ACHARYA NAGARJUNA UNIVERSITY

4-Year B. Tech. Degree Course

(Semester System)

w.e.f. 2019-2020

COMPUTER SCIENCE & ENGINEERING (CSE)

&

COMPUTER SCIENCE & INFORMATION TECHNOLOGY (CI)

SYLLABUS

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ACHARYA NAGARJUNA UNIVERSITY

COLLEGE OF ENGINEERING AND TECHNOLOGY

ACHARYA NAGARJUNA UNIVERSITY

NAGARJUNA NAGAR, GUNTUR, ANDHRA PRADESH-522510

ACHARYA NAGARJUNA UNIVERSITY

NAGARJUNA NAGAR, GUNTUR, ANDHRA PRADESH-522510

Revised Regulations,

Scheme of Instructions,

Examination and Syllabi

For

COMPUTER SCIENCE & ENGINEERING(CSE)

&

COMPUTER SCIENCE & INFORMATION TECHNOLOGY (CI)

4-Year B. Tech. Degree Course

(Semester System)

w.e.f. 2019-2020

Acharya Nagarjuna University
Faculty of Engineering
Academic Regulations 2019 (R19) for B. Tech (Regular)

(Applicable for the students admitted during the
Academic Year 2019-2020 and onwards)

1. Eligibility for Admission:

Admission to the above program shall be made subject to the eligibility, qualification and specialization prescribed by the University for each program from time to time.

i. Admission shall be made either on the basis of merit/rank obtained by the qualifying candidates in EAMCET/ECET or otherwise specified, whichever is relevant.

The duration of B.Tech program is of four academic years divided into eight semesters comprising of two semesters in each academic year. A student is required to choose a branch of study at the time of admission. Students under lateral entry will be admitted straightaway into Third semester of B.Tech course in the respective branch. No change of branch shall be allowed after the admissions are closed.

2. Award of B.Tech. Degree:

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

i. Regular entry students shall pursue a course of study for not less than four academic years and in not more than eight academic years.

ii. Student's who fail to fulfill all the academic requirements for the award of the degree within eight academic years (for Regular Entry) / six academic years (for Lateral Entry) from the year of their admission, shall forfeit their seat in B.Tech course and their admission is cancelled.

Completing the course of study shall mean not only satisfying the attendance requirements but also passing of all the subjects within the respective stipulated period

3. Branches of study:

The following Branches of study are offered at present for B. Tech. degree

S.No.	Branch
1.	Civil Engineering
2.	Electrical and Electronics Engineering.
3.	Mechanical Engineering.
4.	Electronics and Communication Engineering
5.	Computer Science and Engineering.
6.	Chemical Engineering

and any other branch as approved by the authorities of the University from time to time.

Each Branch will have a curriculum with a syllabi that shall consist of the following:

i. General Core Courses 1. Basic Sciences
2. Engineering Sciences
3. Humanities and social sciences
ii. Program core courses in Engineering / Technology
iii. Elective courses of Engineering / Technology / Management Entrepreneurship / Business Communication and allied fields.
iv. Open Electives/CBCS
v. Mandatory learning courses
vi. Project work

4. Credits:

i. *Academic Year:* Two consecutive (one odd + one even) semesters constitute one academic year.

ii. *Choice Based Credit System (CBCS):* The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).

iii. *Credit:* A unit by which the course work is measured.

5. Distribution and Weightage of Marks (Internal & External):

i. 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. In addition internship & project work shall be evaluated for 100 and 200 marks respectively.

ii. For both theory and lab subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the External Evaluation.

iii. There shall be five units in each of the theory subjects.

iv. For theory subjects, there shall be <u>two</u> midterm examinations during the semester. Each midterm examination shall consist of assignment for 15 marks and sessional test for 20 marks with duration of 150 minutes respectively.

First midterm examination shall be conducted for 50% coverage of syllabus and second midterm examination shall be conducted for remaining 50% of syllabus. Both the midterm exams are compulsory. Final midterm examination marks for a total of 35 marks shall be arrived at, by considering the 80% weightage (28 marks) to that midterm examination in which the student scores more marks and the remaining 20% (7 marks) for other midterm exam.

*****Note 1: The assignment test paper shall contain 6 questions of equal weightage and student is asked to answer any 3 questions randomly and shall be condensed for 15 marks, any fraction rounded off to the next higher mark.

*****Note 2: The sessional examination shall contain 3 questions out of which first question is objective(6marks) and compulsory and remaining two questions(7 marks each) having internal choice and shall be considered for 20 marks, any fraction rounded off to the next higher mark.

***Note 3: Remaining** 5 marks allotted for attendance as indicated in CLAUSE(_6)

V. For theory subjects, there will be 5 questions with following pattern in the End-Examination.

a. All Questions have to be answered compulsorily.

b. All five questions, EITHER/OR type shall be followed with 12 marks for each.

c. In each question as mentioned in (c), one, two or more bits can be set.

vi. Further, whenever any theory subject with two parts is offered (combined subject), for ex: Electrical & Mechanical Technology, then there shall be only two parts Part A, Part B in the question paper.

First question objective can be equally divided into two parts.

Part – A: shall contain two questions, EITHER/OR type shall be followed with 12 marks for each.

Part – B: shall also contain two questions, EITHER/OR type shall be followed with 12 marks for each.

vii. Model Question paper for each theory course shall be prepared by the teacher within 15 days from the commencement of the semester and the same shall be forwarded to the Controller of Examinations through the Chairman, BOS concerned.

viii. For practical subjects there shall be a continuous evaluation during the semester for 40 internal marks and 60 end examination marks. Day-to-day work in the laboratory shall be evaluated for 25 marks by the concerned laboratory teacher based on the report of experiments/jobs (10 marks for the record submitted and 15 marks for day to day work). The end examination for 15 marks (10 marks for experiment and 5 marks for viva-voce) shall be conducted by the laboratory teacher and another examiner from the same department.

*Note: Day to day performance shall be recorded in student record (each experiment carries 15 marks, at least ten experiments should be done and average marks must be taken at the end of semester).

ix. For the subject having design and / or drawing, such as Engineering Drawing, Machine Drawing and Estimation, the distribution shall be 40 marks for internal evaluation and 60 marks for end examination. The Internal evaluation will be 20 marks for day-to-day work in the class that shall be evaluated by the concerned subject teacher based on the reports/submissions prepared in the class. Further, there shall be two midterm exams in a Semester for a duration of 2 hrs each, evenly distributed over the syllabi for 20 marks and the average marks of both the mid examinations shall be considered as internal test marks. The sum of day to day evaluation and the internal test marks will be the final internal marks for the subject.

x. Out of a total of 200 marks for the project work, 80 marks shall be for Internal Evaluation and 120 marks for the End Semester Examination (Viva-voce). The viva-voce shall be conducted by a committee consisting of Head of the Department, Project Supervisor and an External Examiner nominated by the Principal from the panel of 3 members proposed by Head of the Department. The project work shall start in IV year I semester and shall continue in the semester break. The evaluation of project work shall be conducted at the end of the IV year II semester. The Internal Evaluation shall be made on the basis of weekly progress (a minimum of 12 weeks and 3 marks for each week progress) and at least two seminars (one at the beginning of IV B.Tech II semester (20 marks) and the other before submission of project work(24 marks) given by each student on the topic of his project.

xi. The laboratory records and internal test papers shall be preserved for minimum of 2 years in the respective departments and shall be produced to the Committees of the college as and when the same are asked for.

6. Attendance Requirements:

i. A student shall be eligible to appear for end examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.

ii. **Shortage of Attendance below 65% in aggregate shall in <u>NO</u> case be condoned**.

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

iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.

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

vi. A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

vii. A weightage in sessional marks upto a maximum of 5 marks out of 40 marks in each theory subject shall be given for those students who put in a minimum of 75% attendance in the respective subject in a graded manner as indicated below.

Attendance of 90% and above	5 marks
Attendance of 85% and above and less than 90%	3 marks
Attendance of 80% and above and less than 85%	2 marks
Attendance of 75% and above and less than 80%	1 marks

7. Minimum Academic Requirements (For Regular Entry Students):

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.**6**

i. A student who could not secure a minimum of 50% aggregate from midterm examination marks is not eligible to appear for the semester end examination and shall have to repeat that semester.

ii. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, design, drawing subject or project if he secures not less than 40% of marks in the end examination and a minimum of 50% of marks in the sum total of the internal evaluation and end examination taken together. In the internship & project he/she should secure 40%. For practical examination if he secures not less than 50% of marks in the semester end examination.

iii. A student shall be promoted from I to II year only if he/she fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 irrespective of back log subjects in I/IV B.Tech.

iv. A student shall be promoted from II to III year only if he/she fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 and also must secure 70% of the credits of the subjects that have been studied up to I year II semester from

irrespective of whether the candidate takes the end examination or not as per the normal course of study. At the time of commencement of calss work, he must attain the re quired credits

v. A student shall be promoted from third year to fourth year only if he fulfills the academic requirements of of attendance and internal marks as stipulated in clause 6 and 7 and also must secure 70% of the credits of the subjects that have been studied upto II year II semester. At the time of commencement of class work, he must attain the required credits

And in case of getting detained for want of credits by sections ii and iii above, the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of Third or Fourth year I semester respectively.

8. Minimum Academic Requirements (For Lateral Entry Students):

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.**6**

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 40% of marks in the end examination and a minimum of 50% of marks in the sum total of the internal evaluation and end examination taken together. In the Seminar & Comprehensive viva-voce he/she should secure 40%.

ii. A student who could not secure a minimum of 50% aggregate from midterm examination marks is not eligible to appear for the semester end examination and shall have to repeat that semester.

iii. A student shall be promoted from II to III year only if he/she fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 irrespective of back log subjects in II/IV B.Tech

iv. A student shall be promoted from III to IV year only if he/she fulfils the academic requirement of of attendance and internal marks as stipulated in clause 6 and 7 and also must secure **70%** of the subjects that have been studied up to III year I semester from

9. Grading:

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

Table – Conversion into Grades and Grade Points assigned

Range in which the marks in the subject fall	Grade	Grade points assigned
≥ 90	O (Outstanding)	10
80-89	A+ (Excellent)	9
70-79	A (Very Good)	8
60-69	B+ (Good)	7
50-59	B (Above Average)	6
45-49	C (Average)	5
40-44	D (Pass)	4
< 40	F (Fail)	0
Absent	Ab (Absent)	0

i. A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered.

ii. For non credit courses 'Satisfactory' or "Unsatisfactory' shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

9.1. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$SGPA = \Sigma (Ci \times Gi) / \Sigma C_i$

Where, Ci is the number of credits of the i^{th} subject and Gi is the grade point scored by the student in the i^{th} course.

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

$CGPA = \Sigma (Ci \times Si) / \Sigma C_i$

Where 'Si' is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

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

iv. While computing the GPA/CGPA the subjects in which the student is awarded Zero grade points will also be included.

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

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

10. Gap - Year:

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. An evaluation committee shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for having the Gap Year.

11. Transitory Regulations:(old regulations changed)

1. Candidates who admitted into the four year B.Tech degree course under R-15 regulations but who got detained in any year for want of attendance/minimum aggregate sessional marks may join the appropriate year /semester in the semester system applicable for that batch and be governed by the regulations of that batch from then onwards unless otherwise specified.
2. A student admitted under credit based regulations(CR) detained due to lack of sessional marks/attendance at the end of the first semester of II/IV B.Tech shall join II/IV first semester fo R-15 batch . Such students will study all the courses prescribed for that R-15 in which the student joins. However the student has to clear all the first year backlog subjects by appearing the supplementary examination. Such candidates will be governed by the regulations applicable to lateral entry candidates of R-15 batch for the award of the degree.

3. A student admitted under CR, detained due to lack of sessional marks/attendance at the end of the second semester of II/IV B.Tech /at the end of subsequent semesters shall follow the credit based regulations only (CR).

12. With–holding of results:

If the candidate has any dues not paid to the college or if any case of indiscipline or malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

13. Award of Class:

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

Class Awarded	**CGPA Secured**
First Class with Distinction	≥ 8.0
First Class	≥ 6.5 < 8.0
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 4.0 < 5.5

14. Minimum Instruction Days:

The minimum instruction period for a semester is 16 weeks. The minimum instruction days including exams for each semester shall be for 90 days.

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

16. General:

i. The academic regulations should be read as a whole for purpose of any interpretation.
ii. Malpractice rules - nature and punishments is appended
iii. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the BOS is final.
v. The University may from time to time, revise, amend or change the Regulations, Schemes of Examinations, and/or Syllabi.

17. Conduct and discipline

a) Students shall conduct themselves within and outside the premises of the institute in a manner befitting the students of our institution.
b) As per the order of Honourable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.
c) The following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.

i. Lack of courtesy and decorum, indecent behavior anywhere within or outside the campus.
ii. Willful damage of college / individual property
iii. Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.
iv. Mutilation or unauthorized possession of library books.
v. Noisy and unseemly behavior, disturbing studies of fellow students.
vi. Hacking of computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber-crime etc.)
vii. Usage of camera / cell phone in the campus (viii) Plagiarism of any nature
viii. Any other acts of gross indiscipline as decided by the academic council from time to time.

d) Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute / hostel, debar from examination, disallowing the use of certain facilities of the institute, rustication for a specified period or even outright expulsion from the institute or even handing over the case to appropriate law enforcement or the judiciary, as required by the circumstances.

e) For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief warden, the head of the department and the principal respectively, shall have the authority to reprimand or impose fine.

f) Cases of adoption of unfair means and / or any malpractice in an examination shall be reported to the principal for taking appropriate action.

g) All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the academic council.

h) The institute level standing disciplinary action committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.

i) The principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the programmes committee in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved by the appropriate authority, shall be reported to the academic council for ratification.

j) "Grievance and Redressal Committee" (General) constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters

18. Punishments for Malpractice Cases - Guidelines

The examinations committee may take the following guidelines into consideration while dealing with the suspected cases of malpractice reported by the invigilators/squad members etc; during end examinations. The punishment may be more severe or less severe depending on the merits of the individual cases.

S. No	Nature of Malpractices/Improper conduct	Punishment
1.	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 student 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.
2.	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.
3.	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.

4.	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any other student 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 students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
5.	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 student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year.
6.	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 including practical examinations and project work of that semester/year.
7.	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects of that semester/year. The students 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.

9.	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 including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
10.	Posseses 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 including practical examinations and project work of that semester/year. The student is also debarred and forfeits the seat.
11.	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 7 to 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work 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.
12.	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college fur one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed over to the police and a case is registered against him. The performance of the original student who has been impersonated, shall be cancelled in all the subjects of the examination including practicals and project work of that semsester/year. The student is rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat

13	If any malpractice is detected which is not covered in the above clauses 1 to 12 it shall be reported to the college academic council for further action to award suitable punishment.
14	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable punishment.

Category code	Category Name
BS	Basic Science course
ES	Engineering Science Courses
HS	Humanities and social science
MC	Mandatory course
LC	
PC	Professional Core Course
SKILL	Skill oriented course
OE/JOE	Open Elective Course/Job oriented elective

ACHARYA NAGARJUNA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2019-2022
COMPUTER SCIENCE & ENGINEERING (CSE)
COMPUTER SCIENCE & INFORMATION TECHNOLOGY(CI)
I/IV B.TECH - SEMESTER I

I/IV B.TECH - SEMESTER I

		I/IV B.Tech CSE-Semester – 1(Theory - 5, Lab -4)		
S.No	**Course No**	**Course Name**	**Category**	**L-T-P-C**
1	CSE 111	Mathematics I (Calculus & Linear Algebra)	BS	3-0-0-3
2	CSE 112	Engineering Chemistry	BS	3-0-0-3
3	CSE 113	Problem Solving & Programming(using C)	ES	3-1-0-4
4	CSE 114	Communicative English I	HS	2-0-0-2
5	CSE 115	Constitution of India	MC	3-0-0-0
6	CSE 151	Chemistry lab	BS	0-0-3-1.5
7	CSE 152	Problem solving & Programming using C	ES	0-0-3-1.5
8	CSE153	English lab	HS	0-0-3-1.5
9	CSE 154	Workshop I (Basic Engineering Workshop)	LC	0-0-3-1.5
			Total ==>	**18**

I/IV B.TECH - SEMESTER II

		I/IV B.Tech CSE-Semester – 1(Theory - 5, Lab -4)		
S.No	**Course No**	**Course Name**	**Category**	**L-T-P-C**
1	CSE 121	Mathematics II (Probability & Statistics)	BS	3-0-0-3
2	CSE 122	Engineering Physics	BS	3-0-0-3
3	CSE 123	Engineering Graphics & Design	ES	1-0-3-2.5
4	CSE 124	Essential Electrical & Electronic Engineering	ES	3-1-0-4
5	CSE 125	Python Programming	ES	2-1-0-3
6	CSE 126	Environmental Science	MC	3-0-0-0
7	CSE 161	Physics Lab	BS	0-0-3-1.5
8	CSE 162	Electrical & Electronics Lab	ES	0-0-3-1.5
9	CSE 163	Python Lab	ES	0-0-3-1.5
10	CSE 164	Workshop (Computer Science and Engineering)	LC	0-0-3-1.5
			Total ==>	**21.5**

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SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2019-2022
COMPUTER SCIENCE & ENGINEERING (CSE)
COMPUTER SCIENCE & INFORMATION TECHNOLOGY(CI)
II/IV B.TECH - SEMESTER I

II/IV B.TECH - SEMESTER I

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE / CI 211	Analog & Digital Electronics	PC	3	0	0	40	60	3
2	CSE / CI 212	Data structures & Algorithms	PC	3	0	0	40	60	3
3	CSE / CI 213	Operating Systems	PC	3	0	0	40	60	3
4	CSE / CI 214	Mathematics-III (Differential Calculus)	BS	3	0	0	40	60	3
5	CSE / CI 215	UNIX programming	PC	3	0	0	40	60	3
6	CSE / CI 216	Essence of Indian Traditional Knowledge	MC	2	0	0	100	0	0
6	CSE / CI 251	Data structures & Algorithms Lab	PC	0	0	3	40	60	1.5
7	CSE / CI 252	Analog & Digital Electronics Lab	PC	0	0	3	40	60	1.5
8	CSE / CI 253	UNIX Lab	PC	0	0	3	40	60	1.5
9	CSE / CI 254	MATLAB	Skill	0	0	3	40	60	2
Total Credits									21.5

II/IV B.TECH - SEMESTER II

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE / CI 221	Discrete Mathematics	PC	3	0	0	40	60	3
2	CSE / CI 222	Computer Organization & Architecture	PC	3	0	0	40	60	3
3	CSE / CI 223	Database Management Systems	PC	3	0	0	40	60	3
4	CSE / CI 224	Advanced Data Structures	PC	3	0	0	40	60	3
5	CSE / CI 225	Signals & Systems	ES	3	0	0	40	60	3
6	CSE / CI 261	DBMS Lab	PC	0	0	3	40	60	1.5
7	CSE / CI 262	ADS Lab	PC	0	0	3	40	60	1.5
8	CSE / CI 263	Communicative English lab II	PC	0	0	3	40	60	1.5
9	CSE / CI 264	Web designing	SKILL	0	0	3	40	60	2
Total Credits									21.5`

ACHARYA NAGARJUNA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2019-2022 (R19)
COMPUTER SCIENCE & ENGINEERING (CSE)
COMPUTER SCIENCE & INFORMATION TECHNOLOGY(CI)

III/IV B.TECH - SEMESTER I (R19 Regulation - Structure & Syllabus)

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE / CI 311	Automata Theory & Compiler Design	PC	3	0	0	40	60	3
2	CSE / CI 312	Java Programming	PC	3	0	0	40	60	3
3	CSE / CI 313	Design & Analysis of Algorithms	PC	3	0	0	40	60	3
4	CSE / CI 314	Job Elective – 1	JE-1	3	0	0	40	60	3
5	CSE / CI 315	Professional Elective-1	PE-1	3	0	0	40	60	3
6	CSE / CI 351	Java Lab	PC	0	0	3	40	60	1.5
7	CSE / CI 352	Design & Analysis of Algorithms	PC	0	0	3	40	60	1.5
8	CSE / CI 353	Job Elective -1 Lab	JE-1 Lab	0	0	3	40	60	1.5
9	CSE / CI 354	Mobile Application development	Skill	0	0	3	40	60	2
Total Credits									21.5

JE-1 (Lab Oriented)

A. VLSI
B. Digital Signal Processing
C. Internet of Things (IoT)
D. Digital Image Processing

PE-1:

A. Computer Graphics
B. Design Methodologies
C. Software Engineering
D. Distributed Systems

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COMPUTER SCIENCE & ENGINEERING (CSE)
COMPUTER SCIENCE & INFORMATION TECHNOLOGY(CI)

III/IV B.TECH - SEMESTER II (R19 (R19 Regulation - Structure & Syllabus))

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE / CI 321	Cryptography & Network Security	PC	3	0	0	40	60	3
2	CSE / CI 322	Artificial Intelligence & Machine Learning	PC	3	0	0	40	60	3
3	CSE / CI 323	Computer Networks	PC	3	0	0	40	60	3
4	CSE / CI 324	Job Elective – 2	JE-2	3	0	0	40	60	3
5	CSE / CI 325	Professional Elective-2	PE-2	3	0	0	40	60	3
6	CSE / CI 361	AI&ML Lab	PC	0	0	3	40	60	1.5
7	CSE / CI 362	Computer Networks Lab	PC	0	0	3	40	60	1.5
8	CSE / CI 363	JE2 Lab	JE 2 Lab	0	0	3	40	60	1.5
9	CSE / CI 364	.NET programming	SKILL	0	0	3	40	60	2
Total Credits									21.5`

JE-2 (Lab Oriented)

A. Soft Computing
B. Data Engineering
C. Big Data & Hadoop
D. Software Testing Methodologies

PE-2

A. Wireless Networks
B. Decision Support Systems
C. Cloud Computing Architecture and Its Applications
D. Advanced Computer Architecture

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COMPUTER SCIENCE & ENGINEERING (CSE)
COMPUTER SCIENCE & INFORMATION TECHNOLOGY(CI)

IV/IV B.TECH - SEMESTER I (R19 Regulation - Structure & Syllabus)

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE / CI 411	Deep Learning	PC	3	0	0	40	60	3
2	CSE / CI 412	Design & Analysis of Parallel Algorithms	PC	3	0	0	40	60	3
3	CSE / CI 413	Software Project Management	PC	3	0	0	40	60	3
4	CSE / CI 414	Professional Elective Course-III	PEC	3	0	0	40	60	3
5	CSE / CI 415	Open Elective/ Job Oriented Course-III	OEC	3	0	0	40	60	3
6	CSE / CI 416	Cyber Laws and Ethics	BS	3	0	0	40	60	3
7	CSE / CI 451	Advanced Python Programming	Skill Oriented Course	0	0	3	40	60	2
8	CSE / CI 452	Industrial / Research Internship(2 months) after 3rd year	MC	0	0	3	100	0	2.5
Total Credits									22.5

PROFESSIONAL ELECTIVE COURSE-III

CSE / CI 414/1. Data Analytics through R Programming
CSE / CI 414/2. Big Data & Hadoop
CSE / CI 414/3. Block Chain Technology
CSE / CI 414/4. Introduction to Data Science

OPEN ELECTIVE (OEC)/JOB ORIENTED COURSES III(JOEC)

CSE / CI 415/1. Computer Vision
CSE / CI 415/2. Natural Language Processing
CSE / CI 415/3. Speech & Audio Processing
CSE / CI 415/4. Introduction to Pattern Recognition

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COMPUTER SCIENCE & ENGINEERING (CSE)
COMPUTER SCIENCE & INFORMATION TECHNOLOGY(CI)

IV/IV B.TECH - SEMESTER II (R19 Regulation - Structure & Syllabus)

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE / CI 461	Project work	Project	0	0	0	50	100	8
2	CSE / CI 462	Seminar	Seminar	0	0	0	50	0	2
3	CSE / CI 463	MOOCs	MOOC	0	0	0	100	0	2
Total Credits									12

CSE-111
MATHEMATICS-I

(Calculus & Algebra)
(Common to all branches of Engineering)

L	T	P	C
3	0	0	3

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Bridge Course: Limits, continuity, Types of matrices

Unit I: Matrix Operations and Solving Systems of Linear Equations 10 hrs

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

Learning Outcomes:

At the end of this unit, the student will be able to

- solving systems of linear equations, using technology to facilitate row reduction determine the rank, eigenvalues and eigenvectors, diagonal form and different factorizations of a matrix; (L3)
- identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics; (L3)

Unit II: Mean Value Theorems 6 hrs

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);

Learning Outcomes:

At the end of this unit, the student will be able to

- Translate the given function as series of Taylor's and Maclaurin's with remainders (L3)
- analyze the behaviour of functions by using mean value theorems (L3)

Unit III: Multivariable calculus 8 hrs

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies. (L3)
- Acquire the Knowledge maxima and minima of functions of several variable (L1)
- Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (L3)

Unit IV: Double Integrals **8hrs**

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves.

