ACHARYA NAGARJUNA UNIVERSITY

A State Government University, Accredited with "A" Grade by NAAC

Nagarjuna Nagar - 522 510, Guntur, Andhra Pradesh, India.

B.Tech. COMPUTER SCIENCE & ENGINEERING

SYLLABUS

2020 - 2021 onwards

Dr. Y.S.R. ANU COLLEGE OF ENGINEERING & TECHNOLOGY

PROGRAM CODE:

ANUCETUG02


ACHARYA NAGARJUNA UNIVERSITY
సత్యం సర్వం ప్రతిష్ఠితమ్

ABOUT UNIVERSITY

ACHARYA NAGARJUNA UNIVERSITY (ANU)

- A Brief Profile

Acharya Nagarjuna University, a State University established in 1976, has been constantly striving towards achieving progress and expansion during its existence for over four decades, in terms of introducing new courses in the University Colleges, affiliated colleges and professional colleges. Spread over 300 acres of land on the National High Way (NH-16) between Vijayawada and Guntur of Andhra Pradesh, the University is one of the front ranking and fastest expanding Universities in the state of Andhra Pradesh. The University was inaugurated on 11th September, 1976 by the then President of India, Sri Fakruddin Ali Ahmed and celebrated its Silver Jubilee in 2001. The National Assessment and Accreditation Council (NAAC) awarded "A" grade to Acharya Nagarjuna University and also has achieved 108 International ranks, 39 National ranks UI Green Metrics rankings and many more It is named after Acharya Nagarjuna – one of the most brilliant preceptors and philosophers, whose depth of thought, clarity of perception and spiritual insight were such that even after centuries, he is a source of inspiration to a vast number of people in many countries. The University is fortunate to be situated on the very soil where he was born and lived, a soil made more sacred by the aspiration for light and a state of whole someness by generations of students. With campus student strength of over 5000, the University offers instruction for higher learning in 68 UG & PG programs and guidance for the award of M.Phil. and Ph.D. in 48 disciplines spread over six campus colleges and one PG campus at Ongole. It also offers 160 UG programs in 440 affiliated colleges in the regions of Guntur and Prakasam Districts. It has a Centre for Distance Education offering 87 UG & PG programs. Characterized by its heterogeneous students and faculty hailing from different parts of the state and the country, the University provides most hospitable environment for pursuing Higher Learning and Research. Its aim is to remain connected academically at the forefront of all higher educational institutions. The University provides an excellent infrastructure and on- Campus facilities such as University Library with over one lakh books & 350 journals; Computer Centre; University Scientific Instrumentation Centre; Central Research Laboratory with Ultra-modern Equipment; Well-equipped Departmental Laboratories; Career Guidance and Placement Cell; Health Centre; Sports Facilities with Indoor & Outdoor Stadiums and Multipurpose Gym; Sports Hostel; Separate hostels for Boys, Girls, Research Scholars and International Students; Pariksha Bhavan (Examinations Building); Computers to all faculty members; Wi-Fi connectivity to all Departments and Hostels; Canteen, Student Centre & Fast-food Centre; Faculty Club; Dr. H.H. Deichmann & Dr. S.John David Auditorium cum Seminar Hall; Post office; Telecom Centre; State Bank of India; Andhra Bank; Energy Park; Silver Jubilee Park; Fish ponds; internet center; xerox center; cooperative stores; Water harvesting structures.

VISION, MISSION & OBJECTIVES OF THE UNIVERSITY

ACHARYA NAGARJUNA UNIVERSITY

VISION

To generate sources of knowledge that dispels ignorance and establish truth through teaching, learning and research.

MISSION

To promote a bank of human talent in diversified faculties – Commerce & Management Studies, Education, Engineering & Technology, Humanities, Law, Natural Sciences, Pharmacy, Physical Education & Sports Sciences, Physical Sciences and Social Sciences that would become an investment for a prosperous society.

OBJECTIVES

- To inspire and encourage all who would seek knowledge through higher education and research.
- To provide quality instruction and research for the advancement of science and technology.
- To promote teaching and research studies in disciplines of societal relevance.
- To bridge the gap between theory and practice of the principles of higher education.
- To develop human talent necessary for the industry.
- To open up avenues of higher education and research through non-formal means.
- To invite and implement collaborations with other institutes of higher learning on a continuous basis for mutual academic progress.
- To motivate and orient each academic department/center to strive for and to sustain advanced levels of teaching and research so that the university emerges as an ideal institute of higher learning.
- To focus specially on the studies involving rural economy, justifying its existence in the rural setting.

VISION

&

MISSION OF THE COLLEGE

ACHARYA NAGARJUNA UNIVERSITY

Dr. Y.S.R. ANU COLLEGE OF ENGINEERING & TECHNOLOGY

ABOUT ANUCET:

The ANU college of Engineering & Technology is established in the academic year 2009-2010 in the University campus under the able leader ship of the Vice-chancellor, Prof. Hara Gopal Reddy. The College offers UG and PG courses that include B.Tech. and M.Tech. The college commenced its operations with an annual intake of 60 into 5 branches of B.Tech. (Civil Engineering, Computer Science Engineering, Electronics & Communication Engineering, Electrical & Electronics Engineering & Mechanical Engineering) and 20 into 5 branches of M.Tech. The institution has been growing from strength to strength and got recognition in limited period.

VISION OF THE COLLEGE:

ANU College of Engineering & Technology is started with an aim of imparting technical values in the students, who can change the shape of global scenario in engineering arena.

MISSION OF THE COLLEGE:

- To educate students for careers of leadership, innovation in engineering and its related fields.
- To expand the base of engineering knowledge through original research and by developing technology to serve the needs of society.

OBJECTIVES:

- To inspire and encourage all knowledge seekers of higher education and research.
- To provide quality instruction and research for the advancement of science and technology.
- To promote teaching and research studies in disciplines of societal relevance.
- To bridge the gap between theory and practice.
- To develop human talent necessary for the industry.

VISION & MISSION OF THE DEPARTMENT

ACHARYA NAGARJUNA UNIVERSITY

Dr. Y.S.R. ANU COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

B.Tech. COMPUTER SCIENCE & ENGINEERING

VISION OF THE DEPARTMENT:

To be in the frontiers of Computer Science and Engineering with academic excellence and Research.

MISSION OF THE DEPARTMENT:

The mission of the Computer Science and Engineering Department is to:

- ★ Educate students with the best practices of Computer Science by integrating the latest research into the curriculum
- ★ Develop professionals with sound knowledge in theory and practice of Computer Science and Engineering
- ★ Facilitate the development of academia-industry collaboration and societal outreach programs
- ★ Prepare students for full and ethical participation in a diverse society and encourage lifelong learning

ACHARYA NAGARJUNA UNIVERSITY

Dr. Y.S.R. ANU COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

B.Tech. COMPUTER SCIENCE & ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEO's):

- PEO1: Practice engineering in a broad range of industrial, societal and real world applications.
- PEO2: Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.
- PEO3: Conduct themselves in a responsible, professional, and ethical manner.
- PEO4: Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.

PROGRAM OUTCOMES (PO's):

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO's):

PSO1	An ability to Understand the theoretical and mathematical concepts to analyze real time problems.
PSO2	An Ability to Design and Analyze systems based on the theoretical and Practical Knowledge

ACHARYA NAGARJUNA UNIVERSITY

FACULTY OF ENGINEERING

ACADEMIC REGULATIONS 2020 (R20) FOR B.TECH (REGULAR)

(APPLICABLE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021 AND ONWARDS)

PROGRAM EDUCATIONAL OBJECTIVES (PEO's):

- PEO1: Practice engineering in a broad range of industrial, societal and real world applications.
- PEO2: Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.
- PEO3: Conduct themselves in a responsible, professional, and ethical manner.
- PEO4: Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.

PROGRAM OUTCOMES (PO's):

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO's):

PSO1	An ability to Understand the theoretical and mathematical concepts to analyze real time problems.
PSO2	An Ability to Design and Analyze systems based on the theoretical and Practical Knowledge

ACHARYA NAGARJUNA UNIVERSITY
FACULTY OF ENGINEERING
ACADEMIC REGULATIONS 2020 (R20) FOR B.TECH (REGULAR)
(APPLICABLE FOR THE STUDENTS ADMITTED DURING THEACADEMIC YEAR 2020-2021 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.

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) Students 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

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

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

i) General Core Courses
   a) Basic Sciences
   b) Engineering Sciences
   c) 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 30 marks for Internal Evaluation and 70 marks for the External Evaluation.
iii) There shall be five units in each of the theory subjects.
iv) For theory subjects, there shall be two midterm examinations during the semester. Each midterm examination shall consist of assignment for 10 marks and sessional test for 20 marks with duration of 135 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 30 marks shall be arrived at, by considering the 80% weightage (24 marks) to that midterm examination in which the student scores more marks and the remaining 20% (6 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 2 questions randomly and shall be condensed for 10 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.

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 30 internal marks and 70 end examination marks. Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the report of experiments/jobs (10 marks for the record submitted and 5 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 30 marks for internal evaluation and 70 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 150 marks for the project work, 50 marks shall be for Internal Evaluation and 100 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 II semester. 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 (30 marks) and the other before submission of project work (20 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.

xii) A student shall be permitted to pursue up to a maximum of ONE elective courses under MOOCs during the Program. The courses must be of minimum 12 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to pursue and acquire a certificate for a MOOC course only from the organizations/agencies approved by the BoS in order to earn the 2 credits. The Head of the department shall notify the list of such courses at the beginning of the semester.

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 NO 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.

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 class 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 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 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 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.

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

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.

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

Where 'Si' is the SGPA of the ith semester and Ci 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)

i. 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.

ii. 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 of 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.

iii. 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	$\geq 6.5 < 8.0$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 4.0 < 5.5$

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. BRANCH TRANSFER:

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 Honorable 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) Will full 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

   ix) 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 programs 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 p is registered against him olice and a case
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	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 tothe police and a police case is registered against them.

	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.	
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	Possesses 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 practical's and project work of that semester/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.	

CURRICULAR FRAMEWORK FOR REGULAR AND HONORS B.TECH. PROGRAMS OF ALL BRANCHES:

AWARD OF THE DEGREE:

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

i) Pursues a course of study in not less than four and not more than eight academic years.
ii) After eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.
iii) Registers for 160 credits and must secure all the 160 credits.
iv) A student shall be eligible for the award of B.Tech. degree with Honors or Minor if he/she earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

CURRICULAR FRAMEWORK FOR HONORS PROGRAM:

1) Students of a Department/Discipline are eligible to opt for Honors Program offered by the same Department/Discipline.
2) A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Program stands cancelled and he/she shall continue with the regular Program.
3) Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.
4) In addition to fulfilling all the requisites of a Regular B.Tech. Program, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e., 160 credits).
5) Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.
6) It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.
7) The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

8) Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component. (Model pool list is enclosed in the Annexure-2)
9) MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.
10) The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Program.
11) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.
12) In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech. degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
13) Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

CURRICULAR FRAMEWORK FOR MINOR PROGRAM:

1) a) Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering
   b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech. Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.
2) The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

3) The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.
4) There shall be no limit on the number of programs offered under Minor. The University/Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.
5) The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.
6) A student shall be permitted to register for Minors program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) up to the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 8 SGPA up to 3rd semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active. 18
7) A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e., 160 credits).
8) Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Program.
9) In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.
10) Student can opt for the industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

11) A committee should be formed at the level of College/Universities/department to evaluate the grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.
12) If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript. 19
13) In case a student fails to meet the CGPA requirement for B.Tech. degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
14) Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

STRUCTURE

ACHARYA NAGARJUNA UNIVERSITY

Dr. Y.S.R. ANU COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

B.Tech. COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE

I/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	Int.	Ext.	
1	**CS111(R20)**	Mathematics - I	BSC	3	0	0	30	70	3
2	**CS112(R20)**	Engineering Physics	BSC	3	0	0	30	70	3
3	**CS113(R20)**	Basic Electrical Engineering	ESC	3	0	0	30	70	3
4	**CS114(R20)**	Engineering Mechanics	ESC	3	0	0	30	70	3
5	**CS115(R20)**	Computer Programming With C	ESC	3	0	0	30	70	3
6	**CS116(R20)**	Environmental Science	MC	0	0	3	30	70	0
7	**CS151(R20)**	Basic Electrical Engineering	BSC	0	0	3	30	70	1.5
8	**CS152(R20)**	Engineering Physics Lab	ESC	0	0	3	30	70	1.5
9	**CS153(R20)**	Computer Programming Lab	ESC	0	0	3	30	70	1.5
TOTAL CREDITS									**19.5**

S.No.	Category	Abbreviation	Required Credits Criteria
1	BSC	Basic Science Course	7.5
2	ESC	Engineering Science Course	12
3	MC	Mandatory course	0

I/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	Int.	Ext.	
1	**CS121(R20)**	MATHEMATICS – II	BSC	3	0	0	30	70	3
2	**CS122(R20)**	ENGINEERING CHEMISTRY	BSC	3	0	0	30	70	3
3	**CS123(R20)**	PROFESSIONAL COMMUNICATION SKILLS	HSC	3	0	0	30	70	3
4	**CS124(R20)**	PYTHON	ESC	3	0	0	30	70	3
5	**CS125(R20)**	ENGINEERING GRAPHICS	ESC	3	0	0	30	70	3
6	**CS161(R20)**	ENGINEERING CHEMISTRY LAB	BSC	2	0	0	30	70	1.5
7	**CS162(R20)**	COMMUNICATION SKILLS LAB	HSC	0	0	3	30	70	1.5
8	**CS163(R20)**	PYTHON LAB	ESC	0	0	3	30	70	1.5
TOTAL CREDITS									**19.5**

S.No.	Category	Abbreviation	Required Credits Criteria
1	BSC	Basic Science Course	7.5
2	ESC	Engineering Science Course	7.5
3	HSC	Humanities and social science	4.5

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	Int.	Ext.	
1	**CS211(R20)**	Probability & Statistics	BS	3	0	0	30	70	3
2	**CS212(R20)**	Data structures & Algorithms	PC	3	0	0	30	70	3
3	**CS213(R20)**	Operating Systems	PC	3	0	0	30	70	3
4	**CS214(R20)**	Analog & Digital Electronics	PC	3	0	0	30	70	3
5	**CS215(R20)**	UNIX programming	PC	3	0	0	30	70	3
6	**CS216(R20)**	Professional Ethics and Human Values	MC	2	0	0	30	70	0
7	**CS251(R20)**	Data structures & Algorithms Lab	PC	0	0	3	30	70	1.5
8	**CS252(R20)**	Analog & Digital Electronics Lab	PC	0	0	3	30	70	1.5
9	**CS253(R20)**	UNIX Lab	PC	0	0	3	30	70	1.5
10	**CS254(R20)**	MATLAB	SC	0	0	3	30	70	2
TOTAL CREDITS									**21.5**

S.No.	Category	Abbreviation	Required Credits Criteria
1	BSC	Basic Science Course	3
2	PC	Program Core Course	16.5
3	SC	Skill Oriented Course	2
4	MC	Mandatory Course	0

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	Int.	Ext.	
1	**CS221(R20)**	Discrete Mathematics	BSC	3	0	0	30	70	3
2	**CS222(R20)**	Computer Organization & Architecture	PC	3	0	0	30	70	3
3	**CS223(R20)**	Database Management Systems	PC	3	0	0	30	70	3
4	**CS224(R20)**	Advanced Data Structures	PC	3	0	0	30	70	3
5	**CS225(R20)**	Signals & Systems	ESC	3	0	0	30	70	3
6	**CS261(R20)**	DBMS Lab	PC	2	0	0	30	70	1.5
7	**CS262(R20)**	ADS Lab	PC	0	0	3	30	70	1.5
8	**CS263(R20)**	Communicative English Lab II	PC	0	0	3	30	70	1.5
9	**CS264(R20)**	Web designing	SKILL	0	0	3	30	70	2
TOTAL CREDITS									**21.5**
Internship 2 Months (Mandatory) during summer vacation									
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)									**4**

S.No.	Category	Abbreviation	Required Credits Criteria
1	BSC	Basic Science Course	3
2	PC	Program Core Course	16.5
3	SC	Skill Oriented Course	2

III/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	Int.	Ext.	
1	**CS311(R20)**	Automata Theory & Compiler Design	PC	3	0	0	30	70	3
2	**CS312(R20)**	Java Programming	PC	3	0	0	30	70	3
3	**CS313(R20)**	Design & Analysis of Algorithms	PC	3	0	0	30	70	3
4	**CS314(R20)**	Job Elective – 1	JE-I	3	0	0	30	70	3
5	**CS315(R20)**	Professional Elective- 1	PE-I	3	0	0	30	70	3
6	**CS316(R20)**	Constitution of India	MC	2	0	0	30	70	0
7	**CS351(R20)**	Java Lab	PC	0	0	3	30	70	1.5
8	**CS352(R20)**	Job Elective -1 Lab	PC	0	0	3	30	70	1.5
9	**CS353(R20)**	Mobile Application development Lab	SC	1	0	2	30	70	2
10	**CS354(R20)**	Internship Program	MC	0	0	0	100	0	1.5
TOTAL CREDITS									**21.5**
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)									**4**

Professional Elective Course -I		JOB Elective Course-I	
1	**CS315A**. Computer Networks	1	**CS314A** Artificial Intelligence & Machine Learning
2	**CS315B**. Software Project Management	2	**CS314B** Internet of Things (IoT)
3	**CS315C**. Advanced Computer Architecture.	3	**CS314C**. Digital Signal Processing
4	**CS315D**. Distributed Systems	4	**CS314D**. Digital Image Processing

III/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	Int.	Ext.	
1	**CS321(R20)**	Cryptography & Network Security	PC	3	0	0	30	70	3
2	**CS322(R20)**	Data Engineering	PC	3	0	0	30	70	3
3	**CS323(R20)**	Web Technologies	PC	3	0	0	30	70	3
4	**CS324(R20)**	Job Elective – 2	JE-II	3	0	0	30	70	3
5	**CS325(R20)**	Professional Elective-2	PE-II	3	0	0	30	70	3
6	**CS361(R20)**	Data Engineering Lab	PC	0	0	3	30	70	1.5
7	**CS362(R20)**	Web Technologies Lab	PC	0	0	3	30	70	1.5
8	**CS363(R20)**	JE2 Lab	PC	0	0	3	30	70	1.5
9	**CS364(R20)**	Full Stack Lab	SC	1	0	2	30	70	2
TOTAL CREDITS									**21.5**
Industrial/Research Internship (2 Months) after 3rd Year during summer vacation									
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)									**4**

Professional Elective Course -II		**JOB Elective Course-II**	
1	**CS325 A**. High Performance Computing	1	**CS324 A**. Network Programming
2	**CS325 B**. Cloud Computing Architecture and Its Applications	2	**CS324 B**. Introduction to block chain technology
3	**CS325 C**. Mobile Computing	3	**CS324 C**. Cyber Security
4	**CS325 D**. Industry 4.0	4	**CS324 D**. Advanced Databases

IV/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	Int.	Ext.	
1	**CS411(R20)**	Design of Deep Learning Networks	PC	3	0	0	30	70	3
2	**CS412(R20)**	Design & Analysis of Parallel Algorithms	PC	3	0	0	30	70	3
3	**CS413(R20)**	Data Science	PC	3	0	0	30	70	3
4	**CS414(R20)**	Job Elective -3	JE-III	3	0	0	30	70	3
5	**CS415(R20)**	Open Elective-1	OE-I	3	0	0	30	70	3
6	**CS416(R20)**	Research Methodology	BS	3	0	0	30	70	3
7	**CS451(R20)**	Tensor Flow	SC	1	0	2	30	70	2
8	**CS452(R20)**	Industrial / Research Internship (2 months) after 3rd year (to be evaluated during VII semester)	MC	0	0	0	100	0	3
TOTAL CREDITS									**23**
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)									**4**

