electronics and Communication Engineering) 05-CSE (Computer Science and Engineering) 12-IT (Information Technology) 54-AI&DS (Artificial Intelligence and Data Science) 48-CS&BS (Computer Science and Business System)
RB 4.1	**Groups of Courses: The Group of courses is as per APSCHE Revised Engineering Curriculum (B.Tech. Regular/Honors/Minor) 2020.** The Courses in the B.Tech. Programme are of these following kinds: Basic Science, Engineering Science, Professional Core, Professional Elective, Open Elective/Job Oriented elective, Humanities and Social Science, Humanities and Social Science Elective, Skill Oriented, Skill Advanced Course/Soft Skill Course, Summer Internship, Industrial/Research internship, Mandatory Course and Project.
RB 5.0	**DISTRIBUTION AND WEIGHTAGE OF MARKS**
RB 5.1	The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. The Project evaluated for 200 marks and internship for 100 marks.
RB 5.2	For theory subjects, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End Examinations.

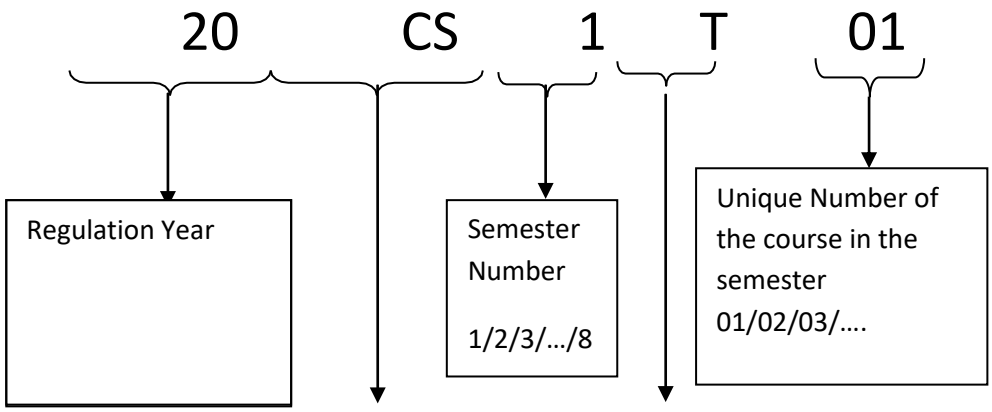
RB 5.3	The Internal evaluation 30 marks shall be awarded as follows: 15 marks for Descriptive, 10 marks for Quiz and 5 marks for Assignment. The descriptive examination is for 90 minutes duration conducted for 30 marks. Each descriptive examination question paper consists of three questions (either - or type) from 2½ units (Mid-1: Q1 from Unit-1 for 12 marks, Q2 from Unit-2 for 12 marks, and Q3 from first-half of Unit-3 for 6 marks) (Mid-2: Q1 from second-half of Unit-3 for 6 marks, Q2 from Unit-4 for 12 marks, and Q3 from Unit-5 for 12 marks). All the questions shall be answered. The descriptive examination conducted for 30 Marks is to be brought down to total marks of 15. The quiz examination is for 20 minutes duration (Conducted with 20 objective questions with a weightage of ½ Mark each). Thought provoking questions shall be covered in Quiz examination. After every 2 ½ Units, one Assignment/Tutorial shall be assigned/conducted. Assignment/Tutorial consists of Theory, Design, Analysis, Simulation, Algorithms, Drawing, etc. as the case may be. Out of the two Assignments / tutorials, average of the two Assignments shall be considered for awarding of marks. Average of two Mid tests (descriptive, quiz and assignment) shall be considered as final marks of the MID. Eg: A student got 12 marks out of 15 marks in Descriptive-1, 7 marks out of 10 marks in Quiz-1 and 8 marks out of 15 marks in Descriptive-2 and 2 marks out of 10 marks in Quiz-2. Assignment-1 = 3 out of 5 and Assignment-2 = 5 out of 5. The student Internal marks are = ((19+10)/2 + (3+5)/2) = 18.5 is rounded off to 19 marks out of 30 marks. If a student is absent from any one MID examination, he/she can appear for a Grand Test after MID-2. The Grand Test will be conducted with questions covering the entire syllabus. The marks in the grand test is reduced to 25 marks and to be considered for the respective MID.
RB 5.4	The end semester examination is conducted for 70 marks. The Question Paper consists of two parts (Part-A for 10 Marks and Part-B for 60 marks). Part A consists of 5 questions for 2 marks each, where five questions shall be from each unit. In Part-A the student has to answer all 5 Questions. Part-B consists of 5 Questions (either - or type) from each unit with 12 marks each. In Part-B the student has to answer all 5 Questions. For design subjects (like Design Drawing Concrete Structures, Steel Structures, Building Planning and Drawing), the pattern will consist of 2 parts (part-A and B), where in part-A two questions will be given with each question carrying 25 marks, out of which the student has to answer one question and part-B consists of 5 questions with each question carrying 15 marks, out of which the student has to answer 3 questions.
RB 5.5	For practical subjects, there shall be continuous evaluation during the semester for 30 internal marks. Out of the 30 marks for internal, day-to-day work 15 marks, Record 5 marks and 10 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted for 70 marks by the internal examiner and the external examiner.
RB 5.6	For the subjects having design and/or drawing (such as Engineering Graphics, Engineering Drawing, Machine Drawing, Design Drawing Concrete Structures, Steel Structures, Building Planning and Drawing), the distribution shall be 30 marks for internal evaluation (15 marks for day–to–day work, and 15 marks for MID tests) and 70 marks for end examination. The average of 2 MIDs shall be considered as final

	marks of the MID.
RB 5.7	For the seminar, the student shall collect the information on a specialized topic and prepare a technical report showing his/her understanding over the topic, and submit to the department, which shall be evaluated by the Departmental Committee consisting of the Head of the Department, a seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.
RB 5.8	Out of a total of 200 marks for the Project, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the Committee. The Committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the Eighth semester. The Internal Evaluation marks shall be on the basis of two seminars given by each student on the topic of his/her project and evaluated by an Internal Committee, consisting of Head of the department, the supervisor of the project and a senior faculty member.
RB 5.9	Laboratory marks and the internal marks awarded by the department are not final. The marks are subjected to be scrutinized and scaled by the Institute wherever it is felt desirable. The internal and laboratory marks awarded by the department shall be referred to a Committee if required. The Committee shall arrive at a scaling factor and the marks shall be scaled as per the scaling factor. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved for two years after the final examinations of that semester in the respective departments as per the norms of the Institute and shall be produced to the Committees as and when they ask for.
RB 6.0	**PROGRAMME STRUCTURE**
	The programme structure is as per APSCHE Revised Engineering Curriculum (B.Tech Regular/Honors/Minor) 2020.
	Basic Science Courses
	Engineering Science Courses
	Professional Core Courses
	Professional Elective Courses
	Humanities and Social Science Courses
	Humanities and Social Science Elective
	Internship
	Industrial /Research internship
	Skill Oriented Course
	Skill Advanced Course/Soft Skill Course
	Open Elective/Job Oriented elective
	Mandatory Courses
	Project
RB 7.0	**SCHEME OF INSTRUCTION FOR I, II, III AND IV YEARS**
RB 7.1	The Schemes of Instruction and syllabi of all B.Tech. programmes are given separately, which are approved by the BOS concerned and the Academic Council.
RB 8.0	**CONTACT HOURS AND CREDITS**

RB 8.1	One hour of lecture/Tutorial is equivalent to one credit and one hour of practical work/field work is equivalent to 0.5 credit**.**
RB 8.2	**THEORY / TUTORIAL CLASSES** Each course is prescribed with a fixed number of lecture periods per week. During lecture periods, the course instructor shall deal with the concepts of the course. For certain courses, tutorial periods are prescribed in order to give exercises to the students and to closely monitor their learning abilities and achievements.
RB 8.3	**LABORATORY / DRAWING COURSES** A minimum prescribed number of experiments/drawings/jobs/programmes have to be performed by students, who shall complete these in all aspects and get each experiment evaluated by the teacher concerned and certified by the Head of the Department concerned at the end of the semester.
RB 9.0	**MEDIUM OF INSTRUCTION**
	The Medium of Instruction and examination is in English.

RB 10.0	**ATTENDANCE REQUIREMENTS**
RB 10.1	In each semester, the candidate has to put in a minimum attendance of 75% with at least 40% attendance in each subject and with a provision of condonation of 10% of the attendance by the Principal on the specific recommendation of the HOD, showing some reasonable cause such as medical grounds, participation in University level sports, cultural activities, seminars, workshops, paper presentation etc.
RB 10.2	Students, having shortage of attendance and got condonation for attendance, shall have to pay requisite fee towards condonation.
RB 10.3	Shortage of attendance below 65% in aggregate shall not be condoned.
RB 10.4	Students whose shortage of attendance is not condoned will be detained and the student has to re-register for that semester when it is offered by the department.
RB 10.5	Rules for calculation of attendance for the re-admitted candidates who were detained for want of attendance or who had break–in study for various reasons: a) No. of classes conducted shall be counted from the day one of the semester concerned, irrespective of the date of payment of tuition fee. b) They should submit a written request to the Principal, along with a challan paid towards tuition and other fee, for re-admission before the commencement of class-work. c) Student should come to know about the date of commencement of class-work of the semester into which he/she wishes to get re-admission. The information regarding date of commencement of class-work for each semester is available in the college notice boards/ website.
RB 11.0	**CONDITIONS FOR PASS AND AWARD OF CREDITS FOR A COURSE**
RB 11.1	A candidate shall be declared to have passed in individual theory/drawing course if he/she secures a minimum of 40% aggregate marks (40 marks out of 100, Internal and semester end examination marks put together), subject to a minimum of 35% marks (24 marks out of 70) in semester end examination. For successful completion of mandatory course, the student must get a satisfactory grade from the department offering the course. If fails, he/she has to reappear whenever the course is offered.

RB 11.2	A candidate shall be declared to have passed in individual lab/project course if he/she secures a minimum of 40% aggregate marks (Internal and semester end examination marks put together), subject to minimum of 35% marks in semester end examination.
RB 11.3	The student has to pass the failed course by appearing the supplementary examination as per the requirement for the award of degree.
RB 11.4	On passing a course of a programme, the student shall earn assigned credits in that course.
RB 12.0	**TRANSITORY REGULATIONS**
RB 12.1	A candidate, who is detained or discontinued in the semester, on readmission shall be required to pass all the courses in the curriculum prescribed for such batch of students in which he/she joins subsequently. However, exemption shall be given to those candidates who have already passed in such courses in the earlier semester(s) and substitute subject may be offered as approved by College Academic Committee and ratified by the Academic Council.
RB 12.2	A student shall be eligible for promotion to the next semester of B.Tech. programme, if he/she satisfies the conditions as stipulated in Regulation RB10.0
RB 12.3	A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of the 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. 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. **For Lateral Entry Candidates** 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.
RB 13.0	**COURSE CODE AND COURSE NUMBERING SCHEME:** The subject codes shall be given by the Department teaching the subject. Each subject code contains 8 characters. The 8 Characters for each subject shall be coded as per the following guidelines.



Code of the Dept teaching the subject
IT – IT
CS – CSE
EC – ECE
EE – EEE
ME – Mech
CE – Civil
MB – MBA
BS – Basic Sc.
AD-AI & DS
CB-CS&BS

Type of subject
T – Theory-Core/Elective
P – Practical
S – Seminar
J – Project
A – Mandatory course
M – MOOC
I – Internship/certification course/Yoga/Foreign Languages

	While giving the subject codes the Departments can follow the following steps. i. Collect the requirements from various Departments.(subjects which they have to teach for other Departments) ii. Prepare a list of all the subjects the Departments have to teach in that semester (for their Department as well as the other Departments based on the requirements they have collected in point i.) iii. Give subject codes to all these subjects following the guidelines given. iv. Communicate these subject codes(identified in point i) to various Departments. v. Use the subject codes identified in point iii to the subjects in their course structure.
RB 14.0	**CONSOLIDATED GRADE CARD**
	A consolidated grade card containing credits and grades obtained by the candidate shall be issued after completion of the four year B.Tech. Programme.
RB 15.0	**METHOD OF AWARDING LETTER GRADES AND GRADE POINTS FOR A COURSE**
RB 15.1	A letter grade and grade point shall be awarded to the student in each course based on his/her performance as per the grading system given below

Marks Range Theory (Max – 100)	Marks Range for Lab with Max – 50	Letter Grade	Level	Grade Point
≥ 90	≥ 45	O	Outstanding	10
≥ 80 < 90	≥ 40 < 45	S	Excellent	9
≥ 70 < 80	≥ 35 < 40	A	Very Good	8
≥ 60 < 70	≥ 30 < 35	B	Good	7
≥ 50 < 60	≥ 25 < 30	C	Fair	6
≥ 40 < 50	≥ 20 < 25	D	Satisfactory	5
< 40	< 20	F	Fail	0
			Absent	0

RB 15.2	**Calculation of Semester Grade Points Average(SGPA)* for semester:** **The Performance of each student at the end of each semester is indicated in terms of SGPA. The SGPA is calculated as below:** $SGPA\ (S_i) = \sum(C_i \times G_i) / \sum C_i$ (for all courses passed in that semester) Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course. * SGPA is calculated for the candidates who passed all the courses in that semester
RB 15.3	**Calculation of Cumulative Grade Points Average (CGPA)** The CGPA is calculated as below: $CGPA = \sum(C_i \times S_i) / \sum C_i$ (for entire programme) Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts
RB 15.4	Equivalent Percentage for CGPA is = (CGPA-0.75) x 10
RB 16.0	**REVALUATION** As per the notification issued by the Controller of Examination, the student can submit the application for revaluation, along with the fee receipt for revaluation of his/her answer script(s) of theory course(s), if he/she is not satisfied with the Grade obtained. The Controller of Examination shall arrange for revaluation of those answer script(s).
RB 16.1	For Revaluation, a new external examiner, other than the first examiner, shall re-evaluate the answer script(s). If there is any change in marks (below 15% of the maximum External marks) the highest of the two marks will be considered and if there is any change in marks (Equal or above 15% of the maximum External marks), the script will be evaluated by the third valuator. The marks of all the three valuators are compared and the average of two nearer marks will be awarded to the student.
RB 17.0	**SUPPLEMENTARY EXAMINATIONS.** Supplementary examinations shall be conducted twice in an academic year, along with regular semester end examinations.
RB 18.0	**READMISSION CRITERIA.** A candidate, who is detained in a semester due to lack of attendance/ credits, has to obtain written permission from the Principal for readmission in the same semester after duly fulfilling all the required norms stipulated by the college in addition to paying an administrative fee of Rs.1,000/-
RB 19.0	**BREAK IN STUDY.** Student, who discontinues his/her studies for whatsoever may be the reason, can get readmission into appropriate semester of B.Tech. programme after break-in study only with the prior permission of the Principal of the College provided. Such candidate shall follow the transitory regulations applicable to such batch in which he/she joins. An administrative fee of Rs.1000/- per year of break in study in addition to the prescribed tuition fee and special fee has to be paid by the candidate to condone his/her break in study.

RB 20.0	**AWARD OF DIVISION.**
	The award of division for the candidates who admitted into respective B.Tech. programmes in the year 2020-2021 and onwards should be as per JNTUK regulations.
	For the purpose of awarding First Class with Distinction, the student must get CGPA within 4 years in case of candidates admitted through EAMCET & Management Quota or within 3 years in case of Lateral Entry candidates admitted through ECET, without appearing for any supplementary examinations. Detained candidates are not eligible for the award of First Class with Distinction. For the purpose of awarding First, Second and Pass Class, CGPA obtained in the examinations appeared within the maximum period allowed for the completion of course shall be considered.
RB 21.0	**BETTERMENT /IMPROVEMENT OF CUMULATIVE GRADE POINT AVERAGE**
RB 21.1	A candidate, after becoming eligible for the award of the Degree, may reappear for the external Examination in any of the theory courses as and when conducted, for the purpose of improving the CGPA. But this reappearance shall be within a period of two academic years after becoming eligible for the award of the Degree, subject to fulfillment of Regulation RB 2.0.
RB 21.2	However, this facility shall not be availed by a candidate to reappear either for Internal Examination or for Semester End Examinations in Practical courses (including Project Viva- voce) and also for Semester End Examinations evaluated internally for the purpose of improvement.
RB 21.3	Modified Grade Card and New Consolidated Grade Card shall be issued after incorporating new Grades and Credits.
RB 22.0	**ADVANCED SUPPLEMENTARY EXAMINATIONS**
	Candidate(s), who fails in Theory or Lab courses of 4^{th} year second semester, can appear for advanced supplementary examinations conducted within one month after declaration of the revaluation results. However, those candidates who fail in this advanced supplementary examinations of IV year second semester shall appear for subsequent examination along with regular candidates in the examinations conducted at the end of the respective academic year.
RB 23.0	**MALPRACTICES** The Principal/chief superintendent shall refer the cases of malpractices in internal assessment tests and Semester End Examinations to a Malpractice Enquiry Committee, constituted for the purpose. The Principal shall take necessary action, against the erring students based on the recommendations of the Committee as per JNTUK Malpractice regulations.
RB 24.0	The physically challenged candidates who have availed additional examination time and a scribe during their Intermediate/EAMCET examinations shall be given similar concessions on production of relevant proof/documents.