Learning Outcomes:

At the end of this unit, the student will be able to

- Evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates (L5)
- Apply double integration techniques in evaluating areas bounded by region (L4)

Unit V: Multiple Integrals and Special Functions **8 hrs**

Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates, Beta and Gamma functions and their properties, relation between beta and gamma functions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Conclude the use of special function in multiple integrals (L4)
- evaluate multiple integrals in Cartesian, cylindrical and spherical geometries (L5)

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

References:

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

Course Outcomes:

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

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- Utilize mean value theorems to real life problems (L3)

- familiarize with functions of several variables which is useful in optimization (L3)
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems (L5)
- Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

CSE-112
ENGINEERING CHEMISTRY

Common to all branches **L T P C**

3 0 3 4.5

Course Objectives:

- To familiarize engineering chemistry and its applications
- To impart the concept of soft and hard waters, softening methods of hard water
- To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement.
- **compare** the materials of construction for battery and electrochemical sensors (L2)
- **explain** the preparation, properties, and applications of thermoplastics & thermosettings, elastomers & conducting polymers. (L2)
- **explain** the principles of spectrometry, GC and HPLC in separation of gaseous and liquid mixtures (L2)

UNIT-I: WATER TECHNOLOGY

Various impurities of Water, WHO guidelines, Hardness unit sand determination by EDTA method, water treatment for drinking purpose-sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

Water treatment for industrial purpose: Boiler troubles, scales, sludges, caustic embrittlement, boiler Corrosion, priming and foaming- causes and prevention, Internal conditioning -Phosphate, Calgon and Carbonate treatment, External conditioning-Lime Soda process (simple problems), softening by ion-Exchange process, Desalination of Brackish water by Electro dialysis and Reverse osmosis.

Learning outcomes:

The student will be able to

- **list** the differences between temporary and permanent hardness of water (L1)
- **explain** the principles of reverse osmosis and electrodialysis. (L2)
- **compare** quality of drinking water with BIS and WHO standards. (L2)
- **illustrate** problems associated with hard water - scale and sludge**.** (L2)
- **explain** the working principles of different Industrial water treatment processes (L2)

UNIT-II: POLYMER CHEMISTRY

Introduction to polymers, Functionality of monomers, chain growth and step growth polymerization, Co-polymerization (Stereo specific polymerization) with specific examples and mechanisms of polymer formation.

PLASTICS: Thermoplastics and Thermosetting, preparation, properties and applications of Bakelite, Elastomers, Preparation, properties and applications of BUNA-S and BUNA-N Rubbers.

Conducting Polymers- Introduction, examples, general applications and mechanism of Conduction on Polyacetylene.

Chemistry of Nano materials: Introduction to nano chemistry, preparation of nano materials - carbon nanotubes and fullerenes and their engineering applications.

Learning Outcomes:

At the end of this unit, the students will be able to

- **explain** different types of polymers and their applications (L2)
- **demonstrate** the mechanism of conduction in conducting polymers (L2)
- **explain** the preparation, properties and applications of Bakelite, Nylon-66, and carbon fibres (L2)
- **describe** the mechanism of conduction in conducting polymers (L2)
- **discuss** Buna-S and Buna-N elastomers and their applications (L2)
- **discuss** types and preparation of Nano materials and Fullerenes(L3)

UNIT-III: ELECTRO CHEMISTRY AND APPLICATIONS

Electrodes-concepts, types of cells, electro chemical series, Nernst equation.

BATTERIES: Primary cell (Dry cell), Secondary cell (Lead-acid), Lithium batteries and their advantages, Fuel cell (H_2-O_2 cell).

Corrosion:

Types of corrosions- chemical corrosion, dry corrosion, electro chemical corrosion and wet corrosion, galvanic series, pitting and differential aeration of corrosion, factors affecting corrosion.

Corrosion control: Cathodic protection, Corrosion Inhibitors, Electro plating (Au) & (Ni).

Learning Outcomes:

At the end of this unit, the students will be able to

- **apply** Nernst equation for calculating electrode and cell potentials (L3)
- **differentiate** between pH metry, potentiometric and conductometric titrations (L2)
- **explain** the theory of construction of battery and fuel cells (L2)
- **explain** the types of corrosion, factors affecting corrosion(L2)
- **explain** protection methods of corrosion and corrosion inhibitors(L2)

UNIT-IV: INSTRUMENTAL METHODS

Electromagnetic spectrum-Absorption of Radiation: Beer-Lambert's law-Principle and applications of Ultra-Violet, Infra-Red and Nuclear Magnetic Resonance Spectroscopy. Principle and applications of Gas Chromatography and HPLC Techniques.

Learning outcomes:

After completion of Module IV, students will be able to

- **explain** the different types of spectral series in electromagnetic spectrum (L2)
- **understand** the principles of different analytical instruments (L2)
- **explain** the different applications of analytical instruments (L2)
- **explain** the principles of spectrometry, GC and HPLC in separation of gaseous and liquid mixtures (L2)

UNIT-V: (i) Cement and Concrete Chemistry

Introduction to Building Materials, Portland Cement, Constituents, Manufacturing Process, Setting and Hardening Cement.

(ii) Organic reactions and synthesis of a drug molecule:

Introduction to reactions involving substitution (SN_1 and SN_2), elimination reactions (E_1 and E_2), Synthesis of commonly used drug molecule – Aspirin and Paracetmol.

Learning Outcomes:

At the end of this unit, the students will be able to

- **explain** the manufacturing of portland cement (L2)
- **demonstrate** the scheme of concrete formation (L2)
- **identify** the constituents of portland cement (L2)
- **enumerate** the reactions at different temperatures in the manufacture of cement (L2)
- **explain** substitution and elimination reactions(L2)
- **explain** the synthesis of aspirin and paracetmol drug molecules(L2)

Prescribed Text Books

1. Engineering Chemistry, P.C. Jain and M. Jain - Dhanapathi Rai & Sons, Delhi
2. A text book of Engineering Chemistry, S.S. Dara - S. Chand & Co. New Delhi
3. Engineering Chemistry, B.K. Sharma - Krishna Prakashan, Meerut
4. Shashi chawla,A text book of engineering chemistry,3rd Edition,Dhanpat rai & co new delhi,2007.
5. Gurudeep raj & chatwal anand , "Instrumental methods of analysis ", 7th edition,CBS publications,1986.
6. Quantitative analysis by day&underwood.
7. A Text book of Instrumental methods by Skoog and West.
8. H.W. Wilard and demerit, "Instrumental methods of analysis ", 7th edition,CBS publications,1986.
9. Text book of Nano Science and Nano technology, B.S. Murthy and P. Shankar, University press.

Course Outcomes:

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

- **demonstrate** the corrosion prevention methods and factors affecting corrosion (L2)
- **explain** the preparation, properties, and applications of thermoplastics & thermosettings, elastomers & conducting polymers. (L2)
- **explain** calorific values, octane number, refining of petroleum and cracking of oils (L2)
- **explain** the manufacturing of portland cement **and** concrete formation (L2)
- **explain** the principles of spectrometry, GC and HPLC in separation of gaseous and liquid mixtures (L2)

CS 113

Problem Solving and Programming(Using C)

L-T-P-C :

3-1-3-5.5

Course Objectives:

1. To teach problem solving through Flow charting tool – Raptor
2. To solve numerical problems using Raptor
3. To analyze problems by modular approach using Raptor
4. To understand the basic concepts and tokens of C
5. To learn the concepts of control structures, functions, arrays and pointers of C
6. To understand the concepts of structures , unions and files in C

Unit – 1: Flowchart design through Raptor

Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems(section 1) – Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers

Example problems(section 2) - Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, Linear search, Binary Search.

Learning Outcomes: Student should be able to

1. Select flowchart symbols for solving problems.
2. Develop basic flowcharts for performing Input, Output and Computations
3. Solve numerical problems using Raptor
4. Analyse problems by modular approach using Raptor

Unit 2: C Basics

C-Basics: C-character set, Data types, Constants, Expressions, Structure of C program, Operators and their precedence & associatively, Simple programs in C using all the operators, Type casting ,type coercion.

Learning outcomes: Student should be able to

1. Exercise concepts of control structures in C
2. Develope user defined and predefined functions in C

Unit 3: Control Structures and Functions

Control Structures, Basic input and output statements, Preprocessor directives.

Functions: Concept of a function, passing the parameters, automatic variables, scope and extent of variables, storage classes, recursion, iteration vs recursion, types of recursion, Simple recursive and non recursive programs, Towers of Hanoi problem.

Learning Outcomes: Student should be able to

1. Illustrate the flowchart and design an algorithm for a given problem and to develop IC programs using operators
2. Develop conditional and iterative statements to write C programs

3. Exercise user defined functions to solve real time problems

Unit 4: Arrays and Pointers

Arrays: Single and multidimensional Arrays, Character array as a string, string functions, Programs using arrays and string manipulation.

Pointers: Pointers declarations, Pointer expressions, Pointer parameters to functions. Pointers, Pointers and array, Pointer arithmetic.

Learning Outcomes: Student should be able to

1. Inscribe C programs that use the concepts of structures , unions in C
2. Develop programs on files and command line arguments in C
3. Inscribe C programs that use Pointers to access arrays, strings and functions.
4. Inscribe C programs using pointers and to allocate memory using dynamic memory management functions.

Unit 5: Structures and Files

Structures: Declaring and using structures, operations on structures, structures and arrays, user defined data types, pointers to structures.Command line arguments.

Files: Introduction, file structure, file handling functions, file types, file error handling, Programs using file functions.

Learning Outcomes: Student should be able to

4. Exercise user defined data types including structures and unions to solve problems
5. Exercise files concept to show input and output of files in C

Text Books:

1. https://raptor.martincarlisle.com/
2. Programming with C-Gottfried-Schaums Outline Series-TMH
3. C Programming – AnithaGoel/Ajay Mittal/E.Sreenivasa Reddy-Pearson India

Referrences:

1. Problem Solving with C- Somasekharan-PHI.
2. C Programming- Behrouz A forouzan – CENGAGE Learning
3. Test your c skills-Yaswanthkanithker
4. Let us C- Yaswanthkanithker

CSE-114
Communicative English-I

B.T./CE/Ch.E./CSE/ECE/EEE/EI/IT/ME

L-T-P-C

2-1-3-3.5

Course Objectives:

The course aims to inculcate a sense of professionalism among the students while emphasizing on the basic aspects of the language learning such as grammar and vocabulary building. It also aspires to train the students to meet the global challenges.

- Adopt activity based teaching-learning methods to ensure that learners would be engaged in use of language in the classroom sessions.
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- 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

Syllabus:

UNIT-1: 6 Hrs.

1. Reading: Reading Comprehension (Skimming, Scanning & Inference)
2. Writing: Paragraph Writing
3. Grammar: Common Errors in Nouns- Pronoun Agreement
4. Vocabulary Building: Content and Functional word list -100

Learning Outcomes:

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

- identify the context, topic, and pieces of specific information (L3)
- ask & answer general questions on familiar topics (L2)
- employ suitable strategies for skimming & scanning to get the general idea of a text and specific information (L3)
- recognize paragraph structure with beginnings/endings (L3)
- form sentences using proper grammatical structures and correct word forms (L3)

UNIT- II: 6 Hrs.

1. Reading: Jumbled Sentences
2. Writing: Proposal Writing
3. Grammar: Correction of Errors in Subject- Verb Agreement
4. Vocabulary Building: Sign Post, Transition signals

Learning Outcomes:

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

- comprehend short paragraphs on general topics (L2)
- understand the use of cohesive devices for better reading comprehension (L2)
- write well-structured paragraphs on specific topics (L3)
- make necessary grammatical corrections in short texts (L3)

UNIT - III: 6 Hrs.

1. Reading: Article Review
2. Writing: Note Making, Note Taking
3. Grammar: Correction of errors in Tense Usage
4. Vocabulary Building: Synonyms and Antonyms

Learning Outcomes:

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

- Review the content with clarity & precision from an article (L3)
- infer meanings of unfamiliar words using contextual clues (L3)
- write summaries based on global comprehension of reading texts (L3)
- produce a well-organized essay with adequate details (L3)
- use correct tense forms, appropriate structures in speaking and writing (L3)

UNIT - IV: 6 Hrs.

1. Reading: Story Reflection
2. Writing: Pictorial Description
3. Grammar: Correction of Errors in Adjectives, Articles, Prepositions
4. Vocabulary Building: Root Words (200)

Learning Outcomes:

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

- Reflect the content of the story with clarity & creatively (L3)
- infer meanings of unfamiliar words using contextual clues in the story (L3)
- infer & predict about content of a discourse (L4)
- interpret graphic elements used in academic texts (L2)
- make formal written communication using effective strategies (L3)

UNIT - V: 6 Hrs.

1. Reading: Mind Mapping
2. Writing: Information Transfer
3. Grammar: Correction of Errors in Wh- questions, Question Tags
4. Vocabulary Building: One Word Substitutes

Learning Outcomes:

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

- take notes in mind while reading a text to answer questions (L3)
- edit short texts by correcting common errors (L4)
- produce a coherent paragraph interpreting a figure/graph/chart/table (L4)
- use language appropriate for description and interpretation of graphical elements (L4)

Course Outcomes:

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

- identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English (L3)
- formulate sentences using proper grammatical structures and correct word forms (L3)
- speak clearly on a specific topic using suitable discourse markers in informal discussions (L3)
- write summaries based on global comprehension of reading texts (L3)
- produce a coherent paragraph interpreting a figure/graph/chart/table (L4)
- take notes while listening to a talk/lecture to answer questions (L3)

REFERENCE BOOKS:

1. Bailey, Stephen. *Academic writing: A handbook for International Students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
3. *Skillful Level 2 Reading & Writing Student's Book Pack (B10),* Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2).* CUP, 2012.
5. Michael Swan. *Practical English Usage,* OUP. 1995.
6. F.T. Wood. *Remedial English Grammar,* Macmillan.2007

7. William Zinsser. *On Writing Well.* Harper Resource Book. 2001
8. Liz Hamp-Lyons and Ben Heasly. *Study Writing,* Cambridge University Press. 2006.
9. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad.
10. Sharon J.Gerson, Steven M.Gerson, *Technical Writing*, New Delhi: Pearson education, 2007.
11. Sanjay Kumar and Pushp Lata, *Communication Skills*, Noida: Oxford University Press, 2012.
12. Dr. Shalini Verma, *Word Power Made Handy*, S.Chand & Co Ltd., 2009.

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CSE-115
Constitution of India

L-T-P-C
3-0-0-0

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of india and election commission of india.
- To understand the central and state relation financial and administrative.

UNIT-I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

LEARNING OUTCOMES:

After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secrateriate

UNIT-IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zilla panchayat block level organisation

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

LEARNING OUTCOMES:- After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-RESOURCES:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Course Outcomes: At the end of the semester/course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission

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CSE-151

ENGINEERING CHEMISTRY LABORATORY

Course Objectives:

- Verify the fundamental concepts with experiments

LIST OF EXPERIMENTS:

1. **Determination of hardness of water by EDTA method**
2. **Estimation of Mohr's salt by Permanganometry**
3. **Estimation of Mohr's salt by Dicrometry**
4. **Determination of alkalinity of water**
5. **Percentage of purity of washing soda**
6. **Determination of available chlorine in bleaching powder**
7. **Preparation of Urea-formaldehyde resin**
8. **Determination on strength of NaoH using HCl conductometrically**
9. **Acid-Base titration by P^H meter**
10. **Acid-Base titration by Potentiometer**
11. **Determination of viscosity of lubricating oil**
12. **Determination of Surface tension**

Course Outcomes:

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

- **measure** the strength of an acid present in secondary batteries (L3)
- **determine** the cell constant and conductance of solutions (L3)
- **prepare** advanced polymer materials (L2)
- **determine** the physical properties like surface tension, adsorption and viscosity (L3)
- **estimate** the Iron and Calcium in cement (L3)
- **calculate** the hardness of water (L4)

Problem Solving & Programming Using C Lab (CSE152)

Cycle 1:

1. Construct flowcharts to
a. calculate the maximum, minimum and average of N numbers
b. develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
2. Construct flowcharts with separate procedures to
a. calculate simple and compound interest for various parameters specified by the user
b. calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user
3. Construct flowcharts with procedures to
a. generate first N numbers in the Fibonacci series
b. generate N Prime numbers
4. Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)
5. Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)
6. Design a flowchart to determine the number of characters and lines in a text file specified by the user

Cycle 2:

1.Exercises on data types and operators?

a) Practice exercises 3.1 to 3.16 and 4.1 to 4.17 and 14.1 to 14.20 Test your C Skills - yaswanthkanitkar text book.

b) Write a program which determines the largest and the smallest number that can be stored in different data types of like short, int., long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?

c) Write a program to find greatest of three numbers using conditional operator?

d) Write a program to swap two numbers with and without temp variable?

e) Practice a program using multiple unary increment and decrement operators in arithmetic expressions?

2. Exercises on control structures?

a) Practice exercise 2.1 to 2.15 Test your C Skills - yaswanthkanitkar text book.

b)Write a program to find greatest of three numbers? Use nested if, if else if and switch statements?

c) Write a program to read marks of a student and print the sum and average?

d) Display the grade based on the sum of marks?

e) write a program to count the digits of a number? Use for loop

f) Write a program to check whether a number is perfect or not? Use do-while

g) Write a program to check whether a number is strong or not? Use while

h) Write a program to check whether a number is amstrong or not? Use for

i) Write a program to check whether a number is palindrome or not? Use for

j) Write a program to find the Fibonacci series upto the given number? Use while

k) Write a program to print the pascals triangle? Used do-while

l) Write a program to print the result of the series 1+x^2/2+x^3/3+….+x^n/n

3. Exercises on functions?

a) Practice exercise 5.1 to 5.14 Test your C skills -yaswanthkanitkar text book.

b) Write program to swap two variables using functions? Write a program to perform menu driven arithmetic operations using functions?

c) Write a program to find the factorial of a number using recursive and non- recursive functions?

d) Write a program to find the Fibonacci series using recursive functions?

e) Write a program to find the solution for towers of Hanoi using recursive function?

f) Write a program to pass parameters to a functions using call by value and call by reference?

4. Exercises on Arrays?

a) Practice exercise 9.1 to 9.17 Test your C skills - yaswanthkanitkar text book.

b) Write a program to read n numbers and sort them?

c) Write a program to find the minimum and maximum numbers of the array?

d) Write a program to read two matrices and find their sum, difference and product of them?

e)Find the transpose of a matrix?

f) Write a program to print upper and lower triangle of a given matrix?

5. Exercises on strings?

a) Practice exercise 10.1 to 10.15 yaswanthkanitkar text book.

b) Write a program to demonstrate the use of string manipulation functions?

c) Write a program to compare two strings?

d) Write a program to sort the names in Alphabetical order?

6. Exercises on pointers?

a) Practice exercise 7.1 to 8.26 yaswanthkanitkar text book.

b) Write a program to read dynamic array and sort the elements?

c) Write a program to read dynamic array and find the minimum and maximum of the elements?

d) Write a program to perform pointer arithmetic?

e) Write a program on pointers for strings?

f) Write a program to use array of pointers?

7. Exercises on structures?

a) Practice exercise 11.1 to 11.30 yaswanthkanitkar text book.

b) Write a program to create student structure and read marks of three subjects and find the sum and total of the student?

c) Write a program on arrays of structures for 60 students record using the above student structure?

d) Write a program for complex structure? Perform addition, subtraction and multiplication of two complex numbers?

e) Write a program for addition and multiplication of two polinomials?

8.Write a program on Files?

a) Practice exercise 12.1 to 12.20 yaswanthkanitkar text book.

b)write a program to append content of a file?

c)Write a program to display the content of a file?

d)Write a program to copy content of one file to other file?

e)Write a program to count the no of characters in a file?

f)Write a program to compare the contents of two files?

References:

1. Test your C Skills by – YaswanthKanithkar-BPB Publishers

2. C programming; Test your skills-A.N.Kamthane-Pearson India

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CSE-153
Communicative English Lab -I

(*Common to all branches)*

Lectures: 3 Periods Sessional Marks: 40

University Exam: 3 hours University Examination Marks: 60

Learning Objectives

The C***ommunicative English Lab*** mainly focuses on to improve the Linguistic Listening, Communicative Competence and Presentation Skills of the learners. Activities in the English Communication Skills Lab will simulate actual discourses that students will engage in their interaction with their peers, teachers or strangers in their day-to-day situations.

Learning Outcomes

The students will be able to

- Identify the sounds of English and able to check the correct pronunciation of the words
- Able to listen carefully to communicate effectively in cross- cultural contexts
- Capable to make the students communicate in Daily life situations
- Capable to read for content/ main idea
- Able to communicate confidently in oral presentations
- Enhance vocabulary

List of Activities

1. Identifying phonic sounds, listening to the sounds, practice and record the sounds from the English learning software
2. Common mispronounced words
3. Listening to the short audios and complete the tasks based on the audios
4. Listening to motivational speeches and answering the questions
5. Comprehending Spoken material in British English & American English
6. Situational Dialogues
7. Role plays
8. Reading comprehension exercises for GRE, TOEFL, GATE etc
9. Reading articles from newspaper
10. Specific reading for enhancing vocabulary
11. Vocabulary building exercises
12. Extempore
13. JAM sessions
14. Small talks
15. Oral presentations

CSE-154
Basic Engineering Workshop
(Common to all branches)

L	T	P	C
0	0	3	1.5

Course Objective:
To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Wood Working:
Familiarity with different types of woods and tools used in wood working and make following joints

a. Half – Lap joint
b. Mortise and Tenon joint
c. Corner Dovetail joint or Bridle joint

Sheet Metal Working:
Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets

a. Tapered tray b) Conical funnel c) Elbow pipe d) Brazing

Fitting:
Familiarity with different types of tools used in fitting and do the following fitting exercises

a. V-fit b) Dovetail fit c) Semi-circular fit
d) Bicycle tire puncture and change of two wheeler tyre

Electrical Wiring:
Familiarities with different types of basic electrical circuits and make the following connections

a. Parallel and series b) Two way switch c) Godown lighting d) Tube light
e) Three phase motor f) Soldering of wires

Course Outcomes:
After completion of this lab the student will be able to

1. apply wood working skills in real world applications. (L3)
2. build different parts with metal sheets in real world applications. (L3)
3. apply fitting operations in various applications. (L3)
4. apply different types of basic electric circuit connections. (L3)
5. demonstrate soldering and brazing. (L2)

CSE-121
Mathematics-II

(Probability and Statistics)

(CSE)

L	T	P	C
3	0	0	3

Course Objectives:

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

Unit 1: Descriptive statistics and methods for data science 10 hrs

Data science(Applications or importance in Engineering), Statistics Introduction, Population vs Sample, Measures of Central tendency, Measures of Variability (spread or variance) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, regression lines.

Learning Outcomes:

At the end of this unit, the student will be able to

- summarize the basic concepts of data science and its importance in engineering (L2)
- analyze the data quantitatively or categorically , measure of averages, variability (L4)
- adopt correlation methods and principle of least squares, regression analysis (L5)

UNIT 2: Probability 8 hrs

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

Learning Outcomes:

At the end of this unit, the student will be able to

- define the terms trial, events, sample space, probability, and laws of probability (L1)
- make use of probabilities of events in finite sample spaces from experiments (L3)
- apply Baye's theorem to real time problems (L3)
- explain the notion of random variable, distribution functions and expected value(L2)

UNIT 3: Probability distributions 6 hrs

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

Learning Outcomes:

At the end of this unit, the student will be able to

- apply Binomial and Poisson distributions for real data to compute probabilities, theoretical frequencies (L3)
- interpret the properties of normal distribution and its applications (L2)

Unit 4: Estimation and Testing of hypothesis, large sample tests 8 hrs

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

Learning Outcomes:

At the end of this unit, the student will be able to

- explain the concept of estimation, interval estimation and confidence intervals (L2)
- apply the concept of hypothesis testing for large samples (L4)

Unit 5: Small sample tests 8 hrs

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

Learning Outcomes:

At the end of this unit, the student will be able to

- apply the concept of testing hypothesis for small samples to draw the inferences (L3)
- estimate the goodness of fit (L5)

Textbooks:

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

Reference Books:

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

Course Learning Outcomes:

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

- make use of the concepts of probability and their applications (L3)
- apply discrete and continuous probability distributions (L3)
- classify the concepts of data science and its importance (L4)
- interpret the association of characteristics and through correlation and regression tools (L4)
- design the components of a classical hypothesis test (L6)
- infer the statistical inferential methods based on small and large sampling tests (L6)

CSE-122
Engineering Physics
(ECE, CSE, EEE)

L T P C
3 0 3 4.5

Course Objectives:

- To impart knowledge in basic concepts of wave optics, properties of dielectric and magnetic materials, electromagnetic theory, fiber optics, semiconductors, superconductivity
- To familiarize the applications of nanomaterials relevant to engineering branches

Course Outcomes:

The students will be able to

- **interpret** the interaction of energy with the matter (L2)
- **explain** the principles of physics in materials science, nanoscience, medical physics and communication industry (L2)
- **apply** electromagnetic wave propagation in different guided media (L3)
- **calculate** conductivity of semiconductors (L3)
- **interpret** the difference between normal conductor and super conductor (L2)
- **demonstrate** the application of nanomaterials (L2)

Unit-I : Wave Optics (8hrs)

Principle of Superposition-Interference of light-Theory of Interference fringes-Conditions for sustained Interference -Interference in thin films (reflected light)-Newton's Rings-Determination of Wavelength.