JOB Elective Course -III		Open Elective Course-III	
1	**CS 414 A.** Wireless Networks	1	**CS 415 A.** Principles of Entrepreneurship
2	**CS 414 B.** Storage Area Networks	2	**CS 415 B.** Intellectual Property Rights
3	**CS 414 C.** Introduction to NoSQL Databases	3	**CS 415 C.** Biomedical Applications
4	**CS 414 D.** Multicore Architecture & Programming	4	**CS 415 D.** Fundamentals of Robotics

IV/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	Int.	Ext.	
1	**CS461(R20)**	Project Work	Project	0	0	0	50	100	8
2	**CS462(R20)**	Seminar	Seminar	0	0	0	50	0	2
3	**CS463(R20)**	MOOCs	MOOC	0	0	0	100	0	2
TOTAL CREDITS									**12**

MINOR DEGREE COURSES [R-20]

S. No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Int.	Ext.	
1	**CSM001(R20)**	Operating Systems	Minor	3	0	0	30	70	4
2	**CSM002(R20)**	Data Structures & Algorithms	Minor	3	0	0	30	70	4
3	**CSM003(R20)**	Java Programming	Minor	3	0	0	30	70	4
4	**CSM004(R20)**	Computer Organization & Architecture	Minor	3	0	0	30	70	4
5	**CSM005(R20)**	Data Base Management Systems	Minor	3	0	0	30	70	4
6	**CSM006(R20)**	Computer Networks	Minor	3	0	0	30	70	4

HONOURS DEGREE COURSES NETWORKING DOMAIN

S. No.	Course Details		Category	Scheme Of Instruction			Scheme of Examination		
	Code	Subject Name		Hours In A Week			Marks		Credits
				L	T	P	Int.	Ext.	
1	**CSHT101(R20)**	Network Security	Honour	3	0	0	30	70	4
2	**CSHT102(R20)**	Cyber Security	Honour	3	0	0	30	70	4
3	**CSHT103(R20)**	Digital Forensics	Honour	3	0	0	30	70	4
4	**CSHT104(R20)**	TCP/IP	Honour	3	0	0	30	70	4

HONOURS DEGREE COURSES AI & ML DOMAIN

S. No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Int.	Ext.	
1	**CSHT201(R20)**	Artificial Neural Networks	Honour	3	0	0	30	70	4
2	**CSHT202(R20)**	Deep Learning	Honour	3	0	0	30	70	4
3	**CSHT203(R20)**	Soft computing	Honour	3	0	0	30	70	4
4	**CSHT204(R20)**	Advanced Python Programming	Honour	3	0	0	30	70	4

HONOURS DEGREE COURSES SOFTWARE ENGINEERING DOMAIN

S. No.	Course Details		Category	Scheme Of Instruction			Scheme of Examination		
	Code	Subject Name		Hours In A Week			Marks		Credits
				L	T	P	Int.	Ext.	
1	**CSHT301(R20)**	Software Testing	Honour	3	0	0	30	70	4
2	**CSHT302(R20)**	Software Project Management	Honour	3	0	0	30	70	4
3	**CSHT303(R20)**	Software metrics and measurement	Honour	3	0	0	30	70	4
4	**CSHT304(R20)**	Software verification and validation	Honour	3	0	0	30	70	4

HONOURS DEGREE COURSES DIGITAL IMAGE PROCESSING DOMAIN

S. No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Int.	Ext.	
1	**CSHT401(R20)**	Digital Image and Video Processing	Honour	3	0	0	30	70	4
2	**CSHT402(R20)**	Soft Computing	Honour	3	0	0	30	70	4
3	**CSHT403(R20)**	Computer Vision	Honour	3	0	0	30	70	4
4	**CSHT404(R20)**	Natural Language Processing	Honour	3	0	0	30	70	4

I/IV B.Tech
SEMESTER I

ACHARYA NAGARJUNA UNIVERSITY

Dr. Y.S.R. ANU COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

B.Tech. COMPUTER SCIENCE ENGINEERING

I/IV B.Tech. SEMESTER-I

CE/ME/EE/EC/CS 111 (R20): MATHEMATICS-I

L-3	T-0	P-0	M-100	C-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

COURSE OUTCOMES:

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

CO1	Using Matrix method find the inverse of matrix, and using other methods solving Homogeneous and non-homogeneous equations. Determining the eigen values and eigen vectors.
CO2	Finding the approximate real root of given equation.
CO3	Finding partial derivatives of first and higher orders and maxima and minima of functions of two variables.
CO4	Evaluate double integrals techniques over a region of two dimensional and with polar coordinates.
CO5	Familiarize with special functions to evaluate some proper and improper integrals using beta and gamma functions.

Unit I:

Matrix Operations and Solving Systems of Linear Equations

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.

Unit II:

Mean Value Theorems

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

Unit III:

Multivariable calculus

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

Unit IV:

Double Integrals

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

Unit V:

Special Functions

Beta and Gamma functions and their properties, relation between beta and gamma functions.

TEXT BOOKS:

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

REFERENCE BOOKS:

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	2	-	-	-	-	-	-	-	2	3	-	-	-	1
CO2	1	3	-	-	-	-	-	-	-	1	3	-	-	-	1
CO3	2	3	-	-	-	-	-	-	-	2	2	-	-	-	2
CO4	2	2	-	-	-	-	-	-	-	3	2	-	-	-	2
CO5	2	3	-	-	-	-	-	-	-	1	3	-	-	-	2

CS/EE 112 (R20): ENGINEERING PHYSICS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

At the end of the Course/Subject, the students will:

- Understand the phenomena of light- Interference, diffraction, and analyze the differences between interference and diffraction with applications.
- Explain the concepts of lasers and fiber optics and apply them in various fields of engineering.
- Understand the significance of wave function, concepts of classical, quantum free electron theories and classify the materials based on band theory.
- Explain various types of polarizations of dielectrics, classify the magnetic materials and apply the magnetic, dielectric materials for given engineering applications.

COURSE OUTCOMES:

Course Outcome	Course Outcome Statement	Bloom's Taxonomy	Level
CO1	Distinguish the phenomena of light- Interference, diffraction, and determination of the wavelength of given light using these phenomena.	**Remember & understand**	**1 & 2**
CO2	Apply the concepts of light in optical fiber and lasers in communication system. Use of fibers in communication system. Major applications of fibers and Lasers in medical field.	**Application**	**3**
CO3	Classify the magnetic materials and apply the magnetic, dielectric materials for given engineering applications.	**Application**	**3**
CO4	Classify the semiconductors and study the properties of Semiconductors. Hall effect.	**Analyzing**	**4**
CO5	Calculate the energy of quantum particle at different energy levels, de Broglie's hypothesis, Schrodinger's wave function and its applications, study of the properties of superconductors. BCS Theory of Superconductivity	**Analyzing**	**4**

UNIT-I **(10 hrs)**

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

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

UNIT-II **(12 hrs)**

Lasers: Laser characteristics, Spontaneous and Stimulated emissions, Basic requirements of a laser, Population inversion – Solid state laser (Ruby laser), Gas (He-Ne) laser, Semiconductor (GaAs) laser, applications of lasers.

Fiber optics: Introduction to Optical Fibers-Principle of optical fiber-Critical angle, Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile, Modes-Propagation of electromagnetic wave through optical fiber - Fiber optic Communication system-applications of Optical fibers.

Unit – III **(14 hrs)**

Dielectrics: Introduction to Dielectrics--Electric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations-Lorentz (internal) field - Claussius -Mossotti equation.

Magnetics: 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- applications of magnetic materials.

Unit – IV: **(12 hrs)**

Semiconductors

Origin of energy band formation in solids-Classification of materials into conductors, semi-conductors & insulators – Semiconductors-Intrinsic semiconductors-dependence of Fermi level on carrier concentration and temperature(Qualitative)- Extrinsic semiconductors - P-type & N-type-dependence of Fermi level on carrier concentration and temperature (Qualitative)- Direct and Indirect band gap semiconductors-Hall effect- applications of Semiconductors.

Unit-V **(12 hrs**

Principles of Quantum Mechanics: Dual nature of light, Matter waves & properties, de Broglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle and application (non-existence of electron in nucleus). One dimensional time independent Schrodinger's wave equation, Physical significance of the wave function, Particle in a box (one dimensional).

Superconductivity: First experiment, critical parameters (Tc, Hc, Ic), Meissner effect, BCS Theory (in brief) and Applications of superconductors.

TEXT BOOKS:

1) M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics"-S.Chand Publications,2017
2) H.K.Malik & A.K.Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018
3) Gaur R.K. and Gupta S.L., "Engineering Physics"- Dhanpat Rai publishers, 2012.

REFERENCE BOOKS:

1) Gerd Keiser "Optical Fiber Communications"- 4/e, Tata McGrawHill,2008
2) S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008
3) D.K. Bhattacharya and A. Bhaskaran, "Engineering Physics"- Oxford Publications-2015

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	-
AVG_CO	3	3	2	-	-	-	-	-	-	-	-	-	-	-

CE/ME/CS 113 (R20): BASIC ELECTRICAL ENGINEERING

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO1	Understand the fundamental concepts of DC and AC circuits, including Kirchhoff's laws, series and parallel connections, and nodal and loop analysis
CO2	Analyze single-phase AC circuits consisting of RL, RC, and RLC series circuits, including series resonance and band width
CO3	Demonstrate knowledge of magnetic circuits and their properties, including Faraday's laws of electromagnetic induction, dynamically and statically induced EMF, and self and mutual inductance
CO4	Explain the principle and operation of DC machines, including DC generators and motors, and understand their performance characteristics and speed control methods.
CO5	Describe the principle, operation, and construction of AC machines, including single-phase transformers and three-phase induction motors, and understand their losses, efficiency, and testing methods.

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.

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.

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

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.

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 emitter configuration, Transistor amplifying action, Common collector configuration, Operating point

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.

REFERENCE BOOKS:

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

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	2	-	-	-	-	-	-	-	3	3	3	-	
CO2	-	-	-	2	2	-	-	1	-	3	3	3	-	-	
CO3	2	2	2	-	-	-	-	-	-	-	-	-	3	3	
CO4	-	-	-	-	-	2	2	2	2	2	-	3	3	-	
CO5	-	-	2	-	-	1	1	-	-	-	3	1	2	-	
AVG_CO	1	1	1	1	1	1	1	1	1	1	2	1	2	1	

CS/EE 114 (R20): ENGINEERING MECHANICS

L-3	T-0	P-0	M-100	C-3

COURSE OUTCOMES:

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

CO1	Determine resultants and apply conditions of static equilibrium to plane force systems.
CO2	Develop complete and correct free body diagrams and Write the appropriate equilibrium equations from the free body diagrams.
CO3	Analyze systems that include frictional forces.
CO4	Locate the centroid of area, moment of inertia, product of inertia of various shape.
CO5	Apply the theorem of virtual work on beam, frame and link problem.

Unit I

Introduction to Engineering Mechanics: Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.

Friction: Laws of friction, types of friction, equilibrium of force systems involving frictional forces, wedge friction. Free body diagrams involving frictional forces.

Unit II

Analysis of Structures: Introduction to plane trusses, analysis of plane trusses by method of joints and method of sections.

Properties of Surfaces and Volumes: Centroid and center of gravity, derivation of centroids from first moment of area, centroids of composite sections, center of gravity of common volumes - cylinder, cone, sphere, theorem of Pappus-guidinus.

Unit III

Moment of Inertia: Area moment of inertia of plane and composite shapes, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, mass moment of inertia of common volumes -thin plates, thin rod, cylinder, cone, sphere, rectangular prism, radius of gyration.

Unit IV

Kinematics: Equations of motion for rigid bodies, constant and variable acceleration, rectilinear and curvilinear motion, motion under gravity -projectile motion, use of rectangular coordinates, tangential and normal coordinates.

Unit V

Kinetics: Principles of dynamics - Newton's Laws of motion, D'Alembert's principle in rectilinear translation, principle of work and energy.

Ideal Systems: Principle of conservation of energy, concept of power, conservation of linear and angular momentum, principle of momentum and impulse.

TEXT BOOKS:

1) N H Dubey, Engineering Mechanics: Statics and Dynamics, McGraw Hill, 2014.
2) S Timoshenko, DH Young, JV Rao, SukumarPati, Engineering Mechanics (in SI units), 5/e, McGraw Hill, 20
3) S SBhavikatti, Engineering Mechanics, 4/e, New Age International, 2008.

REFERENCE BOOKS:

1) Basudeb Bhattacharya., Engineering Mechanics, 2/e, Oxford University Press (India), 2015.
2) Irving Shames, G K M Rao, Engineering Mechanics: Statics and Dynamics, 4/e, Pearson, 2009.
3) K L Kumar, Veenu Kumar, Engineering Mechanics, 4/e, Tata McGraw Hill, 2010

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	1	-	-	-	-	-	-	-	-	1	-	-	3
CO2	2	2	1	-	-	-	-	-	-	-	-	1	-	-	2
CO3	2	2	1	-	-	-	-	-	-	-	-	1	-	-	2
CO4	2	2	1	-	-	-	-	-	-	-	-	1	-	-	2
CO5	2	2	1	-	-	-	-	-	-	-	-	1	-	-	2
AVG_CO	2	2	1	-	-	-	-	-	-	-	-	1	-	-	2

CE/ME/EE/EC/CS 115 (R20): COMPUTER PROGRAMMING

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- Understand the basic terminology, write, compile and debug programs in computer programming
- Implement different control statements for solving problems.
- Understand the concept of structured program and arrays.
- Implement the idea of strings and pointers.
- Analyse the usage of structures and different file operations

COURSE OUTCOMES:

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

CO1	Design and develop flowcharts using Raptor to solve simple problems related to basic programming constructs
CO2	Write basic programs in C using different data types, operators, and control structures
CO3	Develop programs using functions and understand concepts like scope, storage classes, and recursion
CO4	Implement programs using arrays, pointers, and strings for solving problems related to data manipulation.
CO5	Understand the concept of structures and files in C programming, and develop programs using structures and file handling functions.

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.

Unit II:

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.

Unit III: 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.

Unit IV: 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.

Unit V: 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.

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

REFERENCE BOOKS:

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

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	2	2	-	-	2	-	2	-	-	-	-	-	1	1
CO2	2	-	-	2	-	-	-	1	-	2	2	2	2	2
CO3	-	-	2	-	2	2	-	-	-	-	3	3	3	3
CO4	-	2	-	-	2	2	-	-	2	-	3	-	3	3
CO5	1	-	-	2	-	-	-	2	-	-	-	3	1	2
AVG_CO	1	1	1	1	1	1	1	1	1	1	2	2	2	2

EE/CS116 (R20): ENVIRONMENTAL SCIENCE

L-3	T-0	P-0	M-100	C-3

COURSE 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.

COURSE OUTCOMES:

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

CO1	Gain knowledge about environment and importance of Environmental Studies in the life. They have to know about resources, its importance and environmental impacts of human activities on natural resources.
CO2	Students will learn about the Ecosystem functioning and Importance of biodiversity and its Conservation.
CO3	Gain knowledge about the environmental pollution control, management of waste and pollution related aspects
CO4	Aware students about social issues and natural calamities, constitutional tools provisions for human welfare.
CO5	Students will learn about increase in population growth and its impact on environment and study of different ecosystems through field visit.

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:

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:

1) Forest ecosystem.
2) Grassland ecosystem
3) Desert ecosystem
4) 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.

UNIT – III:

Environmental Pollution and Solid Waste Management

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

1) Air Pollution.
2) Water pollution
3) Soil pollution
4) Marine pollution
5) Noise pollution
6) Thermal pollution
7) 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.

UNIT – IV:

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.

UNIT – V:

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..

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.AzeemUnnisa, Academic Publishing Company

REFERENCE BOOKS:

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3	2	2	2	2	3	3	1	1	1	1	3	2	3
CO2	2	2	2	2	2	3	3	3	1	1	1	1	3	2	2
CO3	3	2	2	2	2	2	3	3	1	1	1	1	3	2	3
CO4	2	3	2	2	3	2	3	3	1	1	1	1	3	2	2
CO5	3	3	2	2	3	2	3	3	1	1	1	1	3	2	3
AVG_CO	3	2	2	2	2	2	3	3	1	1	1	1	3	2	3

CS/CE/ME 151 (R20): BASIC ELECTRICAL ENGINEERING LABORATORY

L-3	T-0	P-0	M-100	C-1.5

COURSE OUTCOMES:

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

CO1	Understand basic safety precautions and be able to use measuring instruments such as voltmeter, ammeter, multi-meter, and oscilloscope.
CO2	Verify Kirchhoff's laws by performing experiments on electrical circuits.
CO3	Verify the Superposition theorem by performing experiments on electrical circuits.
CO4	Verify Thevenin's theorem by performing experiments on electrical circuits.
CO5	Understand the open circuit characteristics of a DC shunt generator and be able to perform experiments to determine its behavior.

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

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	1	2	-	1	1	-	-	2	-	-	-	2	3	1
CO2	2	3	1	3	2	-	-	2	-	-	-	2	3	1
CO3	-	2	-	1	-	-	-	2	-	-	-	2	3	1
CO4	2	3	-	3	2	-	-	2	-	-	-	2	3	1
CO5	3	3	2	3	-	-	-	2	-	-	1	3	2	1
AVG_CO	2	2	1	2	1	-	-	2	-	-	1	2	3	1

CE/ME/CS152 (R20): ENGINEERING PHYSICS LABORATORY

L-3	T-0	P-0	M-100	C-1.5

COURSE OBJECTIVES:

At the end of the Course/Subject, the students will:

- To Measure the wavelength of light using optical instruments.
- To determine the numerical aperture and acceptance angle of optical fiber
- To Study the behavior of semiconducting materials.
- To study the magnetizing behaviour of magnetic materials
- To measure the dielectric constant of a material

COURSE OUTCOMES:

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

CO1	Examine the physical properties of light using interference and diffraction.
CO2	Calculate the numerical aperture and acceptance angle of optical fiber
CO3	Analyze the characteristics of semiconducting material
CO4	Demonstrate the magnetizing behavior of magnetic materials
CO5	Calculate the dielectric constant of a material

LIST OF PHYSICS EXPERIMENTS:

1) Determination of the radius of curvature of the lens by Newton's ring method.
2) Determination of wavelength by plane diffraction grating method.
3) Dispersive power of a Prism.
4) Resolving power of a grating.
5) Photo cell – I-V Characteristic curves and determination of stopping potential.
6) Magnetic field along the axis of a circular coil carrying current.
7) B-H Curve
8) To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle.
9) Hall Effect.
10) Photo voltaic cell - Determination of fill-factor.
11) To determine the energy gap of a semiconductor.
12) Determination of Acceleration due to gravity by using compound Pendulum.
13) Poisson's ratio of aluminium and rubber.
14) Rigidity modulus of material by wire-dynamic method (torsional pendulum).
15) Determination of a.c. Frequency – Sonometer.
16) Determine the wavelength of Laser source.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3	-	-	3	-	-	-	3	-	-	-	-	-	
CO2	3	-	-	-	3	-	-	-	3	-	-	-	-	-	
CO3	3	3	-	-	3	-	-	-	3	-	-	-	-	-	
CO4	3	-	-	-	3	-	-	-	3	-	-	-	-	-	
CO5	3	-	-	-	3	-	-	-	3	-	-	-	-	-	
AVG_CO	3	1	-	-	3	-	-	-	3	-	-	-	-	-	

CE/ME/EE/EC/CS 153 R(20): COMPUTER PROGRAMMING LAB

L-3	T-0	P-0	M-100	C-1.5

COURSE OBJECTIVES:

This course provides the fundamental concepts of programming using C language, apply the control structures, iterations statements, arrays, functions, strings, pointers, structures, unions and files. This course also explains the concepts of searching and sorting techniques in C language.