RB 25.0	The students who are suffering from contagious diseases are not allowed to appear either internal or Semester end examinations with other students. A separate room will be allotted for such type of students.
RB 26.0	The students who participate in coaching/tournaments held at State/National/International levels through University / Indian Olympic Association during Semester end external examination period shall be promoted to subsequent semesters till the entire course is completed as per the guidelines of University Grants Commission Letter No. F. 1-5/88 (SPE/PES), dated 18-08-1994.
RB 27.0	The Principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the Heads of the Departments in an appropriate manner, and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of Regulation, approved in the Heads of the Departments meetings, shall be reported to the Academic Council for ratification.
RB 28.0	The Academic Council, from time to time, may revise or amend or change the Regulations, schemes of examination and/or syllabi.
RB 29.0	**ELECTIVES** Minimum 20% of intake of students is compulsory for offering regular electives.
RB 30.0	**INTERNSHIP** For internship, minimum period shall be one month. However, it can be completed in 3 to 4 slots /intervals which shall be a minimum of five day slot.

MALPRACTICES 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.
1.(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and held with the Institution.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and 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 Institution 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 Institution 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-incharge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Institution examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the Performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject 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 Institution for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.

2. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
   (i) A show cause notice shall be issued to the college.
   (ii) Impose a suitable fine on the college.
   (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

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VISHNU INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE & Affiliated to JNTU-Kakinada)
(Accredited by NBA& NAAC 'A' Grade)
Vishnupur, BHIMAVARAM – 534 202

Ragging

Prohibition of ragging in Educational institutions Act 26 of 1997

Salient Features

- Ragging within or outside any educational institution is prohibited.
- Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student.

	Imprisonment upto		Fine Upto
Teasing, Embarrassing & Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	2 Years	+	Rs. 5,000/-
Causing gri evous 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/-

LET US MAKE VIT A RAGGING FREE COLLEGE

VISHNU INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE & Affiliated to JNTU-Kakinada)

(Accredited by NBA& NAAC 'A' Grade)

Vishnupur, BHIMAVARAM – 534 202

ABSOLUTELY NOT 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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VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING Course Structure for B. Tech. (With effect from 2020-2021)

I YEAR I SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	BS	Mathematics-I	3	0	0	3	30	70
2	BS	Applied Physics	3	0	0	3	30	70
3	H&S	Communicative English	3	0	0	3	30	70
4	ESC	Computational Thinking and Programming	3	0	0	3	30	70
5	ESC	Elements of Electrical and Electronics Engineering	3	0	0	3	30	70
6	BS Lab	Applied Physics Lab	0	0	3	1.5	15	35
7	ESC Lab	Computational Thinking and Programming Lab	0	0	3	1.5	15	35
8	H &S Lab	English Communication Skills Lab	0	0	3	1.5	15	35
	Total Credits					**19.5**	**195**	**455**
	Total Marks						**650**	

I YEAR II SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	BS	Mathematics –II	3	0	0	3	30	70
2	BS	Applied Chemistry	3	0	0	3	30	70
3	ESC	Digital Logic Design	3	0	0	3	30	70
4	ESC	Programming for Problem Solving	3	0	0	3	30	70
5	ESC	Computer Engineering Workshop	1	0	4	3	15	35
6	BS Lab	Applied Chemistry Lab	0	0	3	1.5	15	35
7	ESC Lab	Advanced Python Programming Lab	0	0	3	1.5	15	35
8	ESC Lab	Programming for Problem Solving Lab	0	0	3	1.5	15	35
9	MC	Environmental Science	2	0	0	0	0	0
	Total Credits					**19.5**	**180**	**420**
	Total Marks						**600**	

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II YEAR I SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	BS / PC	Discrete Mathematical Structures	3	0	0	3	30	70
2	PC	Data Structures	3	0	0	3	30	70
3	PC	Database Management Systems	3	0	0	3	30	70
4	ESC	Object Oriented Programming through Java	3	0	0	3	30	70
5	BS	Probability & Statistics	3	0	0	3	30	70
6	PC Lab	Data Structures Lab	0	0	3	1.5	15	35
7	PC Lab	Database Management Systems Lab	0	0	3	1.5	15	35
8	PC Lab	Object Oriented Programming through Java Lab	0	0	3	1.5	15	35
9	SO	Skill Oriented Course – I 1) Animations – 2D Animation 2) Web Application Development Using Full Stack –Module - I	0	0	4	2	--	50
10	MC	Constitution of India	2	0	0	0		
	Total Credits					**21.5**	**195**	**505**
	Total Marks						**700**	

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II YEAR II SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	PC	Software Engineering	3	0	0	3	30	70
2	PC	Data warehousing and Mining	3	0	0	3	30	70
3	PC	Operating Systems	3	0	0	3	30	70
4	PC	Fundamentals of Artificial Intelligence & Machine Learning	3	0	0	3	30	70
5	HS	Universal Human Values	3	0	0	3	30	70
6	PC Lab	Data Warehousing and Mining Lab	0	0	3	1.5	15	35
7	PC Lab	Operating Systems Lab	0	0	3	1.5	15	35
8	PC Lab	Fundamentals of Artificial Intelligence & Machine Learning Lab	0	0	3	1.5	15	35
9	SO	Skill Oriented Course – II 1) Animations – 3D Animation 2) Web Application Development Using Full Stack – Module - II	0	0	4	2	--	50
10	MC	Critical Reading & Creative Writing	2	0	0	0		
	Total Credits					**21.5**	**195**	**505**
						Total Marks	**700**	

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III YEAR I SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	PC	Design and Analysis of Algorithms	3	0	0	3	30	70
2	PC	Computer Organization	3	0	0	3	30	70
3	PC	Machine Learning	3	0	0	3	30	70
4	OE / JE	Web Technologies	3	0	0	3	30	70
5	PE	Computer Vision/ Internet of Things / Data Visualization/ DevOps	3	0	0	3	30	70
6	PC Lab	Web Technologies Lab	0	0	3	1.5	15	35
7	PC Lab	Machine Learning Lab	0	0	3	1.5	15	35
8	SAC/ Soft Skill	Quantitative Aptitude & Logical Reasoning	0	0	4	2	--	50
9	MC	Competitive Coding	2	0	0	0		
10	Summer Internship		0	0	0	1.5		
	Total Credits					**21.5**	**195**	**505**
	Total Marks						**700**	

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III YEAR II SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	PC	Computer Networks	3	0	0	3	30	70
2	PC	Big Data Analytics	3	0	0	3	30	70
3	PC	Deep Learning	3	0	0	3	30	70
4	PE	Natural Language Processing / Distributed Systems/ Pattern Recognition / Software Project Management	3	0	0	3	30	70
5	OE / JE	NO SQL Databases	3	0	0	3	30	70
6	PC Lab	Deep Learning Lab	0	0	3	1.5	15	35
7	PC Lab	Big Data Analytics Lab	0	0	3	1.5	15	35
8	PC Lab	No SQL Databases Lab	0	0	3	1.5	15	35
9	SAC/Soft Skill	Advanced English Communication Skills Lab	0	0	4	2	--	50
10	MC	Employability Skills - II	2	0	0	0		
	Total Credits					**21.5**	**195**	**505**
	Total Marks						**700**	

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IV YEAR I SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	PE	Reinforcement Learning/ Cloud Computing/ Social Network Analysis/ Speech and video processing	3	0	0	3	30	70
2	PE	Cryptography Network Security/ Soft Computing/Block Chain Technologies/ Semantic Web	3	0	0	3	30	70
3	PE	E-commerce & digital Marketing / AI Chatbots / Object Oriented Design/ Recommender Systems	3	0	0	3	30	70
4	OE / JE	Robotic Process Automation	3	0	0	3	30	70
5	OE	Open Electives offered by other departments	3	0	0	3	30	70
6	HS Elective	Managerial Economics and Financial analysis / Management Science / Intellectual Property Rights and Patents	3	0	0	3	30	70
8	Skill Advanced Course	Machine Learning with GO (Infosys SpringBoard)	0	0	4	2	--	50
9	PR	Internship	0	0	0	3		100
	Total Credits					**23**	**180**	**570**
	Total Marks						**750**	

IV YEAR II SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	Project	Major Project Work, Seminar, Internship	-	-	-	12		
	Total Credits					**12**		
	Total Marks							

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

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

I Year - I Semester	L	T	P	C
	3	**0**	**0**	**3**
MATHEMATICS-I (LINEAR ALGEBRA & CALCULUS)				

Course Objectives:

- 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:

- Solve linear system of equations in engineering problems
- Find Eigen-values and Eigen vectors of a matrix in engineering studies.
- Model engineering problems as differential equations and solve analytically.
- Find out local /global optimum of functions of several variables
- 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 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. Chandrashekharaiah, Engineering Mathematics, Volume 1, Prism Publishers, 2010
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, reprint, 2008.

I Year - I Semester	L	T	P	C
	3	0	0	3
APPLIED PHYSICS				

Course Objectives:

- To identify the importance of the optical phenomenon i.e., interference, diffraction and polarization related to its Engineering applications
- 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 fibres and their implications in optical communications
- To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
- 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.
- 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:

CO1: Explain the need of coherent sources and the conditions for sustained interference. Identify the applications of interference in engineering. Analyse the differences between interference and diffraction with applications. Illustrate the concept of polarization of light and its applications.

CO2 Explain various types of emission of radiation. Identify the role of laser in engineering applications. Describe the construction and working principles of various types of lasers. Explain the working principle of optical fibers. Classify optical fibers based on refractive index profile and mode of propagation. Identify the applications of optical.

CO3: Explain the concept of dielectric constant and polarization in dielectric materials. Summarize various types of polarization of dielectrics. Classify the magnetic materials based on susceptibility and their temperature dependence. Explain the applications of dielectric and magnetic materials. Apply the concept of magnetism to magnetic devices.

CO4: Describe the dual nature of matter. Explain the significance of wave function. Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well. Identify the role of classical free electron theory in the study of electrical conductivity.

CO5**:** Explain the concept of quantum free electron theory in the study of electrical conductivity. Classify the energy bands of solids. Outline the properties of charge carriers in semiconductors. Identify the type of semiconductor using Hall effect. Identify applications of semiconductors in electronic devices.

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 Optics

Lasers:

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. Ajoy Ghatak "Optics" Tata Mc GrawHill.

I Year - I Semester	L	T	P	C
	3	**0**	**0**	**3**
COMMUNICATIVE ENGLISH				

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.

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 lecture method when a completely new concept is introduced in the class.

Course Outcomes

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

- 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
- Write well-structured paragraphs and understand applying cohesive devices

- Will be able to read a text in detail and summarize and use verbs, adjectives and adverbs appropriately
- Make notes of the important information of a text, information transfer
- Read for comprehension and write formal letters and emails and edit short texts by correcting common errors

Unit 1
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 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: countable and uncountables; singular and plural, pronouns, basic sentence structures; simple question form - why-questions; word order in sentences.

Unit 2
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 3

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 4

Detailed: Liking a Tree, Unbowed: Wangari Maathai-

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 for Writing: 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 5

Detailed: Stay Hungry-Stay foolish from "Infotech English", 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)

Textbooks:

Detailed Textbook:
Infotech English by Maruthi Publications

Non-Detailed Textbook:
Wings of Fire: APJ Abdul Kalam by University Press

Reference Books

- Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
- Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- 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	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**
COMPUTATIONAL THINKING AND PROGRAMMING				

Course Objectives:

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

Course Outcomes: Student should be able to

1. Understand the working principles of various components of a computer
2. Develop computational thinking and be able to use Python constructs to solve basic problems
3. Understand modularization and data structures concepts in Python
4. Apply file handling concepts in problem solving
5. Solve Real world problems by applying Object Oriented 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, Allen B. Downey, 2nd Edition (https://www.greenteapress.com/thinkpython/thinkCSpy.pdf)

Reference Books:

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

Web Resources:

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

I Year - I Semester	L	T	P	C
	3	0	0	3
ELEMENTS OF ELECTRICAL & ELECTRONICS ENGINEERING				

Learning 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 Transformer and Induction motor.
- To study the operation of PN junction diode, half wave, full wave rectifiers and OP-AMPs.
- To learn the operation of PNP and NPN transistors and various amplifiers.

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 of DC Motor, Back EMF, Types of DC machines, Performance Characteristics of DC Motors, Speed control of DC Motors, Applications.

UNIT - III

AC Machines: Classification of AC machines, Principle and operation of 3-phase Induction Motor and 3-phase Synchronous 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 of Operation Amplifiers (OP- AMPs), Applications of OP-AMPs -Inverting, Non-Inverting, Integrator and Differentiator.

UNIT V

Transistors: PNP and NPN junction transistor, transistor as an amplifier, Transistor Configurations-CE, CB,CC configurations, 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 Surinder Pal Bali, Pearson Publications.

6. Principles of Basic Electrical Engineering by T.N. Nagsarkar, M.S. Sukhija, Oxford University Press.

I Year - I Semester	L	T	P	C
	0	**0**	**3**	**1.5**
APPLIED PHYSICS LAB				

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 semiconductor.

REFERENCES:

1. Engineering Physics Lab Manual by Dr.Y. Aparna & Dr.K.Venkateswarao (V.G.S.Book links)
2. Physics Practical Manual, Lorven Publication.

I Year - I Semester	L	T	P	C
	0	**0**	**3**	**1.5**
COMPUTATIONAL THINKING AND PROGRAMMING LAB				

Objectives:

- Get acquainted with fundamentals of writing Python scripts.
- Master core Python scripting elements by solving more number of problems
- Able to identify right data structure to solve the problem
- Design Python functions to facilitate code reuse.
- Gaining familiarity in Python file I/O

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 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	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 student' 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:

- CO1 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
- CO2 Articulate Vowels and Consonants properly and answering a series of questions about specific information after listening to audio texts and
- CO3 Understand stress and intonation and answering a series of questions about main idea and supporting ideas after listening to audio texts
- CO4 Enact Dialogues/Role Plays and listening for global comprehension and summarizing what is listened to
- CO5 Ask and answer general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others
- CO6 Practice topics from academic contexts - with using PPT slides

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 main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks.
Functional English: Greetings and leave takings.
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.
Speaking: Debate
Functional English: Complaining and Apologizing.
Pronunciation: Syllable, Word Stress: Weak and Strong forms, Stress in compound words, Contrastive Stress

MODULE– IV
Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Functional English: Permissions, Requesting, Inviting.
Pronunciation: Rhythm & Intonation

MODULE– V
Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.
Speaking: Formal oral presentations on topics from academic contexts - with the use of PPT slides.
Functional English: Suggesting/Opinion giving.
Pronunciation: Accent Neutralization

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

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.

I Year - II Semester	L	T	P	C
	3	0	0	3
MATHEMATICS-II				

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:

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*
4. B. V. Ramana, Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009
5. D. S. Chandrashekharaiah, Engineering Mathematics, Volume 1, Prism Publishers, 2010
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, reprint, 2008

I Year - II Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**
APPLIED CHEMISTRY				

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, UreaFormaldehyde, 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. Semi conductors: Preparation of pure semiconductors by Zone refining, Distillation and Czochralski crystal 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 nano tubes and fullerenes - Types, Preparation (Arc discharge Laser ablation and Chemical Vapour 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 Prasanth 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 Sashi Chawla, Dhanpat Rai & Co. 2017

I Year - II Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**
DIGITAL LOGIC DESIGN				

COURSE OBJECTIVES:

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

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

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

• Boolean function simplification using Karnaugh maps.

• To understand concepts of combinational circuits.

• To develop advanced sequential circuits.

COURSE OUTCOMES:

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

• Use the concept of Boolean algebra in minimization of switching functions

• Design different types of combinational logic circuits.

• Apply knowledge of flip-flops in designing of Registers and counters

• 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. Micro electronics by Milliman MH edition.

I Year - II Semester	L	T	P	C
	3	**0**	**0**	**3**
PROGRAMMING FOR PROBLEM SOLVING				

Course Description:

In this course, the student will be able to learn problem solving skills using 'C' programming language, which is a pre-requisite to learn many other programming Languages. The purpose of this course is to provide the basic programming methodology in C. This course will enable the students to learn programming skills necessary to implement all the basic mathematical, scientific and real-world applications. C is a structured high-level programming language. The student can write programs using structures, functions and pointers. This course will give the foundation for a beginner to develop computer programmes effectively.

Course Outcomes:

1. Identify various building blocks to write a C program.
2. Use Control Statements for solving a given problem.
3. Write programs using arrays and pointers to store and manipulate the data.
4. Build programs with functions for organizing a complex task.
5. Make use of strings and structures to store and retrieve the data.

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, Initialisation 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, 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 arguments.

Case Study: Recursion - Mathematical Recursion, Recursion versus Iteration

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 yashavant kanetkar.
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 - I Semester	L	T	P	C
	3	**0**	3	**1.5**
COMPUTER ENGINEERING WORKSHOP				

Task 1: Identification of the peripherals of a computer - Prepare a report containing the block diagram of the computer along with the configuration of each component and its functionality. Describe about various I/O Devices and its usage and Practicing disassembling and assembling components of a PC.

Task 2: Demonstration and Practice of various features of Microsoft Word Assignment: 1. Create a project certificate. 2. Creating a newsletter Features to be covered:-Formatting Fonts, Paragraphs, Text effects, Spacing, Borders and Colors, Header and Footer, Date and Time option, tables, Images, Bullets and Numbering, Table of Content, Newspaper columns, Drawing toolbar and Word Art and Mail Merge in word etc.,

Task 3: Demonstration and Practice of various features Microsoft Excel Assignment: 1. Creating a scheduler 2. Calculating GPA 3. Calculating Total, average of marks in various subjects and ranks of students based on marks Features to be covered:- Format Cells, Summation, auto fill, Formatting Text, Cell Referencing, Formulae in excel, Charts, Renaming and Inserting worksheets, etc.,

Task 4: Demonstration and Practice of various features Microsoft Power Point Features to be covered:- Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks Tables and Charts, Master Layouts, Types of views, Inserting – Background, textures, Design Templates, etc.,

Task 5: Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices.