Diffraction-Fraunhofer Diffraction-Single slit Diffraction -Diffraction Grating – Grating Spectrum - Determination of Wavelength.

Polarization-Polarization by reflection, refraction and double refraction-Nicol's Prism--Half wave and Quarter wave plate- Engineering applications of Interference, Diffraction and Polarization.

Learning Outcomes:

The students will be able to

- **explain** various types of coherent sources (L2)
- **outline** the conditions for sustained interference (L2)
- **identify** applications of interference including homodyne and heterodyne detection (L3)
- **analyze** the differences between interference and diffraction (L4)
- **illustrate** the concept of polarization of light and its applications (L2)
- **classify** the production and detection of different polarized light (L4)
-

Unit-II: Dielectrics and Magnetics (10hrs)

Introduction to Dielectrics--Electric polarization-Dielectric polarizability, Susceptability and Dielectric constant- Types of polarizations Lorentz(internal) field-Claussius -Mosotti equation-Applications of Dielectrics .

Introduction to Magnetics-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials - Hysteresis-soft and hard magnetic materials-Ferrites and applications.

Learning Outcomes:

The students will be able to

- **explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **summarize** Gauss's law in the presence of dielectrics (L2)
- **interpret** dielectric loss, Lorentz field and Claussius- Mosotti relation (L2)
- **classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **explain** the applications of dielectric and magnetic materials (L2)

Unit – III: Electromagnetic Waves and Fiber Optics (10hrs)

Divergence and Curl of Electric and Magnetic Fields-Maxwell's Equations- Electromagnetic wave Equation and velocity.

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

Learning Outcomes:

The students will be able to

- **apply** the Gauss' Theorem for divergence and Stokes' Theorem for curl (L3)
- **evaluate** Maxwell's displacement current and correction in Ampere's law (L3)
- **assess** the electromagnetic wave propagation in different media and its power (L3)
- **explain** the working principle of optical fibers and its classification based on refractive index profile and mode of propagation (L2)
- **identify** the applications of optical fibers in medical , communication and other fields (L2)

Unit – IV: Semiconductors (8 hrs)

Origin of energy bands - Classification of solids based on energy bands – Intrinsic semi conductors - Fermi energy – Electrical conductivity - extrinsic semiconductors - P-type & N-type Dependence of Fermi energy on carrier concentration and temperature (Qualitative)- Direct and Indirect band gap semiconductors-Hall effect- Hall coefficient - Applications of Hall effect - Applications of Semiconductors.

Learning Outcomes:

The students will be able to

- **classify** the energy bands of semiconductors (L2)
- **outline** the properties of n-type and p-type semiconductors (L2)
- **interpret** the direct and indirect band gap in semiconductors (L2)
- **identify** the type of semiconductor using Hall effect (L2)
- **list** the applications of semiconductors in electronic manufacturing (L2)
-

Unit – V: Superconductors and Nano materials (8 hrs)

Superconductors-Properties-Critical parameters of Superconductors- Meissner effect-BCS Theory-Josephson effect(AC & DC)-Types of Superconductors-High T_C Superconductors- Applications.

Basics of Nano materials - Preparation and characterization – CNTs - Applications of Nano materials.

Learning Outcomes:

The students will be able to

- **explain** electrical resistivity of solids with temperature (L2)
- **classify** superconductors based on Meissner effect (L2)
- **explain** BCS theory , Josephson effect and high T_c materials (L2)
- **analyze** the size dependent properties of nanomaterials (L4)
- **choose** the methods for the preparation and characterization of CNTs (L3)

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

Reference Books:

1. David J.Griffiths, "Introduction to Electrodynamics"- 4/e, Pearson Education,2014
2. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata Mc GrawHill ,2008
3. Charles Kittel "Introduction to Solid State Physics",Wiley Publications,2011
4. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008
5. T Pradeep "A Text book of Nano Science and Nano Technology"- Tata Mc GrawHill 2013

CSE-123
Engineering Graphics and Design

L T P C
1 0 3 2.5

Course Objectives:

- Bring awareness that Engineering Drawing is the Language of Engineers.
- Familiarize how industry communicates technical information.
- Teach the practices for accuracy and clarity in presenting the technical information.
- Develop the engineering imagination essential for successful design.
- Instruct the utility of drafting & modeling packages in orthographic and isometric drawings.
- Train the usage of 2D and 3D modeling.
- Instruct graphical representation of machine components.

Manual Drawing: (7 Classes)

Introduction to Engineering graphics: Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions. Dimensioning principles and conventional representations
a) Conic sections including the rectangular hyperbola- general
method only, b) Cycloid, epicycloids and hypocycloid
c) Involutes **(2L + 6P hrs)**

Projection of points, lines and planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.**(2L + 6P hrs)**

Projections of solids: Projections of regular solids inclined to one or both planes by rotational. **(1L + 3P hrs)**

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.**(1L + 3P hrs)**

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts. **(1L + 6P hrs)**

Orthographic Projections: Systems of projections, orthographic projections (Simple Figures). **(3L +9P hrs)**

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines,
planes, figures, simple and compound solids. **(2L + 6P hrs)**

Text Books

1. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar
Publishers, 2016. Reference Books:
1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. BasantAgarwal&C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Course
Outcomes:

After completing the course, the student will
be able to

- draw various curves applied in engineering. (L2)
- show projections of solids and sections graphically. (L2)
- draw the development of surfaces of solids. (L3)
- use computers as a drafting tool. (L2)

● draw isometric and orthographic drawings using CAD
packages. (L3) Note:
1. Manual and Computer Aided Drafting classes can be held in alternative weeks for optimal utilization of computer facilities.
2. External examinations to be conducted both manual and computer mode with equal weightage of marks. Additional Sources
1. Youtube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

CSE-124

Essential Electrical & Electronic Engineering

Common to all branches **L-T-P-C**
3-1-3-5.5

Course Objectives:

1. To introduce basics of electric circuits.
2. To teach DC and AC electrical circuit analysis.
3. To explain working principles of transformers and electrical machines.
4. To impart knowledge on Basic Electronic Components.

UNIT – I: DC & AC Circuits

Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Nodal and loop analysis. Thevenin's and Superposition Theorems

Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits. Series Resonance and band width.

Learning Outcomes:
The students will be able to

- **explain** properties and behaviour of Electric circuit elements (R, L and C) in DC and AC circuits.
- **analyze** various circuits using Kirchhoff laws, Nodal and loop analysis & Theorems.
- Make use of basic principles involved in electrical engineering concepts.
- Analysis of single phase ac circuits.

.**UNIT-II: Poly phase & Magnetic circuits**

Generation of 3-phase voltages - phase sequence - star & delta connections - voltage, current & power in star & delta connected systems - analysis of 3-phase balanced circuits - measurement of 3-phase power by 2 wattmeter method.

Faraday's Laws of Electromagnetic Induction .Dynamically induced EMF –Statically induced EMF – Self Inductance – Mutual Inductance - Coefficient of coupling –Inductances in Series – Inductances in parallel – Dot convention.

Learning Outcomes:
The students will be able to

- Analysis of Poly Phase AC Circuits, the representation of alternating quantities and determining the power in these circuits.
- Faraday's laws.

UNIT-III: DC Machines

Principle and operation of DC Generator - EMF equation - OCC characteristics of DC generator – Principle and operation of DC Motor – Performance Characteristics of DC Motors - Speed control of DC Motors.

Learning Outcomes:
The students will be able to

- Know the principles and basics of DC machines used in industries.
- Analyze the performance of DC Machines.
- Summarize the different applications of commonly used electric machinery.

UNIT-IV: AC Machines:

Principle and operation of Single Phase Transformer - EMF equations-losses in transformers, regulation and efficiency. OC and SC test on transformer – auto transformer.

Principle, operation and construction of Three phase Induction Motor –torque equation and torque slip characteristics-power losses and efficiency.

Learning Outcomes:
The students will be able to

- Know the principles and basics of AC machines used in industries.
- Analyze the performance of AC Machines.
- Summarize the different applications of commonly used electric machinery.

UNIT-V: Semiconductor Devices:
Characteristics of Semiconductor junction Diode, Zener diode, transistor, JFET, UJT, SCR and their applications. Half-wave, Full-wave rectifiers and Bridge rectifier, with (L and LC) and without filters.
Bipolar Junction Transistor: Transistor operation, Common base configuration, Common emitterconfiguration, Transistor amplifying action, Common collector configuration, Operating point

Learning Outcomes:
The students will be able to

- . To acquire the knowledge about the characteristics and working principles of semiconductor diodes, Bipolar Junction Transistor.
- To study the Characteristics of basic electronic devices like P-N junction diode, zener diode & transistor in various configurations.

Text Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

References:

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

Python programming (CS125)

L	T	P	C
2	1	3	4.5

Course Objectives:

- To understand software development life cycle
- To learn the basics of Python Programming
- Apply a solution clearly and accurately in a program using Python.
- Apply the best features of mathematics, engineering and natural sciences to program real life problems.

Unit 1:

Context of software development: Software, Development tools, Learning programming with Python, Writing a python program.

Values and Variables: Variables and assignments, identifier, Control codes within Strings, User Input, The eval function, the print function.

Expressions and Arithmetic: Expressions, Operator precedence and Associativity, Comments, Errors, More arithmetic operators.

Learning Outcomes: The students will be able to

- Learn how to design and program Python applications.
- Learn how to write loops and decision statements in Python.
- Acquire programming skills in core Python.

Unit 2:

Conditional Execution: Boolean Expressions, Simple if and if else,nested conditionals, multiway decision statements, conditional expressions, errors in conditional statements.

Iteration: While statements, for statement, definite loops and indefinite loops, nested loops, abnormal loop termination, infinite loops, iteration examples: computing square root, drawing a tree, printing prime numbers.

Learning Outcomes: The students will be able to

- Develop write functions and pass arguments in Python.
- Exercise custom and standard functions of Python programming

Unit 3:

Functions: Introduction, standard mathematical functions, time functions, Random numbers, main function, parameter passing, Function examples: Better organized prime number, Command Interpreter, Restricted Input, Better Die rolling simulator, Tree-Drawing Function, Floating –Point equality, Custom functions Vs Standard functions.

More on Functions: Global variables, Default Parameters, recursion, Making functions reusable, documenting functions and modules, functions as data.

Learning Outcomes: The students will be able to

- Exercise usage of Lists in Python programming
- To learn processing of Lists in Python programming

Unit 4:

Lists: Using Lists, List assignment and equivalence, list bounds, Slicing, Lists and functions, Prime generation with a list

Lists processing: Sorting, flexible sorting, search, list permutations, randomly permuting a list, reversing a list.

Learning Outcomes: The students will be able to

- Develop programs on Lists in Python programming
- Develop programs on processing Lists using Python

Unit 5:

Objects: Using Objects, String Objects, List Objects.

Custom types: geometric points, Methods, Custom type examples, Class inheritance.

Handling Exceptions: Motivation, Exception examples, Using Exceptions, Custom Exceptions.
Learning Outcomes: The students will be able to

- Understand String and List Objects
- Exercise on exception handling in Python applications

Text books:

1. LEARNING TO PROGRAM WITH PYTHON Richard L. Halterman
2. Core Python Programming by Dr. R.Nageswara Rao, dreamtech, second edition

CSE-126

Environmental Science

Common to all branches

L-T-P-C
3-0-0-0

OBJECTIVE:

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

UNIT – I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

LEARNING OUTCOMES

Students will be able to

1. articulate the basic structure, functions, and processes of key social systems affecting the environment.
2. explain how water resources should be used.
3. articulate basic understanding of effects of modern agriculture on environment.
4. explain how various paradigms or world views and their implicit and explicit assumptions and values shape the viewer's perception of environmental problems and solutions.

UNIT – II: Ecosystems, Biodiversity, and its Conservation

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION : Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

LEARNING OUTCOMES

Students will be able to

1. get a clear picture of structure and functions of ecosystems.
2. explain why renewable and non-renewable energy resources are important.
3. get awareness about land degradation, soil erosion & desertification.
4. gain a rigorous foundation in various scientific disciplines as they apply to environmental science, such as ecology, evolutionary biology, hydrology, and human behavior.

UNIT – III: Environmental Pollution and Solid Waste Management

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT : Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

LEARNING OUTCOMES UNIT-3

Students will be able to

1. demonstrate knowledge and understanding of theories in the field of Biodiversity and Systematics in the broad sense.
2. conduct basic conservation biology research.
3. explain endangered and endemic species of India.
4. identify the threats to biodiversity.

UNIT – IV: Social Issues and the Environment

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

LEARNING OUTCOMES:

Students will be able to

1. understand Cause, effects and control measures of air pollution.
2. understand soil, noise & water pollution.
3. explain the enforcement of Environmental legislation
4. understand solid waste management.

UNIT – V: Human Population and the Environment

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK : Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

LEARNING OUTCOMES

Students will have

1. knowledge about watershed management and environmental ethics.
2. explain the reasons for global warming
3. explain principles and impact of disasters on environment.
4. explain disaster management cycle in India.

TEXT BOOKS :

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

REFERENCES :

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

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

CO1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO4	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO5	Influence their society in proper utilization of goods and services.

CO6	Learn the management of environmental hazards and to mitigate disasters and have a clear understanding of environmental concerns and follow sustainable development practices.

CSE-161

ENGINEERING PHYSICS LABORATORY SYLLABUS

Learning Outcomes:

The students will be able to

- **handle** optical instruments like microscope and spectrometer
- **determine** thickness of a hair/paper with the concept of interference
- **estimate** the wavelength and resolving power of different colors using diffraction grating
- **demonstrate** the importance of dielectric material in storage of electric field energy in the capacitors
- **plot** the intensity of the magnetic field of circular coil carrying current with varying distance
- **evaluate** the acceptance angle of an optical fiber and numerical aperture
- **determine** magnetic susceptibility of the material and its losses by B-H curve
- **determine** the fill-factor of the given semiconductor using solar cell
- **identify** the type of semiconductor i.e., n-type or p-type using Hall effect
- **determine** the band gap of a given semiconductor

List of Physics Experiments

1. Determine the thickness of the fiber using wedge shape method
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Dispersive power of a Prisam
5. Resolving power of a grating
6. Photo cell – I-V Characteristic curves and determination of stopping potential
7. Magnetic field along the axis of a circular coil carrying current.
8. To determine the self inductance of the coil (L) using Maxwells-wines bridge.
9. B-H Curve
10. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
11. Hall effect
12. Photo voltaic cell - Determination of fill-factor
13. To determine the energy gap of a semiconductor
14. Measurement of resistance with varying temperature
15. Determination of Acceleration due to gravity by using compound Pendulum

16. References:

1. S. Balasubramanian , M.N. Srinivasan " A Text book of Practical Physics"- S Chand Publishers, 2017
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

CSE-162
Electrical & Electronics Lab **LABORATORY**
SYLLABUS

Learning Outcomes:

The students will be able to

1. Verify Kirchoff's Laws, Superposition theorem & Thevenin's Theorem for dc excitation
2. Analyze the performance of AC and DC Machines by testing.
3. Study Characteristics of P-N junction and zener diode, transistor
4. Perform speed control of dc shunt motor

List of experiments: -

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of Kirchhoff laws.
3. Verification of Superposition Theorem.
4. Verification of Thevenin's Theorems
5. Open circuit characteristics of a DC Shunt Generator.
6. Speed control of DC Shunt Motor.
7. Brake test on DC Shunt Motor.
8. OC & SC test of 1 – Phase Transformer.
9. Brake test on 3 - Phase Induction Motor.
10. Characteristics of PN junction and zener diode
11. Characteristics of transistor in common emitter configuration
12. Verification of transistor self bias circuit

Python Programming Lab (CSE163)

1. Design a Python script to convert a Binary number to Decimal number and verify if it is a Perfect number.
2. Design a Python script to determine if a given string is a Palindrome using recursion
3. Design a Python script to sort numbers specified in a text file using lists.
4. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.
5. Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.
6. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)
7. Design a Python Script to find the value of (Sine, Cosine, Log, PI, *e*) of a given number using infinite series of the function.
8. Design a Python Script to convert a given number to words
9. Design a Python Script to convert a given number to roman number.
10. Design a Python Script to generate the frequency count of words in a text file.
11. Design a Python Script to print a spiral pattern for a 2 dimensional matrix.
12. Design a Python Script to implement Gaussian Elimination method.
13. Design a Python script to generate statistical reports(Minimum, Maximum, Count, Average, Sum etc) on public datasets.
14. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorising them into distinction, first class, second class, third class and failed.
15. Design a Python script to search an element in the given list.
16. Design a Python script on *str* methods and *list* methods.

CSE-164
Workshop (Computer and IT)

L-T-P-C
0-0-3-1.5

Course Objectives:

To

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

Unit 1**: Computer Hardware**

Types of Computing Devices such as PC, Laptops, Servers, Smart Phones, Tablets, other accessories, PC parts, Input/Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Unit Outcomes:

Student should be able to

1. Identify various kinds Computing devices and their components.
2. Identify the different peripherals, ports and connecting cables in a PC.
3. Assemble and disassemble components of a PC

Text Books:

References:

1. Introduction to computer-peter Norton
2. https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.doc
3. https://explorersposts.grc.nasa.gov/post631/2006-2007/bitsnbyte/Digital_Storage_Basics.doc

Unit 2**: Operating Systems**

Virtual Machine setup:

- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

Operating System installation:

- Installing an Operating System such as Linux on Computer hardware.

Linux Operating System commands:

- General command syntax
- Basic *help* commands: whatis, man, info
- Filesystem: ls, mkdir, cd, touch, chmod, rm, mv, bc, finger, who, whoami, ps, du, df
- Date and Time: cal, date,
- Filters and Text processing: echo, cat, tac, rev, more, less, head, tail, nl, cut, paste, wc, sort, uniq, cp, cmp, diff, tr, ln, grep, fgrep, egrep, sed, awk, find, xargs, tee,
- File compression: tar, compress, uncompress, split, uuencode, uudecode, gzip, gunzip, read, expr, test, ping, ssh
- Miscellaneous: apt-get, vi editor
- Shell I/O redirection and piping, regular expressions, simple shell programs without control structures.

Search for “20 examples of grep in linux” and practice like this on all the given commands.
https://www.thegeekstuff.com/2009/07/linux-ls-command-examples
https://www.pcsuggest.com/basic-linux-commands/
https://www.linuxtechi.com/25-find-command-examples-for-linux-beginners/

Unit Outcomes:

Student should be able to:

1. construct a fully functional virtual machine (L3)
2. summarize various linux operating system commands (L2)

References:

1. https://www.vmware.com/pdf/VMwarePlayerManual10.pdf
2. https://zorinos.com/help/
3. https://zorinos.com/help/install-zorin-os/
4. https://geek-university.com/vmware-player/manually-install-a-guest-operating-system/
5. https://clearlinux.org/documentation/clear-linux/get-started/virtual-machine-install/vmw-player-preconf

6. https://www.thegeekstuff.com/2009/07/linux-ls-command-examples
7. https://www.pcsuggest.com/basic-linux-commands/
8. https://www.linuxtechi.com/25-find-command-examples-for-linux-beginners/

Unit 3**: Networking and Internet**
Networking Commands :

- ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget,route

Internet Services:

- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/plugins
- Antivirus installation, configuring a firewall, blocking pop-ups
- Google search techniques(text based, voice based)
- alexa website traffic statistics
- Email creation and usage
- google hangout/skype/gotomeeting video conferencing
- archive.org for accessing archived resources on the web
- Creating a Digital Profile on LinkedIn, Twitter, Github

Unit Outcomes:
Students should be able to

1. resolve internet connectivity issues (L2)
2. secure a computer from cyber threats (L2)
3. apply google search techniques (L3)
4. create their own digital profile on social media (L3)

References:

1. http://www.googleguide.com/advanced_operators_reference.html
2. https://www.alexa.com/find-similar-sites
3. https://www.alexa.com/topsites examine links Global, By Country and By Category
4. Use https://archive.org/ to locate missing links in other sites.

Unit 4**: Productivity Tools**
Productivity Tools:

- archival and compression tools
- scanning and image editing tools
- photography with digital camera and photo editing tools
- OCR and text extraction
- audio players, recording using Mic, editing, podcast preparation
- video players, recording using webcam/camcorder, editing
- podcast, screencast, vodcast, webcasting

Unit Outcomes:
Students should be able to :

1. archive and unarchive data on the filesystem using relevant compression tools(L2)
2. edit photos & images in various formats using photo & image editing tools (L2)
3. recognize characters & extract text from scanned images (L2)
4. create audio files and podcasts (L4)
5. create video tutorials and publishing (L4)

References:

1. File Archivers: https://en.wikipedia.org/wiki/File_archiver .
   Comparison of file archivers: https://en.wikipedia.org/wiki/Comparison_of_file_archivers
2. Image editing: https://en.wikipedia.org/wiki/Image_editing
   Comparison of raster graphics editors:
   https://en.wikipedia.org/wiki/Comparison_of_raster_graphics_editors
3. Optical Character Recognition: https://en.wikipedia.org/wiki/Optical_character_recognition
4. Audio editing software: https://en.wikipedia.org/wiki/Audio_editing_software
   Comparison of free software for audio:
   https://en.wikipedia.org/wiki/Comparison_of_free_software_for_audio
5. Video editing software: https://en.wikipedia.org/wiki/Video_editing_software
   Comparison of video editing software:
   https://en.wikipedia.org/wiki/Comparison_of_video_editing_software
6. Podcast: https://en.wikipedia.org/wiki/Podcast, Screencast: https://en.wikipedia.org/wiki/Screencast,
   Webcast: https://en.wikipedia.org/wiki/Webcast

Unit 5**: Office Tools**

Cloud based productivity enhancement and collaboration tools:

- Store, sync, and share files with ease in the cloud
  - Google Drive
- Document creation and editing text documents in your web browser
  - Google docs
- Handle task lists, create project plans, analyze data with charts and filters
  - Google Sheets
- Create pitch decks, project presentations, training modules
  - Google Slides
- Manage event registrations, create quizzes, analyze responses
  - Google Forms
- Build public sites, internal project hubs
  - Google Sites
- Web-based service providing detailed information about geographical regions and sites around the world. Explore the globe by entering addresses and coordinates
  - Google Maps and Earth
- Online collaboration through cross-platform support
  - Jamboard
- Keep track of important events, sharing one's schedule, and create multiple calendars.
  - Google Calendar

Unit Outcomes:

Students should be able to :

1. use office tools for documentation (L2)
2. build interactive presentations (L2)
3. navigate through the globe (L2)
4. build websites (L2)
5. create quizzes & analyze responses (L3)

References:

1. Cloud computing, productivity and collaboration tools, software and products offered by Google: https://en.wikipedia.org/wiki/G_Suite,
2. G Suite Learning Center: https://gsuite.google.com/learning-center/products/#!/

Course Outcomes:

Students should be able to :

1. assemble and disassemble components of a PC (L3)
2. construct a fully functional virtual machine (L3)
3. summarize various linux operating system commands (L2)
4. secure a computer from cyber threats (L2)
5. apply google search techniques (L3)
6. create their own digital profile on social media (L3)
7. edit photos & images in various formats using photo & image editing tools (L2)
8. recognize characters & extract text from scanned images (L2)
9. create audio files and podcasts (L4)
10. create video tutorials and publishing (L4)
11. use office tools for documentation (L2)
12. build interactive presentations (L2)
13. build websites (L2)
14. create quizzes & analyze responses (L3)

ACHARYA NAGARJUNA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2019-2022
COMPUTER SCIENCE & ENGINEERING (CSE)
COMPUTER SCIENCE & INFORMATION TECHNOLOGY(CI)
II/IV B.TECH - SEMESTER I

II/IV B.TECH - SEMESTER I

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE / CI 211	Analog & Digital Electronics	PC	3	0	0	40	60	3
2	CSE / CI 212	Data structures & Algorithms	PC	3	0	0	40	60	3
3	CSE / CI 213	Operating Systems	PC	3	0	0	40	60	3
4	CSE / CI 214	Mathematics-III (Differential Calculus)	BS	3	0	0	40	60	3
5	CSE / CI 215	UNIX programming	PC	3	0	0	40	60	3
6	CSE / CI 216	Essence of Indian Traditional Knowledge	MC	2	0	0	100	0	0
6	CSE / CI 251	Data structures & Algorithms Lab	PC	0	0	3	40	60	1.5
7	CSE / CI 252	Analog & Digital Electronics Lab	PC	0	0	3	40	60	1.5
8	CSE / CI 253	UNIX Lab	PC	0	0	3	40	60	1.5
9	CSE / CI 254	MATLAB	Skill	0	0	3	40	60	2
Total Credits									21.5

II/IV B.TECH - SEMESTER II

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE / CI 221	Discrete Mathematics	PC	3	0	0	40	60	3
2	CSE / CI 222	Computer Organization & Architecture	PC	3	0	0	40	60	3
3	CSE / CI 223	Database Management Systems	PC	3	0	0	40	60	3
4	CSE / CI 224	Advanced Data Structures	PC	3	0	0	40	60	3
5	CSE / CI 225	Signals & Systems	ESC	3	0	0	40	60	3
6	CSE / CI 261	DBMS Lab	PC	0	0	3	40	60	1.5
7	CSE / CI 262	ADS Lab	PC	0	0	3	40	60	1.5
8	CSE / CI 263	Communicative English lab II	PC	0	0	3	40	60	1.5
9	CSE / CI 264	Web designing	SKILL	0	0	3	40	60	2
Total Credits									21.5`

CSE / CI 211	**Analog & Digital Electronics**

UNIT-I: BJT Characteristics: Junction transistor, Transistor as an amplifier, CE/CS, CB/CG, CC/CD Configurations and their features. Biasing Schemes for BJT and FET amplifiers, Bias stability,

Amplifier models: Voltage amplifier, Current amplifier, Trans-conductance amplifier and Trans-resistance amplifier.

Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators(phase shift, Wien-bridge etc.), LC oscillators (Hartley,Colpitt, Clapp etc.), non-sinusoidal oscillators.

UNIT-II: Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OPAMP design: design of differential amplifier for a given specification, design of gain stages and output stages, compensation. OP-AMP applications: review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier.

UNIT-III: Fundamentals of Digital Systems :

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates. Number systems: binary, signed binary octal, hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.

Combinational Circuits:

Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Quine McCluskey method of function realization.Multiplexer, De- Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder,

UNIT-IV: Sequential Circuits

A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J- K-T and D types flip-flops, applications of flip-flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, applications of counters.

UNIT-V: A/D and D/A Converters

Digital to Analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, Analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs.

TEXT BOOKS:

1. Integrated Electronics: Analog and Digital Circuits and Systems, 2/e, Jaccob Millman, Christos Halkias and Chethan D. Parikh, Tata McGraw-Hill Education, India, 2010.
2. Principles of Electronic Devices & circuits—B L Thereja & Sedha—S Chand
3. Digital Design, 5/e, Morris Mano and Michael D. Cilette, Pearson, 2011.

REFERENCE BOOKS:

1. Electronic Devices and Circuits, Jimmy J Cathey, Schaum‟s outline series, 1988.
2. Digital Principles, 3/e, Roger L. Tokheim, Schaum‟s outline series, 1994.

Course Objectives/ Student Learning Outcomes:

The Students completing this course will understand basic analog and digital electronics, including comparing the merits and demerits of the different amplifiers and able to bias the transistors accordingly. Transistor characteristics, operational amplifiers. The student must be able to convert from one number system to another, work out problems related to Boolean algebra, minimisation problems etc., logic gates, combinational and sequential logic and analog-to-digital digital-to-analog conversion techniques. Finally, students will gain experience in with the design of analog amplifiers, power supplies and logic devices.

CSE / CI 212	Data structures & Algorithms

Objectives of the course:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures.

UNIT I:

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.

Searching: Linear Search and Binary Search Techniques and their complexity analysis.

UNIT II:

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

UNIT III:

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

UNIT IV:

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

UNIT V:

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Suggested books:

1. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

Suggested reference books:

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. "How to Solve it by Computer", 2nd Impression by R.G. Dromey, Pearson Education.

Course outcomes

1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.

2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort,Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

CSE / CI 213	Operating Systems

Objectives of the course

To learn the fundamentals of Operating Systems.

1. To learn the mechanisms of OS to handle processes and threads and their communication
2. To learn the mechanisms involved in memory management in contemporary OS.
3. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.
4. To know the components and management aspects of concurrency management.
5. To learn to implement simple OS mechanisms.

UNIT I:

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.

UNIT II:

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

UNIT III:

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT IV:

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

UNIT V:

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

Suggested books:

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

Suggested reference books:

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Course Outcomes

1. Create processes and threads.
2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
4. Design and implement file management system.
5. For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

CSE / CI 214	Mathematics-III (Differential Calculus)

UNIT - I

Rolle's theorem - Lagranges mean value theorem - Geometrical interpretation - Cauchy's mean value theorem - geometrical interpretation - Taylors theorem - Maclaurin's series.

UNIT - II

Indeterminate forms - Tangents and normals for cartesian - polar curves - pedal equations - derivative of arc. Curvature: Radius of curvature - cartesian curves - parametric equations - at origin - Newton's formula - polar curves - pedal curves - centre of curvature - circle of curvature- Evaluates - Envelopes.

UNIT – III

Increasing and decreasing functions - Maxima and Minima - practical problems - Asymptotes - Curve tracing- Cartesian- parametric and polar curves.

UNIT-IV Finite Differences and Interpolation:Finite Differences – Differences of a polynomial – factorial notation – relations between operators – Newton's Interpolation formulae – central difference interpolation formulae - Gauss interpolation formulae – stirlings formula - interpolation with unequal intervals – Lagranges interpolation – inverse interpolation.

UNIT-V Numerical Differentiation and Integration: Numerical Differentiation – Formulae for derivatives. Numerical Integration: Trapezoidal rule - Simpson's one-third rule - Simpson's three-eighth. Numerical Solution of Ordinary Differential Equations: Introduction – Picard's Method- Euler's Method - Runge- Kutta Method of fourth order.

Numerical Solution of Partial Differential Equations: Introduction - Classification of second order equations.

Textbooks/References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
3. . Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
4. Differential Calculus by Santhi Narayana, S. Chand & Co
5. N.P. Bali, Satyanarayana Bhavanari and Indrani Kelkar - Engineering Mathematics - I, Laxmi Publications, New delhi.

CSE / CI 215	UNIX Programming

UNIT I **(18 hours)**

Introduction to unix : Unix architecture , Features of Unix, Vi editor.

Directory Related utilities- pwd, mkdir, ls, cd , rmdir.

File Handling and Text Processing utilities- cp, mv, rm, ln, unlink, lp, cat, more, pg , head, tail, sort ,nl, grep, egrep, fgrep, cut, paste, join, tee, w ,chgrp, chmod, chown, find, cmp, diff, uniq, tr.

Disk utilities,Backup and other utilities- du, df, mount, unmount, umask, ulimit, tar, cpio, dump , who, mail, compress, uncompress, gzip, gunzip, crypt, sed, tty,

Networking utilities – finger, telnet, rlogin, ftp, rcp, write, talk, wall.

Programmable text processing: awk - awk programs, accessing individual fields, Begin and end, operators, variables, control structures, extended regular expressions, condition Ranges, field separators, Build – in functions.

UNIT-II **(20 hours)**

Bourne Shell programming: Shell, functions of the shell , Meta characters, Input redirection, Output redirection, pipes, shell as programming language, shell variables, predefined local variables, predefined environment variables, Arithmetic, conditional expressions, control structures, positional parameters, passing command line arguments, Built – in Shell commands and shell programs.

Unix Internals: Kernel Basics, File System, Process Management.

UNIT-III **(18 hours)**

File management system calls : Regular file management system calls – open( ), read( ), write( ), lseek( ), Close(),unlink( ),stat( ), getdents( ). Miscellaneous file management system calls – chown( ) and fchown( ), chmod( ) and fchmod( ), dup( ) and dup2( ), fcntl( ), ioctl( ), link( ), mknod( ), sync( ), truncate( ) and ftruncate( ).

UNIT IV: **(18 hours)**

Process Management: Creating a new process – fork( ),orphan processes, terminating a process – exit( ), zombie processes, waiting for child – wait( ), Differentiating a process – exec( ), changing directories – chdir( ), changing priorities- nice( ), Accessing user and Group ID's , file locking – deadlocks.

UNIT V **(18 hours)**

Signals: The defined signals, A list of signals, terminal signals, Requesting on Alarm signal – alarm( ), handling signals – signal( ), protecting critical code and chaining interrupt handlers, sending signals – kill( ), Death of children, suspending and Resuming processes, process Group's and control terminals.

Inter process communication: Pipes, Sockets, shared memory, semaphores.

Text Book:

1 "**Unix for programmers and users**" 3rd edition by Graham Glass, King Ables, Pearson Education .

Reference Books:

1. "**Advanced programming in the unix environment**" w- Richard Stevens 2nd Edition Pearson education

2. "**Unix programming environment"**, Kernighan and pike, Pearson education.

3. "**Your unix the ultimate guide**" Sumitabha Das, TMH 2nd edition.

4. "**Advanced unix programming**" by Marc J. Rochkind, 2nd edition Pearson

CSE / CI 216 Essence of Indian Traditional Knowledge

Course Objectives:

The course will introduce the students to:

1. To get a knowledge in Indian Culture
2. To know Indian languages , literature and the fine arts in India.
3. To explore the science and scientists of Medieval and Modern India.

UNIT I:

Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.

UNIT II:

Indian Languages, culture and Literature: The role of Sanskrit, Significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of South India.

UNIT III:

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious reform movements in Modern India(selected movements only).

UNIT IV:

Fine Arts in India: (Arts, Technology & Engineering): Indian painting, Indian handicrafts, music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (Ancient, Medieval and Modern), Science and Technology in India, development of science in ancient, medieval and modern India.

UNIT V:

Education system in India: Education in Ancient, Medieval and Modern India, aims of Education, subjects, languages, science and scientists of Ancient India, Medieval and Modern India.

Text Books:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005
2. "Science and Samskrit", Samskrita BhartiPublisher, ISBN 13:978-8187276333, 2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN: 81-7450 494- X, 200

Course Outcomes:

After successful completion of the course the students will be able to

1. Understand philosophy of Indian culture.
2. Distinguish the Indian languages and literature.
3. Learn the philosophy of ancient, medieval and modern India.
4. Acquire the information about the fine arts in India.
5. Know the contribution of scientists in different eras.

1. Code the following list ADT operations using array, single linked list, double linked list.

(a) void is_emptyList(List 1) (b) List makeNullList(size n)

(c) Position firstPost(List 1) (d) Position endPost(List 1)

(e) Position nextPost(List 1, Position p) (f) Position prevPos(List 1, position p)

(g) Position find)List 1, Element x) (h) Position findKth(List 1, int k)

(i) void insert(List 1, Position p) (j) void delete(List 1, Position p)

(k) void append(List 1, Element x) (l) int cmp(List 1, Position p1, Position p2)

(m) int cmp2(List11, List, Position p1, Position p2)

(n) void swap(List 1, Position p1, Position p2)

(o) Element retrieveElement(List 1, Position p)

(p) void print element(List 1, Position p)

2. Using the above List ADT operations, Write a menu driven program to support following higher level list operations:

(a) Create null list

(b) Read a list of elements into the list.

(c) Insert an element in the Kth position of the list

(d) Delete an element in the Kth position of the list

(e) Delete a given element from the list

(f) Find whether given element is present in the list

(g) Display the elements of the list

3. Write a program that reads two lists of elements, prints them, reverses them, prints the reverse list, sort the lists, print the sorted lists, merges the list, prints merge list.

4. Implement a polynomial ADT and write a program to read two polynomials and

print them, adds the polynomials, prints the sum, multiply the polynomials and print the product.

5. Implement stack ADT and write a program that reads an infix arithmetic expression of variables, constants, operators (+, -, *, /) and converts it into the corresponding postfix form. Extend the program to handle parenthesized expression also.

6. Implement Queue ADT and write a program that performs Radix sort on a given set of elements.

7. Implement the following sorting operations:-

(a) Shell Sort, (b) Heap Sort (c) Merge Sort (d) Quick Sort

8. Implement Binary Tree ADT and write a program that reads postfix Arithmetic expression form, builds the expression tree and performs tree Traversal on it.

9. Implement Binary search Tree ADT and write a program that interactively allows

(a) Insertion (b) Deletion (c) Find_min (d) Find_max (e) Find operations

10. Implement AVL Tree ADT and Write a program that interactively allows

(a) Insertion (b) Deletion (c) Find_min (d) Find_max

Analog Electronics:

1. Characteristics of Common Base Configuration
2. Characteristics of Common Emitter Configuration
3. Design a Common Emitter amplifier with self-bias and determine the voltage gain to plot the frequency response.
4. Design a Common Collector amplifier with self-bias and determine the voltage gain to plot the frequency response.
5. Design a Common Base amplifier with self-bias and determine the voltage gain to plot the frequency response.

Digital Electronics:

6. Realization of basic Logic gates using Universal gates
7. Design and construct half-adder and full-adder circuits and verify the truth tables using logic gates.
8. Design and implement a 4-bit adder/subtractor using IC 7483.
9. Design and implement multiplexer and demultiplexer using logic gates
10. Verify The Truth Tables of Flip-Flops using gates and perform the conversion of Flip-Flops(JK-T,JK-D)
11. Design and verify 4 bit ripple counter and Mod-10 ripple counter
12. Design and implement the 3 bit synchronous up/down counter.

1. Working with different Unix commands, Pipes, I/O redirection.
2. Write Shell Programs for the following
a) Display all the words which are entered as command line arguments.
b) Changes Permissions of files in PWD as rwx for users.
c) To print the list of all sub directories in the current directory.
d) Program which receives any year from the keyboard and determine whether the year is leap year or not. If no argument is supplied the current year should be assumed.
e) Program which takes two file names as arguments, if their contents are same then delete the second file.
3. Write shell scripts for the following
a) To print the given number in the reversed order.
b) To print first 25 Fibbonacci numbers.
c) To print the Prime numbers between the specified range.
d) To print the first 50 Prime numbers.
4. Write shell scripts for the following
a) To delete all lines containing the word 'unix' in the files supplied as arguments.
b) Menu driven program which has the following options.
i) contents of /etc/passwd
ii) list of users who have currently logged in.
iii) present working directory. iv) exit.
c) For sorting, searching and insertion, deletion of elements in the list
5. Program to transfer the data from one file to another file by using un-buffered I/O.
6. Program to create two processes to run a loop in which one process adds all even numbers and the other adds all the odd numbers (Hint: use fork ( )).
7. Program to create to process 'i' and sends data to process 'j', prints the same after receiving it. (Hint: use vfork( )).
8. Program to demonstrates orphan process .
9. Program which demonstrates how to avoid Zombie using wait( ) .

1. Write a MATLAB program to find greatest of three numbers? Use nested if, else if ladder

2. Write a MATLAB program to read marks of a student and print the sum, average and display the grade?

3. Write a MATLAB program to count the digits of a number? Use for loop

4. Write a MATLAB program to check whether a number is perfect or not? Use do-while

5. Write a MATLAB program to check whether a number is strong or not? Use while

6. Write a MATLAB program to check whether a number is armstrong or not? Use for

7. Write a MATLAB program to check whether a number is palindrome or not? Use for

8. Write a MATLAB program to find the Fibonacci series upto the given number? Use while

9. Write a MATLAB program to print the result of the series 1+x^2/2+x^3/3+….+x^n/n

10. Write a MATLAB program to perform menu driven arithmetic operations using functions?

11. Write a MATLAB program to find the factorial of a number using recursive and non- recursive functions?

12. Write a MATLAB program to find the Fibonacci series using recursive functions?

13. Write a MATLAB program to find the solution for towers of Hanoi using recursive function?

14. Write a MATLAB program to read an array and sort the elements in an array?

15. Write a MATLAB program to find the minimum and maximum numbers of the array?

16. Write a MATLAB program to read two matrices and find their sum, difference and product?

17. Write a MATLAB program to find the transpose of a matrix?

18. Write a MATLAB program to print upper and lower triangle of a given matrix?

19. Write a MATLAB program to read a file and write data into file?

20. Write a GUI MATLAB program to create student application form?

21. Write a MATLAB program on creating simple plots?

22. Write a MATLAB program to read an image, perform different operations on image and display the resulting images?

CSE / CI 221	Discrete Mathematics

UNIT – I

Foundations: Sets, Relations and Functions, Methods of Proof and Problem Solving Strategies, Fundamentals of Logic, Logical Inferences, Methods of Proof of an implication, First order Logic & Other methods of proof, Rules of Inference for Quantified propositions, Disjunction normal forms, Conjunction normal forms, Mathematical Induction.

UNIT – II

Elementary Combinatorics, Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Permutation with Constrained repetitions.

UNIT – III

Recurrence relations, Solving recurrence relations by Substitution and generating functions. The methods of characteristic roots. Relations and digraphs, Special properties of binary relations, Equivalence relations. Operations on relation.

UNIT – IV

Ordering relations, Lattices and Enumerations, Paths and Closures, Directed Graphs and Adjacency Matrices, Application : Topological Sorting.

UNIT-V:

Graphs: Basic Concepts, Isomorphisms and Subgraphs, Planar Graphs, Euler's Formula; Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four Color Problem.

TEXT BOOK:

1. Toe L.Mott, Abraham Kandel & Theodore P.Baker, Discrete Mathematics for Computer Scientists & Mathematicians, PHI 2nd edition,2008.
2. J.P. Trembly and R. Manohar- Discrete Mathematics for Computer Scientists & Mathematicians, PHI Ltd., New Delhi, 2nd Edition, 2008.
3. Narasingh deo Graph Theory , Narosa Publishers
4. Satyanarayana Bhavanari. and Syamprasad Kuncham. "Discrete Mathematics and Graph Theory" by PHI, 2014 second edition.
5. Satyanarayana Bhavanari,T.V.Pradeep Kumar,Sk. Mohiddin shaw" Mathematical Foundations for Computer Sciences" by BS Publications, first editions, 2016.

REFERENCE BOOKS:

1. T. Sengadir- Discrete Mathematics-Pearson Education
2. C.L. Liu and D.P. Mohapatra-Elements of Discrete Mathematics, Tata McGraw-Hill ,3rd Edition, 2008.
3. Seymour Lipschutz, Lipson-Discrete Mathematics-Scaums outlines-TMH.
4. Santha-Discrete Mathematics-Cengage Learning
5. Kenneth H Rosen-Discrete Mathematics & its Applications , TMH, 6ht Edition,2009

CSE / CI 222	Computer Organization & Architecture

Objectives of the course:
To expose the students to the following:

- How Computer Systems work & the basic principles
- Instruction Level Architecture and Instruction Execution
- The current state of art in memory system design
- How I/O devices are accessed and its principles.
- To provide the knowledge on Instruction Level Parallelism
- To impart the knowledge on micro programming
- Concepts of advanced pipelining techniques.

Detailed contents:

UNIT I:
Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU–registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.
Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

UNIT II:
Introduction to x86 architecture.
CPU control unit design: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU.
Memory system design: semiconductor memory technologies, memory organization.

UNIT III:
Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes–role of interrupts in process state transitions, I/O device interfaces – SCII, USB

UNIT IV:
Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.
Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

UNIT V:
Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Text books:
1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition
by David A. Patterson and John L. Hennessy, Elsevier.

2. “Computer Organization and Embedded Systems”, 6th Edition by CarlHamacher, McGraw Hill Higher Education.
3. “Computer Organization and Architecture: Designing for Performance”, 10th Edition by William Stallings, Pearson Education.
4. “ Computer System Architecture “ , 3rd edition by M. Morris Mano

Reference books:

1. “Computer Architecture and Organization”, 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2. “Computer System Design and Architecture”, 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

Course outcomes:

- Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
- Write assembly language program for specified microprocessor for computing 16 bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).
- Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
- Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.
- Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology.

CSE / CI 223	Database Management Systems

Objectives of the course

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency & Client/Server (Database Server).
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.

Detailed contents

UNIT I:

Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

Data models: Entity-relationship model, network model, relational and object-oriented data models, integrity constraints, data manipulation operations.

UNIT II:

Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

SQL Concepts: Basics of SQL, DDL,DML,DCL, structure –creation, alteration, defining constraints –Primary key, foreign key, unique, not null, check, IN operator, aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, joins.

Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.

UNIT III:

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Storage strategies: Indices, B+-trees, hashing.

UNIT IV:

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp-based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

UNIT V:

PL/SQL Concepts: Cursors, Stored Procedures, Stored Function, Database Triggers

Advanced topics: Object oriented and object relational databases, Logical databases

Text books:

1. “Database System Concepts”, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

Reference books

1 “Principles of Database and Knowledge – Base Systems”, Vol 1 by J. D. Ullman, Computer Science Press.
2 “Fundamentals of Database Systems”, 5th Edition by R. Elmasri and S. Navathe, Pearson Education
3 “Foundations of Databases”, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley
4. “An introduction to Database Systems”, C J Date, Pearson.
5.“Modern Database Management”, Hoffer , Ramesh, Topi, Pearson.
6.“Principles of Database and Knowledge –Base Systems”, Vol 1 by J. D. Ullman, Computer Science Press.

Course Outcomes

- For a given query write relational algebra expressions for that query and optimize the developed expressions
- For a given specification of the requirement design the databases using E-R method and normalization.
- For a given specification construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.
- For a given query optimize its execution using Query optimization algorithms
- For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
- Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

CSE / CI 224	Advanced Data Structures

Objectives of the course:

- To understand the usage of algorithms in computing.
- To learn and use hierarchical data structures and its operations
- To learn the usage of graphs and its applications.
- To select and design data structures and algorithms that is appropriate for problems.

UNIT-1

ROLE OF ALGORITHMS IN COMPUTING : Review of Basic Concepts, Asymptotic Analysis of Recurrences: The Substitution Method, iterative method, Recursion-Tree Method, master method. Randomized Algorithms, Randomized Quicksort, Algorithm Analysis Techniques - Amortized Analysis.

UNIT II:

HIERARCHICAL DATA STRUCTURES: Red-Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion , Splay Trees: Rotations – Insertion – Deletion ,B-trees, B+ trees, Heap trees, priority queues, Binomial Heaps, Fibonacci Heaps.

UNIT III:

GRAPHS: Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components, Connected graphs, Articulation points in a graph, minimum cost spanning tree. Network Flows-Max flow, min-cut theorem, Ford-Fulkerson, Edmonds-Karp algorithm, Bipartite Matching.

UNIT IV:

Partition ADT: Disjoint sets, operations on sets, weighted union or union by rank, path compression, Permutations and Combinations.

UNIT V:

Data Structures for Strings: Tries and Compressed Tries, Dictionaries allowing Errors in Queries, Suffix Trees and Suffix Arrays.

Text Books:

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, ―Data Structures and Algorithms‖, Pearson Education, Reprint 2006.

2. Advanced Data Structures, PETER BRASS City College of New York, CAMBRIDGE UNIVERSITY PRESS.

3. Classic Data Structures, Debasis Samanta, PHI.

4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, ―Introduction to Algorithms‖, Third Edition, Prentice-Hall, 2011.

Reference Books:

1. Robert Sedgewick and Kevin Wayne, ―ALGORITHMS‖, Fourth Edition, Pearson Education.

2. S.Sridhar,‖Design and Analysis of Algorithms‖, First Edition, Oxford University Press. 2014

Course Outcomes:

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

- Design data structures and algorithms to solve computing problems

- Design algorithms using graph structure and various string matching algorithms to solve real-life problems
- Apply suitable design strategy for problem solving

CSE/ CI 225	SIGNALS & SYSTEMS	L	T	P	M	C
		3	0	0	100	3

UNIT -1

SIGNAL ANALYSIS: Introduction to signals and systems, Elementary Signals, Basic Operation on Signals, Classification of signals, Classification of systems (both discrete and continuous), Approximation of a function by a set of mutually orthogonal functions, Evaluation of mean square error, Orthogonality in complex functions.

UNIT – II

FOURIER SERIES REPRESENTATION OF PERIODIC SIGNAL Trigonometric Form of Fourier Series, Wave Symmetry, Exponential Fourier series, Fourier Spectrum.

FOURIER TRANSFORM

Representation of an arbitrary function over the entire interval: Fourier transform, Fourier transform of some useful functions, Singularity functions, Fourier transform of periodic function, some properties of Fourier transform, Energy density spectrum.

UNIT – III

SIGNAL TRANSMISSION THROUGH LINEAR NETWORKS: Linear time- invariant system, Time response, Convolution and it's graphical interpretation, Causality and stability, Paley-Wiener criterion, Frequency response, Filter characteristics of linear systems, Conditions for distortionless transmission, Relation between bandwidth and rise time.

UNIT-IV

SPECTRAL DENSITY AND CORRELATION: Energy and power spectral density, Properties, Auto-correlation and Cross-correlation functions, Properties of correlation function, Parseval's theorem.

SAMPLING THEOREM AND ITS IMPLICATIONS RECONSTRUCTION: ideal interpolator, Zero-order hold, First order hold, Aliasing and its effects.

UNIT –V

LAPLACE TRANSFORM: The Laplace transform, Region of Convergence, the inverse Laplace transform, Properties of Laplace transform, problems.