SOFTWARE REQUIREMENTS: Turbo C

COURSE OUTCOMES:

CO1	Understand and apply fundamental programming concepts such as variables, data types, operators, control structures, functions, arrays, pointers, and structures in C language.
CO2	Develop efficient algorithms and use appropriate data structures to solve programming problems in C
CO3	Demonstrate the ability to write and debug C programs using appropriate tools and techniques, including integrated development environments (IDEs) and debugging utilities
CO4	Evaluate the efficiency and complexity of C programs in terms of time and space complexity, and apply appropriate techniques to optimize program performance.
CO5	Work collaboratively in teams to develop complex C programs, and effectively communicate technical information and programming solutions to others.

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 – yaswanth kanitkar 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 – yaswanth kanitkar 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 –yaswanth kanitkar 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 yaswanth kanitkar 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 student's 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 polynomials?

8. WRITE A PROGRAM ON FILES?

a) Practice exercise 12.1 to 12.20 yaswanth kanitkar 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?

REFERENCE BOOKS:

1) Test your C Skills by – Yaswanth Kanithkar-BPB Publishers.

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

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	-	-	-	-	2	2	2	-	-	2	2	2	1	
CO2	-	2	2	2	-	-	1	2	-	2	2	2	3	1	
CO3	1	-	2	1	-	-	1	-	1	-	2	2	3	1	
CO4	2	-	-	2	-	-	-	1	1	2	2	2	3	1	
CO5	-	2	1	-	2	-	-	1	-	-	2	2	2	1	
AVG_CO	1	1	1	1	1	1	1	1	1	1	2	2	2	1	


I/IV B.Tech
SEMESTER II

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

B.Tech. COMPUTER SCIENCE & ENGINEERING

SEMESTER-II (I YEAR)

CE/ME/EE/EC/CS121 (R20): MATHEMATICS-II

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO1	Using variable separable method and using other methods solving the higher order differential equation.
CO2	Reducing the given differential equations and solving for the required solutions.
CO3	Student should be known about first order partial differential equations and its solutions obtained by using different methods.
CO4	Student should able to understand about vectors, vector differentiation methods.
CO5	Student should able to find vector integration by using different methods and also applications of vectors in various fields.

UNIT I: Linear Differential Equations of Higher Order

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

UNIT II: Equations Reducible to Linear Differential Equations and Applications

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients,

UNIT III: Partial Differential Equations – First order

First order partial differential equations, solutions of first order linear and non-linear PDEs.

Solutions to homogenous and non-homogenous higher order linear partial differential equations

UNIT IV: Multivariable Calculus (Vector differentiation)

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V: Multivariable Calculus (Vector integration)

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

TEXT BOOKS:

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

REFERENCE BOOKS:

1) Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2) Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3) George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4) R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
5) Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	2	-	-	-	-	-	-	-	2	3	-	-	-	1
CO2	1	3	-	-	-	-	-	-	-	1	3	-	-	-	1
CO3	2	3	-	-	-	-	-	-	-	2	2	-	-	-	2
CO4	2	2	-	-	-	-	-	-	-	3	2	-	-	-	2
CO5	1	2	-	-	-	-	-	-	-	3	3	-	-	-	1
AVG_CO	1	2	-	-	-	-	-	-	-	2	3	-	-	-	1

CS/EE 122 (R20) : ENGINEERING CHEMISTRY

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- To acquire knowledge about desalination of brackish water and treatment of municipal water.
- To gain the knowledge of conducting polymers, bio-degradable polymers and fiber reinforced plastics and the synthesis of nano materials.
- Apply electrochemical basics to the field of battery technology and the main components and chemistries and the manufacturing process of batteries. assess different batteries by teaching them about battery specifications.
- To understand the mechanism of corrosion and preventive methods.
- This subject is designed to impart fundamental knowledge of the principles and instrumentation of spectroscopic and chromatographic techniques.
- The main processes involved during cement production will be discussed, including the extraction and processing of raw materials, the combustion process, cement grinding, quality control and storage, and cement distribution.
- To understand the nucleophilic substitution and elimination mechanisms.
- The synthesis of aspirin and paracetamol lab methods are used included recrystallization and scratching to produce a precipitate, which was then filtered to remove any excess moisture.

COURSE OUTCOMES:

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

CO1	Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost
CO2	Substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution. Design economically and new methods of synthesis nano materials.
CO3	Identify electronic components that can provide protection and specify a minimum set of protections needed - Compute stored energy in a battery pack - List the manufacturing steps of different types of lithium-ion cells and possible failure modes and apply their knowledge for protection of different metals from corrosion
CO4	Ability to understand, explain and select instrumental techniques for analysis
CO5	Develop the technique involved in the manufacturing process of cement Apply the knowledge about the properties of chemical fuels for the generation of power Apply the knowledge of various polymeric material, their synthesis and applications and synthesize medicinal compounds and the physical chemical properties of drugs using drug design software

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.

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.

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:

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.

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.

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,3rdEdition, Dhanpat rai & co new delhi,2007.
5) Gurudeep raj & chatwalanand, "Instrumental methods of analysis "7thedition, 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 ", 7thedition,CBS publications,1986.
9) Text book of Nano Science and Nano technology, B.S. Murthy and P. Shankar, University press.

CO-PO/PSO MATRIX MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	1	2	-	-	1	-	3	3	3
CO2	3	2	1	1	-	-	2	-	-	1	-	3	2	2
CO3	3	2	1	2	1	-	-	-	-	1	-	3	2	2
CO4	3	3	2	1	1	-	-	-	-	1	-	2	2	3
CO5	3	3	2	2	-	1	-	-	-	1	-	3	3	2
AVG_CO	**3**	**3**	**2**	**1**	**1**	**1**	**2**	**-**	**-**	**1**	**-**	**3**	**3**	**3**

CS/EE/EC 123 (R20): PROFESSIONAL COMMUNICATION SKILLS

L-3	T-0	P-0	M-100	C-3

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

COURSE OUTCOMES:

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

CO1	Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English (L3)
CO2	Formulate sentences using proper grammatical structures and correct word forms (L3)
CO3	Speak clearly on a specific topic using suitable discourse markers in informal discussions
CO4	Write summaries based on global comprehension of reading texts (L3)
CO5	Produce a coherent paragraph interpreting a figure/graph/chart/table (L4)

UNIT-1:

1) Reading: Listening Skills – The Boy who broke the Bank (English & Soft Skills)
2) Writing: Paragraph Writing
3) Grammar: Common Errors in Nouns- Pronoun Agreement
4) Vocabulary Building: Functional word list -100

UNIT- II:

1) Reading: Assertive Skills – The Verger (English & Soft Skills)
2) Writing: Letter Writing (Formal and Informal)
3) Grammar: Correction of Errors in Subject- Verb Agreement
4) Vocabulary Building: Sign Post

UNIT - III:

1) Reading: Learning Skills – Three Questions (English & Soft Skills)
2) Writing: Note Making, Note Taking
3) Grammar: Correction of in Tense Usage
4) Building: One Word Substitutes

UNIT - IV:

1) Reading: Adaptability Skills – Senor Payroll (English & Soft Skills)
2) Writing: Pictorial Description
3) Grammar: Correction of Errors in Adjectives, Articles, Prepositions
4) Vocabulary Building: Synonyms and Antonyms

UNIT - V:

Reading: Written Communication Skills - Gateman's Gift (English & Soft Skills)

Writing: Information Transfer

Grammar: Correction of Errors in Wh- questions, Question Tags. Vocabulary Building: Idioms and Phrasal Words (200)

TEXT BOOK:

1) Dhanavel S. P. *English and Soft Skills*, Orient Black Swan Pvt. Limited, 2013.
2) Barun K Mitra, *Effective Technical Communication*, Oxford University Publication, 2014.

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) Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
4) Michael Swan. *Practical English Usage*, OUP. 1995.
5) F.T. Wood. *Remedial English Grammar*, Macmillan.2007
6) Liz Hamp-Lyons and Ben Heasly. *Study Writing*, Cambridge University Press. 2006.
7) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad.
8) Sharon J.Gerson, Steven M.Gerson, *Technical Writing*, New Delhi: Pearson education, 2007.
9) Sanjay Kumar and Pushp Lata, *Communication Skills*, Noida: Oxford University Press, 2012.
10) Dr. Shalini Verma, *Word Power Made Handy*, S. Chand & Co Ltd., 2009.

CO-PO/PSO MAPPING MATRIX:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	2	2	-	-	2	3	-	3	3	-	-
CO2	-	-	-	2	2			2	3	-	3	3	-	-
CO3	-	-	-	2	2	-	-	2	3	-	3	3	-	-
CO4	-	-	-	2	2			2	3	-	3	3	-	-
CO5	-	-	-	2	2	-	-	2	3	-	3	3	-	-
AVG_CO	-	-	-	2	2			2	3	-	3	3	-	-

EE/EC/CS/ME/CE 124 (R20): PYTHON

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

This course enables the students to understand the fundamentals of python programming, describe the various operators and control flow statements, analyse various data structures, make use of functions, discuss about MODULE s, packages in python, object oriented concepts, exception handling, illustrate advanced concepts like multithreading, graphics and generate various test cases.

COURSE OUTCOMES:

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

CO1	Understand the basic building blocks in python programming language to construct different applications.
CO2	Apply the necessary data structures to solve a given problem
CO3	Extract and import packages for developing different solutions for real time problems.
CO4	Implement the problems in terms of real -world objects using concept of OOPS.

Unit-I

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.

Unit-II

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.

Unit-III

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.

Unit-IV

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.

Unit-V

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.

TEXT BOOKS:

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

CO-PO/PSO MAPPING MATRIX:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	2	-	-	3	2	1
CO2	2	2	2	-	-	-	-	-	2	-	-	3	1	2
CO3	2	2	2	-	-	-	-	-	2	-	-	3	3	2
CO4	2	2	2	-	-	-	-	-	2	-	-	3	3	1
AVG_CO	2	2	2	-	-	-	-	-	2	-	-	3	2	2

CS/EC/ME/CE 125 (R20): ENGINEERING GRAPHICS

L-3	T-0	P-0	M-100	C-3

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.

COURSE OUTCOMES:

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

CO1	To understand how to construct and analyze different types of curves used in engineering design and manufacturing to study conic sections, cycloids, helixes, spirals, and involutes.
CO2	To analyze their drawing skills through regular practice of the different techniques taught in the course, including freehand sketching, orthographic and isometric projections.
CO3	Applying of their drawing skills through regular practice of the different techniques taught in the course, including orthographic projections, section views, and dimensioning.
CO4	To understand various topics such as projections of lines in different planes, true length and true inclination of lines, and projection of planes in different planes, true shape and true size of planes, and the concept of auxiliary planes.
CO5	To evaluate various topics such as sectioning of solids, different types of sections, and the application of sectioning in engineering design and manufacturing.

UNIT-I

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-hhyperbola- general method only,

b) Cycloid, epicycloids and hypocycloid

c) Involutes

UNIT-II

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. .

UNIT-III

Projections of solids: Projections of regular solids inclined to one or both planes by rotational.

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

UNIT-IV

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

UNIT-V

Orthographic Projections: Systems of Projections, Orthographic Projection (Simple Figures)

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) Basant Agarwal&C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.
6) Youtube: http-sewor, Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu.

CO-PO/PSO MATRIX MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	-	-	-	-	-	2	3	3
CO2	3	3	3	3	3	2	-	-	-	-	-	2	3	3
CO3	3	3	3	3	3	2	-	-	-	-	-	3	3	3
CO4	3	3	3	3	3	2	-	-	-	-	-	2	3	3
CO5	3	3	3	3	3	2	-	-	-	-	-	3	3	3
AVG_CO	3	3	3	3	3	2	-	-	-	-	-	2	3	3

CS/EE 161 (R20): ENGINEERING CHEMISTRY LABORATORY

L-3	T-0	P-0	M-100	C-1.5

COURSE OUTCOMES:

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

CO1	Explain various methods of volumetric analysis i.e. Redox, Iodometric, complexometric, Neutralization etc. and use of conductivity meter for measurement of conductance of water sample.
CO2	Apply the use of internal and external indicators and their comparison for redox titrations and mechanisms of iodometric titrations and use of double indicator method in a single titration.
CO3	Estimate the % values of moisture, volatile matter, ash and carbon of fuel by Proximate analysis and instrument handling
CO4	Analyse the properties of lubricants viz. Flash & fire point, viscosity, cloud & pour point and their significance.
CO5	Produce a coherent paragraph interpreting a figure/graph/chart/table (L4) Explain synthetic technique of drug like Aspirin, Paracetamol etc.

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 tensions

CO-PO/PSO MAPPING MATRIX:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	1	-	-	-	-	-	-	-	-
CO2	2	-	-	1	-	-	-	-	-	-	-	-
CO3	2	1	-	2	3	-	-	-	-	-	-	-
CO4	2	1	-	2	3	-	-	-	-	-	-	-
CO5	2	-	1	-	-	-	-	-	-	-	-	-

CS/CE/ME 162 (R20): COMMUNICATION SKILLS LAB

L-3	T-0	P-0	M-100	C-1.5

COURSE OUTCOMES:

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

CO1	Identify the sounds of English and use of stress and intonation in connected speech
CO2	Able to listen carefully to communicate effectively in cross- cultural contexts
CO3	Capable to make the students communicate in Daily life situations
CO4	Capable to read for content/ main idea.
CO5	Able to communicate confidently in oral presentations

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

CO-PO/PSO MAPPING MATRIX:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	2	2	-	-	2	3	3	-	3	-	-
CO2	-	-	-	2	2	-	-	2	3	3	-	3	-	-
CO3	-	-	-	2	2	-	-	2	3	3	-	3	-	-
CO4	-	-	-	2	2	-	-	2	3	3	-	3	-	-
CO5	-	-	-	2	2	-	-	2	3	3	-	3	-	-
AVG_CO	-	-	-	2	2	-	-	2	3	3	-	3	-	-

CS/CE/ME/EE/EC/CS 163 (R20): PYTHON LAB

L-3	T-0	P-0	M-100	C-1.5

COURSE OBJECTIVES:

This course enables the students to develop various applications using python

COURSE OUTCOMES:

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

CO1	Implement python programming constructs to build small to large scale applications.
CO2	Implement the problems in terms of real -world objects using OOP's technology.
CO3	Evaluate and handle the errors during runtime involved in a program
CO4	Extract and import packages for developing different solutions for real time problems.

LIST OF ACTIVITIES:

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.

CO-PO/PSO MAPPING MATRIX:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	2	-	-	-	-	-	2	-	-	3	2	1
CO2	3	2	2	-	-	-	-	-	2	-	-	3	1	2
CO3	2	2	2	-	-	-	-	-	2	-	-	3	3	2
CO4	2	2	2	-	-	-	-	-	2	-	-	3	3	1
AVG_CO	2	2	2	-	-	-	-	-	2	-	-	3	2	1

II/IV B.Tech
SEMESTER I

B.Tech. COMPUTER SCIENCE & ENGINEERING

II/IV B.Tech. SEMESTER-I

CS211 (R20): PROBABILITY & STATISTICS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

To provide the students with sufficient knowledge in probability and statistics, this can be used in their respective fields.

COURSE OUTCOMES:

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

- Remembering the theory and have practical knowledge of Statistics, Measures of Central tendency, Variability, Skewness, Kurtosis, correlation, rank correlation, regression coefficients, principle of least squares.
- Understanding the clear conception of the terms Probability, random variables (discrete and continuous), probability density functions, mathematical expectation.
- Analysing evaluation of Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties.
- Evaluation about the Estimation- sampling distribution, point estimation, Formulation of null hypothesis, Large Sample: Tests of significance and Confidence interval.
- Evaluation of Student t-distribution, F-test, $\chi 2$ - test for goodness of fit, about test for independence of attributes.

Unit 1: Descriptive statistics

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.

UNIT 2: Probability

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.

UNIT 3: Probability distributions

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

Unit4: Estimation and Testing of hypothesis, large sample tests

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

Unit 5: Small sample tests

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, χ^2 - test for independence of attributes.

REFERENCE BOOKS:

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

CO-PO/PSO MAPPING MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	2	-	3	2	-	-	-	-	-	-	1	-	-
CO2	3	2	-	3	2	-	-	-	-	-	-	1	-	-
CO3	3	2	-	3	2	-	-	-	-	-	-	1	-	-
CO4	3	2	-	3	2	-	-	-	-	-	-	1	-	-
CO5	3	1	-	3	2	-	-	-	-	-	-	1	-	-

CS212 (R20): DATA STRUCTURES & ALGORITHMS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

- ★ Remembering basic data structure operations and analyse the time and space complexity of algorithms.
- ★ Understanding algorithms using the basic operations of stacks and queues and analyse their complexity.
- ★ Understanding basic operations of linked lists and analyse their algorithm complexity.
- ★ Evaluate the performance of selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort algorithms in term of Space and Time complexity and implementing the searching algorithms.
- ★ Constructing binary trees, binary search tress, AVL trees and B+ trees and Graphs.

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.

Array Data Structure: Array ADT and its operations, Time complexity.

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: 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.

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

Hashing: Hash function, Open addressing and separate chaining.

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, Tree traversals.

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

REFERENCE BOOKS:

1) Data Structures and Algorithms by Alfred V Aho,John E Hopcroft, Jeffrey D Uiiman, Pearson Education.
2) "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
3) Classic Data Structures by Debasis Samanta, PHI Publications.
4) Data Structures LIPSCHUTZ, Schaum publications.

CO-PO/PSO MAPPING MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	3	2	-	1	-	-	-	-	-	-	-	1	
CO2	3	2	1	-	1	-	-	-	-	-	-	-	1	
CO3	3	2	1	-	1	-	-	-	-	-	-	-	1	
CO4	3	2	1	-	1	-	-	-	-	-	-	-	1	
CO5	2	2	2	2	1	-	-	-	-	-	-	-	1	

CS213 (R20): OPERATING SYSTEMS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

To learn the fundamentals of Operating Systems.

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

COURSE OUTCOMES:

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

- ★ Remembering the fundamental concepts of an operating system functionality, and processes.
- ★ Apply the concepts of multithreading and IPC mechanisms and also analyze the performance of CPU scheduling algorithms, page replacement algorithms and disk scheduling algorithms.
- ★ Understanding the methods to solve critical section problem and deadlock handling in a system.
- ★ Analyse the effectiveness and the hardware support required for contiguous, non-contiguous, and virtual memory management schemes.
- ★ Analyse various disk scheduling methods.

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

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

CO-PO/PSO MAPPING MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	2	-	2	-		-	-	-	-	-	-	1	1	
CO2	3	-	2	1	1	-	-	-	-	-	-	1	1	
CO3	2	-	2	1	1	-	-	-	-	-	-	1	1	
CO4	2	2	3	1	1	-	-	-	-	-	-	1	1	
CO5	2	2	2	-	1	-	-	-	-	-	-	1	1	

CS214 (R20): ANALOG & DIGITAL ELECTRONICS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

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.

COURSE OUTCOMES:

- ★ Understand the concepts of BJT and op-amps.
- ★ Analysis of differential amplifiers.
- ★ Understanding the concepts of Number systems.
- ★ Construct Digital multiplexers, Adders and Subtractors, Binary Comparators, Latches and Master-Slave Flip-Flops.
- ★ Analyze Synchronous and Asynchronous Sequential circuits and Understand registers and Counters, A/D and D/A converters.