Task 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.,

I Year - II Semester	L	T	P	C
	3	**0**	3	**1.5**
APPLIED CHEMISTRY LAB				

Outcomes:
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.

10 Out of 16
1. Trial experiment - Determination of HCl using standard Na2CO3 solution.
2. Determination of alkalinity of a sample containing Na2CO3 and NaOH.
3. Determination of KMnO4 using standard Oxalic acid solution.
4. Estimation of MnO2 in Pyrolusite.
5. Determination of Copper using standard K2Cr2O7 solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Vitamin – C.
8. Determination of PH of the given sample solution using PH 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. Photo Chemical 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 - II Semester	L	T	P	C
	3	**0**	3	**1.5**
ADVANCED PYTHON PROGRAMMING LAB				

Course Description:

This course is a Basic Engineering course for all computation aspiring students. It is designed to provide a comprehensive study of the C programming language that covers Course objectives: To enable students

- Explore basic workflow of learning from data.
- Apply various NumPy and pandas' concepts to preprocess the data.
- Understand data visualization techniques and create reports
- Calculating simple descriptive statistical measures on datasets.
- Using sklearn to get inference from data.

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	L	T	P	C
	3	**0**	3	**1.5**
Programming for problem Solving				

Course Description:

This course is a Basic Engineering course for all computation aspiring students. It is designed to provide a comprehensive study of the C programming language that covers the fundamental principles of computer programming, with an emphasis on problem solving strategies using structured programming techniques. The syntax and constructs of data types, control statements, arrays, functions and pointers are elaborated. The derived data types like structures are discussed. It stresses the strengths of C, which provide students with the means of writing efficient, maintainable and reusable code to solve mathematical, engineering and simple data processing problems.

Course Outcomes (COs):

After the completion of the course, the student will be able to:
1.Select right identifiers, data types and operators for effective computation.
2.Write programs using control statements.
3.Write programs demonstrating use of arrays, strings and their applications.
4.Demonstrate the applications of function and recursion.
5.Write programs for simple real life problems using pointers and structures.

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	**L**	**T**	**P**	**C**
ENVIRONMENTAL SCIENCE				

OBJECTIVES: To make the student to get awareness on environment, to understand the important of protecting natural recourses, ecosystems for futures 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 social systems affecting the Environment.
2. Explain how Natural Recourses should be used.
3. Identify the threats to biodiversity.
4. Understand causes, effects and control measures of Environmental pollution.
5. Gain knowledge about Watershed management and Environmental ethics.
6. Gain 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.

Environmental Impact Assessment and its significance 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, New Delhi.
2. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press

REFERENCE BOOKS:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada.
2. Text Book of Environmental Studies, Deekshita Dave & P. Udaya Bhaskar, Cengage Learning.
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, New Delhi.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

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

II YEAR I SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	BS / PC	Discrete Mathematical Structures	3	0	0	3	30	70
2	PC	Data Structures	3	0	0	3	30	70
3	PC	Database Management Systems	3	0	0	3	30	70
4	ESC	Object Oriented Programming through Java	3	0	0	3	30	70
5	BS	Probability & Statistics	3	0	0	3	30	70
6	PC Lab	Data Structures Lab	0	0	3	1.5	15	35
7	PC Lab	Database Management Systems Lab	0	0	3	1.5	15	35
8	PC Lab	Object Oriented Programming throuh Java Lab	0	0	3	1.5	15	35
9	SO	Skill Oriented Course – I 1) Animations – 2D Animation 2) Web Application Development Using Full Stack –Module - I	0	0	4	2	--	50
10	MC	Constitution of India	2	0	0	0		
	Total Credits					**21.5**	**195**	**505**
	Total Marks						**700**	

II Year - I Semester	DISCRETE MATHEMATICAL STRUCTURES	L	T	P	C
		3	0	0	3

Course Objectives:

- Check the validity of arguments by using basic connective and valid rules of inference.
- Observe various properties of sets and relations.
- Identify different graphs, isomorphism of graphs, paths, cycles and circuits.
- Identify different types of trees.
- 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. Apply graph theory concepts to modeling problems in Computer Science 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.

II Year - I Semester	DATA STRUCTURES	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand and apply algorithm analysis for various searching and sorting techniques
- Understand the concept of linked lists and be use it in various applications
- Be able to use Stacks and Queues in various applications
- Understand the concept of Trees & Graphs and perform various operations on it
- Understand the concept of Hashing & different types of Hashing Techniques

Course Outcomes:

1. By the end of the course, the students should be able to:
2. Use various searching and sorting techniques, and analyze the complexity of various algorithms
3. Perform various operations on Linked Lists, and use them in various applications
4. Perform various operations on Stacks and Queues, and use them in various applications
5. Perform various operations on Trees and Graphs, and use them in various applications
6. Understand different types of Hashing Techniques

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

II Year - I Semester	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

Course Objective:

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

Course Outcomes:

1. Understand database concepts and the use of data models in describing database
2. Create, maintain and manipulate a relational database using SQL
3. Understand the importance of schema refinement & be able to refine the schema
4. Understand how the DBMS manages the execution of transactions
5. Understand and differentiate various file organizations for the representation of data

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

Course Objectives:

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

Course Outcomes:

1. Able to realize the concept of Object Oriented Programming & Java Programming Constructs
2. Able to describe the basic concepts of Java such as, classes, objects, packages, Enumeration and various keywords
3. Develop applications using various types of Inheritance and Interfaces.
4. Able to handle exceptions and perform various input/output operations on strings and files.
5. Write programs using multithreading and interface with databases from Java program.

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://nptel.ac.in/courses/106/105/106105191/
2) https://www.w3schools.com/java/java_data_types.asp

II Year - I Semester	PROBABILITY & STATISTICS	L	T	P	C
		3	0	0	3

Course Objectives:

To enable the students to

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

Course Learning 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, χ^2 and Fdistributions – 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:

2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
3. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
4. 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.
2. B. V. Ramana, Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009
3. S. Ross, a First Course in Probability, Pearson Education India, 2002.

II Year - I Semester	DATA STRUCTURES LAB	L	T	P	C
		0	0	3	1.5

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

Course Outcomes:

1. By the end of this lab the student is able to
2. Use various searching and sorting algorithms.
3. Use basic data structures such as arrays and linked list.
4. 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	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C
		0	0	3	1.5

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.

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

Course Objectives:

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

Course Outcomes:

1. Apply the basic features of JAVA such as Control statements, Arrays, Classes, Inheritance, Interface and Packages in solving a problem
2. Apply appropriate IO stream and collection framework for solving real time problem
3. Determine Class, Objects, Methods, Exception and Polymorphism.
4. Illustrating Simple Inheritance, multi-level Inheritance , Exception handling mechanism.
5. Construct Threads and Implement Packages.

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	SKILL ORIENTED COURSE – I ANIMATIONS – 2D ANIMATION	L	T	P	C
		0	0	4	2

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:

1. At the end of the course the student will be able to:
2. learn various tools of digital 2-D animation.
3. understand the production pipeline to create 2-D animation.
4. analyze special effects in animation to bring interest and awe in the scenes and backgrounds.
5. 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	SKILL ORIENTED COURSE – I WEB APPLICATION DEVELOPMENT USING FULL STACK – MODULE - I	L	T	P	C
		0	0	4	2

Course Objectives:

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

Course Outcomes:

1. By the end of this lab the student is able to
2. Analyze a web page and identify its elements and attributes.
3. Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet
4. Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone
5. 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

II Year - I Semester	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- To train students in understanding the basic structure of Indian Constitution
- To prepare students to live better and happily with other fellow beings through the application of Fundamental Rights in their lives.

COURSE OUTCOMES:

Upon the completion of the course, the student will be able to:

CO1: Examine salient features of Indian Constitution and live accordingly in society.
CO2: Interpret the meaning of Fundamental Rights and Directive Principles of State Policy and, develop an attitude which paves the way for better living conditions.
CO3: Discover various aspects of Union Government legislation and live up to the expectations of the rules.
CO4: Critically examine State Government legislation and improve your living standards by following the rules strictly
CO5: Examine powers and functions of local bodies such as Muncipalities and Panchayats and, take advantage of available resources for better living

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 Excecutive -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, Panchyats, ZP's and Co – Operative Societies

BOOKS:

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

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

II Year - II Semester	**SOFTWARE ENGINEERING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objectives:

- 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.
- 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.
- Represent classes, responsibilities and states using UML notation
- 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.
- Apply their foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes

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/

OUTCOMES:

- Define and develop a software project from requirement gathering to implementation.
- Obtain knowledge about principles and practices of software engineering.
- Represent classes, responsibilities and states using UML notation
- Focus on the fundamentals of modeling a software project.
- Obtain knowledge about estimation and maintenance of software systems

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

II Year - II Semester	**DATA WAREHOUSING AND MINING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

CourseObjectives:

- To understand and implement classical models and algorithms in data warehousing and datamining.
- To analyze the data, identify the problems, and choose the relevant models and algorithms toapply.
- To assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- Summarize the architecture of datawarehouse
- Apply different preprocessing methods, Similarity, Dissimilarity measures for any given rawdata.
- Construct a decision tree and resolve the problem of modeloverfitting
- Compare Apriori and FP-growth association rule mining algorithms forfrequent itemset generation
- Apply suitable clustering algorithm for the given data set

UNIT- I

Data Warehouse and OLAP Technology: An Overview: Data Warehouse, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining. (Han &Kamber)

UNIT- II

Data Mining: Introduction, What is Data Mining?, Motivating challenges, The origins of Data Mining, Data Mining Tasks, Types of Data, DataQuality.

Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature creation, Discretization and Binarization, Variable Transformation, Measures of Similarity and Dissimilarity. (Tan &Vipin)

UNIT -III

Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.

Model Overfitting: Due to presence of noise, due to lack of representation samples, evaluating the performance of classifier: holdout method, random sub sampling, cross-validation, bootstrap. Bayes Theorem, Naïve Bayes Classifier (Tan & Vipin)

UNIT -IV

Association Analysis: Basic Concepts and Algorithms: Problem Definition, Frequent Item Set Generation, Apriori Principle, Apriori Algorithm, Rule Generation, Compact Representation of Frequent Itemsets, FP- Growth Algorithm. (Tan & Vipin)

UNIT -V

Cluster Analysis: Basic Concepts and Algorithms: Overview, What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Tan &Vipin)

Text Books:

1. Introduction to Data Mining : Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson,2015.
2. Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier,2011

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

II Year - II Semester	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives :

- Study the basic concepts and functions of operating systems.
- Understand the structure and functions of the OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.

Course Outcomes:

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

- Describe various generations of Operating System and functions of Operating System.
- Understand process management & various CPU scheduling algorithms.
- Apply the principles of concurrency, Design deadlock prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Design and Implement a prototype file systems and system protection.

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 form 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	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	L	T	P	C
		3	0	0	3

Course Objectives:

- To provide a strong foundation of fundamental concepts in ArtificialIntelligence.
- To provide a basic exposition to the goals and methods of Artificial Intelligence.
- To provide fundamentals of machine learning

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- Enumerate the history and foundations of Artificial Intelligence
- Apply the basic principles of AI in problem solving
- Choose the appropriate representation of Knowledge
- Enumerate the Perspectives and Issues in Machine Learning
- Identify issues in Decision Tree Learning

UNIT I

Introduction: What Is AI?,The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure ofAgents.

UNIT II

Problem Solving: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions.

UNIT III

Knowledge Representation: Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

UNIT IV

Introduction to Machine Learning: Well-Posed Learning Problem, Designing a Learning system, Perspectives and Issues in Machine Learning.

Concept Learning and The General-to-Specific Ordering: Introduction, A Concept Learning Task, Concept Learning as Search, FIND-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination Algorithm, Remarks on Version spaces and Candidate-Elimination, Inductive Bias

Decision Tree Learning: Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

Text Books:

1) Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Pearson

2) Tom M. Mitchell, *Machine Learning*, McGraw Hill Edition,2013

Reference Books:

1) Saroj Kaushik, "Artificial Intelligence", Cengage Learning India,2011

2) Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGrawHill

3) David Poole and Alan Mackworth, "Artificial Intelligence: Foundations forComputational Agents", Cambridge University Press2010.

4) Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House,Delhi.

5) Christopher Bishop, Pattern Recognition and Machine Learning (PRML) , Springer,2007.

6) ShaiShalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms (UML) , Cambridge University Press,2014.

Web Resources:

1) https://nptel.ac.in/courses/106105077
2) https://nptel.ac.in/courses/106106126
3) https://aima.cs.berkeley.edu
4) https://ai.berkeley,edu/project_overview.html
5) http://www.zuj.edu.jo/download/machine-learning-tom-mitchell-pdf/
6) http://www.ntu.edu.sg/home/egbhuang/pdf/ieee-is-elm.pdf
7) https://swayam.gov.in/nd1_noc20_cs73/preview

II Year - II Semester	UNIVERSAL HUMAN VALUES	L	T	P	C
		3	0	0	3

Course Objectives

This introductory course input is intended:

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

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 *PS1 Sharing about Oneself*

Tutorial 2: Practice Session PS*2 Exploring Human consciousness*

Tutorial 3: Practice Session PS*3 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 PS*4 Exploring the difference of Needs of Self and Body*

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

Tutorial 6: Practice Session PS*6 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 PS*7 Exploring the Feeling of Trust,*

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

Tutorial 9: Practice Session PS*9 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 FAQ

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

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING Course Structure for B. Tech. (With effect from 2020-2021)

II Year II Semester	Data Warehousing and Mining Lab	L	T	P	C
		0	0	3	1.5

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. Emphasize hands-on experience working with all real data sets.
3. Test real data sets using popular data mining Python Libraries
4. Develop ability to design various algorithms based on data mining tools.

Course Outcomes:

By the end of the course student will be able to

- Pre-process the raw data provided by the client for best results
- Design a data warehouse for any organization and apply operations on it.
- Extract knowledge using data mining techniques and enlist various algorithms used in information analysis of Data Mining Techniques
- Implement and Analyse on knowledge flow application on data sets and Apply the suitable visualization techniques to output analytical results

Software Requirements: Python, pentaho /Microsoft-SSIS/ Informatica

1. Demonstrate the following data preprocessing tasks using python libraries.
    a. Loading the dataset
    b. Dealing with missing data
2. Demonstrate the following data preprocessing tasks using python libraries.
    a. Dealing with categorical data
    b. Scaling the features
    c. Splitting dataset into Training and Testing Sets
3. Demonstrate the following Similarity and Dissimilarity Measures using python.
    a. Pearson's Correlation
    b. Cosine Similarity
    c. Jaccard Similarity
    d. Euclidean Distance
    e. Manhattan Distance
4. Creation of a Data Warehouse

   a. 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.,)
   b. 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).
   c. Write ETL scripts and implement using data warehouse tools.
   d. Perform Various OLAP operations such slice, dice, roll up, drill up and pivot
5. Build a model using linear regression algorithm on any dataset.
6. Build a classification model using Decision Tree algorithm on iris dataset
7. Apply Naïve Bayes Classification algorithm on any dataset
8. Generate frequent itemsets using Apriori Algorithm in python and also generate association rules for any market basket data.
9. Apply K- Means clustering algorithm on any dataset.
10. Apply Hierarchical Clustering algorithm on any dataset.
11. Apply DBSCAN clustering algorithm on any dataset.

Reference:

1. https://analyticsindiamag.com/data-pre-processing-in-python/

2.https://towardsdatascience.com/decision-tree-in-python-b433ae57fb93

3. https://towardsdatascience.com/calculate-similarity-the-most-relevant-metrics-in-a-nutshell9a43564f533e

4. https://www.springboard.com/blog/data-mining-python-tutorial/

5. https://medium.com/analytics-vidhya/association-analysis-in-python-2b955d0180c

6. https://www.datacamp.com/community/tutorials/naive-bayes-scikit-learn

7. https://www.analyticsvidhya.com/blog/2019/05/beginners-guide-hierarchical-clustering/

8. https://towardsdatascience.com/dbscan-algorithm-complete-guide-and-application-with-pythonscikit-learn-d690cbae4c5d

II Year - II Semester	OPERATING SYSTEMS LAB	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To understand the design aspects of operating system.
- To study the process management concepts & Techniques.
- To study the concurrency and dead lock concepts.
- To study the storage management concepts.
- To study the file management and disk management concepts.

Course Outcomes:

1. Students should be able to solve the scheduling algorithms.
2. Students can analyse the concurrency and Deadlock problems.
3. Students should be able to solve the page replacement algorithms.
4. Students should be able to implement the memory management techniques.

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

II Year - II Semester	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING LAB	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To provide a strong foundation of fundamental concepts in ArtificialIntelligence.
- To provide a basic exposition to the goals and methods of ArtificialIntelligence.
- To apply the techniques in applications which involve perception, reasoning and learning.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- Apply the basic principles of AI in problem solving usingLISP/PROLOG
- Implement different algorithms usingLISP/PROLOG
- Develop an Expert System usingJESS/PROLOG

List of Experiments (Artificial Intelligence)

1. Implementation of DFS for water jug problem usingLISP/PROLOG
2. Implementation of BFS for tic-tac-toe problem usingLISP/PROLOG/Java
3. Implementation of TSP using heuristic approach usingJava/LISP/Prolog
4. Implementation of Simulated Annealing Algorithm usingLISP/PROLOG
5. Implementation of Hill-climbing to solve 8- PuzzleProblem
6. Implementation of Monkey Banana Problem usingLISP/PROLOG

List of Experiments (Machine Learning) Python Libraries required: Sklearn

Note: Standard datasets can be downloaded from UCI Machine Learning Repository (https://archive.ics.uci.edu/ml/datasets.php**)**

1. Implement and demonstrate FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .csvfile.
2. For a given set of training data examples stored in a .csv file, implement and demonstrate the candidate elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree classifier. Use appropriate dataset for building the decision tree and apply this knowledge to classify a new sample.
4. Write a program to demonstrate the working of Decision tree regressor. Use appropriate dataset for decision tree regressor.