TEXT BOOKS:

1. Rodger E. Ziener, William H Tanter, D.Ronald Fannin, Signals and Systems, Prentice Hall
2. Tarun Kumar, Signals and Systems, Oxford Publications
3. Ramesh Babu P., Signals and Systems, Scitech Publications(India) Pvt. Ltd.
4. Edara Sreenivas Reddy, Signals and Systems, BS Publications
5. B P Lathi, Signals, Systems and Communications, BSP, 2003
6. P.Z Peebles, Jr, Probability, random variables and random signal principles, TMH.
7. Simon Haykin, Signals and Systems, John Wiley, 2004

REFERENCE BOOKS:

1. A V Oppenheim, A S Wilsky and IT Young, Signals and Systems, PHI/ Pearson, 2003
2. David K Cheng, Analysis of Linear Systems, Narosa Publishers, 1990.

1. Learn the Data Definition Language (DDL) commands in RDBMS, Data Manipulation Language (DML) and Data Control Language (DCL)
2. Create table and insert sample data in tables.
3. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions
4. Queries using Partial Matching operators (LIKE, %, _, *, ?) ,ASC-DESC ordering combinations Checking for Nulls and aggregate functions in SQL
5. Perform queries involving predicates LIKE, BETWEEN, IN etc.
6. Queries to Retrieve and Change Data: Select, Insert, Delete, and Update
7. Queries on Controlling Data: Commit, Rollback, and Save point
8. Queries for Creating, Dropping, and Altering Tables, Views, and Constraints
9. To apply the concept of Aggregating Data using Group functions
10. Queries using Group By, Order By, and Having Clauses
11. Queries on Multi-table queries (JOIN OPERATIONS) ,Simple joins (no INNER JOIN) Aliasing tables – Full/Partial name qualification ,Inner-joins (two and more (different) tables) ,Inner-recursive-joins (joining to itself) , Outer-joins (restrictions as part of the WHERE and ON clauses) ,Using where & having clauses and Correlated Sub-Queries
12. Nested queries: In, Not In Exists, Not Exists Dynamic relations (as part of SELECT, FROM, and WHERE clauses)
13. Set Oriented Operations: Union, Difference, Intersection, Division
14. PL/SQL Programming I: Programs using named and unnamed blocks, using SQL and Control Structures in PL/SQL, Programs using Cursors, Cursor loops and records
15. PL/SQL Programming II: Creating stored procedures, functions
16. Triggers and auditing triggers

OUTCOMES:

- Understand, appreciate and effectively explain the underlying concepts of database technologies
- Design and implement a database schema for a given problem-domain Normalize a database
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS
- Programming PL/SQL including stored procedures, stored functions, cursors, packages

Text Books/Suggested Reading:

- Oracle: The Complete Reference by Oracle Press
- Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
- Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

List of Open Source Software/learning website:

- https://www.tutorialspoint.com/dbms/
- https://www.w3schools.com/sql/
- https://in.udacity.com/

1. Write C program for Randomized Quick sort method to sort a given list of integers in ascending order.
2. Write a C program that uses functions to perform the following:
i) Creating a SplayTree of integers ii) insertion iii) Traversing splay tree in preorder, inorder and postorder.
3. Write a C program to perform operations on B-tree.
4. Write a C program to implement operations on binary heap.
5. Write a C program to implement priority queue using heap tree.
6. Write a C program to implement prim's algorithm.
7. Write a C program to implement krushkal's algorithm.
8. Write a C program to implement Fibonacci heap.
9. Write a C program for BFS and DFS traversals.
10. Write a C program for Edmonds-Karp algorithm.
11. Write a C program to perform various operations on Disjoint sets.
12. Write a C program to find the longest common substring using suffix tree.

Course Objectives:

The main course objective of ***Advanced English Communication Skills Lab*** is to develop the student's Non-Verbal Communication, Cognitive and Poignant Skills, Interview Skills, Employability and Interpersonal skills, which relate to situations in the work place. The skills imparted to the learners are body language, leadership, time management, team management, assertive skills, group discussions, interview techniques and positive work ethics ...etc.

The methodology includes Interactive sessions, Role Play, Team Work/Group Work/Pair Work and Peer Evaluation. The emphasis is on learning by doing to improve the learners' life skills.

Course Outcomes:

CO1	To realize the importance of communication skills in job arena To enhance the students ability to communicate
CO2	Able to learn vocabulary for GRE, TOEFL, IELTS,IES etc
CO3	Capable to participate in all recruitment procedures
CO4	Able to communicate effectively over a phone and proficient to demonstrate telephoning skills
CO5	Able to describe procedures and improves analytical thinking
CO6	Able to know the importance of personality development

Syllabus:

Module-l Communication Skills

I. Verbal

a) Types of Communication
b) Barriers to Communication
c) Strategies for effective communication

II. Nonverbal Skills -

a) Body Language – Voluntary and Involuntary
b) Kinesics
c) Facial Expressions
d) Proxemics
e) Oculesics
f) Haptics and Chronemics

Module-2: Advanced Vocabulary
a) Word list (GRE & TOEFL related)
b) One Word Substitutes
c) Idioms

Module-3: Employability Skills (Ref: 6)
a) Interview Skills
b) Group Discussion
c) Resume Writing

Module-4: Telephonic Skills
a) Formal &Informal interaction
b) Receiving Messages & Complaints
c) Tone modulation

Module-5: Descriptions
a) Process Description
b) Pictures
c) Narration

Module-6: Behavioural Skills
a) Emotional Intelligence
b) Positive Attitude
c) Team Work
d) Organization Skills

CYCLE - I

Basics - Introduction

1. Practice Internet applications
2. Explore Web browsers , search engines
3. Familiarise with web portals, e-commerce sites, blogs etc

HTML

4. Basic Html Tags
5. Hyper Links, Tables & Multimedia
6. Frames & iFrames

CSS

7. Inline, Internal and External Style sheets

CYCLE – II

JAVA SCRIPT

8. Demonstrate java script control statements.
9. Demonstrate java script functions.
10. Registration Form with Table
11. String, Math & Date Object's predefined methods
12. Event Handling - Validating Simple Form
13. Event Handling - Multi-Validating Registration Form
14. Event Handling - Background Color Change
15. Event Handling - calendar for the month and year by combo box
16. Event Handling - OnMouseover event
17. Event Handling - OnMouseover using objects

CYCLE - III

XML

18. Demonstrate the creation of XSL style sheets to render XML document.
19. Demonstrate to retrieve and manipulate XML data using java script

AJAX

20. Demonstrate Rich Internet Applications with Ajax
21. Demonstrate the full scale Ajax enabled application

PHP

22. File operation
23. Regular Expression, Array, Math, Date functions
24. Demonstrate the form processing and business logic in PHP

ACHARYA NAGARJUNA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2019-2022 (R19)
COMPUTER SCIENCE & ENGINEERING (CSE)
COMPUTER SCIENCE & INFORMATION TECHNOLOGY(CI)

III/IV B.TECH - SEMESTER I (R19 Regulation - Structure & Syllabus)

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE / CI 311	Automata Theory & Compiler Design	PC	3	0	0	40	60	3
2	CSE / CI 312	Java Programming	PC	3	0	0	40	60	3
3	CSE / CI 313	Design & Analysis of Algorithms	PC	3	0	0	40	60	3
4	CSE / CI 314	Job Elective – 1	JE-1	3	0	0	40	60	3
5	CSE / CI 315	Professional Elective-1	PE-1	3	0	0	40	60	3
6	CSE / CI 351	Java Lab	PC	0	0	3	40	60	1.5
7	CSE / CI 352	Design & Analysis of Algorithms	PC	0	0	3	40	60	1.5
8	CSE / CI 353	Job Elective -1 Lab	JE-1 Lab	0	0	3	40	60	1.5
9	CSE / CI 354	Mobile Application development	Skill	0	0	3	40	60	2
Total Credits									21.5

JE-1 (Lab Oriented)

E. VLSI
F. Digital Signal Processing
G. Internet of Things (IoT)
H. Digital Image Processing

PE-1:

E. Computer Graphics
F. Design Methodologies
G. Software Engineering
H. Distributed Systems

CSE / CI 311	Automata Theory & Compiler Design

Objectives:

The learning objectives of this course are to:

Introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability. Compiler design is to explore the principles, algorithms, and data structures involved in the design and construction of compilers. Topics include context-free grammars, lexical analysis, parsing techniques, symbol tables, error recovery, code generation, and code optimization.

UNIT-I

Finite Automata & Regular Languages - Languages vs. Problems. Finite State Automata, Regular Languages. Closure properties, Limitations, Pumping Lemma, Myhill-Nerode relations, Quotient Construction. Minimization Algorithm. Non-determinism & Regular Expressions - Notion of non-determinism. Acceptance condition. Subset construction. Pattern matching and regular expressions.

UNIT-II

Grammars & Context-free Languages (CFLs) - Grammars and Chomsky Hierarchy, CFLs, Regular Grammars, Chomsky Normal Form, Pumping Lemma for CFLs, Inherent Ambiguity of Context-Free Languages, Cock-Younger-Kasami Algorithm, Applications to Parsing. Pushdown Automata (PDA).

Unit-III

Turing Machines & Computability - Introduction to Turing Machines, Configurations, Halting Vs. Looping. Multi-tape Turing machines. Recursive and Recursively enumerable languages. Undecidability of Halting Problem. Reductions.

Unit-IV

Introduction to Compiler: Phases and passes, Bootstrapping, Finite state machines and regular Expressions and their applications to lexical analysis, Implementation of lexical analyzers, Lexical-analyzer generator.

Basic Parsing Techniques: Parsers, top-down parsing, bottom-up parsing, LR parsing, Canonical LR parsing, LALR parsing.

Unit-V

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntaxdirected Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples. Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time

Introduction to code optimization: Loop optimization, the DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

Reference Books:

1. Automata and Computability, Dexter C. Kozen, Springer Publishers, 2007.
2. Introduction to Automata Theory, Languages and Computation, Hopcroft, Motwani, and Ullman, Pearson Publishers, Third Edition, 2006.
3. Elements of the Theory of Computation, H. R. Lewis and C.H. Papadimitriou, Prentice Hall Publishers, 1981
4. Introduction to Languages and the Theory of Computation, John. C. Martin, Tata McGraw-Hill, 2003.

5. Formal Languages and Automata Theory, E.Srinivasa Reddy, B.S.Publications
6. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson.
7. Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.
8. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.

Course Outcomes:

- Understand the basic properties of formal languages and grammars.
- Differentiate regular, context-free and recursively enumerable languages.
- Make grammars to produce strings from a specific language.
- Including decidability and intractability.
- At the end of the subject, students will understand different considerations and phases of compilation, the impact of language attributes upon the compilation process, the effect of hardware feature on the generated code and the practical fundamentals of compiler implementation.

CSE / CI 312	Java Programming

COURSE OBJECTIVES:

1. To teach principles of Object-Oriented Programming paradigm including abstraction, encapsulation, inheritance and polymorphism.
2. To impart fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
3. To inculcate concepts of inheritance to create new classes from existing one & Design the classes needed given a problem specification;
4. To familiarize the concepts of packages and interfaces.
5. To facilitate students in handling exceptions.
6. To demonstrate the concept of event handling used in GUI.

UNIT - I JAVA BASICS: Review of Object Oriented concepts, History of Java, Java buzzwords, JVM architecture, Data types, Variables, Scope and life time of variables, arrays, operators, control statements, type conversion and casting, simple java program, constructors, methods, Static block, Static Data, Static Method String and String Buffer Classes, Using Java API Document.

UNIT - II INHERITANCE AND POLYMORPHISM: Basic concepts, Types of inheritance, Member access rules, Usage of this and Super key word, Method Overloading, Method overriding, Abstract classes, Dynamic method dispatch, Usage of final keyword.

PACKAGES AND INTERFACES: Defining package, Access protection, importing packages, Defining and Implementing interfaces, and Extending interfaces.

I / O STREAMS: Concepts of streams, Stream classes- Byte and Character stream, Reading console Input and Writing Console output, File Handling.

UNIT - III EXCEPTION HANDLING: Exception types, Usage of Try, Catch, Throw, Throws and Finally keywords, Built-in Exceptions, Creating own Exception classes.

MULTI THREADING: Concepts of Thread, Thread life cycle, creating threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter Thread communication.

UNIT - IV AWT CONTROLS: The AWT class hierarchy, user interface components- Labels, Button, Text Components, Check Box, Check Box Group, Choice, List Box, Panels – Scroll Pane, Menu, Scroll Bar. Working with Frame class, Color, Fonts and layout managers.

EVENT HANDLING: Events, Event sources, Event Listeners, Event Delegation Model (EDM), Handling Mouse and Keyboard Events, Adapter classes, Inner classes.

UNIT - V SWINGS: Introduction to Swings, Hierarchy of swing components. Containers, Top level containers - JFrame, JWindow, JDialog, JPanel, JButton, JToggleButton, JCheckBox, JRadioButton, JLabel,JTextField, JTextArea, JList, JComboBox, JScrollPane.APPLETS: Life cycle of an Applet, Differences between Applets and Applications, Developing applets, simple applet.

REFERENCE BOOKS:

1. Herbert Schildt (2010), The complete reference, 7th edition, Tata Mc graw Hill, New Delhi

2. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press, 2008.

3. Head First Java, O'rielly publications

4. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition, Pearson Education, India.
5. Nino, F. A. Hosch (2002), An Introduction to programming and OO design using Java, John Wiley & sons, New Jersey.
6. Y. Daniel Liang (2010), Introduction to Java programming, 7th edition, Pearson education, India.

COURSE OUTCOMES:

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

1. Analyse the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP like encapsulation, Inheritance and Polymorphism
2. Design and develop java programs, analyse, and interpret object-oriented data and report results.
3. Design an object-oriented system, AWT components and multithreaded processes as per needs and specifications.
4. Participate and succeed in competitive examinations like GATE, Engineering services, recruitment interviews etc.

CSE / CI 313	Design & Analysis of Algorithms

Objectives:

- Analyse the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Unit I

Background: Introduction, algorithms specification, time and space complexity, performance analysis.

Divide and Conquer: Binary search, merge sort, bubble sort, quick sort, Strassen matrix multiplication, maximum and minimum problem.

Unit II

Greedy Methods: General method, optimal merge patterns, optimal storage on tapes, Knapsack problem, job scheduling problem, single source shortest path problem.

Unit III

Dynamic Programming: General method, multistage graphs, 0/1 Knapsack problem, longest common subsequence, string editing, matrix chain multiplication, travelling salesmen problem, optimal binary search trees.

Unit IV

Back Tracking: General method, 4-queen problem, sum of subset problem, graph colouring, Hamiltonian cycles.

Unit V

Branch and Bound: General method, 0/1 knapsack problem, traveling salesman problem

NP Hard and NP Complete: deterministic and nondeterministic algorithms, NP Hard and NP complete.

Reference Books:

1. Cormen T. H, Leiserson C. E, Rivest R. L, and Stein C., Introduction to Algorithms, Prentice-Hall of India, 2nd Ed., 2001.
2. Brassard G., Fundamentals of Algorithmics, Prentice-Hall of India, 2003.
3. Aho A. V., Design and Analysis of Algorithms, Addison Wesley, 2001.
4. Horowitz E., Computer Algorithms, Galgotia Publications, 1998

Course Outcomes:

Students who complete the course will have demonstrated the ability to do the following:

- Ability to understand mathematical formulation, complexity analysis and methodologies to solve recurrence relations for algorithms.
- Ability to design algorithms using standard paradigms like: Greedy, Divide and Conquer, Dynamic Programming, Backtracking and Branch and Bound.
- Ability to understand NP class problems and formulate solutions using standard approaches.
- Ability to apply algorithm design principles to derive solutions for real life problems and comment on complexity of solution.

CSE / CI 314 A	VLSI

Course Objectives:

The objectives of the course are to:

1. Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/BICMOS transistors.
2. Study the fundamentals of CMOS circuits and its characteristics.
3. Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
4. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
5. Provide concept to design different types of logic gates using CMOS inverter.

UNIT – I

An introduction to MOS technology: Introduction to IC technology, Basic MOS transistors, NMOS fabrication, CMOS fabrication and BiCMOS technology. Basic Electrical Properties of MOS and BiCMOS Circuits: Ids versus Vds relationships, threshold voltage Vt, Transconductance (gm), Figure of merit (ω), Pass transistor, NMOS inverter, Pull-up to pull- down ratio, CMOS inverter, BICMOS inverters, Latch-up in CMOS circuits.

UNIT – II

MOS and BICMOS circuit Design processes: MOS layers, Stick diagrams, Layout diagrams, Design rules and layout, Sheet resistance Rs, Standard unit of capacitance, The Delay unit, Inverter delays, Propagation delays, Wiring capacitances, Scaling models, Scaling factors for device parameters.

UNIT – III

Subsystem design and layout: Architectural issues, Switch logic, Gate Logic, examples of Structured Design (combinational logic). Design of an ALU subsystem: Design of 4-bit adder, adder element requirements, a standard adder element, Implementing ALU functions with an adder. A further consideration of adders: Manchester carry chain, carry select adder, carry skip adder.

UNIT – IV

VLSI design flow, Introduction to ASICs, Full Custom ASICs, standard cell based ASICs, Gate array based ASICs, Programmable logic devices, PLAs, PALs, CPLDs and FPGAs.

UNIT – V

VHDL Hardware Description Language: Program Structure, Types and Constants, functions and Procedures, Libraries and Packages, Structural Design Elements, Dataflow design Elements, Behavioral design Elements, VHDL programs, The Time Dimension and Simulation, Synthesis.

REFERENCE BOOKS:

1. Douglas A.Pucknell and Kamran Eshranghian, Basic VLSI Design, 3 rd edition, PHI, 2002.
2. Debaprasad Das, VLSI Design, Oxford University Press, 2nd edition, 2015.
3. Michael John Sebastian Smith, Application Specific Integrated Circuits, Addison Wesley, 2003.
4. K Lal Kishore and VSV Prabhakar, VLSI Design, I K International Publishing House, 2009
5. J.Bhasker, A VHDL Primer, Pearson Education India, 3rd edition, 2015.
6. John F Wakerly, Digital Design Principles & Practices, 3rd Edition, Pearson Education, 2002.
7. Neil H E Weste and Kamran Eshranghian, Principles of CMOS VLSI Design, A system perspective, 2nd edition, Pearson Education, 2002.
8. Stephen Brown and Z Vonko Vranesic, Fundamentals of Digital Logic with VHDL Design, TMH, 2002.
9. Douglas L. Perry, VHDL Programming by Example, McGraw Hill Education, 4th edition 2017

Course Outcomes:

On successful completion of this course, the student should be able to:

1. Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors.
2. Choose an appropriate inverter depending on specifications required for a circuit.

3. Draw the layout of any logic circuit which helps to understand and estimate parasitics of any logic circuit.
4. Design different types of logic gates using CMOS inverter.
5. Provide design concepts to design building blocks of data path of any system using gates.
6. Understand basic programmable logic devices
7. Understand the modeling Styles in VHDL.

CSE / CI 314 B	Digital Signal Processing

Course Objectives:

The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis DSP systems.

UNIT – I

Discrete Signals and Systems: Introduction to digital signal processing, Advantages and applications, Discrete time signals, LTI system: Stability and causality, Frequency domain representation of discrete time signals and systems. Review of Z-transforms and Inverse Z-transforms.

UNIT – II

DFT and FFT: Discrete Fourier Series, Properties of DFS, Discrete Fourier Transform, Properties of DFT, Linear convolution using DFT, Computations for evaluating DFT, Decimation in time FFT algorithms, Decimation in frequency FFT algorithm, Computation of inverse DFT.

UNIT – III

IIR Filter Design Techniques: Introduction, Properties of IIR filters, Design of Digital Butterworth and Chebyshev filters using bilinear transformation, Impulse invariance transformation methods. Design of digital filters using frequency transformation method.

UNIT – IV

FIR Filter Design Techniques: Introduction to characteristics of linear phase FIR filters, Frequency response, Designing FIR filters using windowing methods: rectangular window, Hanning window, Hamming window, Generalised Hamming window, Bartlett triangular window,Kaiser window, Processing Comparison of IIR and FIR filters.

UNIT – V

Realization of Digital Filters: Direct, Canonic, Cascade, Parallel and Ladder realizations Effect of finite register length in FIR filter design, Introduction to Multi rate Signal Processing-Decimation, Interpolation, sampling rate convertion

REFERENCE BOOKS:

1. Lonnie C Ludeman, Fundamentals of Digital Signal Processing, John Wiley & Sons, 2003.
2. S K Mitra, Digital Signal Processing: A Computer Based Approach, 2nd Edition, TMH, 2003
3. Alan V Oppenheim and Ronald W Schafer, Digital Signal Processing, Pearson Education/PHI, 2004.
4. P. Ramesh Babu, Digital Signal Processing, 2nd Edition, Scitech Publications, 20041.
5. Johnny R. Johnson, Introduction to Digital Signal Processing, PHI, 2001.
6. Andreas Antoniou, Digital Signal Processing,TMH, 2006.
7. John G.Proakis, Dimitris G Manolakis, digital Signal Processing: Principles, Algorithms and Applications, Pearson Education / PHI, 2003.

Course Outcomes:

Upon successful completion of this course the students will have developed following skills/abilities:

1. Interpret, represent and process discrete/digital signals and systems.
2. Thorough understanding of frequency domain analysis of discrete time signals.
3. Ability to design & analyze DSP systems like FIR and IIR Filter etc.
4. Practical implementation issues such as computational complexity, hardware resource limitations as well as cost of DSP systems or DSP Processors.

CSE / CI 314 C	Internet of Things

Course Objectives:

1. Students will be explored to the interconnection and integration of the physical world and the cyber space.
2. They are also able to design & develop IOT Devices.

UNIT-I

Introduction to IoT Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

UNIT–II

Elements of IoT: Hardware Components-Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components-Programming API's (using Python / Node.js / Arduino), Communication Protocols- ZigBee, Bluetooth, 6LoPAN, LoRa, MQTT, CoAP,XMPP.

UNIT–III

M2M and IoT Design Methodology: M2M- Differences and Similarities between M2M and IoT, SDN and NFV for IoT; IoT Design Methodology.

UNIT-IV

Domain specific applications of IoT: Home automation, Industry applications, Surveillance Applications, Other IoT applications, challenges of IoT.

UNIT–V

Developing IoTs: Introduction to Python, Implementing IoT concepts with python.

IoT Case Studies: Smart Lighting, Home Intrusion Detection, Smart Parking, Weather Monitoring System, Weather Reporting Bot, Air Pollution Monitoring, Forest Fire Detection, Smart Irrigation.

Reference books:

1. From Internet of Things to Smart Cities: Enabling Technologies,Hongjian Sun, Chao Wang, BasharI Ahmad
2. Internet of Things: A Hands-On Approach,ArshdeepBahga, Vijay Madisetti ,universities press
3. Learning Internet of Things By Peter Waher Packt Publishing Ltd
4. Internet of Things with Python ,GastnCHillar,Packt Publishing Ltd
5. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, John Wiley and Sons,1st Edition, 2014.
6. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill Education, 1st edition, 2017.

Course Outcomes:

1. Able to understand the application areas of IOT ·
2. Able to realize the revolution of Internet in Mobile Devices,Sensor Networks ·
3. Able to understand building blocks of Internet of Things and characteristics.

CSE / CI 314 D	Digital Image Processing

Course Objectives:

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques
3. To study image restoration procedures.
4. To study the image compression procedures.

UNIT – I

Digital image fundamentals:

Introduction: Digital Image- Steps of Digital Image Processing Systems-Elements of Visual Perception -Connectivity and Relations between Pixels. Simple Operations- Arithmetic, Logical, Geometric Operations.

Mathematical Preliminaries - 2D Linear Space Invariant Systems - 2D Convolution - Correlation 2D Random Sequence - 2D Spectrum.

UNIT – II

Image transforms and enhancement:

Image Transforms: 2D Orthogonal and Unitary Transforms-Properties and Examples. 2D DFT-FFT – DCT -Hadamard Transform - Haar Transform - Slant Transform - KL Transform -Properties And Examples.Image

Enhancement:- Histogram Equalization Technique- Point Processing-Spatial Filtering-In Space And Frequency -Nonlinear Filtering-Use Of Different Masks.

Unit – III

Image restoration and construction:

Image Restoration: Image Observation and Degradation Model, Circulant And Block Circulant Matrices and Its

Application In Degradation Model - Algebraic Approach to Restoration- Inverse By Wiener Filtering - Generalized

Inverse-SVD And Interactive Methods - Blind Deconvolution-Image Reconstruction From Projections.

Unit – IV

Image compression & segmentation

Image Compression: Redundancy And Compression Models -Loss Less And Lossy.

Loss Less- Variable-Length, Huffman, Arithmetic Coding - Bit-Plane Coding, Loss Less Predictive Coding, Lossy Transform (DCT) Based Coding, JPEG Standard - Sub Band Coding.

Image Segmentation: Edge Detection - Line Detection - Curve Detection - Edge Linking And Boundary Extraction, Boundary Representation, Region Representation And Segmentation, Morphology-Dilation, Erosion, Opening And Closing. Hit And Miss Algorithms Feature Analysis

Unit – V

Color and multispectral image processing

Color Image-Processing Fundamentals, RGB Models, HSI Models, Relationship Between Different Models.