UNIT-I: BJT: Bipolar Junction transistor, BJT characteristics 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 ofIC gates. Number systems: binary, signed binary octal, hexadecimal number, binaryarithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.

UNIT-IV: 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, serialadder,

UNIT-V: 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.

Digital to Analog converters,Analog to digital converters.

REFERENCE 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.
4) Electronic Devices and Circuits, Jimmy J Cathey, Schaum's outline series, 1988.
5) Digital Principles, 3/e, Roger L. Tokheim, Schaum's outline series, 1994.
6) Analog and Digital Electronics, Dr S.Salivahanan 2019 McGraw-Hill Education

CO-PO/PSO MAPPING MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	1	2	1	-	-	-	-	-	-	-	2	1	-
CO2	3	2	2	1	-	-	-	-	-	-	-	2	1	-
CO3	2	1	3	1	-	-	-	-	-	-	-	2	1	-
CO4	3	2	2	1	-	-	-	-	-	-	-	2	1	-
CO5	3	1	1	1	-	-	-	-	-	-	-	2	1	-

CS215 (R20): UNIX PROGRAMMING

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- Written technical communication and effective use of concepts and terminology.
- Facility with UNIX command syntax and semantics.
- Ability to read and understand specifications, scripts and programs.
- Individual capability in problem solving using the tools presented within the class.

COURSE OUTCOMES:

- ★ Understand the basic Unix architecture, commands and utilities of the UNIX operating system and to work confidently in Unix/Linux environment and open systems
- ★ Creating simple and complex shell scripts to automate various tasks using shell programming.
- ★ Analyse file management system calls.
- ★ Understand various concepts of process and process related commands in UNIX.
- ★ Understand UNIX system administration and Inter Process Communication.

UNIT I

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

Bourne Shell programming: Shell, functions of the shell, Meta characters, Input redirection, Output redirection, pipes, shell as programming language, shellvariables, 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

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:

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

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.

REFERENCE BOOKS:

1) "Unix for programmers and users" 3rd edition by Graham Glass, King Ables,Pearson Education.
2) "Advanced programming in the unix environment" w- Richard Stevens 2nd Edition Pearson education
3) "Unix programming environment", Kernighan and pike, Pearson education.
4) "Your unix the ultimate guide" Sumitabha Das, TMH 2nd edition.
5) "Advanced unix programming" by Marc J. Rochkind, 2nd edition Pearson

CO-PO/PSO MAPPING MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	1	-	1	-	-	-	-	-	-	-	-	1	-
CO2	2	2	1	2	-	-	-	-	-	-	-	-	1	-
CO3	3	1	-	1	-	-	-	-	-	-	-	-	1	-
CO4	2	1	1	1	-	-	-	-	-	-	-	-	1	-
CO5	2	1	1	1	-	-	-	-	-	-	-	-	1	-

CS216 (R20): PROFESSIONAL ETHICS AND HUMAN VALUES

L-3	T-0	P-0	M-100	C-0

COURSE OBJECTIVES:

- Understand the concept of ethics and its importance in professional life.
- Identify and analyze ethical issues and dilemmas in various professional domains.
- Develop ethical decision-making skills and strategies.
- Understand the role of values in shaping professional behavior.
- Foster ethical leadership and responsibility in professional settings.
- Reflect on personal ethical development and growth.

COURSE OUTCOUCOMES:

- ★ Demonstrate knowledge of ethical theories and principles.
- ★ Analyze and evaluate ethical dilemmas in real-world scenarios.
- ★ Apply ethical decision-making models to resolve complex problems.
- ★ Examine the influence of personal and cultural values on professional conduct.
- ★ Demonstrate leadership skills with integrity and ethical behavior.

UNIT – I

Human Values: Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT – II

Engineering Ethics: Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT – III

Engineering as Social Experimentation: Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT - IV

Safety, Responsibility and Rights: Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and reducing risk.

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT – V

Global Issues: Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (ISTE), India, etc.

REFERENCE BOOKS:

1) R.S. Naagarazan "A Textbook on Professional ethics and Human Values", New Age International Publihers, 2006.
2) Govindarajan. M, Natarajan. S, Senthilkumar. V.S, "Engineering Ethics", Prentice Hall of India, 2004.
3) Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Jersey, 2004 (Indian Reprint).
4) Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics Concepts and Cases", Thompson Learning, United States, 2000 (Indian Reprint now available).
5) John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
6) Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

CO-PO/PSO MAPPING MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO2	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO3	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO4	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO5	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**

CS251 (R20): DATA STRUCTURES& ALGORITHMS LAB

L-0	T-0	P-3	M-100	C-1.5

COURSE OBJECTIVES:

- To impart the basic concepts of data structures and algorithms
- To understand concepts about searching and sorting techniques
- To Understand basic concepts about stacks, queues, lists, trees and graphs
- To understanding about writing algorithms and step by step approach in solving problems
- With the help of fundamental data structures

COURSE OUTCOMES:

- ★ Understand basic data structures such as arrays, linked lists, stacks and queues.
- ★ Implement the stack, Queue and their applications
- ★ Implement various types of linked lists and their applications
- ★ Ability to have knowledge of tree and graphs concepts.
- ★ Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

LIST OF ACTIVITIES:

1) Write a C program to perform insertion, deletion, display operations on Array Data Structure.
2) Write a C program to perform insertion, deletion, display operations on stack Data Structure using arrays.
3) Write a C program to convert given infix expression into postfix expression and evaluate the postfix expression.
4) Write a C program to convert given infix expression into prefix expression and evaluate the prefix expression.
5) Write a C program to perform insertion, deletion, display operations on queue Data Structure using arrays.
6) Write a C program to perform insertion, deletion, display operations on circular Queue Data Structure using arrays.
7) Write a C program to perform insertion, deletion, display operations on single linked list Data Structure.
8) Write a C program to perform insertion, deletion, display operations on circular single linked list Data Structure.
9) Write a C program to perform insertion, deletion, display operations on double linked list Data Structure.
10) Write a C program to perform insertion, deletion, display operations on circular double linked list Data Structure.

11) 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.
12) Implement the following sorting operations:-
Shell Sort, (b) Heap Sort (c) Merge Sort (d) Quick Sort e) Radix Sort
13) Implement the following sorting operations:-
(a) Sequential search (b) Binary Search
14) Write a C program for open addressing.
15) Implement Binary Tree ADT and write a program that reads postfix Arithmetic
16) Expression form, builds the expression tree and performs tree Traversal on it.
17) Implement Binary search Tree ADT and write a program that interactively allows Insertion (b) Deletion (c) Find_min (d) Find_max (e) Find operations
18) Write a C program for Graph Traversals: a) DFS b) BFS

CO-PO/PSO MAPPING MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	2	2	1	2							
CO2	3	2	2	1	2							
CO3	3	2	2	1	2							
CO4	3	2	2	1	2							
CO5	3	2	2	1	2							

CS 252 (R20): ANALOG & DIGITAL ELECTRONICS LAB

L-0	T-0	P-3	M-100	C-1.5

COURSE OBJECTIVES:

- Understand the fundamental concepts of analog and digital electronics.
- Design and analyze analog circuits using electronic components.
- Design and analyze digital circuits using logic gates and flip-flops.
- Simulate and validate circuit designs using computer-aided tools.
- Troubleshoot and debug electronic circuits effectively.

COURSE OUTCOMES:

- ★ Apply knowledge of basic analog and digital electronic circuits.
- ★ Design and analyze analog electronic circuits with proficiency.
- ★ Design and analyze digital electronic circuits with proficiency.
- ★ Simulate and validate analog and digital circuit designs using appropriate software tools.
- ★ Identify and rectify faults in analog and digital electronic circuits with accuracy.

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:

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

CO-PO/PSO MAPPING MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	1											
CO2		3										
CO3			3									
CO4				3								
CO5					2							

CS253 (R20): UNIX LAB

L-0	T-0	P-3	M-100	C-1.5

COURSE OBJECTIVES:

This course introduces basic understanding of UNIX OS, UNIX commands and File system and to familiarize students with the Linux environment. To make student learn fundamentals of shell scripting and shell programming. Emphases are on making student familiar with UNIX environment and issues related to it.

COURSE OUTCOMES:

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

- ★ Understand the basic concepts of UNIX Architecture and basic Commands.
- ★ Understand different types of Files, File system and basic file system commands.
- ★ Understand the commands related to Shell basics, vi editor and regular expression commands.
- ★ Implement vi editor commands and shell programs
- ★ Understand the concepts of advance file concepts, commands related to Shell script and filter commands.

LIST OF ACTIVITIES:

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 ( ).

CO-PO/PSO MAPPING MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	2	-	-	1	-	-	-	-	--	-	-
CO2	3	2	-	-	1	-	-	-	-	--	-	-
CO3	3	2	-	-	1	-	-	-	-	--	-	-
CO4	3	2	-	-	1	-	-	-	-	--	-	-
CO5	3	2	-	-	1	-	-	-	-	--	-	-

CS254 (R20): MAT LAB

L-0	T-0	P-3	M-100	C-1.5

COURSE OBJECTIVES:

- Understanding the MATLAB environment
- Being able to do simple calculations using MATLAB
- Being able to carry out simple numerical computations and analyses using MATLAB

COURSE OUTCOMES:

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

- ★ Understand the main features of the MATLAB development environment
- ★ Use the MATLAB GUI effectively
- ★ Create simple programs in MATLAB to solve scientific and mathematical problems
- ★ Develop simple projects on images.

LIST OF ACTIVITIES:

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?

CO-PO/PSO MAPPING MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	**3**	**2**	**1**	**-**	**1**	**-**	**-**	**--**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**1**	**-**	**1**	**-**	**-**	**--**	**-**	**-**	**-**	**-**
CO3	**3**	**2**	**1**	**-**	**1**	**-**	**-**	**--**	**-**	**-**	**-**	**-**
CO4	**3**	**2**	**1**	**-**	**1**	**-**	**-**	**--**	**-**	**-**	**-**	**-**

II/IV B.Tech
SEMESTER II

B.Tech. COMPUTER SCIENCE & ENGINEERING

ESTER-II/IV B.TECH SEM

CS221 (R20): DISCRETE MATHEMATICS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

At the end of the course, the student will

- Introduce the concepts of mathematical logic.
- Understand the combinatorial problems using counting principles,
- Create generating functions and solve recurrence relations.
- Use Directed & Un-Directed Graphs concepts and its applications.

COURSE OUTCOMES:

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

- ★ Understand formal methods of proof and propositional & First order logic to validate the propositional statements.
- ★ Apply techniques for counting the occurrences of discrete events including permutations, combinations with or without repetitions.
- ★ Analyse generating function and recurrence relations.
- ★ Construct the real-world problems using directed and undirected graphs.

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 Graphsand 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 BOOKS:

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) Narasinghdeo Graph Theory, Narosa Publishers
4) Satyanarayana Bhavanari. and Syam Prasad Kuncham. "Discrete Mathematics and Graph Theory" by PHI, 2014 second edition.
5) SatyanarayanaB havanari,T.V.Pradeep Kumar,Sk. Mohiddinshaw" 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, TataMcGraw-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

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	3	3	2	-	-	-	-	-	2	-	3	1	-
CO2	3	3	2	2	-	-	-	-	-	2	-	2	1	-
CO3	3	3	3	2	-	-	-	-	-	2	-	2	1	-
CO4	3	3	3	2	-	-	-	-	-	2	-	3	1	-

CS222 (R20): COMPUTER ORGANIZATION & ARCHITECTURE

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

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.

COURSE OUTCOMES:

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

- ★ Understand components, architecture of a computer system and its working.
- ★ Design of hypothetical CPU control unit design.
- ★ Analyse various I/O handling mechanisms and its interfaces.
- ★ Create a pipeline system for the execution of instruction.
- ★ Analyse memory hierarchy and its impact on computer Cost/performance

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 pointrepresentations, 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, Casestudy – 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 andcache 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
2) by David A. Patterson and John L. Hennessy, Elsevier.
3) "Computer Organization and Embedded Systems", 6th Edition by CarlHamacher,
4) McGraw Hill Higher Education.
5) "Computer Organization and Architecture: Designing for Performance", 10th Edition
6) by William Stallings, Pearson Education.
7) " 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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3		1		-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	1	-	-	-	-	-	-	-	-	-	-

CS223 (R20): DATABASE MANAGEMENT SYSTEMS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- 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.

COURSE OUTCOMES

- Remembering the basic concepts of DBMS and ER Model and How to draw ER Diagrams
- Understand the queries in Databases
- Apply Normalization techniques to solve the problem of redundancy in tables and defining various Normal forms.
- Implementing query optimization algorithms.
- Analyse the concepts of transactions, their processing to become familiar with issues like data integrity, security and recovery.

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	2	1			-	-	-	-	--	-	-	1	-
CO2	2	1	2	1	2	-	-	-	-	--	-	-	1	-
CO3	2	1	2	1	2	-	-	-	-	--	-	-	1	-
CO4	2	3	2	1	1	-	-	-	-	--	-	-	1	-
CO5	2	1	1	1		-	-	-	-	--	-	-	1	-

CS224 (R20): ADVANCED DATA STRUCTURES

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- 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.

COURSE OUTCOMES:

- ★ Understanding the role of algorithms in computing and finding time complexity for recursive algorithms.
- ★ Analyse hierarchical data structures and algorithms to solve computing problems.
- ★ Create algorithms using graph structure to solve real-life problems.
- ★ Understanding partition ADT.
- ★ Implementing data structures for handling strings.

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2	1	2	-	-	-	-	-	-	-
CO2	3	-	2	1	1	-	-	-	-	-	-	-
CO3	3	2	2	1	1	-	-	-	-	-	-	-
CO4	2	2	2	1	1	-	-	-	-	-	-	-
CO5	1	-	2	1	1	-	-	-	-	-	-	-

CS225 (R20): SIGNALS & SYSTEMS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- To develop good understanding about signals, systems and their classification
- To develop expertise in time-domain and frequency domain approaches to the analysis of continuous and discrete systems;

COURSE OUTCOMES:

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

- ★ Remembering Continuous Time (CT) and Discrete Time (DT) signals and systems.
- ★ Understanding LTI system in time domain.
- ★ Analyse periodic and a periodic signals using Fourier transform and Fourier series.
- ★ Describe state space analysis and sampling process.
- ★ Analyse and characterize the LTI continuous time using Laplace Transform and discrete time system using Z transform.

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) EdaraSreenivas 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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	2	3	-	-	-	-	-	-	-	-	2	1	1
CO2	3	2	3	-	1	1	-	-	-	-	-	2	1	1
CO3	3	3	2	-	2	-	-	-	-	-	-	3	1	1
CO4	2	2	2	-	3	-	-	-	-	-	-	2	1	1
CO5	3	1	1	-	1	-	-	-	-	-	-	3	1	-

CS261 (R20): DBMS LAB

L-0	T-0	P-3	M-100	C-1.5

COURSE OBJECTIVES:

- The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently and effectively information from a DBMS.
- This lab enables the students to practice the concepts learnt in the subject DBMS by developing a database.
- The student is expected to practice the designing, developing and querying a database.
- Students are expected to use "Mysql/Oracle" database

COURSE OUTCOMES:

- ★ Understand 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

LIST OF ACTIVITIES:

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.

TEXT BOOKS/SUGGESTED READING:

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

LIST OF OPEN SOURCE SOFTWARE/LEARNING WEBSITE:

1) https://www.tutorialspoint.com/dbms/
2) https://www.w3schools.com/sql/
3) https://in.udacity.com/

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1											
CO2	3	2	1		1							
CO3	3	2	1		1							
CO4	3	2	1		1							
CO5	3	2	1		1							

CS262 (R20): ADVANCED DATA STRUCTURES LAB

L-0	T-0	P-3	M-100	C-1.5

COURSE OBJECTIVES:

- 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.

COURSE OUTCOMES:

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

- ★ Identify the appropriate data structure for a given problem.
- ★ Implement Dictionary by using hashing techniques.
- ★ Analyse various basic operations of AVL tree, B-tree, splay trees to improve the efficiency.
- ★ Implement graphs to solve real world problems.
- ★ Build a Binary Heap using Priority queues.

LIST OF ACTIVITIES:

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 Splay Tree 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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2											
CO2	3	2		2	1							
CO3	3	2		2	1							
CO4	3	2		2	1							
CO5	3	2		2	1							

CS263 (R20): COMMUNICATIVE ENGLISH LAB II

L-0	T-0	P-3	M-100	C-1.5

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

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

CO-PO/PSO MAPPING MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	2	2	-	-	2	3	-	3	3
CO2	-	-	-	2	2			2	3	-	3	3
CO3	-	-	-	2	2	-	-	2	3	-	3	3
C04	-	-	-	2	2			2	3	-	3	3
CO5	-	-	-	2	2	-	-	2	3	-	3	3

CS264 (R20): WEB DESIGNING

L-0	T-0	P-3	M-100	C-2

COURSE OBJECTIVES:

- This course is intended to teach the basics involved in publishing content on the World Wide Web.
- This includes the 'language of the Web' – HTML, the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting.
- This will also expose students to the basic tools and applications used in Web publishing

COURSE OUTCOMES:

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

- ★ Analyze a web page and identify its elements and attributes.
- ★ Create web pages using XHTML and Cascading Style Sheets.
- ★ Build dynamic web pages using JavaScript (Client side programming) and ajax
- ★ Create XML documents and Schemas.
- ★ Demonstrate the form processing and business logic in PHP

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

CO-PO/PSO MAPPING MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	2	1	-	-	-	-	-	-	-
CO2	3	-	-	2	1	-	-	-	-	-	-	-
CO3	3	-	-	2	1	-	-	-	-	-	-	-
C04	3	-	-	2	1	-	-	-	-	-	-	-
CO5	3	-	-	2	1	-	-	-	-	-	-	-

III/IV B.TECH
SEMESTER-I

B.Tech. COMPUTER SCIENCE & ENGINEERING

III/IV B.TECH SEMESTER-I

CS311 (R20): AUTOMATA THEORY & COMPILER DESIGN

L-3	T-1	P-0	M-100	C-3

COURSE 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.

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.

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.
9) Compilers Principles, techniques and tools, Alfred V. Aho Ravi Sethi D. Ullman Pearson Education, 2007
10) Introduction to compiler design, Torben Egdius Mogensen, Pearson Education 2011.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	3	2	1	-	-	-	2	1	-	2
CO2	3	1	3	1	2	-	1	-	1	2	-	2
CO3	2	2	3	1	1	-	-	-	2	2	2	-
CO4	2	2	1	-	-	-	-	-	2	1	-	1
CO5	3	-	2	3	2	2	-	1	1	1	-	1

CS312 (R20): JAVA PROGRAMMING

L-3	T-1	P-0	M-100	C-3

COURSE OBJECTIVES:

- Understand the fundamental concepts of Java programming language.
- Design and implement object-oriented programs using Java.
- Implement algorithms and data structures in Java.
- Develop graphical user interfaces (GUIs) using Java Swing
- Utilize exception handling and error handling techniques in Java programs.

COURSE OUTCOMES:

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

1. Apply knowledge of basic syntax, data types, and control structures of Java.
2. Design and implement object-oriented programs using classes, objects, and inheritance.
3. Implement common algorithms and data structures using Java programming.
4. Develop GUI applications using Java Swing
5. Implement exception handling mechanisms and error handling techniques in Java programs.

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1						1					
CO2		3										
CO3			3									
CO4				3								
CO5					2							

CS313 (R20): DESIGN & ANALYSIS OF ALGORITHMS

L-3	T-0	P-0	M-100	C-3

COURSE 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.