5. Write a program to demonstrate the working of Random Forest classifier. Use appropriate dataset for Random Forest Classifier.
6. Write a program to demonstrate the working of Logistic Regression classifier. Use appropriate dataset for Logistic Regression.

II Year - II Semester	SKILL ORIENTED COURSE- II ANIMATIONS- 3D ANIMATIONS	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To learn the fundamentals ofcomputer based animation.
- To make use of Max tool for animation.
- To understand how simulation, effects, lightening & camera, texturing can be performed with Max tool.
- To understand how to perform Rendering of the objects using V-Ray

Course Outcomes:

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, graphite, 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-based Animation: Definition of Computer-based Animation,BasicTypesof Animation:RealTime,Non-real-time,DefinitionofModelling,Creationof 3D objects.

GettingStartedwithMax: ExploringtheMaxInterface,Controlling&ConfiguringtheViewports,CustomizingtheMaxInterface&SettingPreferences,WorkingwithFiles,Importing&Exporting,SelectingObjects&SettingObjectProperties,DuplicatingObjects,Creating&Editing,StandardPrimitive&extended Primitivesobjects,Transformingobjects,Pivoting,aligningetc.

Unit – II:

3DModelling:
ModelingwithPolygons,usingthegraphite,workingwithXRefs,Buildingsimplescenes,BuildingcomplexsceneswithXRefs,usingassetstracking,deformingsurfaces&usingthemeshmodifiers,modelingwithpatches&NURBS.

Keyframe Animation:

Creating Key frames, Auto Key frames, Move & Scale Keyframe on the timeline,Animating with constraints &simple controllers,
AnimationModifiers&complexcontrollers,functioncurvesinthetrackview,motionmixeretc.

Unit – III

Simulation&Effects: BindtoSpaceWarpobject,Gravity,wind,displaceforceobject,deflectors,FFD spacewarp,wave,ripple,bomb,Creatingparticlesystemthroughparray,understandingparticleflowus erinterface,howtoparticleflowworks,hair&furmodifier,cloth&garmentmakermodifiersetc.

Unit – IV:

Lighting&Camera: Configuring&AimingCameras,cameramotionblur,cameradepthoffield,camerat racking,usingbasiclights&lightingTechniques,workingwithadvancedlighting,LightTracing,Radiosit y,videopost,mentalraylighting 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 ,unwrapping UVs &mapping texture ,using atmospheric &render effects etc.

Unit V:

RenderingwithV-Ray:V-raylightsetup,V-rayrenderingsettings,HDRIIllumination,Fine-tuningshadows,Finalrendersettingetc.

TEXT BOOKS:

1) 3Ds Max7 Fundamentals, TedBoardman, NewRiders 2005.

2) Modelrig,Animatewith3d'smax6, Michelebousquet, Many World Production

3) 3DModelling,Animation,andRendering, —MichaelE.Mortenson, Createspace August 2010.

REFERENCE BOOKS:

1) 3DModellingandAnimation, MichaelG., IgiPublishing

2) BeginningBlender:OpenSource3DModelling,Animation,andGameDesign, 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

II Year - II Semester	WEB APPLICATION DEVELOPMENT USING FULL STACK- MODULE-II	L	T	P	C
		0	0	3	1.5

Course Outcomes:

Through this course, Student should be able to:

CO 1: Describe the principles and tools that are used to develop and access dynamic websites by using HTML5, CSS3 and advanced javascript.

CO 2: Use functions and events for used input and validation

CO 3: Understand the design and development of Single Page Application through AngularJS

CO 4: Examine advance technologies to make web page responsive and more interactive

CO 5: Acquire knowledge on basic React Components and manage data by using State and Props

Unit-I

Advanced HTML: Introduction to HTML5, Page Layout Semantic Elements, Web Forms, Canvas API, SVG API, HTML5 Media (Video & Audio), Web Storage API, Geolocation, Drag and Drop.

Advanced CSS:

Introduction CSS3, CSS Box Model, Border And Box Effects, Background Images And Other Decorative, 2d & 3d Transformations, Transitions And Animations, CSS3 Filters, CSS3-Multi Column Layout, Media

Unit-II

Advanced JavaScript and DOM: Introduction to JavaScript, Working with Web Forms and validating user input, JavaScript functions and events, JavaScript Timing Events, JavaScript Image Slideshow, Recursive function in JavaScript, Error handling in JavaScript. JS DOM Nodes JS Dom Selectors, DOM Styling, DOM Get Set Attributes, DOM Manipulation, DOM Navigation

Unit-III

Working with AngularJS: Basics of AngularJS,Benefits of AngularJs, Angular modules and controllers, AngularJS Directives, Handling events in AngularJS , AngularJS filters, Sorting data in AngularJS.

Unit-IV

Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown

Unit V

Working with ReactJS:

Introduction to ReactJS, Setting up our React App, React Components, Nesting Components, Pure Components, Component LifeCycle, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Props, React State, React setState Method, Simple routing with React Router, Form Handling & useState Hook.

List of practicals/Experiments:

Advanced HTML, CSS and JavaScript:

- Develop informative page with sections which include various images, links to other pages for navigation, make use of all possible formatting by using HTML5 layout tags To demonstrate tables,forms and frames in HTML.
- To demonstrate the use of css and apply CSS properties Border, margins, Padding, Navigation, dropdown list to the page.
- Program to understand the syntax for javascript,operators,functions,events and error handling in javascript.

Document Object Model in JavaScript:

- Program to demonstrate addeventlistener and removeeventlistener in JavaScript,.
- Program to demonstrate Event bubbling , Image gallery with thumbnails in JavaScript.

Working with AngularJS:

- Program to understand angular modules ,controllers, AngularJS Directives.
- Program to demonstrate event handling,filters and sorting data in angularjs.

Working with Bootstrap:

- Program to understand bootstrap by using Image gallery,typography.
- Program to implement Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap TableClasses, Bootstrap Button Classes, Bootstrap Dropdown.

Working with ReactJS:

- Program to understand React Js creating constructs data elements
- Program to understand React Js implementations DoM.

Text Books:

1. HTML 5 BLACK BOOK by DT EDITORIAL SERVICES, DREAMTECH PRESS
2. AngularJS: Up and Running, Shyam Seshadri and Brad Green, O'Reilly
3. Learning React: Functional Web Development with React and Redux, Book by AlexBanks and Eve Porcello, O'Reilly

References:

1. ANGULARJS IN ACTION BY LUKAS RUEBBELKE, DREAMTECH PRESS
2. BOOTSTRAP: RESPONSIVE WEB DEVELOPMENT BY JAKE SPURLOCK,O'REILLY

VISHNU I NSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

Approved by AICTE, New Delhi: Affiliated to JNTU, Kakinada

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

II Year -II Semester	CRITICAL READING & CREATIVEWRITING	L	T	P	C
		2	0	0	0

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 Shorty 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

III YEAR I SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	PC	Design and Analysis of Algorithms	3	0	0	3	30	70
2	PC	Computer Organization	3	0	0	3	30	70
3	PC	Machine Learning	3	0	0	3	30	70
4	OE / JE	Web Technologies	3	0	0	3	30	70
5	PE	Computer Vision/ Internet of Things / Data Visualization/ DevOps	3	0	0	3	30	70
6	PC Lab	Web Technologies Lab	0	0	3	1.5	15	35
7	PC Lab	Machine Learning Lab	0	0	3	1.5	15	35
8	SAC/Soft Skill	Quantitative Aptitude & Logical Reasoning	0	0	4	2	--	50
9	MC	Competitive Coding	2	0	0	0		
10	Summer Internship		0	0	0	1.5		
	Total Credits					**21.5**	**195**	**505**
	Total Marks						**700**	

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

III Year-I Semester	L	T	P	C
	3	0	0	3
DESIGN AND ANALYSIS OF ALGORITHMS				

Course Objectives:

- Induce the students with the fundamental concepts of various algorithm design techniques
- Make the students familiar to conduct performance evaluation of algorithms.
- Expertise the students with the various existing algorithm design techniques
- Motivate the students to design a new algorithm for various problems.
- Introduce the concepts of NP-Hard problems to the students.

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.

Course Outcomes:

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

- Make use of asymptotic notations, divide and conquer techniques to decompose complex problems into small and simple.
- Choose Greedy method to find feasible solutions to problems.
- Examine complex engineering problems in finding the optimal solution.
- Construct all possible solutions using backtracking methods.
- Inspect Branch and Bound techniques and NP complete problems significance in algorithms.

III Year-I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**
COMPUTER ORGANIZATION				

Course Objectives:

- Understand the architecture of a modern computer with its various processing units.
- Realize the basic operations and operating units of a modern computer.
- Understand the functionality of Input/Output Units of Computer
- Annotating Memory hierarchy and different types of memory

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:

T**he 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, ZvonksVranesic, SafeaZaky, 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 of Computer Organization and Design, - Sivarama Dandamudi Springer Int.
4. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy.

Course Outcomes:

- Student can understand the architecture of modern computer
- Understanding of different instruction types.
- Students can calculate the effective address of an operand by addressing modes
- They can understand how computers store positive and negative numbers.
- Understanding of how a computer performs arithmetic operation of positive and negative numbers.

III Year-I Semester	L	T	P	C
	3	0	0	3
MACHINE LEARNING				

Course Objectives:

To enable the students

- Define ML and understand their relationship with data
- Understand different types of supervised learning and build various regression and classification models
- Understand basic math fundamentals of this domain and intuitively understand basic math fundamental behind each technique
- Understand performance metrics
- Explain the mechanism of unsupervised learning and practice various clustering techniques in Python.
- Comprehend text mining and its 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. 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
2. Joseph Howse, Prateek Joshi, Michael Beyeler -Opencv_ Computer Vision Projects with Python-Packt Publishing (2016)
3. 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

Course Outcomes (COs):

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

- Understand the importance of Machine Learning
- Apply regression and classification techniques for machine learning examples.
- Comprehend supervised and unsupervised machine learning techniques.
- Apply the neural network and dimensionality reduction techniques for machine learning applications.
- Design and implement machine learning algorithms to solve real-world application problems.

III Year-I Semester	L	T	P	C
	3	0	0	3
WEB TECHNOLOGIES				

Course Objectives:

The course enables students to:

- Describes the fundamentals of concepts of web and xml schemes
- Acquire server side scripting language concepts using PHP and Nodejs
- Understand creation of databases using MongoDB and integration using PHP and Nodejs.
- Understands the basic knowledge of servlets and jsp in building dynamic web applications.

UNIT I -
Introduction to Web
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 Page
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, Cengage 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.

Web / Other References:

- Wikipedia.org (for information on various concepts related to WT)
- php.net (for documentation/help on PHP language)
- w3schools.com (for code examples of various concepts related to WT)
- tizag.com (tutorials on various languages and technologies)

Course Outcomes:

The student will be able to:

- Enumerate the Basic Concepts of Web, Markup Languages and XML Schemas.
- Develop web applications using Scripting Languages
- Make use of Node JS frameworks and connect to MongoDB
- Implement java and server side servlets to develop web applications.
- Build interactive web applications using JSP by applying MVC framework.

III Year-I Semester	L	T	P	C
	3	**0**	**3**	**3**
PE-I : COMPUTER VISION				

Course Objectives:

- To review image processing techniques for computer vision.
- To understand various features and recognition techniques
- To learn about histogram and binary vision
- Apply three-dimensional image analysis techniques
- Study real world applications of computer vision algorithms

UNIT I

Introduction

Image Processing, Computer Vision ,What is Computer Vision - Low-level, Mid-level, High-level; Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

UNIT II

Feature Extraction and Feature Segmentation

Feature Extraction -Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT. Image Segmentation -Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation.

UNIT III

Images, Histograms, Binary Vision

Simple pinhole camera model – Sampling – Quantisation – Colour images – Noise – Smoothing – 1D and 3D histograms - Histogram/Image Equalisation - Histogram Comparison - Back-projection - k-means Clustering – Thresholding - Threshold Detection Methods - Variations on Thresholding - Mathematical Morphology – Connectivity.

UNIT IV

3D Vision And Motion

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion–spline-based motion- optical flow – layered motion.

UNIT V

Applications

Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing , Virtual Reality and Augmented Reality.

Text Books:

1. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2003.
2. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London Limited,2011.

References:

1. B. K. P. Horn -Robot Vision, McGraw-Hill.
2. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012.
3. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.
4. E. R. Davies, (2012), "Computer & Machine Vision", Fourth Edition, Academic Press.
5. Concise Computer Vision: An Introduction into Theory and Algorithms, by Reinhard Klette, 2014

Course Outcomes:

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

- Explain low level processing of image and transformation techniques applied to images.
- Explain the feature extraction, segmentation and object recognition methods.
- Apply Histogram transform for detection of geometric shapes like line, ellipse and objects.
- Illustrate 3D vision process and motion estimation techniques.
- Apply vision techniques to real time applications.

III Year-I Semester	**L**	**T**	**P**	**C**
	3	**0**	**3**	**3**
PE-II : INTERNET OF THINGS				

Course Objectives:

- To give a comprehensive view of the "Internet of Things".
- To analyze enabling technologies to make it happen in Embedded Devices and communication protocols
- To make use of the fundamental building blocks of such systems (sensors, actuators, converters, processors, intra- and inter-communication networks and interfaces, hardware and software co- design and related implementation and testing environments and techniques) and their inter- relationships.

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 Development Boards : Introduction to Microcontrollers, the 8051 Instruction Set, AT89S8253 Microcontroller, Assembly Language, IoT Development Boards -NodeMCU, ESP8266, Arduino, Intel Galileo and Raspberry Pi.

IoT Protocols : MQTT, UDP, MQTT brokers, publish subscribe modes, HTTP, COAP,XMPP and gateway protocols, IEEE 802.15.4 protocols.

UNIT-IV:

Building IoT Applications with Raspberry Pi : 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, Introduction to NodeMCU, Arduino and working example.

UNIT-V:

IoT Platforms, Cloud and Big Data in IoT : Introduction to Cloud computing : Cloud Computing, clouds types and their features, Open Source IoT Platforms, AWS cloud for IoT, ThingSpeak, Python Web Application Framework, Django, AWS web services for IoT, Challenges in IoT and future directions.

Text Books:

1. Internet of Things – A Hands-on approach, Arshdeep Bagha, Vijay Madisetti University 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. Enabling things to talk – Designing IoT solutions with the IoT Architecture Reference Model, Alessandro Bassi, Martin Bauer, Martin Fielder, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner, Springer

Reference Books :

1. Internet of Things Security – Principles, Applications and Countermeasures, B D Gupta and Megha Quamara , CRC Press, First Edition.
2. Internet of Things and M2M Communication Technologies – Veena S.Chakravarthi, Springer Nature, 13th Edition

Course Outcomes:

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

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to the network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

III Year-I Semester	L	T	P	C
	3	0	3	3
PE-III : DATA VISUALIZATION				

Course Objectives:

- To understand and analyze the data in different formats with quantitative and qualitative approaches.
- To apply different visualization techniques that projects effective and efficient representations using various Visualization tools
- To enable learners to develop knowledge and skills in current and emerging areas of data Visualization.
- To critically assess and evaluate business and technical strategies for data analytics.
- To develop project-management, critical-thinking, problem-solving and decision making skills.

Unit I:

Introduction to Data Visualization:

Basic Considerations – Visualization, Interaction and Computation, Five Ws of Interactive Visual Data Analysis, Enhancing the Data Analysis, Influencing factors, Process models (Book 1).

Unit II:

Graphics Representations: (Book 2)

Good Graphics: Content, Context and Construction, Presentation Graphics and Exploratory Graphics, Presentation (What to Whom, How and Why), Scientific Design Choices in Data Visualization, Higher-dimensional Displays and Special Structures.

Static Graphics: Complete Plots, Customization, Extensibility and other Issues,

Unit III:

Data Visualization through their Graph Representations: (Book 2)

Introduction, Data and Graphs, Graph layout Techniques, Graph Drawing

Unit IV:

Visualization Methods and Techniques: (Book 1)

Visual Encoding and Presentation, Multivariate Data Visualization, Visualization of Temporal Data, Visualization of Geo-spatial Data, Graph Visualization

Interacting with Visualizations: Requirements for Efficient Interaction, Basic Operations for Interaction, Interactive Selection and attenuation, Navigating Zoomable Visualizations, Comparisons

Unit V:

Automatic Analysis: (Book 1)

Visual Representations, Focusing on Relevant Data, Abstracting Data, Grouping Similar Data Elements, Dimensionality Reduction;

Visualization in Multi-Display Environments, Guiding the user and Progressive Visual Data Analysis

Textbooks:

1. Christian Tominski,Heidrun Schumann, Interactive Visual Data Analysis, CRC Press, 2020
2. Chun-houh Chen, Wolfgang Hardle, Antony Unwin, Handbook of Data Visualization, Springer 2008.