Multispectral Image Analysis - Color Image Processing Three Dimensional Image Processing-Computerized Axial

Tomography-Stereometry-Stereoscopic Image Display-Shaded Surface Display.

Reference Books:

1 Digital Image Processing, Gonzalez.R.C & Woods. R.E., 3/e, Pearson Education, 2008.

2. Digital Image Processing, Kenneth R Castleman, Pearson Education,1995.

3. Digital Image Procesing, S. Jayaraman, S. Esakkirajan, T. Veerakumar, McGraw Hill Education ,2009.

Pvt Ltd, NewDelhi

4. Fundamentals of Digital image Processing, Anil Jain.K, Prentice Hall of India, 1989.

5. Image Processing, Sid Ahmed, McGraw Hill, New York, 1995.

Course Outcomes:

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation technique.

CSE / CI 315 A	Computer Graphics

OBJECTIVES:
The student should be made to:

- Gain knowledge about graphics hardware devices and software used.
- Understand the two-dimensional graphics and their transformations.
- Understand the three-dimensional graphics and their transformations.
- Be familiar with understand clipping techniques.

UNIT-I:

2D PRIMITIVES: Elements of pictures created in computer graphics, Graphics input primitives and devices.

Drawing primitives in open GL and Basic open GL programming, open GL basic Graphics primitives, Output primitives – Line, Circle and Ellipse drawing algorithms – Attributes of output primitives.

UNIT-II:

2D GEOMETRIC TRANSFORMATIONS: 2D Viewing – Window-Viewport Transformation - Two dimensional Geometric transformations– Line, Polygon, Curve and Text clipping algorithms.

UNIT-III:

3D CONCEPTS: Three-dimensional object representations – Polygon surfaces- Polygon tables-Plane equations – Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces.

TRANSFORMATION AND VIEWING: Three dimensional geometric and modelling transformations; Three-dimensional viewing

UNIT-IV:

MULTIMEDIA BASICS: Introduction and definitions ,applications , elements , Animations , Compression ,Types of Compressions: Lossless , Lossy , Video compression , Image Compression , Audio compression , Data and file format standards –,Multimedia data structures: KD Trees ,R trees.

UNIT-V:

MULTIMEDIA AUTHORING AND APPLICATIONS: Creating interactive multimedia, Multimedia Authoring Systems, Multimedia Authoring, Software Applications, Video On demand, Virtual Reality, Augmented Reality, Content based retrieval in digital libraries.

Reference Books:

1. John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley ,"Computer Graphics: Principles and Practice", , 3rd Edition, Addison- Wesley Professional,2013.
2. Donald D. Hearn, M. Pauline Baker and Warren Carithers, ―Computer Graphics with OpenGL‖, Fourth Edition, Pearson Education, 2010.
3. Ze-Nian Li and Mark S.Drew, ―Fundamentals of Multimedia‖, First Edition, Pearson Education, 2007.
4. F.S.Hill, ―Computer Graphics using OPENGL‖, Second edition, Pearson Education, 2003.
5. Prabhat K Andleigh, Kiran Thakrar, ―Multimedia systems design‖, First Edition, PHI, 2007.

OUTCOMES:

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

- Design two-dimensional graphics.
- Apply two dimensional transformations.
- Design three-dimensional graphics.
- Apply three dimensional transformations.

- Apply clipping techniques to graphics.

CSE / CI 315 B	Advanced Computer Architecture

Course Objectives:

- To make students know about the Parallelism concepts in Programming
- To give the students an elaborate idea about the different memory systems and buses.
- To introduce the advanced processor architectures to the students.
- To make the students know about the importance of multiprocessor and multicomputers.
- To study about data flow computer architectures

Unit-I

Theory of Parallelism: Parallel computer models, The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI models, Architectural development tracks.

Program and network properties: Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

Unit-II

Principals of Scalable performance: Principals of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speedup performance laws, Scalability Analysis and Approaches, Hardware Technologies.

Processes and Memory Hierarchy: Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

Unit-III

Bus Cache and Shared memory: Bus Cache and Shared memory, Bus systems, Cache Memory organizations, Shared- Memory Organizations, Sequential and weak consistency models.

Pipelining and superscalar techniques: Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

Unit-IV

Parallel and Scalable Architectures: Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms.

Multivector and SIMD computers: Vector Processing Principals, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations.

Unit-V

Scalable, Multithreaded and Dataflow Architectures: Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multicomputers, Scalable and multithreaded Architectures, Dataflow and hybrid Architectures.

REFERENCE BOOKS:

1. Kai Hwang and Naresh Jotwani, Advanced Computer Architecture (SIE): Parallelism, Scalability, Programmability, McGraw Hill Education 3/e. 2015.
2. Computer Architecture, Fourth edition, J. L. Hennessy and D.A. Patterson. ELSEVIER.
3. Advanced Computer Architectures, S.G. Shiva, Special Indian edition, CRC, Taylor &Francis.
4. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G. Wellein, CRC Press, Taylor & Francis Group.
5. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.

Course Outcomes:

- Discuss memory organization and mapping techniques.
- Describe architectural features of advanced processors.
- Interpret performance of different pipelined processors.
- Explain data flow in arithmetic algorithms.

CSE / CI 315 C	Software Engineering

Course Objectives

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

UNIT - I Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths. A Generic view of proc.ess: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models. Process models: The waterfall model, incremental process models, evolutionary process models, the unified process.

UNIT - II Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management. System models: Context models, behavioral models, data models, object models, structured methods.

UNIT - III Design Engineering: Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT - IV Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

UNIT - V Metrics for Process and Products: Software measurement, metrics for software quality. Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

REFERENCE BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education. 4. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
5. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
6. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.
7. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education
8. Rajib Mall, Fundamentals of Software Engineering, Prentice Hall India

Course Outcomes:

- Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
- Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report.

CSE / CI 315 D	Distributed Systems

Course Objectives:

- To learn the principles, architectures, algorithms and programming models used in distributed systems.
- To examine state-of-the-art distributed systems, such as Google File System.
- To design and implement sample distributed systems.

UNIT I

Characterization of Distributed Systems: Introduction, Examples of Distributed systems, Resource sharing and web, challenges.

System Models: Introduction, Architectural and Fundamental models.

UNIT II

Time and Global States: Introduction, Clocks, Events and Process states, Synchronizing physical clocks, Logical time and Logical clocks, Global states, Distributed Debugging.

Coordination and Agreement: Introduction, Distributed mutual exclusion, Elections, Multicast Communication, Consensus and Related problems.

UNIT III

Inter Process Communication: Introduction, The API for the internet protocols, External Data Representation and Marshalling, Client-Server Communication, Group Communication.

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects, Remote Procedure Call, Events and Notifications.

UNIT IV

Distributed File Systems: File service architecture - network file system- Andrew file system recent advances

Transactions and concurrency control: nested transactions, locks, optimistic concurrency control, comparison of methods for concurrency control

UNIT V

Distributed Transactions: Flat and Nested Distributed Transactions, distributed deadlocks, transactions recovery.

Replication System model and group communication: fault tolerant services, transactions with replicated data.

REFERENCE BOOKS:

1. Distributed Systems, Concepts and Design, George Coulouris, J Dollimore and Tim Kindberg, Pearson Education, 5th Edition,2012.
2. Andrew S.Tanenbaum, Maarten Van Steen, ―Distributed Systems‖, Third Edition (2017), Pearson Education/PHI..
3. Distributed Systems, An Algorithm Approach, Sikumar Ghosh, Chapman & Hall/CRC, Taylor & Fransis Group, 2007.

Course Outcomes:

- Students will identify the core concepts of distributed systems: the way in which several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.
- Students will examine how existing systems have applied the concepts of distributed systems in designing large systems, and will additionally apply these concepts to develop sample systems.

CSE / CI 351	Java Lab

COURSE OBJECTIVES:

1. To teach fundamentals of object oriented programming in Java. Understand various concepts of JAVA.
2. To familiarize Java environment to create, debug and run simple Java programs.
3. To demonstrate java compiler and eclipse platform and learn how to use Net Beans IDE to create Java Application.

Programs:

1. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer. (use Scanner class to read input)
2. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.
3. Write a Java program to multiply two given matrices.
4. Write a Java program that checks whether a given string is a palindrome or not.
5. Write a Java program to create a Student class and find the grade of the student.
6. Write a java program to create an abstract class named Shape contains number Of Sides ( ) method and Trapezoid, Triangle and Hexagon classes extends the class Shape.
7. Write a Java program to read copy content of one file to other by handling all file related exceptions.
8. Write a Java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
9. Write a Java program that reads a file and displays the file on the screen.
10. Write a Java program that displays the number of characters, lines and words in a text file.
11. Write a Java program that creates three threads. First thread displays “Good Morning” everyone second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.
12. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.
13. Write a Java program for handling mouse events.
14. Write a Java program for handling key events using Adapter classes
15. Develop simple calculator using Swings.

COURSE OUTCOMES:

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

1. Implement Object oriented features using Java
2. Apply the concept of polymorphism and inheritance.
3. Implement exception handling
4. Develop network and window application using awt and swings.

CSE / CI 352	Design & Analysis of Algorithms Lab

1. Write a java program for merge sort.
2. Write a java program for maximum and minimum problem.
3. Write a java program for solving knapsack problem using greedy method
4. Write a java program for solving single source shortest path problem using greedy method
5. Write a java program for solving multistage graph problem using dynamic method
6. Write a java program for solving string editing problem using dynamic method
7. Write a java program for solving matrix chain multiplication problem using dynamic method
8. Write a java program for solving 4-queens problem using backtracking
9. Write a java program for solving sum of subsets problem using backtracking
10. Write a java program for solving graph colouring problem using backtracking
11. Write a java program for solving Hamiltonian cycle problem using backtracking
12. Write a java program for solving travelling sales man problem using branch and bound.

CSE / CI 353 A	VHDL Lab

VHDL Modelling and Synthesis of the following Experiments

1. Logic gates
2. Adders (Hall adder & Full Adder)
3. Code Converter (Binary to Gray & Gray to Binary)
4. 4x16 Decoder
5. 16x4 Encoder
6. Comparator
7. Arithmetic Logic Unit (ALU)
8. BCD to 7-Segment Display
9. Multiplexer/De-multiplexer
10. Flip Flops: JK/T/D
11. Counter
12. Moore state Machine
13. Mealy State Machine
14. Traffic light controller
15. Universal Asynchronous Receiver Transmitter (UART)

CSE / CI 353 B	Digital Signal Processing Lab

Experiments Based on Tool Boxes

1. Simulation of AM.
2. Simulation of FM.
3. Simulation of LPF and HPF.
4. Fourier Transforms.
5. Simulation of M-ary PSK.
6. Simulation of DPCM.
7. Evaluation of DFT and IDFT of 16 Sample Sequence using DIT Algorithm.
8. Evaluation of DFT and IDFT of 16 Sample Sequence using DIF Algorithm.
9. Design of IIR Butterworth Filter using Impulse Invariant Method.
10. Design of FIR Filter using Windowing Technique.
11. Convolution of Two Signals.
12. Correlation of Two Signals.
13. DFT Analysis of a Noise Corrupted Signal.

CSE / CI 353 C	Internet of Things Lab

Digital Sensors:

1. Write an Arduino/python program for LED RED, GREEN and BLUE sensors
2. Write an Arduino/python program for touch sensor
3. Write an Arduino/python program for push button sensor
4. Write an Arduino/python program for motion sensor
5. Write an Arduino/python program for buzzer ringing based on the input

Analog Sensors:

1. Write an arduino/python program for temperature sensor
2. Write an arduino/python program for gas sensor
3. Write an arduino/python program for rotation sensor
4. Write an arduino/python program for light sensor
5. Write an arduino/python program for ultrasonic sensor
6. Write an arduino/python program for moisture sensor
7. Write an arduino/python program for sound sensor
8. Write an arduino/python program for magnetic sensor
9. Write an arduino/python program for sending message to the mobile

Note: Can use any simulation tools for implementing above list of programs.

CSE / CI 353 D	Digital Image Processing Lab

1. Write a MATLAB program to extract different Attributes of an Image.
2. Write a MATLAB program for image enhancement
3. Write a MATLAB program for Image Negation.
4. Write a MATLAB program for image compression
5. Write a MATLAB program for color image processing
6. Write a MATLAB program for image segmentation
7. Write a MATLAB program for image morphology
8. Write a MATLAB program for Image Restoration
9. Write a MATLAB program for Power Law Transformation.
10. Write a MATLAB program for Histogram Mapping and Equalization.
11. Write a MATLAB program for Image Smoothening and Sharpening.
12. Write a MATLAB program for Edge Detection using Sobel, Prewitt and Roberts Operators.
13. Write a MATLAB program for Morphological Operations on Binary Images.
14. Write a MATLAB program for Pseudo Coloring.
15. Write a MATLAB program for Chain Coding.
16. Write a MATLAB program for DCT/IDCT Computation.

CSE / CI 354	Mobile Application development Lab

OBJECTIVES:

- To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- To understand how to work with various mobile application development frameworks.
- To learn the basic and important design concepts and issues of development of mobile applications.
- To understand the capabilities and limitations of mobile devices.

LIST OF EXPERIMENTS

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Develop an application that makes use of databases.
4. Develop an application that makes use of Notification Manager
5. Develop a native application that uses GPS location information
6. Implement an application that for basic calculator
7. Implement an application that creates an alert upon receiving a message
8. Write a mobile application that makes use of RSS feed
9. Develop a mobile application to send an email.
10. Develop a Mobile application for simple needs (Mini Project)

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Develop mobile applications using GUI and Layouts.
- Develop mobile applications using Event Listener.
- Develop mobile applications using Databases.
- Develop mobile applications using RSS Feed, Internal/External Storage, SMS, Multi-threading and GPS.
- Analyze and discover own mobile app for simple needs.

REFERENCES:

1. Build Your Own Security Lab, Michael Gregg, Wiley India

ACHARYA NAGARJUNA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2019-2022 (R19)
COMPUTER SCIENCE & ENGINEERING (CSE)
COMPUTER SCIENCE & INFORMATION TECHNOLOGY(CI)

III/IV B.TECH - SEMESTER II (R19)(R19 Regulation - Structure & Syllabus)

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE / CI 321	Cryptography & Network Security	PC	3	0	0	40	60	3
2	CSE / CI 322	Artificial Intelligence & Machine Learning	PC	3	0	0	40	60	3
3	CSE / CI /ECE 323	Computer Networks	PC	3	0	0	40	60	3
4	CSE / CI 324	Job Elective – 2	JE-2	3	0	0	40	60	3
5	CSE / CI 325	Professional Elective-2	PE-2	3	0	0	40	60	3
6	CSE / CI 361	AI&ML Lab	PC	0	0	3	40	60	1.5
7	CSE / CI/ 362	Computer Networks Lab	PC	0	0	3	40	60	1.5
8	CSE / CI 363	JE2 Lab	JE 2 Lab	0	0	3	40	60	1.5
9	CSE / CI 364	.NET programming Lab	SKILL	0	0	3	40	60	2
Total Credits									21.5`

JE-2 (Lab Oriented)

E. Soft Computing
F. Data Engineering
G. Digital Image Processing
H. Software Testing Methodologies

PE-2

E. Wireless Networks
F. High Performance Computing
G. Cloud Computing Architecture and Its Applications
H. Advanced Databases

CSE / CI 321	Cryptography & Network Security

Course Objectives:

- To understand basics of Cryptography and Network Security.
- To be able to secure a message over insecure channel by various means.
- To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
- To understand various protocols for network security to protect against the threats in the networks.

UNIT I

Need for Security – Attacks, Services and Mechanisms, Classical encryption Techniques, Block ciphers and data encryption, standard. Advanced encryption standard, evaluation criteria of AES, Symmetric ciphers- multiple encryption and triple DES, Block cipher modes of operation, Stream ciphers and RC4, Stream ciphers – Blowfish, Modern Symmetric encryption - IDEA,

UNIT-II

Introduction to number theory- Prime numbers, Fermat's and Euler's theorems, Chinese Remainder Theorem, Discrete logarithms, Public key cryptography - Principles of public key cryptosystems and RSA, Key management, Diffie-Hellman key exchange, Elliptic curve arithmetic, Elliptic curve cryptography, Key Distribution, Message authentication and Hash functions-Authentication functions, Security and Hash functions and MACs, HMAC, CMAC, Digital signatures and authentication protocols, Authentication protocols, Digital signature standard.

UNIT III

Attacks- Denial-of-service/Distributed denial-of-service attacks, Back door, Spoofing, Man-inthe-middle, Replay, TCP/Hijacking, Fragmentation attacks, Weak keys, Mathematical attacks, Social engineering, Port scanning, Dumpster diving, Birthday attacks, Password guessing, Software exploitation, Inappropriate system use, Eavesdropping, War driving, TCP sequence number attacks, War dialing/demon dialing attacks.

UNIT IV

Other public Key Cryptosystems –Public key algorithms using GMP, Introduction to packet sniffing tool, Architecture of SSL, Attacks on SSL, Introduction to Intruder detection System, Snort and stenographic tools.

UNIT V

Wireless and IP Security-IEEE 802.11 Wireless Security, WEP, WEP security upgrades, IEEE 802.11i, Wireless application protocol, IP Security architecture, Authentication header, Encapsulating security pay load, combining security associations.

Reference Books:

1. William Stallings, Cryptography and Network Security, Pearson Education, 2006
2. Eric Cole, Dr. Ronald Kurtz and James W. Conley, Network Security Bible, Wiley Publishers, 2009
3. Jason Albanese and Wes Sonnenreich, Network Security Illustrated, MGH Publishers, 2003

COURSE OUTCOMES:

After successful completion of the course, the learners would be able to

- Describe network security services and mechanisms.
- Symmetrical and Asymmetrical cryptography.
- Data integrity, Authentication, Digital Signatures.

- Various network security applications, IPSec, Firewall, IDS, Web security, Email security, and Malicious software etc.

CSE / CI 322	Artificial Intelligence & Machine Learning

Course Objectives:

1. the ability to adapt, contribute and innovate new technologies and systems in the key domains of Artificial Intelligence and Machine Learning.
2. Will be able to successfully pursue higher education in reputed institutions with AI Specialization.
3. Graduates will have the ability to explore research areas and produce outstanding contribution in various areas of Artificial Intelligence and Machine Learning.
4. Graduates will be ethically and socially responsible solution providers and entrepreneurs in the field of Computer Science and Engineering with AI/ML Specialization.

UNIT-I

Introduction: Cousins of Artificial Intelligence, Applications, Stages and types of AI, intelligent agents,

Problem Solving: Solving Problems by Searching, heuristic search techniques, constraint satisfaction problems.

UNIT-II

Game Playing: Minimax search, Evaluation functions, Markov Decision Processes, Reinforcement learning for games.

Knowledge and Reasoning: Building a Knowledge Base: Propositional logic, first order logic, Theorem Proving in First Order Logic. Uncertain Knowledge and Reasoning, Probabilities, Introduction to Natural Language Processing.

UNIT-III

Introduction to machine learning: Concept Learning and the General to Specific Ordering: 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 and inductive bias.

Decision Tree Learning: Decision Tree representation, appropriate problems for Decision Tree learning, hypothesis space search in Decision Tree learning, inductive bias in Decision Tree learning and issues in Decision Tree learning.

UNIT-IV

Artificial Neural Networks: Neural Network representations, appropriate problems for Neural Network learning, Perceptrons, Multilayer Networks and the Backpropagation algorithm and remarks on the Backpropagation algorithm.

Bayesian Learning: Bayes theorem and concept learning, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classier, Gibbs algorithm, Naive Bayes classier, Bayesian belief networks and EM algorithm.

UNIT-V

Instance Based Learning: Introduction, k-Nearest Neighbour learning, locally weighted regression, radial basis functions, Case Based Reasoning and remarks on Lazy and Eager learning.

Genetic Algorithms: Introduction, hypothesis space search, Genetic programming and models of evolution and learning.

Reference Books:

1. Artificial Intelligence, A modern Approach, Second Edition by Stuart Russell, Peter Norvig.
2. Tom M. Mitchell, "Machine Learning", Mc. Graw Hill Publishing.

Course Outcomes:

After completing this course, the student will be able to:

1. Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems.

2. Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

3. Demonstrate proficiency in applying scientific method to models of machine learning.

4. Discuss the awareness of ANN and different optimizations techniques.

CSE / CI / ECE 323	Computer Networks

Course Objectives:

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

1. Build an understanding of the fundamental concepts of data communication and computer networking.
2. Understand how errors detected and corrected that occur in transmission
3. How collisions to be handled when many stations share a single channel
4. Know about routing mechanisms and different routing protocols
5. Understand transport layer functions
6. Know about different application layer protocols

UNIT I:

Introduction: Uses of Computer Networks, Network Hardware, LANs, MANs, WANs, Network Software.

Reference Models: The OSI Reference Model, TCP/IP Reference Model, the comparison of OSI, and TCP/IP reference models.

The Physical Layer: Guided transmission media: Magnetic Media, Twisted Pair, Coaxial Cable, and Fiber Optics.

UNIT II:

The Data Link Layer: Data link layer design issues, Error detection and correction, Elementary data link protocols, and Sliding window protocols.

The Medium Access Control Sub layer: The channel allocation problem, multiple access protocols, ETHERNET, and Wireless LANs.

UNIT III:

The Network Layer: Network Layer Design Issues, Routing Algorithms: Shortest Path, Flooding, DVR, and Link State routing algorithm, Congestion Control Algorithms, and Quality of Service. IP protocol and IP address.

UNIT – IV

The Transport Layer: The Transport Service, Elements of Transport Protocols, and the Internet Transport Protocols: UDP- Remote Procedure Call, The Real-Time Transport Protocol, TCP- Introduction to TCP, The TCP Service model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modeling, TCP Transmission Policy, Congestion Control, TCP Timer Management.

UNIT - V

Application Layer: The Domain Name System (DNS) – Resource Records, Name Servers, E-Mail – Architecture and Services, POP3, IMAP, World Wide Web – Architectural Overview, Server side, Uniform Resource Locators, Statelessness and Cookies.

Reference Books:

1.Andrew S Tanenbaum, Computer Networks.4 ed, Pearson Education / PHI.
2.Behrouz A.Forouzan, Data Communications and Networking. 4 ed, TATA McGraw Hill
3.Kurose and Ross, Computer Networks – A Top-down Approach Featuring the Internet.'Pearson Education.

Course Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

1. Describe the basis and structure of an abstract layered protocol model
2. Independently understand basic computer network technology.
3. Identify the different types of network topologies and protocols.
4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
5. Identify the different types of network devices and their functions within a network
6. Understand and building the skills of subnetting and routing mechanisms.
7. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation
8. Understand how the Internet works today.

CSE / CI 324(A)	Soft Computing

Course Objectives:
This course makes the students to Understand

- Fundamentals of Neural Networks & Feed Forward Networks.
- Associative Memories & ART Neural Networks.
- Fuzzy Logic & Systems.
- Genetic Algorithms and Hybrid Systems.

UNIT I
FUZZY SYSTEMS:
Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.
UNIT II
OPTIMAIZATION:
Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.
UNIT III
NEURALNETWORKS
Supervised Learning Neural Networks – Perceptrons – Adaline – Backpropagation. Mutilayer Perceptrons – Radial Basis Function Networks –Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.
UNIT IV
NEUROFUZZY MODELING:
Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.
UNIT V :
APPLICATIONS OF COMPUTATIONAL INTELLIGENCE:
Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel. Efficiency Prediction – Soft Computing for Color Recipe Prediction.

REFERENCES:
1. J.S.R. Jang, C.T. Sun and E. Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill,

1997.
3. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 1989.
4. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms.

Course Outcomes:

On completion of this course the students will be able to

- Identify and employ suitable soft computing techniques in classification and optimization problems.
- Design hybrid systems to suit a given real – life problem.

CSE / CI 324(B)	Data Engineering

Objective:

This course gives an introduction to methods and theory for development of data warehouses and data analysis using data mining. Data quality and methods and techniques for pre-processing of data. Algorithms for classification, clustering and association rule analysis. Practical use of software for data analysis.

UNIT – I

Data Warehouse – Introduction, A Multi-dimensional data model, Data Warehouse Architecture, Data Warehouse Implementation.

Data Mining – Introduction, Data Mining, Kinds of Data, Data Mining Functionalities, Classification of Data Mining Systems, Major issues in Data Mining.

UNIT – II

Data Pre-processing – Data cleaning, Data Integration & Transformation, Data Reduction, Discretization & Concept Hierarchy Generation, Data Mining Primitives.

Mining Association roles in large databases – Association rule mining, mining single-dimensional Boolean Association rules from Transactional Databases, Mining Multi-dimensional Association rules from relational databases & Data Warehouses.

UNIT – III

Cluster Analysis – Introduction, Types of data in Cluster analysis, A categorization of major clustering methods, partitioning methods, Hierarchical methods, Density-Based Methods: DBSCAN, Grid-based Method: STING; Model-based Clustering Method: Statistical approach, Outlier analysis.