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.

Unit I

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

Divide and Conquer: Binary search, merge sort, quick sort, Strassen's 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 salesman 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, travelling 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

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	2	1	-	2	-	2	-	-	-
CO2	3	3	3	1	2	-	1	-	1	-	-	-
CO3	3	2	2	-	1	-	2	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	2	-	-	-

CS314A (R20): ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- The ability to adapt, contribute and innovate new technologies and systems in the key domains of Artificial Intelligence and Machine Learning.
- Will be able to successfully pursue higher education in reputed institutions with AI Specialization.
- Graduates will have the ability to explore research areas and produce outstanding contribution in various areas of Artificial Intelligence and Machine Learning.
- Graduates will be ethically and socially responsible solution providers and entrepreneurs in the field of Computer Science and Engineering with AI/ML Specialization.

COURSE OUTCOMES:

After completing this course, the student will be able to:

- ★ Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems.
- ★ Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- ★ Demonstrate proficiency in applying scientific method to models of machine learning.
- ★ Discuss the awareness of ANN and different optimizations techniques.

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 Back propagation algorithm and remarks on the Back propagation 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 ofevolution 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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	2	1	-	2	-	2	-	-	-
CO2	3	3	3	1	2	-	1	-	1	-	-	-
CO3	3	2	2	-	1	-	2	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	2	-	-	-

CS314B (R20): INTERNET OF THINGS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

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),CommunicationProtocols-ZigBee,Bluetooth,6LoPAN,LoRa,MQTT,CoAP,XMPP.

UNIT–III

M2MandIoTDesignMethodology: 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, Bashar I Ahmad

2) Internet of Things: A Hands-On Approach, Arshdeep Bahga, Vijay Madisetti, Universities press
3) Learning Internet of Things By Peter Waher Packt Publishing Ltd
4) Internet of Things with Python, Gastn C Hillar, Packt Publishing Ltd
5) Adrian Mc Ewen, 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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	2	1	-	-	-	2	-	-	-
CO2	3	3	3	1	2	-	2	-	-	-	-	-
CO3	2	1	2	-	-	-	-	-	-	-	-	-

CS314C (R20): DIGITAL SIGNAL PROCESSING

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

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

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	-	3	3	1	-	-	-	2	-	-	-
CO2	3	3	3	-	2	-	1	-	1	2	2	1
CO3	2	2	-	-	1	-	-	-	-	-	2	-
CO4	-	1	2	-	-	-	-	-	2	1	2	1

CS314D (R20): DIGITAL IMAGE PROCESSING

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.

COURSE OUTCOMES:

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

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	1	-	-	-	2	-	2	-
CO2	3	1	3	1	2	-	1	-	1	2	2	-
CO3	2	2	-	1	1	-	-	-	-	-	2	-
CO4	1	2	1	-	-	-	-	-	2	1	-	1
CO5	3	-	-	3	2	2	-	1	-	-	-	1
CO6	3	3	3	1	-	-	-	-	1	2	2	1

CS315A (R20): COMPUTER NETWORKS

L-3	T-1	P-0	M-100	C-3

COURSE OBJECTIVES:

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

- Build an understanding of the fundamental concepts of data communication and computer networking.
- Understand how errors detected and corrected that occur in transmission
- How collisions to be handled when many stations share a single channel
- Know about routing mechanisms and different routing protocols
- Understand transport layer functions
- Know about different application layer protocols.

COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

- ★ Highlight the significance of the functions of each layer in the network.
- ★ Identify the devices and protocols to design a network and implement it.
- ★ Build network applications using the right set of protocols and estimate their performances.
- ★ Trace packet flows and interpret packet formats.
- ★ Apply addressing principles such as subnetting and VLSM for efficient routing.

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3		1	-	-	-				
CO2	3	1	3		2	-	1	-				
CO3	2	2	-	1	1	-	-	-	2			2
CO4	1	2	1	-	-	-	-	-				
CO5	3	-	-	3	2	2	-	1				
CO6	3	3	3	1	-	-	-	-				

CS315B (R20): SOFTWARE PROJECT MANAGEMENT

L-3	T-1	P-0	M-100	C-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.

COURSE OUTCOMES:

- ★ Identify the process of Conventional Software Management the Evolution and Improvement of Software Economics. (Remember-L1)
- ★ Describe the basic s/w processes, Cost estimation and improvement in s/w Economics. (Remember-L1)
- ★ Summarize Life cycle phases and Artifacts of the process in Software project management. (Understand-L2)
- ★ Apply Workflows and checkpoints in Iterative Process planning. (Apply-L3)
- ★ Illustrate Project Organizations, process automation building blocks and metrics in assessing Software Quality. (Understand-L2)

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

REFERENCE BOOKS:

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
3) Walker Royce: Software Project Management- Addison-Wesley, 1998.
4) Gopalaswamy Ramesh, Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013.
5) Information Technology Project Management: Kathy Schwalbe Thomson Publication.
6) Information Technology Project Management providing measurable organizational value Jack Marchewka Wiley India.
7) Applied software project management Stellman & Greene SPD.
8) Software Engineering Project Management by Richard Thayer, Edward Yourdon WILEY INDIA.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	-	-	-	-	-	-	-	-	2	1
CO2	2	2	-	-	-	-	-	-	-	-	3	1
CO3	2	2	1	-	-	-	-	-	-	-	3	1
CO4	3	2	1	-	-	-	-	-	-	-	2	-
CO5	2	2	1	-	-	-	-	-	-	-	3	1
CO6	2	2	-	-	-	-	-	-	-	-	2	1

CS315C (R20): ADVANCED COMPUTER ARCHITECTURE

L-3	T-0	P-0	M-100	C-3

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

COURSE OUTCOMES:

- ★ Explore the advanced trends and principles of computer design and its performance metrics.
- ★ Examine the instruction set principles, addressing modes to interpret instructions.
- ★ Apply the instruction Level parallelism (IPL) through hardware and software (VLIW) approaches.
- ★ Analyze the performance improvement techniques in memory hierarchical (cache) and operations of virtual memory.
- ★ Improve the multiprocessor and thread level parallelism to improve shared memory system.

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	2	-	3	-	-	-	-	-	-	2
CO2	3	2	3	-	3	-	-	-	-	-	-	3
CO3	3	2	3	-	3	-	-	-	-	-	-	3
CO4	3	2	3	-	3	-	-	-	-	-	-	3
CO5	3	2	3	-	3	-	-	-	-	-	-	3
CO6	2	2	2	-	3	-	-	-	-	-	-	2

CS315D (R20): DISTRIBUTED SYSTEMS

L-3	T-0	P-0	M-100	C-3

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.

COURSE OUTCOMES:

- ★ Identify the hardware and software concepts to design a communication model in Distributed System.
- ★ Understand the implementation of process, thread, file systems and processors in Distributed system.
- ★ Analyze Clock Synchronization protocols in Distributed system as well as Deadlock handling mechanism.
- ★ Compare Shared memory Multiprocessors used in Distributed System.
- ★ Examine the case study of CHROUS, MACH distributed operating 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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	2	-	-	-	-	-	-	-	-	1
CO2	1	2	2	-	-	-	-	-	-	-	-	1
CO3	1	2	2	-	-	-	-	-	-	-	-	1
CO4	1	2	1	-	-	-	-	-	-	-	-	1
CO5	2	2	2	-	-	-	-	-	-	-	-	1

CS316 (R20): CONSTITUTION OF INDIA

L-3	T-0	P-0	M-100	C-3

COURSE OUTCOMES:

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

CO1	Understand the basic features of Constitution of India.
CO2	Understand about salient features of the Constitution of India.
CO3	Understand fundamental duties and federal structure of Constitution of India
CO4	Understand about fundamental rights under constitution of India.
CO5	Understand about emergency provisions in Constitution of India.

CO-PO/PSO MAPPING MATRIX:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	3	-	3	-	-	-	-	-	-
CO2	-	-	-	-	-	3	-	3	-	-	-	-	-	-
CO3	-	-	-	-	-	3	-	3	-	-	-	-	-	-
CO4	-	-	-	-	-	3	-	3	-	-	-	-	-	-
CO5	-	-	-	-	-	3	-	3	-	-	-	-	-	-
AVG_CO	-	-	-	-	-	**3**	-	3	-	-	-	-	-	-

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.

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, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

UNIT-III

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

UNIT-IV

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

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

REFERENCES BOOKS:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. NewDelhi
2) SubashKashyap, 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

CS 351 (R20): JAVA LAB

L-0	T-0	P-3	M-100	C-1.5

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

- ★ Implement the concepts of OOP in program design.
- ★ Apply Exception handling mechanism and implement Multi-thread programming.
- ★ Design CUI and GUI based applications using JDBC concepts.
- ★ Improve individual / team work skills, communication & report writing skills with ethical values.

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	**2**	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**2**	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	**2**	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**	**-**	**-**
CO5												

CS 352A (R20): AI & ML LAB

L-0	T-0	P-3	M-100	C-1.5

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.
5) Implement AO* Search algorithm.
6) 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.
7) 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.
8) 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.
9) 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.
10) a) Classification: Identifying to which category an object belongs to.
11) Regression: Predicting a continuous-valued attribute associated with an object.
12) Clustering: Automatic grouping of similar objects into sets
13) Dimensionality reduction: Reducing the number of random variables to consider.
14) Pre-processing: Feature extraction and normalization.
15) Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	3	1	1	-	-	-	-	-	-	1
CO2	2	3	3	1	1	-	-	-	-	-	-	1
CO3	2	3	3	1	1	-	-	-	-	-	-	1
CO4	-	-	-	-	-	-	-	2	2	2	-	-

CS 352B (R20): INTERNET OF THINGS LAB

L-0	T-0	P-3	M-100	C-1.5

COURSE OBJECTIVE:

The objective of this course, to give a comprehensive view of the - Internet of Things (Applications / Potentials / Challenges). To analyze enabling technologies to make it happen (Embedded Devices and communication protocols) and to conduct Hands on activities (Guidelines on how to operate ―things in the ―Internet of Things).

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

- ★ Understand the programming environment of IOT.
- ★ Develop IOT applications using sensors.
- ★ Develop IOT applications using web/mobile services
- ★ Improve individual / team work skills, communication & report writing skills with ethical values.

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

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	-	1	3	-	-	-	-	-	-	1
CO2	2	2	3	1	3	-	2	-	-	-	-	1
CO3	2	2	3	1	3	-	2	-	-	-	-	1
CO4	-	-	-	-	-	-	-	2	2	2	-	-

CS 352C (R20): DIGITAL SIGNAL PROCESSING LAB

L-0	T-0	P-3	M-100	C-1.5

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.

CS 352D (R20): DIGITAL IMAGE PROCESSING LAB

L-0	T-0	P-3	M-100	C-1.5

COURSE OUTCOMES:

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

- ★ Summarize the fundamentals of digital image processing
- ★ Apply image enhancement techniques in spatial domain
- ★ Apply restoration and color image processing techniques to improve the fidelity of images.
- ★ Analyze image compression, morphological image processing techniques for various applications.
- ★ Evaluate the methodologies for image segmentation

PROGRAMS:

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	-	-	-	-	-	-	-	-	-	-	-		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	3	-	-	-	-	-	-	-	-	-	-		
CO5	3	2	-	3	-	-	-	-	-	-	-	-		

CS 353 (R20): MOBILE APPLICATION DEVELOPMENT LAB

L-0	T-0	P-3	M-100	C-2

COURSE 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.

COURSE OUTCOMES:

- ★ Understand the fundamentals of Android Platform
- ★ Design UI using various UI Components of Android Platform
- ★ Develop android apps using Intents & Broadcast receivers of Android Platform
- ★ Analyse different data repositories in Android Platform
- ★ Explore various advanced concepts in Android Platform

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).

REFERENCE:

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

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	3	3	1	3	2	3	-	2	-	-	-	-	-
CO2	3	3	3	2	3	2	3	-	2	-	-	-	-	-
CO3	3	3	3	2	3	2	3	-	2	-	-	-	-	-
CO4	3	3	3	2	3	2	3	-	2	-	-	-	-	-
CO5	3	3	3	2	3	2	3	-	2	-	-	-	-	-
AVG_CO	3	3	3	2	3	2	3	-	2	-	-	-	-	-

CS 354 (R20): SUMMER INTERNSHIP 2 MONTHS

L-0	T-0	P-0	M-100	C-1.5

S. No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
				Hours in a Week			Marks		Credits
	Code	Subject Name		L	T	P	Int.	Ext.	
1	CS 354(R20)	**SUMMER INTERNSHIP** 2 Months after second year (to be evaluated during V semester)	MC	0	0	0	100	0	1.5

III/IV B.TECH
SEMESTER II

B.Tech. COMPUTER SCIENCE & ENGINEERING

III/IV B.TECH SEMESTER-II

CS321 (R20): CRYPTOGRAPHY & NETWORK SECURITY

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- Learn the basic categories of threats to computers and networks.
- Understand various cryptographic algorithms and be familiar with public-key cryptography.
- Apply authentication functions for providing effective security.
- Analyse the application protocols to provide web security.
- Discuss the place of ethics in the information security area.

COURSE OUTCOMES:

- ★ Understand the basic concepts on attacks of computer,computer security.
- ★ Understand the concepts of symmetric key ciphers.
- ★ To describe about the message authentication algorithm and hash functions.
- ★ Understand the concepts of e-mail security.
- ★ Understand the concepts of web security

UNIT I

Attacks on computers and computer security: Introduction, the need for security, security approaches, principles of security, types of security attacks, security services, security mechanism, a model for network security; Cryptography concepts and techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT-II

Symmetric key ciphers: Block cipher principles and algorithms (DES, AES, Blowfish), differential and linear cryptanalysis, block cipher modes of operation, stream ciphers, RC4 location, and placement of encryption function, key distribution; Asymmetric key ciphers: Principles of public key cryptosystems, algorithms (RSA Diffie - Hellman, ECC) key distribution.

UNIT III

Message authentication algorithm and hash functions: Authentication requirements, functions, message, authentication codes, hash functions, secure hash algorithm, whirlpool, HMAC, CMAC, digitalsignatures, knapsack algorithm.

Authentication application: Kerberos, X.509 authentication service, public –key infrastructure, biometric authentication

UNIT IV

E-mail Security: Pretty Good Privacy; S/MIME IP Security: IP security overview, IP security

architecture, authentication header, encapsulating security payload,combining security associations, key management.

UNIT V

Web security: Web security considerations, secure socket layer and transport layer security, secure electronic transaction intruders; Virus and firewalls: Intruders, intrusion detection password management, virus and related threats, countermeasures, firewall design principles; Types of firewalls

REFERENCE BOOKS:

1) William Stallings, Cryptography and Network Security, Pearson Education, 2006
2) AtulKahate, "Cryptography and Network Security", McGraw-Hill, 2nd Edition, 2009.
3) C K Shymala, N Harini, Dr. T R Padmanabhan, "Cryptography and Network Security", Wiley India, 1st Edition, 2016.
4) Behrouz A. Forouzan Dedeep Mukhopadhyay, "Cryptography and Network Security", McGraw Hill, 2nd Edition, 2010.
5) Eric Cole, Dr. Ronald Kurtz and James W. Conley, Network Security Bible, Wiley Publishers, 2009
6) Jason Albanese and Wes Sonnenreich, Network Security Illustrated, MGH Publishers, 2003.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	3	2	1	-	-	-	2	-	-	-
CO2	2	1	2	2	2	-	1	-	1	-	-	-
CO3	3	2	-	2	1	-	-	-	-	-	-	-
CO4	-	2	1	-	-	-	-	-	2	-	-	-
CO5	3	-	-	3	2	2	-	1	-	-	-	-

CS 322 (R20): DATA ENGINEERING

L-3	T-0	P-0	M-100	C-3

COURSE 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.

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.

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.

TEXT BOOK:

1) Data Mining Concepts & Techniques – Jiawei Han Micheline Kamber – 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 – SamAnahory, Dennis Murray – Pearson Education.
4) Introduction to Data Mining with case studies – G.K.Gupta, PHI Publications, 2006

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	**2**	**3**	**-**	**-**	**1**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO2	**2**	**2**	**3**	**1**	**-**	**-**	**1**	**-**	**-**	**1**	**1**	**-**
CO3	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**
CO4	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**-**

CS 323 (R20): WEB TECHNOLOGIES

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- Write a valid standards-conformant HTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms
- Use CSS to implement a variety of presentation effects in HTML and XML documents, including explicit positioning of elements.
- Identify and correct problems related to concurrency in server-side programs
- Develop a reasonably sophisticated web application that appropriately employs the MVC architecture

COURSE OUTCOMES:

- ★ Design web pages with HTML & DHTML.
- ★ Develop user defined tags and transfer data between components by using XML and JavaBeans.
- ★ Create data driven web applications by applying database connectivity techniques.
- ★ Design and implement dynamic Web Pages using server side components like servlets.
- ★ Understand concepts of JSP and struts framework and apply them in solving real world problems.

UNIT-I

Introduction to HTML and Java Script: Introduction to html, fundamentals of HTML elements, Document body, text, hyperlink, lists, tables, color and images, frames; Cascading Style Sheets: Introduction, defining your own styles, properties and values in styles, style sheets, formatting blocks, and layers;

JavaScript: JavaScript basics, variables, string manipulation, mathematical functions, statements, operators, arrays and functions

UNIT-II

Objects in JAVASCRIPT and XML:

Objects in JavaScript: Data and objects in JavaScript, regular expressions, exception handling, built-in objects, events; Dynamic HTML with JavaScript: Data validation, opening a new window, Rollover buttons, moving images, multiple pages in a single download, floating logos.

XML: Basics XML, document type definition, xml schemas, Document Object Model, presenting XML.

UNIT-III

Servlets and JSP:

Servlet: Lifecycle of a Servlet, a simple Servlet, the servlet API, the Javax.servlet package, reading Servlet parameters, the javax.servlet. HTTP package, Handling HTTP requests and responses, using cookies and sessions.

JSP: The anatomy of a JSP page, JSP processing, declarations, directives, expressions, code snippets, implicit objects, using beans in JSP pages, connecting to database in JSP.

UNIT-IV

Introduction to PHP: Basics of PHP, downloading, installing, configuring PHP, programming in a web environment and the anatomy of a PHP page; Overview of PHP data types and concepts: Variables and data types, operators, expressions and statements, strings, arrays and functions.

UNIT-V

PHP and Database Access:

PHP and database access: Basic database concepts, connecting to a MySQL database, retrieving and displaying results, modifying, updating and deleting data; MVC architecture: PHP and other web technologies: PHP and XML.

TEXT BOOKS:

1) Chris Bates, "Web Programming: Building Internet Applications", Wiley DreamTech, 2nd Edition, 2002.
2) Jeffrey C K Jackson, "Web Technologies", Pearson Education, 1 st Edition, 2006.
3) Steven Holzner, "The Complete Reference PHP", Tata McGraw-Hill, 1st Edition, 2007

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	3	-	2	1	-	-	-	-	-	1
CO2	2	1	3	-	2	1	-	-	-	-	-	1
CO3	2	2	3	-	2	1	-	-	-	-	-	1
CO4	2	2	3	-	2	1	-	-	-	-	-	1

CS 324A (R20): NETWORK PROGRAMMING

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- Demonstrate mastery of main protocols comprising the Internet.
- Develop skills in network programming techniques.
- Implement network services that communicate through the Internet.
- Apply the client-server model in networking applications.
- Practice networking commands available through the operating systems.