Reference Books:

1. Nurul Haszeli Ahmad, Tableau for Beginner Data Analysis and Visualization 101 (2020)
2. Hwang, Jaejin, Yoon, Youngjin, Data Analytics and Visualization in Quality Analysis using Tableau, CRC Press, 2022
3. Stephen Few, Show me the Numbers – Designing the Tables and Graphs to Enlighten, Second Edition, Analytics Press, 2012
4. Tony Fischetti, R Data Analysis and Visualization-Packt (2016)
5. Jay Jacobs, Bob Rudis - Data-Driven SecurityAnalysis, Visualization and Dashboards-Wiley (2014)
6. Alex Campbell, Data Visualization Guide Clear Introduction to Data Mining,Analysis, and Visualization, 2021

Course Outcomes:

By the end of the course, the student will be able to:

- Discuss the basic foundations of visual data analysis and its influence factors
- Discuss the basic concepts of graphics and its presentations, issues
- Apply different data visualization techniques through graph representations
- Apply multivariate data visualization and visualization of temporal, geo and spatial data
- Discuss dimensionality reduction and automatic analysis

III Year-I Semester	L	T	P	C
	3	0	3	3
PE-IV : DEVOPS				

Course Objective:

- DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance.
- Students will be able to Learn why automation, culture, and metrics are essential to a successful DevOps project.
- Students will be able to analyze how DevOps can positively impact your business's bottom line.
- Students will realize which major companies are successfully utilizing DevOps in their own engineering processes.

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 TESTING – CODE COVERAGE: jUnit, nUnit & Code Coverage with SonarQube, SonarQube – Code Quality Analysis.

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 – On OCP, BC , DC & ConfigMaps, 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.

Course Outcomes (COs) :

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

- Identify the DevOps Concepts and Tools for effective project management.
- Utilize GIT to keep track of different versions of the source code.
- Build and Automate Test using Jenkins.

III Year-I Semester	L	T	P	C
	0	0	3	1.5
WEB TECHNOLOGIES LAB				

Course Objectives:

To make the student familiar with:

- Creation of static web pages with HTML & dynamic web pages with HTML, JavaScript & CSS, XML, PHP.
- Design and develop various types of websites using various client side , server side components using Servlets and JSP
- Design and develop 3 tier applications and various web components and Database accessing with JDBC Concepts

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 to create a login form and validate 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 to MongoDB.
7) Write a Nodejs program to read and write file system
8) Write a Nodejs program to connect the 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 student's 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 the table and display all books using JSP and JDBC.

Course Outcomes:

By the end of the course, The student will be able to:

- Develop web applications using Scripting Languages (PHP,Nodejs)
- Develop connect to MongoDB
- Implement java and server side servlets to develop web application.
- Develop interactive web applications using JSP by applying MVC framework.

III Year-I Semester	L	T	P	C
	0	0	3	1.5
MACHINE LEARNING LAB				

Course objectives:

This course will enable students to

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.

Note: For every Machine Learning model students should calculate the performance metrics and calculate the predictions on the test set.

List of Experiments

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
    a. Sigmoid
    b. Tanh
    c. Relu
    d. Softmax
14. Implement perceptron algorithm from scratch and test it on a sample dataset (eg. breast cancer dataset from sklearn)

Web links for Datasets:

1. Company Dataset : https://www.kaggle.com/rahulrky/company-data

III Year-I Semester	L	T	P	C
	0	0	4	2
QUANTITATIVE APTITUDE & LOGICAL REASONING				

Course Objectives:

Enable the students to:

- Understand divisibility, concepts of LCM& HCF, profit or loss incurred in a transaction.
- Understand the concepts of SI & CI and difference between.
- Know the relation between time, speed &distance and combined work & wages paid for the work.
- Be familiar with family relations, the techniques of coding.
- Understand the logic in series, concepts of clocks, identifying day of date.

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.

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

- Find least and greatest number 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.
- Able to calculate the simple and compound interest and the EMI repayment for a loan.
- 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.
- Identify the relation between given persons, Decode the given code pattern and code given word in terms of alphabet, numbers, symbols and mixed,
- Identify missing terms in the pattern/series, find angle between hands at given time and vice-versa, find day of given date and vice-versa.

III Year-I Semester	L	T	P	C
	2	0	0	0
COMPETITIVE CODING				

Course Objectives :

- The development and implementation of advanced algorithms, as well as the skills required for programming competitions.

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 :

1. 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
2. Vie Guide to Competitive Programming: Learning and Improving Algorithms Through Contests (Undergraduate Topics in Computer Science) by Antti Laaksonen.

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.

III YEAR II SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	PC	Computer Networks	3	0	0	3	30	70
2	PC	Big Data Analytics	3	0	0	3	30	70
3	PC	Deep Learning	3	0	0	3	30	70
4	PE	Natural Language Processing / Distributed Systems/ Pattern Recognition / Software Project Management	3	0	0	3	30	70
5	OE / JE	NO SQL Databases	3	0	0	3	30	70
6	PC Lab	Deep Learning Lab	0	0	3	1.5	15	35
7	PC Lab	Big Data Analytics Lab	0	0	3	1.5	15	35
8	PC Lab	No SQL Databases Lab	0	0	3	1.5	15	35
9	SAC/Soft Skill	Advanced English Communication Skills Lab	0	0	4	2	--	50
10	MC	Employability Skills - II	2	0	0	0		
	Total Credits					**21.5**	**195**	**505**
	Total Marks						**700**	

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

III B.TECH II SEM	L	T	P	C
	3	0	0	3
Computer Networks				

Course Objectives:

- An ability to understand the basic concept of data communications and computer networks (e.g., different network types, applications, protocols, OSI layered architecture model, packet switching)
- An ability to understand different models of networks.
- An ability to understand various transmission media and different types of networks.
- An ability to understand functions of each layer in a network model.

UNIT - I

INTRODUCTION: Network applications, network hardware, network software, reference models: OSI, TCP/IP, Comparison of OSI and TCP/IP reference models.
THE PHYSICAL LAYER: Theoretical basis for communication, guided transmission media, wireless transmission, mobile telephone system.

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 MEDIUM ACCESS SUBLAYER: Channel allocations problem, multiple access protocols, Ethernet.

UNIT - III
THE NETWORK LAYER: Network layer design issues, Routing algorithms, Congestioncontrol algorithms, Internet working, The Network layer in the internet (IPv4 and IPv6), Quality of Service.

UNIT - IV
THE TRANSPORT LAYER: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP.

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. A.S. Tanenbaum, Computer Networks (2011), 5th edition, Pearson Education/ PHI. New Delhi, India.
2. Behrouz A. Forouzan (2006), Data communication and Networking, Tata McGraw-Hill, India.

REFERENCE BOOKS:

1. Michael A Gallo, Bill Hancock, (2001), Computer Communications and Networking Technologies, Thomson Fitz Gerald, Dennis (2009), Business Data Communications & Networking, 10th edition, John Willeysons, USA.
2. William Stallings (2006), Cryptography and network security, 4th edition, Pearson Education, India.

Course Outcomes:

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

- Understand OSI and TCP/IP models and LAN Technologies.
- Analyze MAC layer protocols and various control mechanisms to resolve data transmission problems.
- Understand routing and congestion control algorithms
- Explain the Transport Layer functionalities
- Gain familiarity with common networking & Application Protocols.

III B.TECH II SEM	L	T	P	C
	3	0	0	3
Big Data Analytics				

Course Objectives:

1. To optimize business decisions and create competitive advantage with Big Data analytics
2. To learn to analyse the big data using intelligent techniques
3. To introduce programming tools PIG & HIVE in Hadoop ecosystem

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, Tra-ditional Business Intelligence (BI) versus Big Data, Coexistence of Big Data and DataWarehouse, Realms of Big Data, Big Data Analytics, Classification of Analytics, Chal-lenges of Big Data, Terminologies Used in Big Data Environments, Few Top AnalyticsTools.PDF to Word Converter

UNIT - II

The Big Data Technology Landscape: Introduction to Hadoop, RDBMS versus Hadoop, Dis-tributed Computing Challenges, Hadoop Overview, Hadoop Distributors, HDFS (Hadoop Distributed File System), Working with HDFS commands, Interacting with HadoopEcosystem.

UNIT - III

Mapreduce Programming: Processing Data with Hadoop,Mapper, Reducer, Com-biner, Partitioner, Searching, Sorting, Compression,Managing Resources and Applicationswith Hadoop YARN.

UNIT - IV

Cassandra: Features of Cassandra, CQL Data Types, Keyspaces, CRUD Operations,Collection Types, Table Operations. MONGODB: Features of MongoDB, RDBMS vsMongoDB, 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, Run-ning Pig, Execution Modes of Pig, Relational Operators, Eval Functions, Word Count Using Pig. HIVE: Introduction to Hive, Hive Architecture, Hive Data Types, Hive FileFormat, Hive Query Language (HQL): DDL, DML, Partitions, Pig versus Hive.

TEXT BOOKS:

1. Seema Acharya, Subhashini Chellappan. Big Data and Analytics, 2ndEdition, Wiley India Private 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.

Course Outcomes:

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

- Identify the fundamental concepts of big data analytics.
- Select Hadoop environment and apply HDFS commands on file management tasks.
- Utilize optimization techniques of MapReduce Programming to process massive amounts of data in parallel.
- Make use of NoSQL databases like MangoDB and Cassandra to store log data to be pulled for analysis.
- Identify appropriate modern tools like Pig and Hive for complex data flow and analysis.

III B.TECH II SEM	L	T	P	C
	3	0	0	3
Deep Learning				

Course Objectives:

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

- Learn deep learning methods for working with sequential data,
- Learn deep recurrent and memory networks,
- Learn deep Turing machines,
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the currentresearch directions.

UNIT I: Introduction: Why deep learning**,** Various paradigms of learning problems, Perspectives, and Issues in the deep learning framework.
Feed-forward neural network: Biological Neurons and Biological Neural Networks, Perceptron learning, activation functions, Artificial Neural Networks, Learning XOR problem, and multi-layer perceptron.

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, and building a CNN for image classification.

UNIT IV: Recurrent and Recursive Networks: Recurrent Neural Networks, Bidirectional RNNs, Deep recurrent neural networks, Long Short-Term Memory Networks, and building an RNN for text classification.

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, firstedition-2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,3rdedition-2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, TataMcGraw-Hill Education, 3rd edition-2004.

Course Outcomes:

- Demonstrate the basic concepts, fundamental techniques and layers
- Make use of the Algorithms associated with Deep learning and Deep Network architectures for Machine Learning.
- Determine the deep learning algorithms which are more feasible for operations in various domains.
- Implement deep learning models using Python libraries and train them with real-world datasets.

III B.TECH II SEM	L	T	P	C
	3	0	0	3
PE1: Natural LanguageProcessing				

Course Objectives:

- This course introduces the fundamental concepts and techniques of natural language processing (NLP).
- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines NLP models and algorithms using both the traditionalsymbolic and the more recent statistical approaches.
- 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.

UNIT - I:

Introduction: What is Natural Language Processing (NLP), Origins of NLP, Language and Knowledge, The challenges of NLP, Language and Grammar, Processing Indian Languages, NLP Applications, Some successful Early NLP Systems, Information Retrieval, **Language Modelling:** Introduction, Various Grammar-based Language Models, Statistical Language Model.

UNIT - II:

Word Level Analysis: Introduction, Regular Expressions, Finite State Automata, Morphological Parsing, Spelling Error Detection and Correction, Words and Word Classes, Part-of-Speech Tagging, **Syntactic Analysis:** Introduction, Context- Free Grammar, Constituency, Parsing, Probabilistic Parsing, Indian Languages.

UNIT - III:

Semantic Analysis and Pragmatics: Introduction, Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation, **Discourse Processing:** Introduction, Cohesion, Reference Resolution, Discourse Coherence and Structure.

UNIT - IV:

Natural Language Generation: Introduction, Architectures of NLG Systems, Generation task and Representations, Applications of NLG,

Machine Translation: Introduction, Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches, Direct Machine Translation, Rule-based Machine Translation, Corpus-based Machine Translation, Semantic or Knowledge-based MT Systems, Translation involving Indian Languages.

UNIT - V:

NLP Applications: Introduction, Information Extraction, Automatic Text Summarization, Question-Answering System, **Lexical Resources:** Introduction, Word Net, Frame Net, Stemmers, Part-of-Speech Tagger, Research Corpora, Journals and Conferences in the Area.

TEXT BOOKS:

1. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford University Press, 2008.
2. Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

REFERENCE BOOKS:

1. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processingwith Python, First Edition, OReilly Media, 2009.
2. Breck Baldwin, ―Language processing with Java and Ling Pipe Cookbook, Atlantic Publisher, 2015.
3. Richard M Reese, ―Natural Language Processing with Java, OReilly Media,2015.

Course Outcomes:

- Demonstrate a given text with basic Language features.
- Explain a rule based system to tackle morphology/syntax of a language.
- To design an innovative application using NLP components. K6 To design a tagset to be used for statistical processing for real-time applications.
- To compare and contrast the use of different statistical approaches for differenttypes of NLP applications.

III B.TECH II SEM	L	T	P	C
	3	0	0	3
PE2: Distributed Systems				

Course Objectives:

- Describe the issues in the design of modern operating systems of both singleand multiple processor systems.
- Provide hands-on experience in developing distributed protocols.
- Create an awareness of the major technical challenges in distributed systemsdesign and implementation.
- Acquainted with the design principles of distributed operating systems
- The course gives a high ended view on synchronization in distributed systems.
- Understands the working of real time distributed systems.

UNIT –I

INTRODUCTION TO DISTRIBUTED SYSTEMS: What is a Distributed System? Hardware concepts, software concepts, design issues.

UNIT –II

Communication in Distributed Systems, Layered Protocols, ATM networks, The client –server model, remote procedure call, group communication.

UNIT –III

SYNCHRONIZATION IN DISTRIBUTED SYSTEM: Clock synchronization, mutual exclusion, election algorithms, atomic transactions, deadlocks in distributed systems.

UNIT –IV

PROCESS AND PROCESSORS IN DISTRIBUTED SYSTEM: Threads, system models, processors allocation, scheduling in distributed system, fault tolerance, realtime distributed systems

DISTRIBUTED FILE SYSTEMS: Distributed file system design, distributed file system implementation, trends in distributed file system.

UNIT –V

DISTRIBUTED SHARED MEMORY: Introduction, what is Shared memory? Consistency models, page based distributed shared memory, shared variable distributed shared memory, object based distributed shared memory.

TEXT BOOKS:

1. Distributed Operating Systems(2007), Andrew S. Tanenbanm, PearsonEducation, Inc.

REFERENCE BOOKS:

1. Advanced Concepts in Operating Systems, Makes Singhal and Niranjan G. Shivaratna.

Course Outcomes:

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

- Analyze the issues of scheduling for user level processes/threads.
- Understand the concepts of deadlock in operating systems and how they can be managed / avoided. Design and implement network computational techniques using distributed operating systems.
- Classify the types of security problems faced by operating systems and how to minimize these problems.
- Describe the organization and synchronization of distributed operating systems.
- Apply the knowledge of communication in distributed systems and how it can be used in remote procedure calls, remote objects and message-orientedcommunication.

III B.TECH II SEM	L	T	P	C
	3	0	0	3
PE3: Pattern Recognition				

Course Objectives

- This course introduces fundamental concepts, theories, and algorithms for pattern recognition and machine learning.
- Topics include: Pattern Representation, Nearest Neighbor Based Classifier, Bayes Classifier, Hidden Markov Models, Decision Trees, Support Vector Machines, Clustering, and an application of hand-written digit recognition.

UNIT - I:
Introduction: What is Pattern Recognition, Datasets for Pattern Recognition, Different Paradigms for Pattern Recognition. Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

UNIT - II:
Nearest Neighbor Based Classifier: Nearest Neighbor Algorithm, Variants of the NN Algorithm use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection. Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network.

UNIT - III:
Hidden Markov Models: Markov Models for Classification, Hidden Markov Models, Classification using HMMs. Decision Trees: Introduction, Decision Tree for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.

UNIT - IV:
Support Vector Machines: Introduction, Learning the Linear Discriminant Functions, Neural Networks, SVM for Classification. Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods forCombining Classifiers.

UNIT - V:
Clustering: Why is Clustering Important, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets. An Application-HandWritten Digit Recognition: Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results.

TEXT BOOK:

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha, Devi, V. Susheela, Springer Pub, 1st Ed.

REFERENCE BOOKS:

1. Machine Learning - McGraw Hill, Tom M. Mitchell.
2. Fundamentals Of Speech Recognition: Lawrence Rabiner and Biing- Hwang Juang. Prentice- Hall Pub.

Course Outcomes:

- Understand the theory, benefits, inadequacies and possible applications of various machine learning and pattern recognition algorithms
- Identify and employ suitable machine learning techniques in classification, pattern recognition, clustering and decision problems.

III B.TECH II SEM	L	T	P	C
	3	0	0	3
PE4: SOFTWARE PROJECT MANAGEMENT				

Course Objectives:

- Provide cost effective, flexible project management for the software project to meet current and future demands of a business.
- Able Ability to incorporate organizational culture into business software to build employee and workplace morale, to achieve the concurrence among stakeholders at every stage in the life cycle and synchronize the stakeholders expectations by conducting the reviews.
- Able to support configuration management and change management for a healthy project and define the roles and Responsibilities of the Management and Technical people.
- Optimize and analyze the software project resources to improve software ROI by reducing the development cost and State methods to analyze, estimate risks at early stages to reduce reengineering cost.

UNIT-I

Conventional Software Management: The waterfall model, conventional software Management performance. **Evolution of Software Economics:** Software economics, pragmatic software cost estimation. **Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT-II

The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.
Lifecyclephases: Engineeringandproductionstages,inception,Elaboration,construction,transitionphases.**Artifactsoftheprocess:**Theartifactsets,Managementartifacts,Engineeringartifacts,programmaticartifacts.
Model based software architectures: A Management perspective and technical perspective.