UNIT – IV

Classification & Prediction – Introduction, Classification by Decision tree induction, Bayesian Classification,Classification by Back propagation, Other Classification Methods, Prediction, Classifier accuracy.

UNIT-V

Mining Complex Type of Data – Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Text Databases, Mining the World Wide Web.

Textbooks:

1.Data Mining Concepts & Techniques – Jiawei Han MichelineKamber – Morgan Kaufmann Publishers.

Reference Books:

1. Data Warehouse Toolkit – Ralph Kinball – John Wiley Publishers.

2. Data Mining (Introductory and Advanced Topics) – Margaret H.Dunham – Pearson Education.

3. Data Warehousing in the real world – A Practical guide for Building decision support systems – Sam Anahory, Dennis Murray – Pearson Education.

4. Introduction to Data Mining with case studies – G.K.Gupta, PHI Publications, 2006

Course Outcomes

- This course gives an introduction to methods and theory for development of data warehouses and data analysis using data mining.
- Data quality and methods and techniques for pre-processing of data.
- Modelling and design of data warehouses.
- Algorithms for classification, clustering and association rule analysis.

CSE / CI 324(C)	Digital Image Processing

Course Objectives:

5. To study the image fundamentals and mathematical transforms necessary for image processing.
6. To study the image enhancement techniques
7. To study image restoration procedures.
8. To study the image compression procedures.

UNIT – I

Digital image fundamentals:

Introduction: Digital Image- Steps of Digital Image Processing Systems-Elements of Visual Perception -Connectivity and Relations between Pixels. Simple Operations- Arithmetic, Logical, Geometric Operations.

Mathematical Preliminaries - 2D Linear Space Invariant Systems - 2D Convolution - Correlation 2D Random Sequence - 2D Spectrum.

UNIT – II

Image transforms and enhancement:

Image Transforms: 2D Orthogonal and Unitary Transforms-Properties and Examples. 2D DFT-FFT – DCT -Hadamard Transform - Haar Transform - Slant Transform - KL Transform -Properties And Examples.Image

Enhancement:- Histogram Equalization Technique- Point Processing-Spatial Filtering-In Space And Frequency -Nonlinear Filtering-Use Of Different Masks.

Unit – III

Image restoration and construction:

Image Restoration: Image Observation and Degradation Model, Circulant And Block Circulant Matrices and Its

Application In Degradation Model - Algebraic Approach to Restoration- Inverse By Wiener Filtering - Generalized

Inverse-SVD And Interactive Methods - Blind Deconvolution-Image Reconstruction From Projections.

Unit – IV

Image compression & segmentation

Image Compression: Redundancy And Compression Models -Loss Less And Lossy.

Loss Less- Variable-Length, Huffman, Arithmetic Coding - Bit-Plane Coding, Loss Less Predictive Coding, Lossy Transform (DCT) Based Coding, JPEG Standard - Sub Band Coding.

Image Segmentation: Edge Detection - Line Detection - Curve Detection - Edge Linking And Boundary Extraction, Boundary Representation, Region Representation And Segmentation, Morphology-Dilation, Erosion, Opening And Closing. Hit And Miss Algorithms Feature Analysis

Unit – V

Color and multispectral image processing

Color Image-Processing Fundamentals, RGB Models, HSI Models, Relationship Between Different Models.

Multispectral Image Analysis - Color Image Processing Three Dimensional Image Processing-Computerized Axial

Tomography-Stereometry-Stereoscopic Image Display-Shaded Surface Display.

Reference Books:

1 Digital Image Processing, Gonzalez.R.C & Woods. R.E., 3/e, Pearson Education, 2008.

2. Digital Image Processing, Kenneth R Castleman, Pearson Education,1995.
3. Digital Image Procesing, S. Jayaraman, S. Esakkirajan, T. Veerakumar, McGraw Hill Education ,2009.
Pvt Ltd, NewDelhi
4. Fundamentals of Digital image Processing, Anil Jain.K, Prentice Hall of India, 1989.
5. Image Processing, Sid Ahmed, McGraw Hill, New York, 1995.

Course Outcomes:

7. Review the fundamental concepts of a digital image processing system.
8. Analyze images in the frequency domain using various transforms.
9. Evaluate the techniques for image enhancement and image restoration.
10. Categorize various compression techniques.
11. Interpret Image compression standards.
12. Interpret image segmentation and representation technique.

CSE / CI 324(D)	Software Testing Methodologies

COURSE OBJECTIVES

The objective of this course is:

1. Introducing various design approaches, models and metrics.
2. Presenting various techniques and strategies of software testing and inspection and pointing out the importance of testing in achieving high-quality software.
3. Understand concept of reliability, the role it plays in software engineering, and how it is modeled and measured.
4. Showing how software product and process are managed and controlled for maintaining software quality assurance.
5. Highlighting importance of software maintenance, restructuring, and reengineering.
6. Presenting the various techniques of software cost estimation and risk assessment.

Unit I: Introduction

Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and cor-rectness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

Unit II: White Box and Black Box Testing

White box testing, static testing, static analysis tools, Structural testing: Module/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/ graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

Unit III: Integration, System, and Acceptance Testing

Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

Unit IV: Test Selection & Minimization for Regression Testing

Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

Unit V: Test Management and Automation

Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

REFERENCES:

1. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
3. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley ,K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.
4. Software Testing techniques – Baris Beizer, Dreamtech, second edition.
5. Software Testing Tools – Dr.K.V.K.K.Prasad, Dreamtech.
6. Paul C. Jorgensen, Software Testing: A Craftsman‟s Approach, 3rd Edition, CRC Press, 2007.

7. Boris Beizer, Software Testing Techniques, Dreamtech, 2009.

COURSE OUTCOMES

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

1. Use the appropriate methods and tools for estimating software cost.
2. Understand the difference between different software design models and techniques and how to apply them.
3. Recognize the importance of software reliability and how we can design dependable software, and what measures are used.
4. Understand the principles and techniques underlying the process of inspecting and testing software and making it free of errors and tolerable.
5. Recognize the importance of software standards and quality assurance.
6. Apply the appropriate software evolution methods for maintaining, restructuring available software and managing soft-ware development.

CSE / CI 325(A)	Wireless Networks

Course Objectives:

- The students should get familiar with the wireless/mobile market and the future needs and challenges.
- To get familiar with key concepts of wireless networks, standards, technologies and their basic Operations.
- To learn how to design and analyze various medium access.
- To learn how to evaluate MAC and network protocols using network simulation software tools.
- The students should get familiar with the wireless/mobile market and the future needs and challenges.

UNIT-I: Introduction- Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies - CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in Mobile Computing: Resource poorness, Bandwidth, energy etc. Wireless Local Area Networks- IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF& PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues.

UNIT–II: Wireless Cellular Networks-1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular systems, Spread spectrum Technologies.

UNIT-III: WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview, Wireless Sensor Networks: Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.

UNIT–IV: Wireless PANs-Bluetooth AND Zigbee, Introduction to Wireless Sensors.

UNIT–V: Security-Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless communication. Advanced Topics: IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks

Reference Books:

1. Schiller J., Mobile Communications, Addison Wesley, 2000. 2. Stallings W., Wireless Communications and Networks, Pearson Education 2005.
2. Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc, 2002.
3. Yi Bing Lin and Imrich Chlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc, 2000.
4. Pandya Raj, Mobile and Personal Communications Systems and Services, PHI, 2000.

Course Outcomes:

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

- Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.
- Be able to design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.
- Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
- Design wireless networks exploring trade-offs between wire line and wireless links.
- Develop mobile applications to solve some of the real-world problems.

CSE / CI 325(B)	High Performance Computing

Course Objectives:

1. Provide systematic and comprehensive treatment of the hardware and the software high performance techniques involved in current day computing.
2. Introduce the fundamentals of high-performance computing with the graphics processing units and many integrated cores using their architectures and corresponding programming environments.
3. Introduce the learner to fundamental and advanced parallel algorithms through the GPU and MIC programming environments
4. Provide systematic and comprehensive treatment of the components in the pipeline that extract instruction level parallelism.
5. Provide a strong foundation on memory hierarchy design and trade-offs in both uniprocessor and multiprocessors.
6. Illustrate the cache coherence and consistency problems in multiprocessors, and their existing solutions.

UNIT- I

Graphics Processing Units: Introduction to Heterogeneous Parallel Computing. GPU architecture. Thread hierarchy. GPU Memory Hierarchy.

UNIT-II

GPU Programming: Vector Addition, Matrix Multiplication algorithms. 1D, 2D, and 3D Stencil Operations. Image Processing algorithms – Image Blur, Gray scaling. Histogramming, Convolution, Scan, Reduction techniques.

UNIT-III

Many Integrated Cores: Introduction to Many Integrated Cores. MIC, Xeon Phi architecture. Thread hierarchy. Memory Hierarchy. Memory Bandwidth and performance considerations.

UNIT-IV

Shared Memory Parallel Programming: Symmetric and Distributed architectures. OpenMP Introduction. Thread creation, Parallel regions. Work-sharing, Synchronization.

UNIT-V:

Message Passing Interface: MPI Introduction. Point to Point communication, Collective communication. Data grouping for communication.

Reference Books:

1. Wen-Mei W Hwu, David B Kirk, Programming Massively Parallel Processors A Hands-on Approach, Morgann Kaufmann, 3e.
2. Rezaur Rahman, Intel Xeon Phi Coprocessor Architecture and Tools, Apress Open, 2013.
3. Barbara Chapman, Gabriele Jost, Ruud van der Pas, Using OpenMP, MIT Press, 2008.
4. Gropp, Lusk, Skjellum, Using MPI, Using MPI, 2014.

Course Outcomes:

1. The learner will be able to design, formulate, solve and implement high performance versions of standard single threaded algorithms.

2. The learner will know and will be able to demonstrate the architectural features in the GPU and MIC hardware accelarators.
3. The learner will be able to design programs to extract maximum performance in a multicore, shared memory execution environment processor.
4. The learner will be able to design and deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm.

CSE / CI 325(C)	Cloud Computing Architecture and Its Applications

Course outcomes:

The students should be able to:

• Explain cloud computing, virtualization and classify services of cloud computing

• Illustrate architecture and programming in cloud

• Describe the platforms for development of cloud applications and List the application of cloud.

Unit-1: Introduction to Cloud Computing

Introduction ,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, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjrasoft Aneka.

Unit-2: Virtualization and Cloud Computing Architecture

Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples Xen: Paravirtualization, VMware: Full Virtualization, Microsoft Hyper-V.

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 Definition, Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy Organizational Aspects.

Unit-3: Cloud Application Platform

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-4: Concurrent and Data Intensive Computing

Thread Programming, Introducing Parallelism for Single Machine Computation, Programming Applications with Threads, What is a Thread?, Thread APIs, Techniques for Parallel Computation with Threads, Multithreading with Aneka, Introducing the Thread Programming Model, Aneka Thread vs. Common Threads, Programming Applications with Aneka Threads, Aneka Threads Application Model, Domain Decomposition: Matrix Multiplication, Functional Decomposition: Sine, Cosine, and Tangent.

High-Throughput Computing: Task Programming, Task Computing, Characterizing a Task, Computing Categories, Frameworks for Task Computing, Task-based Application Models, Embarrassingly Parallel Applications, Parameter Sweep Applications, MPI Applications, Workflow Applications with Task Dependencies, Aneka Task-Based Programming, Task Programming Model, Developing Applications with the Task Model, Developing Parameter Sweep Application, Managing Workflows.

UNIT-5: Data Intensive Computing and Cloud Platforms in Industry

Map-Reduce Programming, What is Data-Intensive Computing?, Characterizing Data-Intensive Computations, Challenges Ahead, Historical Perspective, Technologies for Data-Intensive Computing, Storage Systems, Programming Platforms, Aneka Map Reduce Programming, Introducing the Map Reduce Programming Model, Example Application.

Cloud Platforms in Industry, Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google AppEngine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

Text Books:

1. RajkumarBuyya, Christian Vecchiola, and ThamaraiSelvi Mastering Cloud. Computing McGraw Hill Education

Reference Books:

1. Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, Elsevier 2013.

CSE / CI 325(D)	Advanced Databases

OBJECTIVES:

- To understand the design of databases.
- To acquire knowledge on parallel and distributed databases and its applications.
- To study the usage and applications of Object Oriented and Intelligent databases.
- To understand the emerging databases like Mobile, XML, Cloud and Big Data

UNIT I

PARALLEL AND DISTRIBUTED DATABASES

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems.

Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems

Distributed Database Concepts: Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing

UNIT II

INTELLIGENT DATABASES

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy-Applications- Design Principles for Active Rules.

Temporal Databases: Overview of Temporal Databases TSQL2- Deductive Databases-Recursive Queries in SQL.

Spatial Databases: Spatial Data Types - Spatial Relationships - Spatial Data Structures-Spatial Access Methods - Spatial Database Implementation.

UNIT III

XML DATABASES

XML Databases: XML Data Model – DTD – XML Schema – XML Querying – Web Databases – Open Database Connectivity.

UNIT IV

MOBILE DATABASES

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols

UNIT V

MULTIMEDIA DATABASES

Multidimensional Data Structures – Image Databases – Text / Document Databases – Video Databases – Audio Databases – Multimedia Database Design.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, —An Introduction to Database Systems‖, Eighth Edition, Pearson Education, 2006.
2. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, —Advanced Database Systems‖, Morgan Kaufmann publishers,2006.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, —Database System Concepts‖, Sixth Edition, McGraw Hill, 2011.
4. R. Elmasri, S.B. Navathe, —Fundamentals of Database Systems‖, Sixth Edition, Pearson Education/Addison Wesley, 2010.
5. Vijay Kumar, —Mobile Database Systems‖, John Wiley & Sons, 2006.

OUTCOMES:

Upon completion of this course, a students should be able:

- To develop skills on databases to optimize their performance in practice.
- To analyze each type of databases and its necessity
- To design faster algorithms in solving practical database problems

CSE / CI 361	AI&ML Lab

Learn Prolog/ Python programming/R- language and implement programs on below topics

1. Write a LISP program to solve the water-jug problem using heuristic function.
2. Create a compound object using Turbo Prolog.
3. Write a program to use of BEST-FIRST SEARCH applied to the eight puzzle problem.
4. a) Implement A* Search algorithm.
   b) Implement AO* Search algorithm.
5. a) 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.

   b) Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
6. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
7. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
8. a) Classification: Identifying to which category an object belongs to.
   b) Regression: Predicting a continuous-valued attribute associated with an object.
   c) Clustering: Automatic grouping of similar objects into sets
   d) Dimensionality reduction: Reducing the number of random variables to consider.
9. Pre-processing: Feature extraction and normalization.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

CSE / CI / 362	Computer Networks Lab

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Study of Network Devices in Detail.
3. Study of network IP.
4. Connect the computers in Local Area Network.
5. Study of basic network command and Network configuration commands.
6. Performing an Initial Switch Configuration
7. Performing an Initial Router Configuration
8. Configuring and Troubleshooting a Switched Network
9. Connecting a Switch
10. Using the Cisco IOS Show Commands
11. Interpreting Ping and Traceroute Output
12. Placing ACLs
13. Implementing an IP Addressing Scheme
14. Examining Network Address Translation (NAT)
15. Configuring RIP

CSE / CI 363 (A)	Soft Computing Lab

1. Create a perceptron with appropriate number of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required and output the final weights.
2. a) Write a program to implement artificial neural network without back propagation.
   b) Write a program to implement artificial neural network with back propagation.
3. Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations.
4. Implement travelling sales person problem (tsp) using genetic algorithms**.**
5. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on soya bins data. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.
6. Implement linear regression and multi-regression for a set of data points
7. Implement crisp partitions for real-life iris dataset.
8. Write a program to implement Hebb's rule Write a program to implement Delta rule.
9. Write a program to implement logic gates.
10. Implement SVM classification by fuzzy concepts.

CSE / CI 363(B)	Data Engineering Lab

1. Analyzing data with ROLLAP, CUBE.

2. Perform Cube slicing – come up with 2-D view of data.

3. Apply Drill-down or Roll-down- going from summary to more detailed data.
4. Apply Dicing – projecting 2-D view of data.
5. Creating Star Schema/snowflake Schema.
6. Create and populate FACT table.
7. Build dimensions using tool.
8. ETL : Extraction Options
    a) Perform Full extraction
    b) Perform Incremental extraction
    c) Perform Change Data Capture(CDC)
9. ETL: Transformation Options
    a) Apply Transformation: during extraction, in staging area, during load, etc.
    b) Apply Multi-state transformation
    c) Apply Pipelined transformation

CSE / CI 363(C)	Digital Image Processing Lab

1. Write a MATLAB program to extract different Attributes of an Image.
2. Write a MATLAB program for image enhancement
3. Write a MATLAB program for Image Negation.
4. Write a MATLAB program for image compression
5. Write a MATLAB program for colour image processing
6. Write a MATLAB program for image segmentation
7. Write a MATLAB program for image morphology
8. Write a MATLAB program for Image Restoration
9. Write a MATLAB program for Power Law Transformation.
10. Write a MATLAB program for Histogram Mapping and Equalization.
11. Write a MATLAB program for Image Smoothening and Sharpening.
12. Write a MATLAB program for Edge Detection using Sobel, Prewitt and Roberts Operators.
13. Write a MATLAB program for Morphological Operations on Binary Images.
14. Write a MATLAB program for Pseudo Colouring.
15. Write a MATLAB program for Chain Coding.
16. Write a MATLAB program for DCT/IDCT Computation.

CSE / CI 363(D)	Software Testing Methodologies Lab

1. **CONSTRUCTS**
   Write programs in C language to demonstrate the working of the following constructs:
   a) while b) switch c) for d) if-else e) do-while
2. **SYSTEM SPECIFICATIONS**
   a. Study the system specifications of ATM system and report various bugs in it.
   b. Study the system specifications of banking application and report various bugs in it.
3. **TEST CASES**
   a. Write the test cases for ATM system.
   b. Write the test cases for banking application.
4. **TEST PLAN**
   a. Create a test plan document for any application (e.g. Library management system)
5. **TESTING TOOL**
   a. Study of any testing tool (e.g. Win runner)
6. **SELENIUM**
   a. Study of web testing tool (e.g. Selenium).
7. **BUG TRACKING TOOL**
   a. Study of bug tracking tool (e.g. Bugzilla)
8. **BUGBIT**
   a. Study of bug tracking tool (e.g. Bugbit).
9. **TEST MANAGEMENT TOOL**
   a. Study of any test management tool (e.g. Testdirector)
10. **OPEN SOURCE TESTING TOOL**
    a. Study of any Open Source Testing Tool (e.g. Test Link).
11. **AUTOMATED FUNCTIONAL TESTING TOOL**
    a. Study of QTP (Quick Test Professional) automated functional testing tool
12. **INTROSPECTION OF MATRIX MULTIPLICATION**
    a**.** A program written in C language for matrix multiplication fails, introspect the causes for its failure and write down the possible reasons for its failure.

CSE / CI 364	.NET programming Lab

OBJECTIVES:

This Lab course will help students to achieve the following objectives:

1.Introduce to .Net IDE Component Framework.

2.Programming concepts in .Net Framework.

3.Creating website using ASP.Net Controls.

LIST OF EXPERIMENTS

1. Create a windows form with the following controls Textbox, Radio button, Check box, Command Button

2. Write a program for Menu option.

3. Create a program to connect with database and manipulate the records in the database using ADO .NET

4. Create a program to implement the concepts of OOPS for creating class, inheritance

5. Create a program to perform input validation using procedure.

6. Write a program to open a file and using I/O operations write contents into a file and read the contents from the file.

7. Create a window form using HTML controls.

8. Create a program to perform validation using validation controls.

9. Create a program in ASP .NET to connect with the database using ADODB connectivity and manipulate the records.

10. Write a program to store the employee details using class and methods in C# .NET

11. Write a program to Handle Exceptions

12. Write a program to create a form with Basic controls. In c#. NET

OUTCOMES:

At the end of this Lab course students will be able to:

1.Create user interactive web pages using ASP.Net.

2.Create simple data binding applications using ADO.Net connectivity.

3. Performing Database operations for Windows Form and web applications.

ACHARYA NAGARJUNA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2019-2022 (R19)
COMPUTER SCIENCE & ENGINEERING (CSE)
COMPUTER SCIENCE & INFORMATION TECHNOLOGY(CI)

IV/IV B.TECH - SEMESTER I (R19 Regulation - Structure & Syllabus)

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE / CI 411	Deep Learning	PC	3	0	0	40	60	3
2	CSE / CI 412	Design & Analysis of Parallel Algorithms	PC	3	0	0	40	60	3
3	CSE / CI 413	Software Project Management	PC	3	0	0	40	60	3
4	CSE / CI 414	Professional Elective Course-III	PEC	3	0	0	40	60	3
5	CSE / CI 415	Open Elective/ Job Oriented Course-III	OEC	3	0	0	40	60	3
6	CSE / CI 416	Cyber Laws and Ethics	BS	3	0	0	40	60	3
7	CSE / CI 451	Advanced Python Programming	Skill Oriented Course	0	0	3	40	60	2
8	CSE / CI 452	Industrial / Research Internship(2 months) after 3rd year	MC	0	0	3	100	0	2.5
Total Credits									22.5

PROFESSIONAL ELECTIVE COURSE-III

CSE / CI 414/1. Data Analytics through R Programming
CSE / CI 414/2. Big Data & Hadoop
CSE / CI 414/3. Block Chain Technology
CSE / CI 414/4. Introduction to Data Science

OPEN ELECTIVE (OEC)/JOB ORIENTED COURSES III(JOEC)

CSE / CI 415/1. Computer Vision
CSE / CI 415/2. Natural Language Processing
CSE / CI 415/3. Speech & Audio Processing
CSE / CI 415/4. Introduction to Pattern Recognition

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COMPUTER SCIENCE & ENGINEERING (CSE)
COMPUTER SCIENCE & INFORMATION TECHNOLOGY(CI)

IV/IV B.TECH - SEMESTER II (R19 Regulation - Structure & Syllabus)

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CSE / CI 461	Project work	Project	0	0	0	50	100	8
2	CSE / CI 462	Seminar	Seminar	0	0	0	50	0	2
3	CSE / CI 463	MOOCs	MOOC	0	0	0	100	0	2
Total Credits									12

CSE / CI 411 **Deep Learning**

Course Objectives:

- The main objective of this course is to make students comfortable with tools and techniques required in handling large amounts of datasets.
- They will also uncover various deep learning methods in NLP, Neural Networks etc.
- Several libraries and datasets publicly available will be used to illustrate the application of these algorithms.

UNIT-I

What is deep learning, Gradient descent, logistic regression, Probability, continuous and discrete distributions; maximum likelihood.

UNIT-II

Output Vs hidden layers; linear Vs nonlinear networks; Deep learning strategies II:RLU and dropouts.

UNIT-III

How to use the SCC cluster; introduction to Tensor flow.

UNIT-IV

Convolutional neural networks, Deep Belief Nets, Recurrent neural networks, Other DNN variants (Kate).

UNIT-V

Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate SecondOrder Methods, Optimization Strategies and Meta-Algorithms.

References:

1.Ian Goodfellow, YoshuaBengio, Aaron Courville. Deep Learning.
2. Duda, R.O., Hart, P.E., and Stork, D.G. Pattern Classication. Wiley-Interscience. 2nd Edition. 2001.
3. Theodoridis, S. and Koutroumbas, K. Pattern Recognition. Edition 4. Academic Press, 2008.
4. Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence. 2003.
5. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville.

Learning Outcomes:

1. Solve problems in linear algebra, probability, optimization, and machine Learning.
2. Evaluate, in the context of a case study, the advantages and disadvantages of deep learning neural network architectures and other approaches.
3. Design convolution networks for handwriting and object classification from images or video.

4. Design recurrent neural networks with attention mechanisms for natural language classification, generation, and translation.
5. Evaluate the performance of different deep learning models (e.g., with respect to the bias-variance trade-off, overfitting and underfitting, estimation of test error).

CSE / CI 412 **Design & Analysis of Parallel Algorithms** **L T P C**
3 0 0 3

Course Objective:

To expose students to basic techniques of parallel algorithm development and programming on different parallel platform.

UNIT I

INTRODUCTION

Introduction to Parallel Algorithms – Models of Parallel Computation – Sorting on an EREW SIMD.

PRAM Computer – Relation between PRAM Models – SIMD Algorithms – MIMD Algorithms – Selection – Desirable Properties for Parallel Algorithms - Parallel Algorithm for Selection – Analysis of Parallel Algorithms.

UNIT II

MERGING, SORTING AND SEARCHING

Merging on the EREW and CREW Models - Fast Merging on EREW - Sorting Networks – Sorting on a Linear Array – Sorting on CRCW, CREW, EREW Models – Searching a Sorted Sequence – Searching a Random Sequence.

UNIT III

MATRIX OPERATIONS

Matrix Transpositions – Matrix by Matrix Multiplications – Matrix by Vector multiplication.

GRAPH THEORY PROBLEMS

Connectivity Matrix – Connected Components – All Pairs Shortest Paths – Minimum Spanning Trees.