COURSE OUTCOMES:

- ★ Understand the key protocols which support the Internet
- ★ Create applications using techniques such as multiplexing, forking, multithreading
- ★ Apply knowledge of Unix/Linux operating systems to build robust client and server software for this environment;
- ★ Learn advanced programming techniques such as IPv6 Socket Programming, Broadcasting, Multicasting

UNIT-I

Introduction to Network Programming: OSI model, UNIX standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

Sockets: Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

UNIT-II

TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.

I/O Multiplexing and socket options: I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server, getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options.

UNIT-III

Elementary UDP sockets: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.

Elementary name and Address conversions: DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.

UNIT-IV

IPC: Introduction, File and record locking, Pipes, FIFOs streams and messages, Name spaces, system IPC, Message queues, Semaphores.

UNIT-V

Remote Login: Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.

REFERENCE BOOKS:

1) UNIX Network Programming, Vol. I, Sockets API, 2nd Edition. - W.Richard Stevens, Pearson Edn. Asia.
2) UNIX Network Programming, 1st Edition, - W.Richard Stevens. PHI.
3) UNIX Systems Programming using C++ T CHAN, PHI.
4) UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education
5) Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	3	2	1	-	-	-	2	-	-	-
CO2	2	1	2	2	2	-	1	-	1	-	-	-
CO3	3	2	-	2	1	-	-	-	-	-	-	-
CO4	-	2	1	-	-	-	-	-	2	-	-	-

CS 324B (R20): BLOCK CHAIN TECHNOLOGY

L-3	T-0	P-0	M-100	C-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.

COURSE OUTCOMES:

- ★ Understand and Implement the workflow behind bitcoin and various consensus mechanisms.
- ★ Create and Design and implement smart contracts.
- ★ Analysis and Develop decentralized applications on the Blockchain.
- ★ Identify and analyse the on-going application models in industry-wide Blockchain frameworks.

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, RicardianContracts.

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 BOOK:

1) Seberrius Jeffery,"Block Chain" 2nd Edition Publishers details 2015

REFERENCE BOOKS:

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	1	-	-	-	2	-	-	-
CO2	3	2	3	1	2	-	1	-	-	1	1	-
CO3	3	2	2	1	3	-	-	-	-	-	1	2
CO4	-	2	1	-	-	-	-	-	2	-	2	-

CS 324C (R20): CYBER SECURITY

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- To understand different threats, harms and vulnerabilities involved in computers and cyberspace.
- Tostudytheaccesscontrolandauthenticationmethodstopreventdifferenttypesofattacksin networks and web.
- To understand the security concepts in the design of operating systems and networks.
- To learn security counter measures like cryptography, firewalls, IDS &IPS systems and privacy principles &policies.
- To study the security requirements and privacy issues in databases and cyberspace.

COURSE OUTCOMES:

- ★ Analyze cyber attacks, types of threats, harms and vulnerabilities and also how to protect them self and ultimately the entire Internet community from such attacks.
- ★ Determine and comprehend the security concepts in the design of operating systems and networks.
- ★ Apply security solutions like cryptography, firewalls, IPS and IDS systems to manage security and privacy issues.
- ★ Evaluate and communicate the human role in security systems with an emphasis one, social engineering vulnerabilities and training.

UNIT-I

INTRODUCTION TO CYBER SECURITY: Introduction - Computer Security - Threats - Harm-Vulnerabilities-Controls -Authentication-Access Control and Cryptography.

THE WEB: User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data-Email Attacks.

UNIT-II

SECURITY IN OPERATING SYSTEM & NETWORKS: Security in Operating Systems-Security in the Design of Operating Systems-Rootkit-Network security attacks-Threats to Network Communications - Wireless Network Security - Denial of Service – Distributed Denial-of-Service.

UNIT-III

SECURITY COUNTER MEASURES: Cryptography in Network Security-Firewalls – Intrusion Detection and Prevention Systems -Network Management.

UNIT-IV

DATABASES: Introduction to Databases - Security Requirements of Databases – Reliability and Integrity -Database Disclosure -Data Mining and Big Data.

UNIT-V

PRIVACY IN CYBER SPACE: Privacy Concepts-Privacy Principles and Policies-Authentication and Privacy - Data Mining -Privacy on the Web - Email Security – Privacy Impacts of Emerging Technologies-Where the Field Is Headed.

TEXT BOOK:

1) Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition, Pearson Education, 2015.

REFERENCE BOOKS:

1) George K. Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
2) Martti Lehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
3) Nelson Phillips and Enfinger Steuart, Computer Forensics and Investigations, Cengage Learning, New Delhi, 2009.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	1	-	-	-	2	-	-	-
CO2	3	2	3	1	2	-	1	-	-	1	1	-
CO3	3	2	2	1	3	-	-	-	-	-	1	2
CO4	-	2	1	-	-	-	-	-	2	-	2	-

CS 324D (R20): ADVANCED DATABASES

L-3	T-0	P-0	M-100	C-3

COURSE 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

COURSE 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

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.

REFERENCE BOOKS:

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	1	1	1	-	-	-	-	-	-	-
CO2	2	3	3	2	-	-	1	-	-	-	1	-
CO3	3	3	2	2	3	-	-	-	-	-	1	2

CS 325A (R20): HIGH PERFORMANCE COMPUTING

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- Provide systematic and comprehensive treatment of the hardware and the software high performance techniques involved in current day computing.
- Introduce the fundamentals of high-performance computing with the graphics processing units and many integrated cores using their architectures and corresponding programming environments.
- Introduce the learner to fundamental and advanced parallel algorithms through the GPU and MIC programming environments
- Provide systematic and comprehensive treatment of the components in the pipeline that extract instruction level parallelism.
- Provide a strong foundation on memory hierarchy design and trade-offs in both uniprocessor and multiprocessors.
- Illustrate the cache coherence and consistency problems in multiprocessors, and their existing solutions.

COURSE OUTCOMES:

- ★ Understand the principles and techniques of high-performance computing.
- ★ Design and implement parallel algorithms for high-performance computing.
- ★ Analyze and evaluate the performance of parallel computing systems.
- ★ Apply optimization techniques for efficient resource utilization in high-performance computing.
- ★ Explore and apply advanced parallel computing architectures.

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. Open MP 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) RezaurRahman, Intel Xeon Phi Coprocessor Architecture and Tools, Apress Open, 2013.
3) Barbara Chapman, Gabriele Jost, Ruud van der Pas, Using Open MP, MIT Press, 2008.
4) Gropp, Lusk, Skjellum, Using MPI, Using MPI, 2014.

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CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	2	1	3	-	-	-	-	-	-	-	-	-	3	1
CO2	3	1	3	-	-	-	-	-	-	-	-	-	3	1
CO3	2	1	3	-	-	-	-	-	-	-	-	-	3	1
CO4	2	1	3	-	-	-	-	-	-	-	-	-	3	1
CO5	2	1	3	-	-	-	-	-	-	-	-	-	3	1
AVG_CO	2	1	3	-	-	-	-	-	-	-	-	-	3	1

CS 325B (R20): CLOUD COMPUTING ARCHITECTURE AND ITS APPLICATIONS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVE:

- This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it

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 App Engine, 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.

REFERENCE BOOKS:

1) Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud. Computing McGraw Hill Education.
2) Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, Elsevier 2013.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	2	1	3	-	-	-	-	-	-	-	-	-	3	1
CO2	3	1	3	-	-	-	-	-	-	-	-	-	3	1
CO3	2	1	3	-	-	-	-	-	-	-	-	-	3	1
AVG_CO	2	1	3	-	-	-	-	-	-	-	-	-	3	1

CS325C (R20): MOBILE COMPUTING

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- To understand the basic concepts of mobile computing.
- To learn the basics of mobile telecommunication system.
- To be familiar with the network layer protocols and Ad-Hoc networks.
- To know the basis of transport and application layer protocols.
- To gain knowledge about different mobile platforms and application development.

COURSE OUTCOMES:

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

- ★ Explain the basics of mobile telecommunication systems
- ★ Illustrate the generations of telecommunication systems in wireless networks
- ★ Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
- ★ Explain the functionality of Transport and Application layers
- ★ Develop a mobile application using android/blackberry/ios/Windows SDK

UNIT-I **18 periods**

Introduction: Mobility of Bits and Bytes – Wireless-The Beginning – Mobile Computing – Dialogue Control– Networks – Middleware and Gateways – Application and Services (Contents) – Developing Mobile Computing Application s- Security in Mobile Computing – Standards-Why is it Necessary? – Standard Bodies – Players in the Wireless Space.

Mobile Computing Architecture: Internet-The Ubiquitous Network – Architecture for Mobile Computing – Three-Tier Architecture – Design Considerations for Mobile Computing – Mobile Computing through Internet – Making Existing Applications Mobile-Enabled.

Mobile Computing Through Telephony: Evolution of Telephony – Multiple Access Procedures – Mobile Computing through Telephone – Developing an IVR Application – Voice XML – Telephony Application Programming Interface (TAPI).

Emerging Technologies: Introduction – Bluetooth – Radio Frequency Identification (RFID), WiMAX –Mobile IP – IPv6 – Java Card.

UNIT-II **15 periods**

Global System for Mobile Communications (GSM): GSM Architecture – Entities – Call Routing in GSM –PLMN Interfaces – GSM Addresses and Identifiers – Network Aspects in GSM – GSM Frequency Allocation –Authentication and Security.

Short Message Service (SMS): Mobile Computing over SMS – SMS – Value Added Services through SMS –Accessing the SMS Bearer.

GPRS: Packet Data Network – Network Architecture – Network Operations – Data Services in GPRS –Applications for GPRS – Limitations – Billing and Charging.

Wireless Application Protocol (WAP): Introduction – WAP – MMS – GPRS Applications.

UNIT-III **15periods**

CDMA and 3G: Introduction – Spread-Spectrum Technology – Is-95 – CDMA Vs GSM – Wireless Data – 3GNetworks & Applications

Wireless LAN: Introduction – Advantages – IEEE 802.11 Standards – Architecture – Mobility – Deploying –Mobile Ad Hoc Networks and Sensor Networks – Wireless LAN Security – Wi-Fi Vs 3G.

UNIT-IV

Internet Networks and Interworking: Introduction – Fundamentals of Call Processing – Intelligence in the Networks – SS#7 Signalling – IN Conceptual Model – Soft switch – Programmable Networks –Technologies and Interfaces for IN.

Client Programming: Introduction – Moving Beyond the Desktop – A Peek under the Hood: Hardware Overview – Mobile Phones – PDA – Design Constraints in Applications for Handheld Devices.

UNIT-V **12 periods**

Android OS

Wireless Devices with Windows CE: Introduction – Different Flavors of Windows CE – Windows CE Architecture – Windows CE Development Environment.

TEXT BOOK:

1) Asoke K Talukder& Roopa R.Yavagal, "Mobile Computing – Technology Applications and Service Creation", TMH 2006.

REFERENCE BOOKS:

1) Uwe Hansmann, Lother Merk, Martin S.Nicklous, Thomas Staber, "***Principles of Computing***", 2/e, Springer International Edition.
2) J.Schiller, "***Mobile communications***", Addison-Wesley, 2003

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	2	1	3	-	-	-	-	-	-	-	-	-	3	1
CO2	3	1	3	-	-	-	-	-	-	-	-	-	3	1
CO3	2	1	3	-	-	-	-	-	-	-	-	-	3	1
CO4	2	1	3	-	-	-	-	-	-	-	-	-	3	1
CO5	2	1	3	-	-	-	-	-	-	-	-	-	3	1
AVG_CO	2	1	3	-	-	-	-	-	-	-	-	-	3	1

CS 325D (R20): INDUSTRY 4.0

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- This course is designed to offer learners an introduction to Industry 4.0 (or the Industrial Internet), its applications in the business world.
- Learners will gain deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges.

COURSE OUTCOMES:

- ★ Understand the drivers and enablers of Industry 4.0
- ★ Appreciate the smartness in Smart Factories, Smart cities, smart products and smart services.
- ★ Able to outline the various systems used in a manufacturing plant and their role in an Industry 4.0 world
- ★ Appreciate the power of Cloud Computing in a networked economy.
- ★ Understand the opportunities, challenges brought about by Industry 4.0 and how organisations and individuals should prepare to reap the benefits.

Unit-1:

Introduction to Industry 4.0 : The Various Industrial Revolutions, Digitalisation and the Networked Economy, Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0, The Journey so far, Developments in USA, Europe, China and other countries, Comparison of Industry 4.0 Factory and Today's Factory, Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation, Summary

Unit-2:

Road to Industry 4.0:, Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services, Smart Manufacturing, Smart Devices and Products, Smart Logistics, Smart Cities, Predictive Analytics, Summary.

Unit- 3:

Related Disciplines, System, Technologies for enabling Industry 4.0: Cyber physical Systems, Robotic Automation and Collaborative Robots, Support System for Industry 4.0, Mobile Computing, Related Disciplines, Cyber Security, Summary.

Unit- 4:

Role of data, information, knowledge and collaboration in future organizations: Resource-based view of a firm, Data as a new resource for organizations, Harnessing and sharing knowledge in organizations, Cloud Computing Basics, Cloud Computing and Industry 4.0, Summary.

Unit- 5:

Other Applications and Case Studies, Industry 4.0 laboratories, IIoT case studies, Case studies, Business issues in Industry 4.0: Opportunities and Challenges, Future of Works and Skills for Workers in the Industry, Era, Strategies for competing in an Industry 4.0 world, Summary.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	2	1	3	-	-	-	-	-	-	-	-	-	3	1
CO2	3	1	3	-	-	-	-	-	-	-	-	-	3	1
CO3	2	1	3	-	-	-	-	-	-	-	-	-	3	1
CO4	2	1	3	-	-	-	-	-	-	-	-	-	3	1
AVG_CO	**2**	**1**	**3**	-	-	-	-	-	-	-	-	-	**3**	**1**

CS 361 (R20): DATA ENGINEERING LAB

L-0	T-0	P-3	M-100	C-1.5

ACTIVITIES:

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

CS 362 (R20): WEB TECHNOLOGIES LAB

L-0	T-0	P-3	M-100	C-1.5

COURSE OBJECTIVES:

- Demonstrate the ability to retrieve data from a database and present it in a web page.
- Use FTP to transfer web pages to a server.
- Construct pages that meet, guidelines for efficient download and cater to the needs of an identified audience.
- Evaluate the functions of specific types of web pages in relationship to an entire web site.
- Create web pages that meet accessibility needs of those with physical disabilities and apply the effects of CSS in web page creation.
- To develop the PHP and Data access

ACTIVITIES:

1) INSTALLATIONS:

a) Installation of XAMPP and WAMP servers

2 HTML

a) Create a table to show your class time table.
b) Use tables to provide layout to your HTML page describing your college infrastructure.
c) Use and tags to provide a layout to the above page instead of a table layout.

3. HTML

a) Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in centre to show body of page, remaining on right to show remarks.
b) Embed Audio and Video into your HTML web page.

4. HTML

a) Create a webpage with HTML describing your department use paragraph and list tags.
b) Apply various colors to suitably distinguish key words, also apply font styling like italics, underline and two other fonts to words you find appropriate, also use header tags.
c) Create links on the words e.g. Wi-Fi and LAN to link them to Wikipedia pages.
d) Insert an image and create a link such that clicking on image takes user to other page.
e) Change the background color of the page; At the bottom create a link to take user to the top of the page.

5. HTML

a) Design the following static web pages required for an online book store web site.
1) HOME PAGE: The static home page must contain three frames.

Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Left frame: At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link "CSE" the catalogue for CSE Books should be displayed in the Right frame.

Right frame: The pages to the links in the left frame must be loaded here. Initially this page contains description of the web site.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Description of the Web Site			

Fig 1.1

2) LOGIN PAGE: This page looks like below:

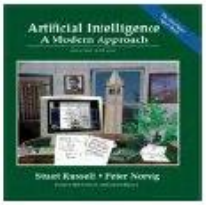
Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Login : Password: Submit Reset			

2) CATOLOGUE PAGE:

The catalogue page should contain the details of all the books available in the web site in a table.

The details should contain the following:

1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE		Book : XML Bible Author : Winston Publication : Wiely	$ 40.5	Add to cart
ECE		Book : AI Author : S.Russel Publication : Princeton hall	$ 63	Add to cart
EEE		Book : Java 2 Author : Watson Publication : BPB publications	$ 35.5	Add to cart
CIVIL		: HTML in 24 hours Author : Sam Peter Publication : Sam publication	$ 50	Add to cart

4) CART PAGE:

The cart page contains the details about the books which are added to the cart.

The cart page should look like this:

Logo	Web Site Name				
Home	Login	Registration		Catalogue	Cart
CSE ECE EEE CIVIL	**Book name** Java 2 XML bible **Total amount** - $130.5	**Price** $35.5 $40.5	**Quantity** 2 1	**Amount** $70 $40.5	

5) REGISTRATION PAGE:

Create a —*registration form* —with the following fields

1) Name (Text field) 2) Password (password field)

3) E-mail id (text field)

4) Phone number (text field)

5) Sex (radio button)

6) Date of birth (3 select boxes)

7) Languages known (check boxes – English, Telugu, Hindi, Tamil)

8) Address (text area)

6. CASCADING STYLE SHEET

Write an HTML page that contains a selection box with a list of 5 countries, when the user selects a country, its capital should be printed next to the list; Add CSS to customize the properties of the font of the capital (color, bold and font size).

7. JAVASCRIPT

a) Write a java script program to test the first character of a string is uppercase or not.
b) Write a pattern that matches e-mail addresses.
c) Write a java script function to print an integer with commas as thousands separators.

8. JAVASCRIPT

a) Write a java script program to sort a list of elements using quick sort.
b) Write a java script for loop that will iterate from 0 to 15 for each iteration, it will check if the current number is odd or even, and display a message to the screen.

9. JAVASCRIPT

a) Write a java script program which compute, the average marks of the following students then this average is used to determine the corresponding grade.
b) Write a java script program to sum the multiple s of 3 and 5 under 1000.
c) To design the scientific calculator and make event for each button using java script.

10. Write an XML file which will display the Book information which includes the following:

1) Title of the book
2) Author Name
3) ISBN number
4) Publisher name
5) Edition
6) Price

Write a Document Type Definition (DTD) to validate the above XML file.

Display the XML file as follows.

The contents should be displayed in a table. The header of the table should be in colorGREY. And the Author names column should be displayed in one color and should be capitalized and in bold. Use your own colors for remaining columns.

Use XML schemas XSL and CSS for the above purpose.

11.1) Install TOMCAT web server and APACHE.

While installation assign port number 4040 to TOMCAT and 8080 to APACHE. Make sure that these ports are available i.e., no other process is using this port.

11.2) Access the above developed static web pages for books web site, using these servers by putting the web pages developed in week-1 and week-2 in the document root.

Access the pages by using the urls: http://localhost:4040/rama/books.html (for tomcat)

http://localhost:8080/books.html (for Apache)

12. Develop and demonstrate PHP Script for the following problems:

a) Write a PHP Script to find out the Sum of the Individual Digits.
b) Write a PHP Script to check whether the given number is Palindrome or not
c) Write PHP program to convert a string, lower to upper case and upper case to lower case or capital case.
d) Write PHP program to change image automatically using switch case.
e) Write PHP program to calculate current age without using any pre-define function.
f) Write PHP program to upload image to the server using html and PHP.

13. Implement the following web applications using

a) PHP
b) Servlets
c) JSP

14. Implement the web applications with Database using

(a) PHP, (b) Servlets and (c) JSP.

15. Modify the above PHP program to use an xml instead of database

16. Write a program to design a simple calculator using

(a) JavaScript (b) PHP (c) Servlet and (d) JSP.