UNIT-III

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

UNIT-IV

Project Organization And Responsibilities Line-of-Business Organizations, Project Organizations, evolution of Organizations. **Process Automation:** Automation Building blocks, The Project Environment.

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics

automation.
Tailoring the Process: Process discriminates.

UNIT-V
Future Software Project Management: modern Project Profiles, Next generation Software economics, modern process transitions.
Case Study: The command Center Processing and Display system-Replacement (CCPDSR).

TEXT BOOKS:

1. Software Project Management, Walker Royce: Pearson Education, 2005.

REFERENCE BOOKS:

1. Software Project Management, Bob Hughes and Mike Cottere ll: Tata McGraw-Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education.
3. Software Project Management in practice, Pankaj Jalote, Pearson Education.2005.

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

- Analyze the function of basic parameters to estimate and improve the software economics.
- Apply principles of modern software management to predict the software success.
- Evaluate iterative process planning to synchronize the process workflows of the project.
- Implement a project to manage project schedule, expenses and resources with suitable project management tools.

III B.TECH II SEM	No SQL Databases	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand the fundamentals of NoSQL Databases
- Understand various NoSQL databases and their uses.
- Perform various operations on NoSQL databases.

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 Databases: 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.

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/

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:
3. 978-9351192022)
4. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage",2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)

Course Outcomes:

At the end of the Course the student will be able to

- Discuss about Aggregate Data Models and NoSQL Databases
- Explain about Master-Slave Replication, Peer-to-Peer replication and Key- Value Databases
- Demonstrate the detailed architecture and performance tune of Document-oriented NoSQLdatabases.
- Explain performance tune of Key-Value Pair NoSQL databases.
- Apply NoSQL development tools on different types of NoSQL Databases.

III B.TECH II SEM	L	T	P	C
	0	0	3	1.5
Deep Learning Lab				

Course Objectives:

- Implement the various deep learning algorithms in Python.
- Learn to work with different deep learning frameworks like Keras, Tensor flow, PyTorch, Caffe etc.

List of Exercises / Experiments

1. Write an application to implement Perception.
2. Write an application to implement AND OR gates using Perception.
3. Write an application to implement a simple neural network
4. Write an application to implement a multi-layered neural network
5. Build an Artificial Neural Network by implementing the Back propagationalgorithm and test the same using appropriate data sets.
6. Design feed forward neural network for solving regression typeProblems. (Example: Predicting car purchase amount from car sales datasets)
7. Basic image processing operations: Histogram equalization, thresholding, edge detection, data augmentation, morphological operations
8. Design Convolution Neural Network for Image classification (use CIFAR-10dataset for image classification)
9. Study the effect of batch normalization and dropout in neural networkclassifier
10. Familiarization of image labelling tools for object detection, segmentation
11. Object detection with single-stage and two-stage detectors (Yolo)
12. Design Recurrent Neural Network with LSTM (Example: Stock priceprediction)
13. Image Captioning with LSTMs

Course Outcome:

Expert knowledge in solving real world problems using state-of-art deep learningtechniques

References:

- Francois Chollet, “Deep learning with Python” – Manning Publications.

III B.TECH II SEM	BIG DATA ANALYTICS LAB	L	T	P	C
		3	0	0	3

List of Experiments

1. a) Perform setting up and Installing Hadoop in its three operating modes:Standalone, Pseudo distributed, Fully distributed

   b) Use web based tools to monitor your Hadoop setup.

2. Implement the following file management tasks in Hadoop:

   - Adding files and directories
   - Retrieving files
   - Deleting files

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

3. Run a basic Word Count MapReduce program to understand MapReduce Paradigm.

4. Write a map reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.

5. Use MapReduce to find the shortest path between two people in a social graph.

Hint: Use an adjacency list to model a graph, and for each node store the distance from the original node, as well as a back pointer to the original node. Use the mappers to propagate the distance to the original node, and the reducer to restore the state of the graph. Iterate until the target node has been reached.

6. Implement Friends-of-friends algorithm in MapReduce.

Hint: Two MapReduce jobs are required to calculate the FoFs for each user in a social network .The first job calculates the common friends for each user, and the second job sorts the common friends by the number of connections to your friends.

7. Implement an iterative PageRank graph algorithm in MapReduce.

Hint: PageRank can be implemented by iterating a MapReduce job until the graph has converged. The mappers are responsible for propagating node PageRank values to their adjacent nodes, and the reducers are responsible for calculating new PageRank values for each node, and for recreating the original graph with the updated PageRank values.

8. Create a Bloom filter in MapReduce.

Hint: Write a MapReduce job to create and output a Bloom filter using the Hadoop built-in BloomFilter class. The mappers are responsible for creating intermediary Bloom filters, and the single reducer combines them together to output a combined Bloom filter.

9. Perform an efficient semi-join in MapReduce.

Hint: Perform a semi-join by having the mappers load a Bloom filter from the Distributed Cache, and then filter results from the actual MapReduce data source by performing membership queries against the Bloom filter to determine which data source records should be emitted to the reducers.

10. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filteryour data.

11. Install and Run Hive then use Hive to create, alter, and drop databases, tables,views, functions, and indexes.

III B.TECH II SEM	L	T	P	C
	0	0	3	1.5
No SQL Databases Lab				

Exercise-1:

1. Installation and setup of MongoDB client and server

Exercise-2:

1. Create a database and collection using the MongoDB environment. For example a document collection meant for analysing Restaurant records can have fields like restaurant_id, restaurant_name, customer_name, locality, date, cuisine, grade, comments. etc.
2. 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

Exercise-3:

1. Experiment with MongoDB comparison and logical query operators - $gt, $gte, $lt, $lte, $in, #nin, $ne, $and, $or, $not

Exercise-4:

1. Practice exercise on element, array based and evaluation query operators -$exists, $type, $mod, $regex

Exercise-5:

1. Exercise on MongoDB shell commands and user management

Exercise-6:

1. Installation and configuration of Cassandra. Find out two use cases where Cassandra is preferred over MongoDB

Exercise-7:

1. Create a database in Cassandra using – Create, Alter and Drop. Add records using Inset, Update, Delete and Truncate.

Exercise-8:

1. Exercise based on Cassandra Query Language i.e. selecting records, select records with specific conditions

III B.TECH II SEM	L	T	P	C
	0	0	4	2
Advanced English Communication Skills Lab				

Course Objectives:

- To expose students to different contexts through right vocabulary
- To inculcate the habit of reading and understanding any text
- To enable students to acquire the ability of writing for business purposes
- To enable students to acquire interview skills and group discussion dynamics

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. **(2 sessions)**

UNIT – II

Reading Comprehension – General Vs Local Comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning. **(2 sessions)**

UNIT – III

Writing Skills – Structure of Resume writing —Short Report Writing (Business/Technical)- **(2 sessions)**

UNIT – IV

Presentation Skills -- Group Discussion – Dynamics of Group Discussion, **(4 sessions)**

UNIT – V

Interview Skills – Concept and process – pre-interview planning, opening strategies, answering strategies, interview through teleconference & video-conference and mock interviews. **(3 sessions)**

Suggested Software:

1. K-Van solutions Software with CD
2. 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
3. Publications. 2011.
4. English Vocabulary in Use Series, Cambridge University Press 2008.
5. Communication Skills by Leena Sen, PHI Learning Pvt. Ltd., New Delhi, 2009.
6. A Course Book of Advanced Communication Skills Lab published by University Press, Hyderabad.

Course Outcomes:

- Upon the completion of the course, the student will be able to:
- Choose vocabulary contextually.
- Comprehend, analyze and interpret the text in a definite time frame.
- Write resumes cohesively and coherently.
- Construct and elaborate on a given topic. and Comprehend and practice thedynamics of group discussion
- Comprehend the concept and process of the interview; answering throughmock interviews.

III B.TECH II SEM	L	T	P	C
	2	0	0	0
Employability Skills - II (BusinessAnalytics using Tableau)				

Course Objectives:

- This Business Analytics program will help you gain the knowledge you need to turn yourorganization's data into a tactical asset to generate business value.
- Outlines the concept of data visualization that is needed to inform changes in business.
- To identify various visual analytics tools and components of tableau.
- Describe different types of charts used for data analysis.
- Gives insight on Functions and parameters that are used in Tableau.

UNIT I: Introduction to Tableau & Data Visualization:: Introduction to Tableau, Tableau Architecture, Tableau Server Architecture, VizQL, introduction to Tableau Prep, Tableau Prep Builder User Interface, Data Visualization, Business Intelligence tools. Tableau Desktop Installation.

UNIT II: Data Visualization using Tableau: Visualizations, Functions in Tableau, Join and Union, Sort, Set, Forecasting, Highlighting, Device designer.

UNIT III: Visual Perception: Overview of perception, Visual analysis, Visual Perception. Components of Tableau: Tableau Product family, Connecting to data, Filters, Sets, Groups, Data types, Measures and Dimensions.

UNIT IV: Charts & Graph: Generated fields in Tableau, Used cases in generated fields, Building charts in tableau, Features of Tableau, Usecase: IPL.

UNIT V: Functions: Numbers, Strings, Type Conversions, Aggregate and Logical Functions. Parameters:parameters in Tableau, creating a parameter, using parameter in calculation, parameter in control, using parameter in visualization.

TEXT BOOKS:

1. Business Analytics : An Application Focus 3.75 by Purba Halady Rao , PHI Learning

REFERENCE BOOKS:

1. Business Analytics: Data Analysis and Decision Making with MindTap, 7th Edition Paperback – 1 September 2022

2. Business Analytics | Third Edition| By Pearson Paperback – 29 January 2021 by James R.Evans

E- Content:- https://www.youtube.com/watch?v=aHaOIvR00So

Course Outcomes:

- Able to get brief ideas on data visualization and tableau installation.
- To learn visualization operations and functions.
- To understand the importance of Visual Analytics, features and techniques used for Visualization.
- Able to explore various charts..
- To understand basic calculations such as Numeric, String Manipulation, Logical and Aggregate functions.

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF CSE(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV YEAR I SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	PE	Reinforcement Learning/ Cloud Computing/ Social Network Analysis/ Speech and videoprocessing	3	0	0	3	30	70
2	PE	Cryptography and Network Security / Soft Computing / Blockchain Technologies/ Semantic Web	3	0	0	3	30	70
3	PE	E-commerce & digital Marketing/ AI Chatbots / Object Oriented Design/ Recommender Systems.	3	0	0	3	30	70
4	OE / JE	Robotic Process Automation.	3	0	0	3	30	70
5	OE	Open Electives offered by other departments	3	0	0	3	30	70
6	HS Elective	Managerial Economics and Financial analysis / Management Science / Intellectual PropertyRights and Patents	3	0	0	3	30	70
8	Skill Advanced Course	Machine Learning with GO	0	0	4	2	--	50
9	PR	Internship	0	0	0	3		100
	Total Credits					**23**	**180**	**570**
	Total Marks						**750**	

IV YEAR II SEMESTER								
S.No	**Category**	**Subjects**	**L**	**T**	**P**	**C**	**I**	**E**
1	Project	Major Project Work, Seminar, Internship	-	-	-	12		
	Total Credits					**12**		
	Total Marks							

IV Year - I Semester	L	T	P	C
	3	0	0	3
PE1 : REINFORCEMENT LEARNING				

Course Objectives:

- Understand the fundamental concepts and principles of reinforcement learning.
- Apply dynamic programming algorithms for solving reinforcement learning problems.
- Implement and analyze temporal difference learning methods.
- Develop proficiency in policy gradient methods for reinforcement learning.
- Apply deep reinforcement learning techniques using neural networks.

Unit-I

Introduction to reinforcement learning concepts and terminology, Markov Decision Processes (MDPs) and the agent-environment interaction, Components of reinforcement learning: agent, environment, actions, states, rewards, and policies, Exploration and exploitation trade-off, Value functions and Bellman equations.

Unit -II

Dynamic Programming: Policy evaluation, policy improvement, and policy iteration, Value iteration and the Bellman optimality equation, Model-based vs. model-free approaches, Monte Carlo methods for estimating value functions

Unit -III

Temporal Difference Learning: TD(0) learning and the TD error, Q-learning and SARSA algorithms, On-policy vs. off-policy learning, Eligibility traces and TD(λ) methods, Function approximation in reinforcement learning

Unit-IV

Policy Gradient Methods: Policy gradient theorem and score function gradient, REINFORCE algorithm and the use of Monte Carlo sampling, Actor-Critic methods and advantage functions, Proximal Policy Optimization (PPO), Trust Region Policy Optimization (TRPO) and its limitations

Unit-V

Deep Reinforcement Learning, Deep Q-Networks (DQN) and experience replay, Double DQN and dueling architectures, Deep Deterministic Policy Gradient (DDPG), Asynchronous Advantage Actor-Critic (A3C), Deep Q-Learning from Demonstrations (DQfD)

Course Outcomes:

- Students will be able to define and explain key terms and concepts related to reinforcement learning, such as Markov Decision Processes, value functions, policies, exploration vs. exploitation, and reward structures.
- Students will be able to implement policy evaluation, policy improvement, and policy iteration algorithms, and use them to solve simple reinforcement learning problems.
- Students will be able to design and implement TD(0), Q-learning, SARSA, and TD(λ) algorithms, and understand their advantages, limitations, and convergence properties.
- Students will be able to implement the REINFORCE algorithm, actor-critic methods, and other policy gradient algorithms, and use them to train agents in various environments.
- Students will be able to design and train deep reinforcement learning models, such as DQN, DDPG, A3C, and DQfD, and understand the challenges and considerations associated with deep RL, such as function approximation and exploration-exploitation trade-offs.

Books :

1. Reinforcement Learning - An Introduction - 2022 Second Edition, Richard S Sutton and Andrew G. Barto
2. Reinforcement Learning - A Complete Guide - 2021 Edition, Emereo Publishing, Practical Tools for Self Assessment.

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV Year - I Semester	L	T	P	C
	3	0	0	3
PE1 : CLOUD COMPUTING				

Course Objectives:

- To understand the concepts of Cloud Computing.
- To learn Taxonomy of Virtualization Techniques.
- To learn Cloud Computing Architecture.
- To acquire knowledge on Aneka Cloud Application Platform.
- To learn Industry Cloud Platforms.

UNIT I

Introduction to Cloud: Cloud Computing at a Glance, the Vision of Cloud Computing, Defining a Cloud, a Closer Look, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments. **Virtualization:** Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V. Before the Move into the Cloud: Know Your Software Licenses, the Shift to a Cloud Cost Model, and Service Levels for Cloud Applications.

UNIT II

Cloud Computing Architecture : Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance. Ready for the Cloud: Web Application Design, Machine Image Design, Privacy Design, Database Management, Data Security, Network Security, Host Security, Compromise Response.

UNIT III

Defining the Clouds for Enterprise: Storage as a service, Database as a service, Process as a service, Information as a service, Integration a s a service and Testing as a service. Scaling a cloud infrastructure - Capacity Planning, Cloud Scale. Disaster Recovery: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management.

UNIT IV

Aneka: Cloud Application Platform Framework Overview, Anatomy of the Aneka Container, From the Ground Up: Platform Abstraction Layer, Fabric Services, Foundation Services, Application Services, Building Aneka Clouds, Infrastructure Organization, Logical Organization, Private Cloud

Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode, Cloud Programming and Management, Aneka SDK, Management Tools.

UNIT V

Cloud Applications: Scientific Applications – Health care, Geoscience and Biology. Business and Consumer Applications- CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming.

Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services and Additional Services. Google App Engine-Architecture and Core Concepts, Application Life-Cycle, cost model. Microsoft Azure- Azure Core Concepts, SQL Azure.

Text Books

1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi from TMH 2013.
2. George Reese Cloud Application Architectures, First Edition, O‟Reilly Media 2009.

References

1. Cloud Computing and SOA Convergence in Your Enterprise A Step-by-Step Guide by David S. Linthicum from Pearson 2010.
2. Cloud Computing 2nd Edition by Dr. Kumar Saurabh from Wiley India 2012.

3. Cloud Computing – web based Applications that change the way you work and collaborate Online – Micheal Miller.Pearson Education.

Course Outcomes:

- Understand the concept of virtualization and how this has enabled the development of Cloud Computing
- Know the fundamentals of cloud, cloud Architectures and types of services in cloud
- Understand scaling, cloud security and disaster management
- Design different Applications in cloud
- Explore some important cloud computing driven commercial systems

IV Year - I Semester	L	T	P	C
	3	0	0	3
PE1 : SOCIAL NETWORK ANALYSIS				

Course Objectives:

- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behaviour in social web and related communities.
- To learn visualization of social networks.

UNIT I

INTRODUCTION

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social 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 - Applications of Social Network Analysis.

UNIT II

MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNIT III

EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.

UNIT IV

PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES

Understanding and predicting human behavior for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT V

VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

TEXT BOOKS:

1. Peter Mika, ―Social Networks and the Semantic Web‖, First Edition, Springer 2007.

2. Borko Furht, ―Handbook of Social Network Technologies and Applications‖, 1st Edition, Springer, 2010.

REFERENCES

1. Guandong Xu ,Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo, ―Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, ―Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling‖, IGI Global Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, ―The Social Semantic Web‖, Springer, 2009.

Course Outcomes:

- Develop semantic web related applications.
- Represent knowledge using ontology.
- Predict human behaviour in social web and related communities.
- Visualize social networks.