UNIT IV

DECISION AND OPTIMIZATION PROBLEMS

Computing Prefix Sums – Applications - Job Sequencing with Deadlines – Knapsack Problem- The Bit Complexity of Parallel Computations.

UNIT V

THE BIT COMPLEXITY OF PARALLEL COMPUTATIONS:

Adding Two Integers, Adding N Integers, Multiplying Two Integers, Computing Prefix Sums, Matrix Multiplication, Selection, Sorting.

REFERENCES:

1. Selim G. Akl, "The Design and Analysis of Parallel Algorithms", Prentice Hall, New Jersey, 1989
2. Michael J. Quinn, "Parallel Computing : Theory & Practice", Tata McGraw Hill Edition, 2003.
3. Justin R. Smith, "The Design and Analysis of Parallel Algorithms", Oxford University Press, USA , 1993.
4. Joseph JaJa, "Introduction to Parallel Algorithms", Addison-Wesley, 1992.

Learning Outcomes:

1. Define the structure of, and cost models associated with, the PRAM, mesh and hypercube models of parallel computation.
2. Define the metrics of cost, speed-up and efficiency and use these as conceptual tools with which to analyse and discriminate between alternative candidate parallel algorithms for given problems. They will be able to demonstrate, by the use of appropriately chosen examples, the importance of scalability in parallel algorithm design.

3. Explain and, with appropriate use of diagrams, sketch the structure and operation of well known parallel algorithms in a range of application areas, including sorting, matrix and graph based problems.

CSE / CI 413 **Software Project Management** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

To make the students to understand how to manage people in an organization.
• To understand the Software Project Planning and Evaluation techniques.
• To plan and manage projects at each stage of the software development life cycle (SDLC).
• To learn about the activity planning and risk management principles.
• To manage software projects and control software deliverables.
• To develop skills to manage the various phases involved in project management and people management.
• To deliver successful software projects that support organization‘s strategic goals.

UNIT -I PROJECT EVALUATION AND PROJECT PLANNING

Importance of Software Project Management – Activities - Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT -II PROJECT LIFE CYCLE AND EFFORT ESTIMATION

Software process and Process Models – Choice of Process models - Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II - a Parametric Productivity Model.

UNIT -III ACTIVITY PLANNING AND RISK MANAGEMENT

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning – Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.

UNIT – IV PROJECT MANAGEMENT AND CONTROL

Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.

UNIT -V STAFFING IN SOFTWARE PROJECTS

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

OUTCOMES: At the end of the course, the students should be able to:

• Understand Project Management principles while developing software.
• Gain extensive knowledge about the basic project management concepts, framework and the process models.
• Obtain adequate knowledge about software process models and software effort estimation techniques.
• Estimate the risks involved in various project activities.
• Define the checkpoints, project reporting structure, project progress and tracking mechanisms

using project management principles.
• Learn staff selection process and the issues related to people management

TEXT BOOK:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
2. Robert K. Wysocki ―Effective Software Project Management‖ – Wiley Publication, 2011

REFERENCES:.

1. Walker Royce: ―Software Project Management‖- Addison-Wesley, 1998.
2. Gopalaswamy Ramesh, ―Managing Global Software Projects‖ – McGraw Hill Education (India), Fourteenth Reprint 2013.
3 Information Technology Project Management: Kathy Schwalbe Thomson Publication.
4. Information Technology Project Management providing measurable organizational value Jack Marchewka Wiley India.
5. Applied software project management Stellman & Greene SPD.
6. Software Engineering Project Management by Richard Thayer, Edward Yourdon WILEY INDIA.

CSE / CI 414/1 Data Analytics through R Programming L T P C

3 0 0 3

Course Objectives:

- Understand the use of R, Basics of R, Advanced data structures, reading/writing data into R.
- Manipulate data using SQL statements and visualization of data using different plots.
- Understand the normal, binomial distributions, correlation and covariance, T-test, ANOVA, Manipulation string, and linear models.
- Understand the cluster analysis and classification.

UNIT-I

Introduction to R - Why use R?, Obtaining and installing R, The R Environment - Command line interface, RStudio, R Packages - Installing packages, loading packages, Building packages.

Basics of R - basic Math, variables, Data types, vectors, calling function, function documentation, missing data. Excel data, reading fromdatabases.

UNIT-II

Basic Data Management - A working example, creating new variables, recoding variables, renaming variables, sorting data, merging data set, sub-setting datasets, Using SQL statement to manipulate data.

UNIT-III

Data Management Challenge - Numerical and character functions, a solution for data management challenge, control flow, User Written functions, pie chart, Histograms, Kernel Density plots, Box plots, dot plots.

UNIT-IV

Data Distribution and Regression- Normal distribution, binomial distribution, summary statistics, correlation and covariance, T-test, ANOVA, paste, sprintf, extracting text, regular expression, Simple linear regression, multiple linear regressions, logistic regression.

UNIT-V

Cluster Analysis- Common steps in cluster analysis, calculating distances, Hierarchical cluster analysis, Partitioning cluster analysis, avoiding nonexistence clusters, Preparing the data, decision trees

Text books:

1. R for Every One, Advanced analytics and graphics by Jared P Lander, Addison Wisley Data and Analytics series.

2. R in Action, Data Analysis and graphics with R, Robert L Kaacoff, Manning Publisher

References:

1. Beginning R by Dr.Mark Gardener, Wrox publisher.
2. Associate Analytics Facilitator Guide provided by NASSCOM.

CSE / CI 414/2	Big Data & Hadoop	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand the Big Data Platform and its Use cases.
- Provide an overview of Apache Hadoop.
- Provide HDFS Concepts and Interfacing with HDFS.
- Apply analytics on Structured, Unstructured Data.

UNIT-I

Introduction to Big Data and Hadoop: Introduction to Big Data, Big Data Analytics, Big Data – Definition, Characteristic Features – Big Data - Applications - Big Data Vs Traditional Data - Risks of Big Data - Structure of Big Data – Challenges of Conventional Systems -History of Hadoop, Apache Hadoop, Analyzing Data with Unix tools, Analyzing Data with Hadoop

UNIT-II

Hadoop Framework: Hadoop – Requirement of Hadoop Framework - Design principle of Hadoop –Comparison with other system - Hadoop Components – Hadoop Daemon's –Working with HDFS Commands.

UNIT-III

HDFS (Hadoop Distributed File System): The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow

Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT-IV

Map Reduce: Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

UNIT-V

Hadoop Eco System:Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

Hive : Hive Shell, Hive Services, Hive Metastore , Tables, Querying Data and User Defined Functions.

Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.

Text books:

1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
2. Bart Baesens, Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley, 2014.
3. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

References:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications,

CRCpress (2013)
3. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.

CSE / CI 414/3 **Block Chain Technology** **L T P C**
3 0 0 3

Course Objectives:

- Develop familiarity of current technologies, tools.
- Impart strong technical understanding of Block Chain technologies.
- Explore the Smart Contracts and Ethereum implementation strategies.
- Introduce the current scenario and practical application areas of Hyper ledger.

UNIT-I

Block Chain 101- Distributed Systems, History of blockchain, Introduction to blockchain, Types of block chain, CAP theorem and blockchain, benefits and limitations of blockchain,

Decentralization- Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full eco system decentralization, Smart contract, Decentralized Organizations, Decentralized autonomous organizations, Decentralized autonomous corporations, Decentralized autonomous societies, Decentralized applications, Platforms for Decentralization.

UNIT-II

Cryptography and Technical Foundations- Introduction, Cryptographic primitives, Asymmetric Cryptography, Public and Private-keys, Financial -market and trading, Summary.

Bitcoin- Bitcoin, Transactions, Blockchain, Bitcoin Payments.

UNIT-III

Smart Contracts- History, Definition, Ricardian Contracts.

Ethereum 101-Introduction, Ethereum blockchain, Elements of the Ethereum block chain, Precompiled contracts, Accounts, Block, Ether, Messages, Mining, Clients and Wallets, Trading and investment, The Yellow paper, The Ethereum Network, Applications developed on Ethereum, Scalability and security issues.

UNIT-IV

Hyper Ledger- Projects, Hyperledger as a Protocol, Fabric, Hyperledger Fabric, Sawtooth lake, Corda,

UNIT-V

Alternative Block Chain- Block chains, Platforms.

Scalability and Other Challenges- Scalability, Privacy, Security,

Text books:

1. Seberrius Jeffery," Block Chain" 2nd Edition Publishers details 2015

References:

1. Narayanan, Bonneau, Felten, Miller and Goldfeder, "Bitcoin and Cryptocurrency Technologies – A Comprehensive Introduction", Princeton University Press.

2. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

CSE / CI 414/4 **Introduction to data Science** **L T P C**
3 0 0 3

Course Objectives:

Will gain knowledge in the basic concepts of Data Analysis

- To acquire skills in data preparatory and preprocessing steps.
- To understand the mathematical skills in statistics.
- To learn the tools and packages in Python for data science.
- To gain understanding in classification and Regression Model.
- To acquire knowledge in data interpretation and visualization techniques.
- To learn the essential concepts of data analytics and data visualization.

UNIT I

Data science: definition, Datafication, Exploratory Data Analysis, The Data science process, A data scientist role in this process.

NumPy Basics: The NumPy ndarray: A Multidimensional Array Object, Creating ndarrays ,Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Data Processing Using Arrays, Expressing Conditional Logic as Array Operations, Methods for Boolean Arrays , Sorting , Unique.

UNIT II

Getting Started with pandas: Introduction to pandas, Library Architecture, Features, Applications, Data Structures, Series, DataFrame, Index Objects, Essential Functionality Reindexing, Dropping entries from an axis, Indexing, selection, and filtering),Sorting and ranking, Summarizing and Computing Descriptive Statistics, Unique Values, Value Counts, Handling Missing Data, filtering out missing data.

UNIT III

Data Loading, Storage, and File Formats : Reading and Writing Data in Text Format, Reading Text Files in Pieces, Writing Data Out to Text Format, Manually Working with Delimited Formats, JSON Data, XML and HTML: Web Scraping, Binary Data Formats,Using HDF5 Format, Reading Microsoft Excel Files, Interacting with Databases, Storing and Loading Data in MongoDB .

UNIT IV

Data Wrangling: Combining and Merging Data Sets, Database style DataFrame Merges, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap , Reshaping and Pivoting, Reshaping with Hierarchical Indexing, Data Transformation, Removing Duplicates, Replacing Values.

UNIT V

Plotting and Visualization: A Brief matplotlib API Primer, Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File,Plotting Functions in pandas, Line Plots, Bar Plots, Histograms and Density Plots, Scatter Plots.

Text Books:

1. Wes McKinney, "Python for Data Analysis",O'REILLY, ISBN:978-1-449-31979-3, 1st edition, October 2012.
2. Rachel Schutt & O'neil, "Doing Data Science", O'REILLY, ISBN:978-1-449-35865-5, 1st edition, October 2013.

Reference Books:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media, 2015
2. Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization , O'Reilly, 2016.

Course Outcomes:

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

- Apply principles of NumPy and Pandas to the analysis of data.
- Make use of various file formats in loading and storage of data.
- Identify and apply the need and importance of pre-processing techniques.

- Show the results and present them in a pictorial format.

CSE / CI 415/1 **Computer Vision** **L T P C**
3 0 0 3

Objective:

- To build an understanding on detailed models of image formation.
- To expose the students to image feature detection and matching.
- To introduce fundamental algorithms for pattern recognition.
- To introduce various classification techniques.
- To expose the students to various structural pattern recognition and feature extraction techniques.

Unit-1

Image formation and Image model- Components of a vision system- Cameras- camera model and camera calibration- Radiometry- Light in space- Light in surface - Sources, shadows and shading.

Unit-2

Multiple images-The Geometry of multiple views- Stereopsis- Affine structure from motion- Elements of Affine Geometry Affine structure and motion from two images- Affine structure and motion from multiple images- From Affine to Euclidean images.

Unit-3

High level vision- Geometric methods- Model based vision- Obtaining hypothesis by pose consistency, pose clustering and using Invariants, Verification.

Unit-4

Introduction to pattern and classification, supervised and unsupervised learning, Clustering Vs classification, Bayesian Decision Theory- Minimum error rate classification Classifiers, discriminant functions, decision surfaces- The normal density and discriminant-functions for the Normal density

Unit-5

Linear discriminant based classifiers and tree classifiers:

Linear discriminant function based classifiers- Perceptron- Minimum Mean Squared Error (MME) method, Support Vector machine, Decision Trees: CART, ID3.

Unsupervised Methods: Basics of Clustering; similarity / dissimilarity measures; clustering criteria. Different distance functions and similarity measures, K-means algorithm.

Recent Advances in Pattern Recognition Neural network structures for pattern recognition, Pattern classification using Genetic Algorithms.

Text Books:

1. Bernd Jahne and Horst HauBecker, Computer vision and Applications, Academic press, 2000.
2. David A. Forsyth & Jean Ponce, Computer vision – A Modern Approach, Prentice Hall, 2002.

Reference Books:

1. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
2. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, John Wiley, 2001.
3. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, 2004.
4. S. Theodoridis and K. Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.
5. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA). Springer, 2010.
6. Image Processing, Analysis, and Machine Vision. Sonka, Hlavac, and Boyle. Thomson.
7. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012.
8. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012.
9. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.

Course Outcomes:

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

- Appreciate the detailed models of image formation.
- Analyse the techniques for image feature detection and matching.
- Apply various algorithms for pattern recognition.
- Examine various clustering algorithms.
- Analyze structural pattern recognition and feature extraction techniques.

CSE / CI 415/2 **Natural Language Processing** **L T P C**
3 0 0 3

Course Objectives:

1. To understand the underlying concepts and techniques required f or natural language processing.
2. To create computational models for enabling effective and natural language processing.

UNIT I

Overview and language modeling: Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. Language Modeling: Various Grammar- based Language Models-Statistical Language Model.

UNIT II

Word level and syntactic analysis: Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.

UNIT III

Extracting Relations from Text: From Word Sequences to Dependency Paths: Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation.

Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles: Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations. A Case Study in Natural Language Based Web Search: InFact System Overview, The GlobalSecurity.orgExperience.

UNIT IV

Evaluating Self-Explanations in iSTART: Word Matching, Latent Semantic Analysis, and Topic Models: Introduction, iSTART: Feedback Systems, iSTART: Evaluation of Feedback Systems.

Textual Signatures: Identifying Text-Types Using Latent Semantic Analysis to Measure the Cohesion of Text Structures: Introduction, Cohesion, Coh-Metrix, Approaches to Analyzing Texts, Latent Semantic Analysis, Predictions, Results of Experiments.

Automatic Document Separation: A Combination of Probabilistic Classification and Finite-State Sequence Modeling: Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results.

UNIT V

INFORMATION RETRIEVAL AND LEXICAL RESOURCES:

Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame Net- Stemmers-POS Tagger- Research Corpora.

Text Books:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
2. Anne Kao and Stephen R. Poteet (Eds), "Natural LanguageProcessing and Text Mining", Springer-Verlag London Limited 2007.

Reference Books:

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: Anintroduction to Natural Language Processing, Computational Linguistics and SpeechRecognition", 2nd Edition, Prentice Hall, 2008.
2. James Allen, "Natural Language Understanding", 2nd edition, Benjamin/Cummingspublishing company, 1995.
3. Gerald J. Kowalski and Mark.T. Maybury, "Information Storage and Retrieval systems", Kluwer academic Publishers, 2000.

Course Outcomes:

The students should be able to:

- Analyze the natural language text.
- Generate the natural language.
- Do Text mining.
- Apply information retrieval techniques.

CSE / CI 415/3 **SPEECH AND AUDIO PROCESSING** **L T P C**
3 0 0 3

Course objectives:

Main objectives can be summarized as follows:

- To understand the basic principles of sound and speech production and perception;
- To understand basic principles of speech regognition,synthesis and dialogue systems;

UNIT-I

Introduction- Speech production and modeling - Human Auditory System;General structure of speech coders; Classification of speech coding techniques – parametric, waveform and hybrid ; Requirements of speech codecs –quality, coding delays, robustness.

UNIT-II

Speech Signal Processing- Pitch-period estimation, all-pole and all-zero filters,convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation. Linear Prediction of Speech- Basic concepts of linear prediction;

UNIT-III

LinearPrediction Analysis of nonstationary signals –prediction gain, examples; Levinson-Durbin algorithm; Long term and short-term linear prediction models; Moving average prediction. Speech Quantization- Scalar quantization–uniform quantizer, optimum quantizer,logarithmic quantizer, adaptive quantizer, differential quantizers; Vector quantization – distortion measures, codebook design, codebook types.

UNIT-IV

Scalar Quantization of LPC- Spectral distortion measures, Quantization based onreflection coefficient and log area ratio, bit allocation; Line spectral frequency – LPC to LSF conversions, quantization based on LSF. Linear Prediction Coding- LPC model of speech production; Structures of LPCencoders and decoders; Voicing detection; Limitations of the LPC model.

UNIT-V

Code Excited Linear Prediction-CELP speech production model; Analysis-by-synthesis; Generic CELP encoders and decoders; Excitation codebook search – state-save method, zero-input zero-state method; CELP based on adaptive codebook, Adaptive Codebook search; Low Delay CELP and algebraic CELP. Speech Coding Standards-An overview of ITU-T G.726, G.728 and G.729standards

Text/Reference Books:

1. “Digital Speech” by A.M.Kondoz, Second Edition (Wiley Students‟ Edition), 2004.
2. “Speech Coding Algorithms: Foundation and Evolution of Standardized Coders”, W.C. Chu, WileyInter science, 2003.

Learning outcomes

Student will be able after finishing the course to describe and explain the basic terms, methods and standards in following areas:

- physiological acoustics, especially the processes of forming and understanding the human speech
- signal digitization and basic signal processing in time and frequency domains
- continues speech recognition
- time and frequency domain text-to-speech synthesis

CSE / CI 415/4 Introduction to Pattern Recognition

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UNIT I

Basics of Probability, Random Processes and Linear Algebra (recap): Probability: independence of events, conditional and joint probability, Bayes theorem Random Processes: Stationary and non-stationary processes, Expectation, Autocorrelation, Cross-Correlation, spectra.

UNIT II

Linear Algebra: Inner product, outer product, inverses, eigen values, eigen vectors, singular values, singular vectors.

Bayes Decision Theory : Minimum-error-rate classification. Classifiers, Discriminant functions, Decision surfaces. Normal density and discriminant functions. Discrete features.

UNIT III

Parameter Estimation Methods : Maximum-Likelihood estimation :Gaussian case. Maximum a Posteriori estimation. Bayesian estimation: Gaussian case. Unsupervised learning and clustering - Criterion functions for clustering. Algorithms for clustering: K-Means, Hierarchical and other methods. Cluster validation. Gaussian mixture models, Expectation-Maximization method for parameter estimation. Maximum entropy estimation. Sequential Pattern Recognition. Hidden Markov Models (HMMs). Discrete HMMs. Continuous HMMs. Nonparametric techniques for density estimation. Parzen-window method. K-Nearest Neighbour method.

UNIT IV

Dimensionality reduction: Principal component analysis - it relationship to eigen analysis. Fisher discriminant analysis - Generalised eigen analysis. Eigen vectors/Singular vectors as dictionaries. Factor Analysis, Total variability space - a dictionary learning methods. Non negative matrix factorisation - a dictionary learning method.

Linear discriminant functions : Gradient descent procedures, Perceptron, Support vector machines - a brief introduction.

UNIT V

Artificial neural networks: Multilayer perceptron - feedforwark neural network. A brief introduction to deep neural networks, convolutional neural networks, recurrent neural networks.

Non-metric methods for pattern classification : Non-numeric data or nominal data. Decision trees: Classification and Regression Trees (CART).

Reference Books:

- R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001
- S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009
- C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

Course Outcomes:

On the successful completion of this course Student are able

- Summarize the various techniques involved in pattern recognition.
- Categorize the various pattern recognition techniques into supervised and unsupervised.
- Illustrate the artificial neural network based pattern recognition.
- Discuss the applications of pattern recognition in various applications.

CSE / CI 416 Cyber Laws and Ethics

Course Objectives

1. The course objective is to provide the fundamental skill to understand cyber laws.
2. It enable to understand the legal frameworks.
3. It helps the student understand different cyber crimes.
4. It provides overview on Intellectual Property, copy rights, patents rights etc.
5. Given rapid changes in technology and the corresponding changes in crime and the law.

Unit-1: Introduction to Cyber Law

Evolution of computer technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

Unit-2: Information Technology Act

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

Unit-3: Cyber Law and Related Legislation

Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).

Unit-4: Electronic Business and Legal Issues

Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models-B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.

Unit-5: Cyber Ethics

The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.

References:

1. Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher
2. Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
3. Computers, Internet and New Technology Laws, Karnika Seth, Lexis Nexis Butterworths Wadhwa Nagpur

LEARNING OUTCOMES:

The student will:

- Demonstrate an understanding of how ethical issues affect individuals, communities and societies and be able to analyze the consequences of various professional ethical dilemmas.
- Demonstrate awareness and understanding of what is morally/ethically at stake in various situations.
- Apply moral principles and standards of behavior in a workplace setting.
- Identify concepts such as ethics, morals, character, ethical principles and ethical relativism.

CSE / CI 451 Advanced Python Programming

1. **CLASS AND OBJECTS:**
   a. Create a class ATM and define ATM operations to create account, deposit, check_balance, withdraw and delete account. Use constructor to initialize members.
   b. Make a class Employee with a name and salary. Make a class Manager inherit from Employee. Add an instance variable, named department. Write a method that prints manager's name, department and salary. Make a class Executive inherit from Manager. Write a method that prints the string "Executive" followed by the information stored in the Manager super class object.
   c. A hospital wants to create a database regarding its indoor patients. The information to store include a) Name of the patient b) Date of admission c) Disease d) Date of discharge. Create a structure to store the date (year, month and date as its members). Create a base class to store the above information. The member function should include functions to enter information and display a list of all the patients in the database. Create a derived class to store the age of the patients. List the information about to store the age of the patients. List the information about all the pediatric patients (less than twelve years in age).
2. **NUMPY:**
   a. Using Numpy, write a basic array of operations on single array to add x to each element of array and subtract y from each element of array.
   b. Using Numpy, write a program to add, subtract and multiply two matrices.
   c. Write a Python program to do the following operations:
   Library: NumPy
   i) Create multi-dimensional arrays and find its shape and dimension
   ii) Create a matrix full of zeros and ones
   iii) Reshape and flatten data in the array
   iv) Append data vertically and horizontally
   v) Apply indexing and slicing on array
   vi) Use statistical functions on array - Min, Max, Mean, Median and Standard Deviation
   vii) Dot and matrix product of two arrays
   viii) Compute the Eigen values of a matrix
   ix) Solve a linear matrix equation such as 3 * x0 + x1 = 9, x0 + 2 * x1 = 8
   x) Compute the multiplicative inverse of a matrix
   xi) Compute the rank of a matrix
   xii) Compute the determinant of an array
3. **GUI:**
   a. Design a GUI based calculator to perform arithmetic operations like addition, subtraction, multiplication and division. (Hint: Expression Calculator using tk)
   b. Design a GUI based application to convert temperature from Celsius to Fahrenheit.
   c. Write a python program to perform various database operations (create, insert, delete, update).
4. **Pandas Library: Selection**
   a) Write a program that converts Pandas DataFrame and Series into numpy.array.
   b) Write a program that demonstrates the column selection, column addition, and column deletion.
   c) Write a program that demonstrates the row selection, row addition, and row deletion.
   d) Get n-largest and n-smallest values from a particular column in Pandas dataFrame
5. **Pandas Library: Visualization**
   a) Write a program which use pandas inbuilt visualization to plot following graphs:
   i. Bar plots ii. Histograms iii. Line plots iv. Scatter plots
   b) Write a program to demonstrate use of groupby() method.
   c) Write a program to demonstrate pandas Merging, Joining and Concatenating

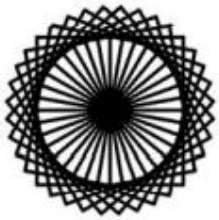
d) Creating dataframes from csv and excel files.

4. GRAPHICS

a. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere.

b. Design a Python program using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorizing them into distinction, first class, second class, third class and failed.

c. Write a python program to implement the following figures using turtle.



Reference Books:

1. Michael H Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.
2. Yashavant Kanetkar, Aditya Kanetkar, "Let us Python, BPB publication, 1st Edition, 2019.
3. Ashok Kamthane, Amit Kamthane, "Programming and Problem solving with Python", McGraw Hill Education (India) Private Limited, 2018.
4. Taneja Sheetal, Kumar Naveen, "Python Programming – A Modular Approach", Pearson, 2017. 5. R Nageswara Rao, "Core Python Programming", Dreamtech Press, 2017 Edition.
6. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python 3", 3rd Edition, 2015.
7. Paul Barry, "Head First Python a Brain Friendly Guide", O'Reilly, 2 nd Edition, 2016.
8. Dainel Y.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019.
9. Martin C. Brown (Author), "Python: The Complete Reference" McGraw Hill Education, Fourth edition , 2018.