REFERENCE BOOKS:

1) Uttam K Roy, Web Technologies, Oxford University Press, 1st Edition, 2010.
2) Steven Holzner, The Complete Reference PHP, Tata McGraw-Hill, 1st Edition, 2007
3) HTML Black Book – Steve Holzner.
4) The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH
5) Java Server Pages –Hans Bergsten, SPD O'Reilly

CS 363A (R20): NETWORK PROGRAMMING LAB

L-0	T-0	P-3	M-100	C-1.5

ACTIVITIES:

1) Socket Programming
   a. TCP Sockets b. UDP Sockets c. Applications using Sockets
2) Implement file transfer using Message Queue form of IPC
3) Write a program to create an integer variable using shared memory concept and increment the variable simultaneously by two processes. Use semaphores to avoid race conditions
4) Design TCP iterative Client and server application to reverse the given input sentence
5) Design TCP iterative Client and server application to reverse the given input sentence
6) Design TCP client and server application to transfer file
7) Design a TCP concurrent server to convert a given text into upper case using multiplexing system call "select"
8) Design a TCP concurrent server to echo given set of sentences using poll functions
9) Design UDP Client and server application to reverse the given input sentence
10) Design UDP Client server to transfer a file
11) Design using poll client server application to multiplex TCP and UDP requests for converting a given text into upper case.
12) Design a RPC application to add and subtract a given pair of integers

CS 363B (R20): INTRODUCTION TO BLOCK CHAIN TECHNOLOGY LAB

L-0	T-0	P-3	M-100	C-1.5

ACTIVITIES:

1) Understand block chain technology.
2) Develop block chain based solutions and write smart contract using Hyperledger Fabric and Ethereum frameworks
3) Build and deploy block chain application for on premise and cloud based architecture.
4) Integrate ideas from various domains and implement them using block chain technology in different perspectives.
5) Able to do payment model using block chain applications.
6) Understand the security features in block chain technology and develop applications.
7) Consider the end user as one of the parties (Alice) and the Java Script application as other party (bob)

CS 363C (R20): CYBER SECURITY LAB

L-0	T-0	P-3	M-100	C-1.5

ACTIVITIES:

1) Implement the following Substitution & Transposition Techniques concepts:
   a) Caesar Cipher b) Rail fence row & Column Transformation.
2) Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
3) Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).
4) Implement the following Attack: a) Dictionary Attack b) Brute Force Attack.
5) Installation of Wire shark, tcp/dump, etc and observe data transferred in client server communication using UDP/TCP and identify the UDP/TCP datagram.
6) Installation of root kits and study about the variety of options.
7) Perform an Experiment to Sniff Traffic using ARP Poisoning.
8) Demonstrate intrusion detection system using any tool (snort or any other s/w).
9) Demonstrate how to provide secure data storage, secure data transmission and for creating Digital signatures.

CS 363D (R20): ADVANCED DATABASES LAB

L-0	T-0	P-3	M-100	C-1.5

ACTIVITIES:

1) Familiarization of the MySQL database – creation and manipulation of tables.
2) Analyze a given situation, develop an ER model and convert the ER model to Relational model.
3) Implement the database using MySQL and manipulate the tables using SQL commands
4) Course project topic selection, develop an ER model and converting ER model to a scheme diagram.
5) Developing a data flow diagram for the problem specification.
6) Implementation of front end pages.
7) Implementation of server side pages and verifying the normalization.
8) Testing the constraints and project

CS 364 (R20): FULL STACK LAB

L-0	T-0	P-3	M-100	C-2

FRONT END SOFTWARE DEVELOPMENT:

HTML & CSS:

- HTML & CSS interaction
- CSS: styling selectors, box model, border, margin, padding etc.,

Java Script:

Java Script Fundamentals, Hoisting, Callbacks, Promises, Asynchronous JavaScript, DOM Manipulation, JSON, AJAX Calls, Communication with Server, Event Listeners, Local and Session Storage etc.

Advanced JavaScript

- ES6, Let & Const, Arrow Functions, Array Destructuring, Async/Await, Babel, Webpack, etc

Java Script Frame Works – React:

- React Introduction, React Router, components and Single Page applications, React forms, flow architecture, Redux & Client-Server Communication, etc

Back End software development:

- Object oriented programming:
- Object Oriented paradigms of Java Programming (Classes, Objects etc.)
- Object Oriented Design
- Exception Handling, Collections, Concurrency, etc.

Data structures:

- Linear Data Structures (Arrays, Strings, Stacks, Queues, Linked Lists, etc.)
- Binary Trees and Binary Search Trees, Tree traversals

Database design & Systems:

- Processing, storing & organizing data: data models, ETL
- Tables, views, SQL queries - simple & complex
- Database schemas, normalization, keys, indexes

JDBC

- Introduction to NoSQL databases
- Server-Side development and frame work
- Spring MVC Architecture

Backend development using Springboot framework:

- ORM & Hibernate
- REST APIs

Linux Essentials:

- Linux OS
- File Structure
- Command Line Ops
- Linux Distros & Usage
- Basic Shell Scripting

Python Essentials:

- Language Basics
- Python Scripting
- Using AWS Python SDK

AWS Core

- AWS Organization & IAM
- Compute
- Storage
- Network
- AWS

IV/IV B.TECH
SEMESTER I

B.Tech. COMPUTER SCIENCE & ENGINEERING

IV/IV B.TECH SEMESTER-I

CS411 (R20): DESIGN OF DEEP LEARNING NETWORKS

L-3	T-0	P-0	M-100	C-3

COURSE OUTCOMES:

- Design and develop deep learning systems that can operate in real-world environments.
- Understand the principles and fundamentals of deep learning and neural networks.
- Evaluate the performance of deep learning models using appropriate metrics.
- Analyze and critique research papers in the field of deep learning and neural networks.
- Implement and train deep learning networks using popular frameworks such as Tensor Flow and Py Torch.

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:

Challenges in Machine Learning, Curse of dimensionality, local consistency, smoothing regularization, manifold learning, Deep feed forward networks, gradient based learning.

UNIT II:

Architectural design of deep learning networks, hidden units, computational graphs, chine rule, forward propagation and backward propagation, back propagation and other differentiation algorithms.

UNIT III:

Regularization for deep learning, data set augmentation, semi-supervised learning, multitask learning, early stopping, parameter sharing, bagging, dropout, adversal training.

UNIT IV:

Optimization of Deep Learning, Learning Vs Optimization, ANN optimization, parameter initialization strategies, adaptive learning, convolution operation, CNN variants, Capsule neural networks.

UNIT V:

Sequence Modelling, Unfolding Graphs, Recurrent Neural Networks, Teacher forcing for RNN, RNN gradients, RNN-PGM, bidirectional RNN, Recursive Neural Networks, LSTM.

TEXT BOOKS:

1) Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville.
2) Deep Learning – A Practical Approach (using Python) by Dr Rajiv Chopra.
3) Beginning with Deep Learning with Tensor Flowby Mohan kumar Silaparasetty.
4) Fundamentals of Deep Learning by Nikhil Buduma.
5) Deep Learning illustrated by Jon Krohn.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	1	3	1	-	-	-	-	-	2
CO2	3	3	2	2	3	1	-	-	-	-	1	2
CO3	3	3	3	2	3	1	-	-	1	-	2	2
CO4	3	3	3	3	3	1	-	-	1	-	2	2
CO5	3	3	3	3	3	1	-	-	2	-	3	3

CS412 (R20): DESIGN & ANALYSIS OF PARALLEL ALGORITHMS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVE:

- To expose students to basic techniques of parallel algorithm development and programming on different parallel platform.
- To learn about parallel computing models, design and analyse parallel algorithms for PRAM machines and Interconnection networks.

COURSE OUTCOMES:

- ★ Identify problems that can be solved using parallel algorithms, and design efficient parallel algorithms to solve them.
- ★ Analyze the complexity and efficiency of parallel algorithms, and understand their limitations.
- ★ Implement and test parallel algorithms using parallel programming frameworks, such as Open MP or MPI.
- ★ Understand and apply parallel algorithm design techniques, including divide-and-conquer, task parallelism, and data parallelism.
- ★ Understand the principles and fundamentals of parallel computing, including the architectures and models of parallel systems.

UNIT I

INTRODUCTION

Introduction to Parallel Algorithms – Models of Parallel Computation – Sorting on an EREWSIMD.

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.

REFERENCE BOOKS:

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.

CO-PO/PSO MAPPING MATRIX:

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CO3	2	3	3	2	3	1	-	-	1	2	2	2
CO4	3	3	3	3	2	1	1	-	1	-	2	2
CO5	3	3	3	3	3	1	-	-	2	1	3	3

CS413 (R20): INTRODUCTION TO DATA SCIENCE

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

Will gain knowledge in the basic concepts of Data Analysis

- To acquire skills in data preparatory and pre-processing 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.

COURSE OUTCOMES:

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

- ★ Identify and apply the need and importance of pre-processing techniques.
- ★ Understand the fundamentals of data science, including the data science process and the role of statistics and programming in data science.
- ★ Collect and explore different types of data using various data collection techniques and tools.
- ★ Apply exploratory data analysis techniques to summarize and visualize data, including measures of central tendency, variability, correlation, and regression.
- ★ Preprocess and clean data to remove outliers, missing values, and other noise.
- ★ Evaluate and compare the performance of different machine learning algorithms using appropriate evaluation metrics.

UNIT I

Data science: definition, Datafication, Exploratory Data Analysis, The Data science process, A data scientist role in this process. NumPy Basics: The NumPyndarray: 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 Data Frame 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.

CO-PO/PSO MAPPING MATRIX:

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CO3	3	3	3	2	3	1	-	-	1	-	2	2
CO4	3	3	3	3	3	1	-	-	1	-	2	2
CO5	1	2	2	3	1	2			2		3	3
CO6	3	3	3	3	3	1	-	-	2	-	3	3

CS414A (R20): WIRELESS NETWORKS

L-3	T-0	P-0	M-100	C-3

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

COURSE OUTCOMES:

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

- ★ Understand the principles and fundamentals of wireless networking, including the wireless channel, wireless communication technologies, and network architectures.
- ★ Design and analyze wireless networks, including cellular networks, wireless LANs, and wireless sensor networks.
- ★ Analyze and critique research papers in the field of wireless networking.
- ★ Understand the wireless medium access control (MAC) protocols and design efficient MAC protocols for wireless networks.
- ★ Develop mobile applications to solve some of the real-world problems.

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

TEXT BOOK:

1) Schiller J., Mobile Communications, Addison Wesley, 2000. 2. Stallings W., Wireless Communications and Networks, Pearson Education 2005

REFERENCE BOOKS:

1) Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc, 2002
2) Yi Bing Lin and Imrich Chlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc, 2000
3) Pandya Raj, Mobile and Personal Communications Systems and Services, PHI, 2000

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	**3**	**3**	**2**	**1**	**3**	**1**	**-**	**-**	**-**	**-**	**1**	**2**
CO2	**2**	**3**	**2**	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**1**	**2**
CO3	**3**	**3**	**3**	**2**	**3**	**1**	**-**	**-**	**1**	**-**	**2**	**2**
CO4	**3**	**3**	**2**	**3**	**3**	**2**	**-**	**-**	**1**	**-**	**2**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**1**	**-**	**-**	**2**	**-**	**3**	**3**

CS414B (R20): STORAGE AREA NETWORKS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- Understand Storage Area Networks characteristics and components.
- Describe the challenges associated with data centre networking and the need for switch network convergence.
- Storage Area Networks including storage architectures, logical and physical components of a storage infrastructure, managing and monitoring the data centre.
- Describe the concept of RAID and different RAID levels and their suitability for different application environments.
- Learn Fibre Channel protocols and how SAN components use them to communicate with each other.

COURSE OUTCOMES:

- ★ Identify single points of failure in a storage infrastructure and list solutions.
- ★ Understand the principles and fundamentals of storage area networks (SANs), including the architectures, components, and protocols used in SANs.
- ★ Design and configure SANs, including zoning, masking, and virtualization.
- ★ Understand and apply the different storage technologies used in SANs, including Fibre Channel, iSCSI, and FCoE.
- ★ Apply different RAID levels for data protection and availability in SANs.

UNIT I

Introduction to Information Storage and Management: Information Storage, Evolution of Storage Technology and Architecture, Data Centre Infrastructure, Information Lifecycle, Key Challenges in Managing Information

Storage System Environment: Components of a Storage System Environment, Disk Drive Components, Disk Drive Performance, Fundamental Laws Governing Disk Performance, Logical Components of the Host, Application Requirements and Disk Performance.

Data Protection: RAID: Implementation of RAID, RAID Array Components, RAID Levels, RAID Comparison, RAID Impact on Disk Performance, Hot Spares

UNIT II

Intelligent Storage System: Components of an Intelligent Storage System, Intelligent Storage Array

Direct-Attached Storage and Introduction to SCSI: Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, SCSI Command Model

Storage Area Networks: Fibre Channel: Overview, The SAN and Its Evolution, Components of SAN, FC Connectivity, Fibre Channel Ports, Fibre Channel Architecture, Zoning, Fibre Channel Login Types, FC Topologies

Network-Attached Storage: General-Purpose Servers vs. NAS Devices, Benefits of NAS, NAS File I/O, Components of NAS, NAS Implementations, NAS File-Sharing Protocols, NAS I/O Operations, Factors Affecting NAS Performance and Availability

IP SAN: iSCSI, FCIP

UNIT III

Content-Addressed Storage: Fixed Content and Archives, Types of Archives, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS, CAS Examples

Storage Virtualization: Forms of Virtualization, SNIA Storage Virtualization Taxonomy, Storage Virtualization Configurations, Storage Virtualization Challenges, Types of Storage Virtualization

Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions

UNIT IV

Backup and Recovery: Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Process, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Technologies,

Local Replication: Source and Target, Uses of Local Replicas, Data Consistency, Local Replication Technologies, Restore and Restart Considerations, Creating Multiple Replicas, Management Interface

Remote Replication: Modes of Remote Replication, Remote Replication Technologies, Network Infrastructure

UNIT V

Securing the Storage Infrastructure: Storage Security Framework, Risk Triad, Storage Security Domains, Security Implementations in Storage Networking

Managing the Storage Infrastructure: Monitoring the Storage Infrastructure, Storage Management Activities, Storage Infrastructure Management Challenges, Developing an Ideal Solution

TEXT BOOK:

1) Information Storage and Management, G. Somasundaram and Alok Shrivastava EMC Education Services, Wiley India, 2009.

REFERENCE BOOK:

1) Storage Networks: The Complete Reference, Robert Spalding, Tata McGraw Hill, Osborne, 2003.

CO-PO/PSO MAPPING MATRIX:

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CO1	3	3	2	1	3	1	-	-	-	-	-	2
CO2	3	3	2	2	3	1	-	-	-	-	1	2
CO3	3	3	3	2	3	1	-	-	1	-	2	2
CO4	3	3	3	3	3	1	-	-	1	-	2	2
CO5	3	3	3	3	3	1	-	-	2	-	3	3

CS414C (R20): INTRODUCTION TO NOSQL DATABASES

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column-oriented and Graph).
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
- Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases

COURSE OUTCOMES:

Demonstrate the concepts of unstructured data

- ★ Analyse and Manage the Data using CRUD operations.
- ★ Develop the applications using NoSQL.
- ★ Remember the concept of Map Reduce its applicability in the real world application development.
- ★ Understand the principles and fundamentals of NoSQL databases, including the different types of NoSQL databases, their characteristics, and use cases.
- ★ apply the different data models used in NoSQL databases, including document-oriented, key-value, column-family, and graph databases.

Unit-I

Why NoSQL? The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL

Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases.

More Details on Data Models; Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access,

Unit-II

Distribution Models; Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums.

Version Stamps, Business and System Transactions, Version Stamps on Multiple Nodes

Unit-III

Map-Reduce, Basic Map-Reduce, Partitioning and Combining, Composing Map-Reduce Calculations, A Two Stage Map-Reduce Example, Incremental Map-Reduce

Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets

Unit-IV

Document Databases: What Is a Document Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Diferent Operations, Queries against Varying Aggregate Structure

Unit-V

Graph Databases: What Is a Graph Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use.

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TEXT BOOKS:

1) Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addision Wesley, 2012
2) The Definitive Guide to Mongo DB, The NOSQL Database for cloud and Desktop Computing EelcoPlugge, Peter Membreyand Tim Hawkins A Press.

REFERENCE BOOKS:

1) Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN-13: 978-9332557338)
2) Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)
3) Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)

CO-PO/PSO MAPPING MATRIX:

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CO3	3	3	3	2	3	1	-	-	1	-	2	2
CO4	2	3	3	3	3	1	-	-	1	-	2	2
CO5	3	3	3	3	3	1	-	-	2	-	3	3

CS414D (R20): MULTICORE ARCHITECTURE & PROGRAMMING

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- Define technologies of multicore architecture and performance measures
- Demonstrate problems related to multiprocessing
- Illustrate windows threading, posix threads, Open MP programming
- Analyze the common problems in parallel programming

COURSE OUTCOMES:

Identify the limitations of ILP and the need for multicore architectures

- ★ Solve the issues related to multiprocessing and suggest solutions.
- ★ Understand the principles and fundamentals of multicore architectures, including shared memory and distributed memory architectures.
- ★ Apply different parallel programming models, including shared memory and message passing models.
- ★ Understand the principles and challenges of parallel computing, including parallel algorithms, synchronization, load balancing, and data dependency.
- ★ Analyze and critique research papers in the field of multicore architecture and programming.

Unit-I

Introduction to Multi-core Architecture Motivation for Concurrency in software, Parallel Computing Platforms, Parallel Computing in Microprocessors, Differentiating Multi-core Architectures from Hyper- Threading Technology, Multi-threading on Single-Core versus Multi-Core Platforms Understanding Performance, Amdahl's Law, Growing Returns: Gustafson's Law. System Overview of Threading : Defining Threads, System View of Threads, Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, What Happens When a Thread Is Created, Application Programming Models and Threading, Virtual Environment: VMs and Platforms, Runtime Virtualization, System Virtualization.

Unit-II

Fundamental Concepts of Parallel Programming :Designing for Threads, Task Decomposition, Data Decomposition, Data Flow Decomposition, Implications of Different Decompositions, Challenges You'll Face, Parallel Programming Patterns, A Motivating Problem: Error Diffusion, Analysis of the Error Diffusion Algorithm, An Alternate Approach: Parallel Error Diffusion, Other Alternatives. Threading and Parallel Programming Constructs: Synchronization, Critical Sections, Deadlock, Synchronization Primitives, Semaphores, Locks, Condition Variables, Messages, Flow Control- based Concepts, Fence, Barrier, Implementation-dependent Threading Features.

Unit-III

Threading APIs: Threading APIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft. NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking.

Unit-IV

Open MP: A Portable Solution for Threading : Challenges in Threading a Loop, Loop-carried Dependence, Data-race Conditions, Managing Shared and Private Data, Loop Scheduling and Portioning, Effective Use of Reductions, Minimizing Threading Overhead, Work-sharing Sections, Performance-oriented Programming, Using Barrier and No wait, Interleaving Single-thread and Multi-thread Execution, Data Copy-in and Copy-out, Protecting Updates of Shared Variables, Intel Task queuing Extension to Open MP, Open MP Library Functions, Open MP Environment Variables, Compilation, Debugging, performance

Unit-V

Solutions to Common Parallel Programming Problems : Too Many Threads, Data Races, Deadlocks, and Live Locks, Deadlock, Heavily Contended Locks, Priority Inversion, Solutions for Heavily Contended Locks, Non-blocking Algorithms, ABA Problem, Cache Line Ping-ponging, Memory Reclamation Problem, Recommendations, Thread-safe Functions and Libraries, Memory Issues, Bandwidth, Working in the Cache, Memory Contention, Cache-related Issues, False Sharing, Memory Consistency, Current IA-32 Architecture, Itanium Architecture, High-level Languages, Avoiding Pipeline Stalls on IA-32, Data Organization for High Performance.