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV Year - I Semester	L	T	P	C
	3	0	0	3
PE1 : SPEECH AND VIDEO PROCESSING				

Course Objectives:

- Understand the fundamental principles and components of speech production, analysis, and modeling.
- Develop proficiency in speech feature extraction techniques and pattern comparison methods.
- Gain knowledge of Hidden Markov Models (HMMs) and their application in speech modeling and recognition.
- Explore the architecture and components of large vocabulary continuous speech recognition systems.
- Gain knowledge of television systems, including color television, digital TV, and advanced TV technologies.

UNIT-I

Basic Concepts: Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

UNIT-II

Speech Analysis: Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

UNIT-III

Speech Modeling: Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, and Implementation issues. **Speech Recognition**: Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word units; Applications and present status. Speech Synthesis: Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

UNIT-IV

Fundamentals of Colour Television: Aspect, scanning, perception of brightness and colour, colour mixing, composite video signal, synchronisation details, digital TV camera, modulation of audio and video, terrestrial signal transmission, video displays: LCD vs LED.

Digital TV: Digital video, resolution, notation, digital video formats, digital video quality measure, video restoration, video streaming, DTH, Video compression: MPEG 2, MPEG 4, comparison of SDTV, EDTV and HDTV.

UNIT-V

Advanced TV Systems and Techniques: Introduction to UHDTV: 4K and 8K, IPTV/web TV, smart TV, Wi-Fi TV, digital surveillance, 3D TV concept, over view of H.264 features, camcorders, webcams, perspective of TV White spaces.

Audio and Video Recording Systems: Digital sound, sound recording, CD/ DVD player, MP3 player, Blue Ray DVD Player, ITU-T(G) compression standards, multichannel/Dolby

TEXT BOOKS

1. Lawrence Rabinerand Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.
2. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education.
3. A. M. Dhake, Television and video Engineering, TMH Publication, 2ndEdition, 2001.
4. Kelth jack, Video Demystified: A Handbook for the Digital Engineer, 5thEdition, Newnes, 2007.

REFERENCES

1. Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”,California Technical Publishing.
2. Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education.
3. Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, John Wiley and Sons,1999.
4. Ben gold and Nelson Morgan, “Speech and audio signal processing”, processing and perception of speech and music, Wiley- India Edition, 2006 Edition.
5. Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press.
6. A. M. Tekalp, Digital Video, Prentice Hall, 1995.
7. R. P. Gulathi, Modern Television Practice, 4thedition, New Age International Publisher,2014.

Course Outcomes:

- Explain articulatory and acoustic phonetics, digital signal processing concepts, and methods for speech analysis.
- Extract features from speech signals and apply pattern comparison techniques for time alignment and normalization.
- Understand the principles of HMMs and implement them for speech recognition tasks.
- Familiarity with the architecture of large vocabulary continuous speech recognition systems and knowledge of speech recognition applications.
- Understand the fundamentals of color television, including scanning, perception ofbrightness and color, and composite video signals.

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV Year - I Semester	L	T	P	C
	3	0	0	3
PE2 : CRYPTOGRAPHY AND NETWORK SECURITY				

Course Objectives:

1. Explain the objectives of information security, importance and application of each of confidentiality, integrity, authentication and availability
2. Understand various cryptographic algorithms and the basic categories of threats to computers and networks
3. Describe public-key cryptosystem and the enhancements made to IPv4 by IPSec
4. Understand Intrusions and intrusion detection
5. Discuss the fundamental ideas of public-key cryptography.
6. Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
7. Discuss Web security and Firewalls

UNIT - I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security **Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric keycryptography, steganography, key range and key size, possible types of attacks.

UNIT - II

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipheroperation, Stream ciphers, RC4.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT - III

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), **Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

UNIT - IV

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN,IEEE 802.11i Wireless LAN Security

UNIT - V

E-Mail Security: Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations,Internet Key Exchange

Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Singlesign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, WileyIndia, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH

Course Outcomes:

- Analyze the different Security Attacks, Services, and Mechanisms work security models.
- Apply classical encryption algorithms (Substitution and Transposition ciphers) and DES algorithms to encrypt plaintext.
- Distinguish the modern Cryptography algorithm such as DES, AES, double DES, Triple DES, RC4 algorithm and analyze modern cryptanalysis techniques.
- Solve the problem on Number theory, public key cryptography techniques (RSA) and key management algorithms (Diffie-Hellman).
- Compare and contrast message authentication algorithms (SHA-512, MAC, HMAC),symmetric and asymmetric encryption and authentication standards and protocols.
- Examine the different network security protocols (IPSec, TLS/SSL, SET, S/MIME, PGP) and Firewall types and principles.

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV Year - I Semester	L	T	P	C
	3	0	0	3
PE2 : SOFT COMPUTING				

Course Objectives:

- To Develop intelligent systems leveraging the paradigm of soft computing technique
- To Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.
- To Recognize the feasibility of applying a soft computing methodology for a particular problem

UNIT I: Introduction: Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation
- Expert systems**.**

UNIT II: Artificial Neural Networks: Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT III: Fuzzy Logic System: Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT IV: Genetic Algorithm: Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and ant D-colony search techniques for solving optimization problems.

UNIT V: Applications: GA application to power system optimization problem, Case studies: Identification and control of linear and nonlinear dynamic systems using MATLAB-Neural Network toolbox, Stability analysis of Neural Network interconnection systems, Implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox, Stability analysis of fuzzy control systems.

TEXT BOOKS:

1. Introduction to Artificial Neural Systems - Jacek.M.Zurada, Jaico Publishing House, 1999.
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.

REFERENCE BOOKS:

1. Fuzzy Sets, Uncertainty and Information - Klir G.J. &Folger T.A., Prentice-Hall of India Pvt. Ltd., 1993.
2. Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994. Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.
3. Artificial Neural Networks - Dr. B. Yagananarayana, 1999, PHI, New Delhi.

Course Outcomes

- Develop intelligent systems leveraging the paradigm of soft computing techniques.
- Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.
- Recognize the feasibility of applying a soft computing methodology for a particular problem
- Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks.
- Design hybrid system to revise the principles of soft computing in various application

VISHNU INSTITUTE OF TECHNOLOGY (AUTONOMOUS) :: BHIMAVARAM

DEPARTMENT OF CSE(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV Year - I Semester	L	T	P	C
	3	0	0	3
PE2 : Blockchain Technologies				

Course Objectives:

- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them,
- Integrate ideas from block chain technology into their own projects.• Design, build, and deploy smart contracts and distributed applications

UNIT I

Introduction : Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.

Evolution of Blockchain : Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT II

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT III

Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications.Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

UNIT IV

Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts,MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts.

UNIT V

Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application. Advanced Concepts in Blockchain: Introduction, InterPlanetary File System (IPFS),Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

Textbooks:

1) Ambadas, Arshad Sarfarz Ariff, Sham "Blockchain for Enterprise Application Developers", Wiley
2) Andreas M. Antonpoulos, "Mastering Bitcoin: Programming the Open Blockchain" , O'Reilly

Course Outcomes (COs)

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

- Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
- Identify the risks involved in building Block chain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Crypto currency markets
- Examine how to profit from trading crypto currencies.

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DEPARTMENT OF CSE(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV Year - I Semester	L	T	P	C
	3	0	0	3
PE2 : Semantic Web				

Course Objectives:

- To understand the concepts of semantic web technology
- To appreciate the merits of semantic web over traditional web
- To appreciate the merits of semantic web over traditional web
- To learn and appreciate RDF and its taxonomy and ontology
- To describe OWL and its usage in semantic web
- To understand various technologies related to semantic web services

UNIT – I

INTRODUCTION: THE BASICS OF SEMANTIC WEB , Traditional web to semantic web – WWW and its usage- meta data and its creation, addition in the web page; meta data tools - search engines for semantic web –search engine for web page mark up problem and query building problem

UNIT – II

RESOURCE DESCRIPTION FRAME WORK (RDF) : RDF and its basic elements-Why we need RDF-RDF triples-RDF toolsFundamental rules of RDF- relationship between DC,and RDF and XML and RDFcore elements of RDF- ontology and taxonomy-inferencing based on RDF

UNIT – III

WEB ONTOLOGY LANGUAGE: The basics idea of Web ontology language– OWL to define classes-OWL to define properties-set operators-Three faces of OWL-Ontology Matching and Distributed Information-Validating OWL ontology

UNIT – IV

SEMANTIC WEB SERVICES: Web services – web services standards – web services to semantic web services- UDDI and its usage- Concept of OWL-S and its building blocks - mapping OWL-S to UDDI-WSDL-S overview and its usage.

UNIT - V

REAL WORLD EXAMPLES AND APPLICATIONS OF SEMANTIC WEB : Swoogle architecture, usage and examples of using Swoogle; FOAF – Explanation, vocabulary –creating FOAF documents – overview of semantic markup – semantic web search engines.

TEXT BOOKS:

1. Liyang Yu , “Introduction to the Semantic Web and Semantic web services” Chapman & Hall/CRC, Taylor & Francis group, 2007.

REFERENCE BOOKS:

1. Johan Hjelm, “Creating the Semantic Web with RDF “ , Wiley, 2001
2. Grigoris Antoniou and Frank van Harmelen, “A Semantic Web Primer”, MIT Press, 2004.
3. Karin K. Breitman K., Marco Antonio Casanova, Walt Truszkowski, “Semantic web concepts, Technologies and applications” Walt Truszkowski - 2007.

Course Outcomes:

Upon completion of this course, students will get the knowledge about:

- Various semantic web concepts and techniques
- An ability to understand the basic architectures of semantic web

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV Year - I Semester	L	T	P	C
	3	0	0	3
PE3 : E-COMMERCE & DIGITAL MARKETING				

Course Objectives:

- Understand the concepts and evolution of e-commerce, including its differences from traditional commerce and the importance of electronic business.
- Explore the history and development of e-commerce, including the role of electronic data interchange (EDI) and the benefits and limitations of e-commerce.
- Examine different business models in e-commerce, such as business-to-business (B2B), business-to-customers (B2C), customers-to-customers (C2C), and business-to-government (B2G).
- Analyze marketing strategies specific to e-commerce, including website design and components, internet advertising models, and the impact of mobile commerce.
- Study electronic payment systems, including online payment methods, prepaid and postpaid systems, various types of electronic payment instruments, security issues, and solutions.

UNIT-I

Introduction to E– commerce: Meaning and concept – E– commerce v/s Traditional Commerce– E– Business & E– Commerce – History of E– Commerce – EDI – Importance, features & benefits of E– Commerce – Impacts, Challenges & Limitations of E–Commerce – Supply chain management & E – Commerce – E – Commerce infrastructure.

UNIT-II

Business models of E – Commerce: Business to Business – Business to customers– Customers to Customers – Business to Government – Business to Employee – E – Commerce strategy – Influencing factors of successful E– Commerce.

UNIT-III

Marketing strategies & E – Commerce: Website – components of website – Concept & Designing website for E– Commerce – Corporate Website – Portal – Search Engine – Internet Advertising – Emergence of the internet as a competitive advertising media– Models of internet advertising – Weakness in Internet advertising – Mobile Commerce

UNIT-IV

Electronic Payment System: Introduction – Online payment systems – prepaid and postpaid Payment systems – e– cash, e– cheque, Smart Card, Credit Card, Debit Card, Electronic purse –

Security issues on electronic payment system – Solutions to security issues – Biometrics – Types Of biometrics.

UNIT-V

Legal and ethical issues in E– Commerce: Security issues in E– Commerce–Regulatory framework of E– commerce

TEXT BOOKS:

1. Turban, Efraim, and David King, "Electronic Commerce: A Managerial Perspective", 2010, Pearson Education Asia, Delhi.
2. Kalakota, Ravi, "Frontiers of Electronic Commerce", 2004, Addison – Wesley, Delhi.
3. Rayport, Jeffrey F. and Jaworksi, Bernard J, "Introduction to E–Commerce", 2003, Tata McGraw Hill, New Delhi.
4. Smantha Shurety, "E–Business with Net Commerce", Addison – Wesley, Singapore.

REFERENCES:

1. Rich, Jason R: Starting an E–Commerce Business, 2007, IDG Books, Delhi.
2. Laudon, Kenneth C and Carol Guercio Traver: E–Commerce business. Technology, 2011, Pearson Education, Delhi.
3. Stamper David A, and Thomas L.Case: Business Data Communications, 2005, Pearson Education, New Delhi.
4. Willam Stallings: Business Data Communications, 2007, Pearson Education, New Delhi

Course Outcomes (COs)

- Identify and explain the key concepts and features of e-commerce and its different business models.
- Evaluate the impacts and challenges of e-commerce on supply chain management and understand the infrastructure required for successful e-commerce implementation.
- Design and develop effective marketing strategies for e-commerce, including website design and internet advertising campaigns.
- Assess and analyze various electronic payment systems, understanding their functionalities, security issues, and potential solutions.
- Understand the legal and ethical considerations associated with e-commerce and develop strategies to address security concerns and comply with regulatory frameworks.

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV Year - I Semester	L	T	P	C
	3	0	0	3
PE3 : AI CHATBOTS				

Course Objectives:

- Understand the fundamental concepts and components of AI chatbots.
- Gain knowledge of different types of chatbots and their underlying technologies.
- Develop practical skills in designing and building rule-based, retrieval-based, and generative chatbots.
- Explore advanced techniques in chatbot development, such as dialog management and reinforcement learning.
- Foster an awareness of ethical considerations and challenges in the design and deployment of AI chatbots.

Unit -I

Introduction to Chatbots, Overview of chatbots and their applications, Historical development of chatbots, Types of chatbots: rule-based, retrieval-based, and generative, Natural Language Processing (NLP) basics for chatbots,

Unit-II

Building Rule-Based Chatbots, Introduction to rule-based chatbots, Designing conversational flows and dialogues, Implementing rules and conditions for chatbot responses, Handling user inputs and intents in rule-based chatbots

Unit -III

Retrieval-Based Chatbots, Understanding retrieval-based chatbots, Building knowledge bases and question-answering systems, Designing and training chatbot models using supervised learning techniques, Evaluating and improving retrieval-based chatbot performance

Unit-IV

Generative Chatbots, Introduction to generative chatbots, Sequence-to-Sequence (Seq2Seq)models for chatbot generation, Attention mechanisms and language modeling for chatbot responses
Training and fine-tuning generative chatbot models

Unit-V

Advanced Topics in Chatbots, Contextual understanding and contextual chatbot responses Dialog management and reinforcement learning for chatbots, Multilingual and cross-lingual chatbots, Ethical considerations and responsible deployment of chatbots.

Books :

1. Chatbots and the domestication of AI : A Relational Approach, Hendrik Kept, 2020 Macmillan Publications.

2. Conversational Interfaces: Principles of Successful Bots, Chatbots, Messaging Apps, and Voice Experiences - Maria Yao, 2018 Edition, Topbots Publication.

Course Outcomes (COs)

- By the end of the course, students will be able to explain the key concepts and components of AI chatbots, including natural language processing (NLP), dialog management, and conversational AI.
- Students will be able to design and implement rule-based chatbots, defining conversational flows, implementing rules and conditions, and handling user inputs effectively.

- Students will gain the skills to build retrieval-based chatbots, including creating knowledge bases, training models using supervised learning techniques, and evaluating and improving chatbot performance.
- Students will be able to develop generative chatbots using sequence-to-sequence models, incorporating attention mechanisms and language modeling techniques to generate meaningful and coherent responses.
- Students will develop an understanding of advanced topics in chatbots, such as contextual understanding, dialog management using reinforcement learning, and ethical considerations in chatbot design, ensuring responsible and ethical deployment of AI chatbots.

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV Year - I Semester	L	T	P	C
	3	0	0	3
PE3 : OBJECT ORIENTED DESIGN				

Course Objectives:

- Understand the application development and analyze the insights of object oriented programming to implement application
- Understand, analyze and apply the role of overall modeling concepts (i.e. System, structural)
- Understand, analyze and apply oops concepts (i.e. abstraction, inheritance)
- Understand the basic concepts of C++ to implement the object oriented concepts
- To understand the object oriented approach to implement real world problem

UNIT-I

Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modelling, principles of modelling, object oriented modelling, Introduction to UML, conceptual model of the UML, Architecture.

UNIT-II

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class &Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, call-back mechanism, broadcast messages. Basic Behavioural Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine, Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT-III

Object Oriented Analysis: Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD).Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation. Object oriented programming style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.

UNIT-IV

C++ Basics: Overview, Program structure, namespace, identifiers, variables, constants, enum, Operators, typecasting, control structures C++ Functions: Simple functions, Call and Return by reference, Inline functions, Macro vs. Inline functions, Overloading of functions, default arguments, friend functions, virtual functions

UNIT-V

Objects and Classes: Basics of object and class in C++, Private and public members, static data and function members, constructors and their types, destructors, operator overloading, type Conversion. Inheritance: Concept of Inheritance, types of inheritance: single, multiple, multilevel, Hierarchical, hybrid, protected members, overriding, virtual base class Polymorphism: Pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual Functions, implementing polymorphism

Text Books

1. James Rumbaugh et. al, "Object Oriented Modeling and Design", Pearson Education

2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education

3. Object Oriented Programming With C++, E Balagurusamy, McGraw Hill.

REFERENCES:

1. C++ Programming, Black Book, Steven Holzner, dreamtech

2. Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia

3. Object Oriented Programming with ANSI and Turbo C++, Ashok Kamthane, Pearson

Course Outcomes (COs)

- Explain the principles and concepts of object orientation and understand their importance in software development.
- Apply UML techniques for conceptual modeling and architectural modeling of software systems.
- Create and interpret UML diagrams, including class diagrams, object diagrams, collaboration diagrams, sequence diagrams, use case diagrams, activity diagrams, and state machine diagrams.
- Analyze and design software systems using object-oriented analysis and design principles, considering factors like inheritance, polymorphism, and encapsulation.
- Develop proficiency in C++ programming, including understanding program structure, using functions, working with objects and classes, and implementing inheritance and polymorphism.

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV Year - I Semester	L	T	P	C
	3	0	0	3
PE3 : RECOMMENDER SYSTEMS				

Course Objectives:

- Understand the fundamental concepts and algorithms used in recommendation systems.
- Gain knowledge of different types of recommendation systems and their strengths and limitations.
- Develop practical skills in implementing and evaluating recommendation systems.
- Explore advanced techniques and emerging trends in recommendation systems.
- Foster an awareness of ethical considerations and challenges in designing and deploying recommendation systems.

Unit-I

Introduction to Recommendation Systems, Overview of recommendation systems, Types of recommendation systems: content-based, collaborative filtering, hybrid, and knowledge-based, Evaluation metrics for recommendation systems, Challenges and ethical considerations in recommendation systems

Unit-II

Content-Based Recommendation Systems, Content-based filtering: concept and algorithms

Feature extraction and representation for content-based recommendations, Similarity measures and techniques for content-based recommendations, Handling cold start problem in content-based recommendations

Unit-III

Collaborative Filtering Recommendation Systems, Collaborative filtering: concept and algorithms, User-based and item-based collaborative filtering, Memory-based and model-based collaborative filtering approaches, Handling sparsity and scalability issues in collaborative filtering

Unit -IV

Hybrid Recommendation Systems, Hybrid recommendation systems: motivation and benefits, combining content-based and collaborative filtering techniques, Weighting and fusion methods for hybrid recommendations, Case studies and examples of successful hybrid recommendation systems

Unit- V

Advanced Topics in Recommendation Systems, Matrix factorization techniques (e.g., Singular Value Decomposition, Non-negative Matrix Factorization), Deep learning approaches for recommendations (e.g., neural networks, deep autoencoders), Context-aware recommendations

(e.g., temporal, location-based recommendations)

Reinforcement learning for recommendations

Text Books:

1. "Recommender Systems: An Introduction" by Dietmar Jannach, Markus Zanker, Alexander Felfernig, and Gerhard Friedrich.
2. "Programming Collective Intelligence: Building Smart Web 2.0 Applications" by Toby Segaran.
3. "Recommender Systems Handbook" edited by Francesco Ricci, Lior Rokach, and Bracha Shapira.
4. "Deep Learning for Recommender Systems" by Balázs Hidasi, Alexandros Karatzoglou, Linas Baltrunas, and Domonkos Tikk.
5. "Building Recommender Systems with Machine Learning and AI" by Suresh K. Gorakala.

References:

1. "Recommender Systems Handbook" edited by Francesco Ricci, Lior Rokach, and Bracha Shapira.
2. "Recommender Systems: The Textbook" by Charu C. Aggarwal.
3. "Algorithmic Recommendations and Collaborative Filtering" by Michael J. O'Mahony and Neil J. Hurley.
4. "Recommender Systems: Introduction and Challenges" by Konstantina Chrysafiadi and Ioannis Papadakis.
5. "Recommender Systems: The Art and Science of Prediction" by Joseph A. Konstan and John Riedl.

Course Outcomes (COs)

- By the end of the course, students will be able to explain the key concepts and algorithms used in recommendation systems, such as content-based filtering, collaborative filtering, and hybrid approaches.
- Students will be able to analyze and evaluate the performance of recommendation systems using appropriate evaluation metrics and techniques.
- Students will be able to design and implement content-based and collaborative filtering recommendation systems, considering factors such as data preprocessing, feature extraction, similarity measures, and scalability.
- Students will have knowledge of advanced topics in recommendation systems, including matrix factorization techniques, deep learning approaches, and context-aware recommendations.
- Students will develop an understanding of the ethical implications and challenges related to recommendation systems, such as privacy, fairness, and transparency, and be able to apply ethical guidelines in their recommendations design.

IV Year - I Semester	L	T	P	C
	3	0	0	3
ROBOTIC PROCESS AUTOMATION				

Course Objectives:

- Understand the scope and techniques of automation, with a specific focus on Robotic Process Automation (RPA).
- Explore the basics of RPA, including its history, benefits, components, and RPA platforms.
- Gain knowledge of RPA development methodologies, process design documentation, and solution design documentation.
- Familiarize with RPA tools and their user interfaces, variables, control flow activities, data manipulation techniques, and advanced automation concepts such as recording, scraping, and image/text automation.
- Learn about advanced automation techniques, including handling user events, assistant bots, and exception handling.

UNIT-I

INTRODUCTION TO ROBOTIC PROCESS AUTOMATION: Scope and techniques of automation, Robotic process automation - What can RPA do?, Benefits of RPA, Components of RPA, RPA platforms, The future of automation.

RPA BASICS:

History of Automation - What is RPA - RPA vs Automation - 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-II

RPA TOOL INTRODUCTION AND 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-III

ADVANCED AUTOMATION CONCEPTS & TECHNIQUES: Recording Introduction - Basic and Desktop Recording - Web Recording - Input/Output Methods - Screen Scraping - Data Scraping - Scraping advanced techniques - 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-IV

HANDLING USER EVENTS & ASSISTANT BOTS, EXCEPTION HANDLING: What are assistant bots? - Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger - Monitoring image and element triggers - An example of monitoring email - Example of monitoring a copying event and blocking it - Launching an assistant bot on a keyboard event.
EXCEPTION HANDLING: Debugging and Exception Handling - Debugging Tools - Strategies for solving issues - Catching errors.

UNIT-V

DEPLOYING AND MAINTAINING THE BOT: Publishing using publish utility - Creation of Server - Using Server to control the bots - Creating a provision Robot from the Server - Connecting a Robot to Server - Deploy the Robot to Server - Publishing and managing updates - Managing packages - Uploading packages - Deleting packages.

TEXT BOOKS:

1. Alok Mani Tripathi, “Learning Robotic Process Automation”, Packt Publishing, 2018.

REFERENCES:

1. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, “Introduction to Robotic Process Automation: a Primer”, Institute of Robotic Process Automation,1st Edition 2015.
2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant”, Independently Published, 1st Edition 2018.
3. Srikanth Merianda,”Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation”, Consulting Opportunity Holdings LLC, 1st Edition 2018.
4. Lim Mei Ying, “Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes”, Packt Publishing, 1st Edition 2018.

WEB REFERENCES:

1. https://www.uipath.com/rpa/robotic-process-automation

2. https://www.academy.uipath.com

Course Outcomes (COs)

- Explain the concepts, scope, and benefits of Robotic Process Automation (RPA) and its significance in automation.
- Analyze and assess different RPA platforms and their suitability for various industries and business processes.
- Develop proficiency in using RPA tools, including variables, control flow activities, data manipulation techniques, and advanced automation concepts.
- Apply RPA development methodologies and design principles to create effective process design documents and solution design documents.
- Implement advanced automation techniques, including handling user events, assistant bots, and exception handling, to enhance the functionality and robustness of RPA solutions.

IV Year - I Semester	L	T	P	C
	3	0	0	3
HS Elective : MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS				

Course Objectives:

- Understand the nature and scope of managerial economics and its importance in decision-making.
- Analyze and evaluate demand for goods and services, including demand determinants, the law of demand, and elasticity of demand.
- Gain knowledge of demand forecasting techniques and factors influencing demand forecasting.
- Learn the theory of production and cost analysis, including production functions, isoquants, isocosts, and cost concepts.
- Examine different market structures and pricing policies, including perfect competition, monopoly, and monopolistic competition.

UNIT I:

Introduction to Managerial Economics: Definition, Nature and Scope of Managerial Economics-Demand Analysis: Demand Determinants, Law of Demand and its exceptions.

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

UNIT II:

Theory of Production and Cost Analysis: Production Function - Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs. Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.

Cost Analysis: Cost concepts, Opportunity cost. Fixed vs. Variable costs, Explicit costs Vs. Implicit costs. Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)- Managerial Significance and limitations of BEA.

UNIT III

Introduction to Markets & Pricing Policies: Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Objectives and Policies of Pricing- Methods of Pricing: Cost Plus Pricing. Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market

Skimming Pricing, Penetration Pricing. Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization.

Business & New Economic Environment: Business & New Economic Environment: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership. Joint Stock Company. Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

UNIT IV

Capital and Capital Budgeting: Capital and Capital Budgeting: Capital and its significance. Types of Capital. Estimation of Fixed and Working capital requirements. Methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposals. Methods of Capital Budgeting: Payback Method. Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

UNIT V

Introduction to Financial Accounting: Introduction to Financial Accounting: Double-Entry Book Keeping, Journal. Ledger. Trial Balance- Final Accounts (Trading Account. Profit and Loss Account and Balance Sheet with simple adjustments).

Financial Analysis through ratios: Financial Analysis through ratios: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio). Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio). Capital structure Ratios (Debt-Equity ratio. Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio. Operating Profit Ratio. P/E Ratio and EPS).

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.

2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.

REFERENCE BOOKS:

1. Raghunatha Reddy & Narasimhachary: Managerial Economics& Financial Analysis, Scitech. 2009.
2. V.Rajasekarn & R.Lalitha. Financial Accounting, Pearson Education. New Delhi. 2010.

3. Suma Damodaran, Managerial Economics, Oxford University Press. 2009.

4. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition. Cengage, 2009.

Course Outcomes (COs)

- Explain the principles and concepts of managerial economics and its application in business decision-making.
- Analyze and evaluate demand for goods and services, considering demand determinants and the concept of elasticity.
- Apply different methods of demand forecasting to make informed business decisions.
- Analyze production functions and cost concepts to determine the optimal combination of inputs.
- Evaluate different market structures and their impact on price-output determination.

IV Year - I Semester	L	T	P	C
	3	0	0	3
HS Elective : MANAGEMENT SCIENCE				

Course Objectives:

- To impart knowledge of source and function of values.
- Demonstrate an understanding of the importance of values, ethics, and social responsibility for the self and for contemporary society.
- Reflect on how values shape personal and community ethics and decision-making. An ability to function effectively on multi-disciplinary teams (team work).
- Inculcate professional, ethical, legal, security and social issues and responsibilities.
- Gain personal and professional insight into organizational behaviour, diversity, personalities, goal setting, motivation, empowerment, and leadership style.

UNIT - I

CONCEPTS OF MANAGEMENT AND ORGANISATION: Functions of management, evolution of management thought, Taylor's scientific management, fayol's principles of management, Hertzberg's Maslow's hierarchy of human needs, theory x and y, Hawthorne experiment, morale, motivation, working environmental conditions, systems approach to management.
DESIGNING ORGANISATIONAL STRUCTURES: Basic concepts related to organisation - departmentation and decentralization, types of organization structures.

UNIT - II

PLANT LOCATION: Definition, factors affecting the plant location, comparison of rural and urban sites, methods for selection of plant- matrix approach. Plant layout - definition, objectives, types of plant layout, various data analyzing forms travel chart. WORK STUDY: Definition, objectives, method study - definition, objectives, steps involved- various types of associated charts, difference between micro motion and memo motion studies. Work measurement- definition, time study, steps involved, equipment, different methods of performance rating, allowances, standard time calculation. Work Sampling - definition, steps involved, standard time calculations, and differences with time study.

UNIT - III

INTRODUCTION TO PERT / CPM : Project management, network modelling-probabilistic model, various types of activity times estimation, programme evaluation review techniques, critical path, probability of completing the project, deterministic model, critical path method (CPM), critical path calculation, crashing of simple of networks.

INSPECTION AND QUALITY CONTROL: Types of inspections, statistical quality control, techniques, variables and attributes, assignable and non-assignable causes, variable control charts, and R charts, attributes control charts, p charts and c charts. Acceptance sampling plan, single sampling and double sampling plans, OC curves. Introduction to TQM - quality circles, ISO 9000 series procedures.

UNIT - IV

MATERIALS MANAGEMENT: Objectives, inventory functions, types, associated costs, inventory Classification techniques-ABC and VED analysis. Inventory control systems, continuous review system, periodical review system. Stores management and stores records. Purchase management, duties of purchase of manager, associated forms.

UNIT - V

INTRODUCTION TO HUMAN RESOURCE MANAGEMENT: Functions of HRM, job evaluation, different types of evaluation methods. Job description, merit rating, different methods of merit ratings, wage incentives, different types of wage incentive schemes. Marketing, selling, marketing mix, product life cycle.

TEXT BOOKS:

1. O. P. Khanna (2004), Industrial Engineering and Management, Dhanpat Rai, New Delhi.

REFERENCE BOOKS:

1. Stoner, Freeman (2005), Gilbert, Management, 6th edition, Pearson Education, New Delhi.

2. Panner Selvam (2004), Production and Operations Management, Prentice Hall of India, New Delhi.

3. Ralph M. Barnes (2004), Motion and Time Studies, John Wiley and Sons.

Course Outcomes (COs)

- Exercise critical thinking to propose, communicate, and implement, action plan that address opportunities and issues.
- Identify and utilize ethical and legal standards in psychology while taking into account all relevant stakeholders.
- Observe and recognize behaviours in organizational settings to aid in predicting outcomes.
- Appreciate the importance of time management, planning, and communication in completing a group project.
- Integrate knowledge of the key theories across the disciplines of public administration.
- Compare various perspectives across organizational environments and the role of manager in core management and public policy disciplines

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV Year - I Semester	L	T	P	C
	3	0	0	3
HS Elective : INTELLECTUAL PROPERTY RIGHTS AND PATENTS				

Course Objectives:

- Understand the nature and scope of managerial economics and its importance in decision-making.
- Analyze and evaluate demand for goods and services, including demand determinants, the law of demand, and elasticity of demand.
- Gain knowledge of demand forecasting techniques and factors influencing demand forecasting.
- Learn the theory of production and cost analysis, including production functions, isoquants, isocosts, and cost concepts.
- Examine different market structures and pricing policies, including perfect competition, monopoly, and monopolistic competition.

UNIT - I:

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT - II:

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for is appropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.

UNIT - III:

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international - trade mark law, copy right law, international patent law, and international development in trade secrets law.

UNIT-IV

Comparative overview of patents, copyrights, trade secrets, and trademarks

Legal fundamentals of patent protection for useful inventions, Design and plant patents, Legal fundamentals of copyright protection, Similarity and access, Expression vs. ideas and information, merger, Fair use of copyrighted works (e.g., for classroom use), Contributory copyright

infringement, Critical differences between patent and copyright protection, Copyright infringement distinguished from plagiarism, Legal fundamentals of trade-secret protection, Legal fundamentals of trademark protection

UNIT-V

Requirements and limitations of patentability, New and useful: (A) The legal requirement of novelty, (B) First to invent vs. first inventor to file

Statutory subject matter and judicial exceptions: (A) Patentability of algorithms, software, and business methods, statutory subject matter and judicial exceptions: (B) Patentability of medical treatments and human genes

The process of applying for a patent ("patent prosecution"), Anatomy of a patent application, Adequate disclosure, the art of drafting patent claims, Patent searching: (A) Purposes and techniques, Patent searching: (B) On-line tools available to MIT students.

TEXT BOOKS:

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, prabuddha ganguli, Tata Mc Graw Hill Publishing Company Ltd.

Course Outcomes (COs)

- Explain the principles and concepts of managerial economics and its application in business decision-making.
- Analyze and evaluate demand for goods and services, considering demand determinants and the concept of elasticity.
- Apply different methods of demand forecasting to make informed business decisions.
- Analyze production functions and cost concepts to determine the optimal combination of inputs.
- Evaluate different market structures and their impact on price-output determination.

Course Structure for B. Tech.CSE(AI&ML) With effect from 2023-24

IV Year - I Semester	L	T	P	C
	3	0	0	3
MACHINE LEARNING WITH GO				

Course Objectives:

- Provide a comprehensive understanding of machine learning and its applications in artificial intelligence.
- Familiarize students with various machine learning algorithms, including supervised, semi-supervised, unsupervised, and reinforcement learning.
- Explore advanced regression, support vector machines, tree models, and model selection techniques in machine learning.
- Introduce the concept of deep learning and neural networks, including feedforward networks, backpropagation, and activation functions.
- Discuss the applications of convolutional neural networks in industries.

UNIT-I

Machine Learning: Fundamentals of artificial intelligence, machine learning, various algorithms like supervised, semi-supervised, and unsupervised or reinforcement learning, Neural Networks and most importantly, machine learning implementations.

Advanced Regression, Support Vector, Tree Models, and Model Selection-Practical Considerations, Boosting, Unsupervised Learning-Clustering, Unsupervised Learning-Principal Component Analysis.

UNIT-II

Deep Learning: Introduction to Neural Networks: This module covers the basics of Neural Networks, activation functions and the Feed Forward network, back end propagation and gradient descent and various activation functions like Sigmoid, ReLu etc.

Convolutional Neural Network-Industry Applications, Neural Networks-Assignment, Recurrent Neural Networks, and Neural Networks Project

UNIT-III

Genetic Algorithms: Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-IV

Reinforcement Learning & Analytical Learning

Reinforcement Learning: Introduction, the learning task, Q–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

Analytical Learning: Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge. Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

UNIT-V

Combining Inductive and Analytical Learning: Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

TEXT BOOKS:

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCES:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

Course Outcomes (COs)

- Understand the fundamental concepts and principles of machine learning and its role in artificial intelligence.
- Identify and apply appropriate machine learning algorithms for different types of data and problem domains.
- Evaluate and select suitable regression, support vector, and tree models for predictive analytics.
- Implement and train neural networks using different activation functions and back propagation algorithms.
- Apply convolutional neural networks to real-world applications in various industries.