TEXT BOOK:

1) Multicore Programming, Increased Performance through Software Multi-threading by Shameem Akhter and Jason Roberts, Intel Press, 2006

REFERENCE BOOKS:

1) Yan Solihin, "Fundamentals of Parallel Multicore Architecture", 1st Edition, CRC Press/Taylor and Francis, 2015.
2) Gerassimos Barlas, "Multicore and GPU Programming: An Integrated Approach Paperback", 1st Edition, Morgan Kaufmann, 2014.
3) Lyla B Das, "The x86 Microprocessors: 8086 to Pentium, Multicores, Atom and the 8051 Microcontroller: Architecture, Programming and Interfacing", 2nd Edition, Pearson Education India, 2014.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	1	3	1	-	-	-	-	-	2
CO2	3	3	2	2	3	1	-	-	-	-	1	2
CO3	3	2	3	2	3	1	-	-	1	-	2	3
CO4	3	3	3	3	3	1	-	-	1	-	2	2
CO5	3	2	3	3	3	1	-	-	2	-	3	3

CS415A (R20): PRINCIPLES OF ENTREPRENEURSHIP

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- The aim of this course is to have a comprehensive perspective of inclusive learning, ability to learn and implement the Fundamentals of Entrepreneurship.
- Inculcate among students, the entrepreneurial competencies including self-confidence, goal setting, planning, information seeking, problem solving and planned risk taking.

COURSE OUTCOMES:

- ★ Understanding of the fundamental concepts and principles of entrepreneurship, including the process of starting and growing a business.
- ★ Knowledge of the skills, attitudes, and behaviors required for successful entrepreneurship, such as creativity, risk-taking, and resourcefulness.
- ★ Analysis with the different types of business models and the various strategies for creating value and generating revenue.
- ★ Practical experience in creating a business idea, conducting market research, developing a business plan, and presenting the plan to potential investors or partners.

UNIT- I:

Introduction to Entrepreneurship: Meaning and Concept of Entrepreneurship - The History of Entrepreneurship Development-Role of Entrepreneurship in Economic Development- Agencies in Entrepreneurship Management-Future of Entrepreneurship.

Unit-II:

Entrepreneur: Meaning-The Skills required to be an Entrepreneur–The Entrepreneurial Decision Process- Role Models-Mentors and Support System. Opportunities for Entrepreneurs in India and abroad, Woman as Entrepreneur.

Unit-III:

Innovation: The Process - Structures and strategies for exploring - Executing Innovations along with the Technology - Market and Strategy Dimensions as the Innovation moves from Idea to Market.

Unit-IV:

Business Idea: Innovative Business Ideas-Methods of Generating Ideas-Opportunity Recognition.

Business Plan: Preparing Business Plan-Meaning and significance of a Business Plan-Components of a Business Plan-Feasibility Study.

Unit-V:

Venture Financing: Importance of New Venture Financing-Identify Financial Institutions and Banks.

Legal Protection: Choosing the Legal form of New Venture –Protection of Intellectual Property.

Marketing: Marketing the New Venture- Characteristics of High Growth New Ventures-Strategies for Growth - Building the New Venture Capital.

TEXT BOOKS:

1) Robert Hisrich, and Michael Peters: Entrepreneurship, TMH, 2009.
2) Dollinger: Entrepreneurship, Pearson, 2009.

REFERENCE BOOKS:

1) Batra Promod, Batra Vijay, Outside he Box-Great Ideas that transformed Business, published by Promod Batra Vijay Batra and Associates, New Delhi
2) Bedi Kanishka, Management and Entrepreneurship, Oxford University Press, New Delhi
3) Hisrich D Robert, Peters P Michael, Shepherd A Dean, Entrepreneurship, sixth edition, Tata McGraw-hill Publishers, NewDelhi
4) Oats David, A Guideto Entrepreneurship, second edition, Jaico Publishing H, Mumbai
5) Bhattacharya P.S, Creativity in Education, National psychological Corporation, Agra.
6) Tony Davila, Marc Epstein and Robert Shelton, Making Innovations Work: How to Manage It, Measure It, and Profit from It.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	1	1	2	2	-	3	1
CO2	2	2-	-	-	-	2	2	3	3	2	3	2
CO3	2	-	1	1	-	3	3	2	3	2	3	2
CO4	1	1	-	-	-	2	3	2	3	3	3	2

CS415B (R20): INTELLECTUAL PROPERTY RIGHTS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- To provide an understanding of the law relating to Intellectual Property and Competition in India.
- To understand the concept of Intellectual Property and Intellectual Property Rights with special reference to India.
- To appreciate the significance of Intellectual Property in modern times, in the light of its international legal regime.
- To study the important Agreements, Treaties and Conventions relating to Intellectual Property Rights.
- To understand the intricacies of grant of Patent, Patentability, Licensing and Revocation at National and International levels.
- To realize the Rights and Duties of Patentees.

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

- ★ Apply the knowledge of IPR for professional development.
- ★ Develop a platform for protection and compliance of Intellectual Property Rights & knowledge.
- ★ Create awareness amidst academia and industry of IPR and Copyright compliance.
- ★ Practical experience in analyzing and drafting intellectual property agreements and in conducting intellectual property due diligence for business transactions.
- ★ Understanding of the basic concepts and principles of intellectual property, including patents, trademarks, copyrights, and trade secrets.

UNIT – I: Introduction

Introduction to IPRs, Basic concepts and need for Intellectual Property – Meaning and practical aspects of Patents, Types of intellectual properties, Copyrights, Geographical Indications, IPR in India and Abroad. Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT – II: Intellectual Property Rights on Patents

The IPR tool kit, Patents, the patenting process, Patent cooperation treaties: International Treaties and conventions on IPRs: Trade Related Aspects of Intellectual Property Rights Agreement, Patent Cooperation Treaty, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT – III: Intellectual Property Protections

IPR of Living Species, protecting inventions in biotechnology, protections of traditional knowledge, biopiracy and documenting traditional knowledge, Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection. Case studies: The basmati rice issue, revocations of turmeric patent, revocation of neem patent.

UNIT – IV: Exercising and Enforcing of Intellectual Property Rights

Rights of an IPR owner, licensing agreements, criteria for patent infringement. Case studies of patent infringement, IPR – contract, unfair competitions and control, provisions in TRIPS

UNIT- V: Role of Patents in Product Development & Commercialization

Recent changes in IPR laws impacting patents and copy rights, intellectual cooperation in the science and allied industry. Patentable and non-patentable research.

TEXT BOOKS:

1) P.B. Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy. Tata Mc Graw Hill, 2001.
2) Steve Smith, The Quality Revolution.1st ed., Jaico Publishing House, 2002.
3) Kompal Bansal and Praishit Bansal. Fundamentals of IPR for Engineers, 1st Edition, BS Publications, 2012.

REFERENCE BOOKS:

1) PrabhuddhaGanguli. Intellectual Property Rights. 1st Edition, TMH, 2012.
2) R Radha Krishnan & S Balasubramanian. Intellectual Property Rights. 1st Edition, Excel Books, 2012.
3) M Ashok Kumar & Mohd. Iqbal Ali. Intellectual Property Rights. 2nd Edition, Serial Publications, 2011.
4) VinodV. Scople, Managing Intellectual Property. Prentice Hall of India Pvt. Ltd, 2012.
5) Deborah E. Bouchoux. Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets. Cengage Learning, 3rd ed. Edition, 2012.
6) Prabuddha Ganguli. Intellectual Property Rights: Unleashing the Knowledge Economy. McGraw Hill Education, 2011.
7) Edited by Derek Bosworth and Elizabeth Webster. The Management of Intellectual Property. Edward Elgar Publishing Ltd., 2013.
8) B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
9) Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
10) Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	1	3	1	-	-	-	-	-	2
CO2	3	2	2	2	3	1	-	-	-	-	1	2
CO3	3	3	3	2	3	1	-	-	1	-	2	2
CO4	3	3	3	3	3	1	-	-	1	-	2	2
CO5	2	3	3	3	3	1	-	-	2	-	3	3

CS415C (R20): BIOMEDICAL APPLICATIONS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- Deals with the block diagram of bio medical instrumentation system and their characteristics.
- To study the ECG, EEG, EMG, and Basic biochemical electrode.
- Deals with measuring blood pressure and use of pacemaker and defibrillator and ventilator.

COURSE OUTCOMES:

After completion of the course the student is able to:

- ★ Understand bios stems and medical systems from an engineering perspective.
- ★ Identify the techniques to acquire record and primarily understand physiological activity of the human body through cell potential, ECG, EEG, BP and blood flow measurement and EMG.
- ★ Understanding the fundamental principles of biomedical engineering and its applications in healthcare.
- ★ Analysis and Developing knowledge and skills in medical imaging technologies, such as MRI, CT scans, and ultrasound.
- ★ Understanding the principles of medical instrumentation and measurement, including biosensors and diagnostic equipment.

Unit – I

Basic of Biomedical Instrumentation: Components of Medical Instrumentation System, Static and dynamic characteristics of medical instruments, Problems encountered with measurements from human beings. Organization of Cell: Derivation of Nernst equation for membrane Resting potential, Generation of action potential and refractory periods, propagation methods of action potentials.

Unit – II

ECG Measurements and Interpretation: Medical Recorders: Classification of recorders, general features of ink-jet, and PMMC writing systems. Basics of Bio chemical electrodes. Electrocardiography: Electrical conduction system of the heart, electrodes and their placement, Standard 12 – lead configurations, Interpretation of ECG waveform with respect of electro mechanical activity of the heart.

Unit – III

Neurological Instrumentation: Neuronal communication, electro encephalogram (EEG), EEG Measurements EEG electrode-placement system, interpretation of EEG, EEG system Block diagram, preamplifiers and amplifiers. EMG block diagram and Stimulators.

Unit – IV

Therapeutic Equipment: Basics of Pacemakers, Defibrillator, electrotherapy and its applications, Dialysis and its significance.

Unit – V

EEG, EMG and Respiratory Measurements: EEG block diagram, electrodes and their placement, EMG block diagram, electrode and their placement, study of neuromuscular junction, nerve conduction velocity using EMG. Respiratory Instrumentation: Mechanism of respiration, Spirometrey, Pnemuotachograph and its types, ventilators and its mode of operation.

TEXT BOOKS:

1) Hand-book of Biomedical Instrumentation – by R.S. Khandpur, McGraw-Hill, 2003.
2) Medical Instrumentation, Application and Design – by John G. Webster, John Wiley.

REFERENCE BOOKS:

1) Joseph J. Carr ad John M. Brown, Introduction to Biomedical Equipment Technology, Pearson Education, 2001.
2) Bronzino Joseph D, Hand Book of Biomedical Engineering, CRC Press, 1995.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	1	3	1	-	-	-	-	-	2
CO2	3	3	2	2	3	1	-	-		-	1	2
CO3	3	3	3	2	3	1	-	-	1	-	2	2
CO4	3	3	3	3	3	1	-	-	1	-	2	2
CO5	3	3	3	3	3	1	-	-	2	-	3	3

CS415D (R20): FUNDAMENTALS OF ROBOTICS

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES:

- The goal of the course is to familiarize the students with the concepts and techniques in robotic engineering, manipulator kinematics, dynamics and control, chose, and incorporate robotic technology in engineering systems.
- Make the students acquainted with the theoretical aspects of Robotics
- Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
- Make the students to understand the importance of robots in various fields of engineering.
- Expose the students to various robots and their operational details.

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

- ★ Understanding the principles of robotics, including kinematics, dynamics, and control systems.
- ★ The ability to evaluate work collaboratively on robotics projects, including designing, building, and programming robots.
- ★ Analyze forces in links and joints of a robot.
- ★ Apply the Knowledge of advanced robotics topics, such as machine learning and artificial intelligence techniques, and their applications in robotics.

UNIT – I

Introduction: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications.

Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT – II

Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems.

Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems on Industrial Robotic Manipulation.

UNIT – III

Differential transformation of manipulators, Jacobeans – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion – straight line motion.

UNIT IV

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors.

UNIT V

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

TEXT BOOKS:

1) Industrial Robotics / Groover M P /McGraw Hill
2) Introduction to Industrial Robotics / RamachandranNagarajan / Pearson

REFERENCE BOOKS:

1) Robot Dynamics and Controls / Spony and Vidyasagar / John Wiley
2) Robot Analysis and control / Asada, Slotine / Wiley Inter-Science

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	1	1	2	2	-	3	1
CO2	2	2-	-	-	-	2	2	3	3	2	3	2
CO3	2	-	1	1	-	3	3	2	3	2	3	2
CO4	3	1	1	-	-	2	3	2	3	3	3	2

CS416 (R20): RESEARCH METHODOLOGY

L-3	T-0	P-0	M-100	C-3

COURSE OBJECTIVES: At the end of this course, the students should be able to

- Understand some basic concepts of research and its methodologies
- Identify appropriate research topics
- Select and define appropriate research problem and parameters
- Prepare a project proposal (to undertake a project)
- Organize and conduct research (advanced project) in a more appropriate manner
- Write a research report and thesis
- Write a research proposal (grants)

COURSE OUTCOMES: By the end of the course students should be able to:

- ★ Demonstrate the ability to choose methods appropriate to research aims and objectives
- ★ Understand the limitations of particular research methods
- ★ Analysis based on skills in qualitative and quantitative data analysis and presentation
- ★ Creating and Develop advanced critical thinking skills
- ★ Evaluate the enhanced writing skills

Unit-I

Introduction to Research Methodology: Objectives of Research, Motivation in Research, Types of Research, Research process and Phases of Research.

Unit-II

Research Design: Need, Problem Definition, variables, research design concepts, Literature survey and review, Research design process, Errors in research.

Unit-III

Research Modeling: Types of Models, Model building and stages, Data consideration and Testing, Heuristic and Simulation modeling.

Simulation: Need for simulation, Types of simulation.

Unit-IV

Report Writing: Pre-writing considerations, Thesis writing, formats of report writing, Formats of publications in Research Journals. Technique of Interpretation, Precaution in Interpretation, Significance of Report writing, Different steps in writing Report, Layout of the Research Report, Types of Reports, Report Format, Typing Instructions, Oral Presentations.

Unit-V

Research Ethics and Morals: Issues related to plagiarism, collaborative models and ethics, acknowledgements. *Intellectual Property Rights:* copy rights, copy left; Patents, Industrial designs, Trade marks.

TEXT BOOKS:

1) C.R. Kothari: Research Methodology, Methods & Techniques, 2nd Edition, New Age International Publications.
2) Krishnaswamy, K N SivaKumar, AppaIyer and Mathiranjan M (2006), Management Research Methodology; Integration of Principles, Methods and Techniques (Person Education, New Delhi).
3) R Pannerselvam, Research Methodology. PHI.

REFERENCE BOOKS:

1) Graziano, A.M., Raulin,M.L : Research Methods – A Process of Inquiry, Pearson Publications.
2) Bhandarkar & Wilkinson: Methodology and Techniques of Social Research, Himalaya publications, 2009.
3) Bell. J.2005: Doing your Research Project, 4th Edition, Open University Press, Berkshire.
4) How to write a Thesis:, Murray.R. Tata Mc Graw-Hill.
5) Writing for Academic Journals, Murray. R. 2009, McGraw-Hill International.
6) A Handbook of Academic Writing, Murray, R. and Moore, S. 2006, Tata Mc Graw-Hill.
7) Wrinting for Publication, Henson, K.T. 2005.
8) Ranjit Kumar, Research Methodology; a step-by-step Guide for Beginners, SAGE Publications

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	1	1	2	2	-	3	1
CO2	2	2-	-	-	-	2	2	3	3	2	3	2
CO3	2	-	1	1	-	3	3	2	3	2	3	2
CO4	1	1	-	-	-	2	3	2	3	3	3	2
CO5	2	1	3	3	-	2	3	2	2	3	3	1

CS 451 (R20): TENSORFLOW

L-0	T-0	P-2	M-100	C-2

ACTIVITIES:

1) Tensor Flow installation
2) Load a dataset
3) Build a Machine learning model
4) Detecting Spam using Tensor Flow
5) Image Classification with Tensor Flow
6) Optical character recognition using Tensor Flow
7) Object detection using Tensor Flow
8) Face recognition using Tensor Flow

CS 452 (R20): INDUSTRIAL/RESEARCH INTERNSHIP

L-0	T-0	P-3	M-100	C-3

COURSE OUTCOMES:

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

CO1	Participate in the projects in industries during his or her industrial training.
CO2	Describe use of advanced tools and techniques encountered during industrial internship and visit.
CO3	Interact with industrial personnel and follow engineering practices and discipline prescribed in industry.
CO4	Develop awareness about general workplace behavior and build interpersonal and team skills.
CO5	Prepare professional work reports and presentations.

CO-PO/PSO MAPPING MATRIX:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	-	-	-	2	-	3	3	3	2	-	2	-	-
CO 2	2	-	-	-	2	-	3	3	3	2	-	2	-	-
CO 3	2	-	-	-	2	-	3	3	3	2	-	2	-	-
CO 4	2	-	-	-	2	-	3	3	3	2	-	2	-	-
CO 5	2	-	-	-	2	-	3	3	3	2	-	2	-	-
AVG_CO	2	-	-	-	2	-	3	3	3	2	-	2	-	-

S. No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Int.	Ext.	
1	CS 452 (R20)	**INDUSTRIAL/RESEARCH INTERNSHIP** (Industrial/Research Internship (2 Months) after 3rd Year (to be evaluated during VII semester)	MC	0	0	0	100	0	3

IV/IV B.TECH
SEMESTER II

B.Tech. COMPUTER SCIENCE & ENGINEERING

IV/IV B.TECH SEMESTER-II

CS461 (R20): PROJECT WORK

COURSE OUTCOMES:

CO1	Identify technically and economically feasible problems with a good technical relevance
CO2	Plan and build the project team with assigned responsibilities
CO3	Identify and survey the relevant literature for getting exposed to related solutions
CO4	Analyse, design and develop adaptable and reusable solutions of minimal complexity by using modern tools
CO5	Implement and test solutions to trace against the user requirements

S. No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Int.	Ext.	
1	**CS 461**	Project Work, Seminar, Internship in Industry	Major Project	0	0	0	50	100	8
2	**CS 462**	Seminar	Seminar	0	0	0	50	0	2
3	**CS 463**	MOOCs	MOOC	0	0	0	100	0	2
TOTAL CREDITS									**12**

CO-PO/PSO MAPPING MATRIX:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	2	1	-	2	2	2	2	2	2	1	1	1
CO 2	3	3	3	3	2	2	2	2	2	2	2	1	2	2
CO 3	3	3	3	3	2	2	2	2	2	2	2	1	2	2
CO 4	3	3	3	3	2	2	2	2	2	2	2	1	2	2
CO 5	3	3	3	3	2	2	2	2	2	2	2	1	2	2
AVG_CO	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	1	**2**	**2**

MINOR DEGREE COURSES

B.Tech. COMPUTER SCIENCE & ENGINEERING

MINOR DEGREE COURSES

CSM001 (R20): OPERATING SYSTEMS

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

To learn the fundamentals of Operating Systems.

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

COURSE OUTCOMES:

- ★ Create processes and threads.
- ★ Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
- ★ 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.
- ★ Design and implement file management system.
- ★ 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

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

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

CO-PO/PSO MAPPING MATRIX:

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CO1	3	3	3	-	-	3	-	-	3	-	-	-
CO2	-	3	-	-	3	2	-	-	-	-	-	3
CO3	2	3	-	2	2	2	2	-	-	-	-	-
CO4	-	3	3	-	-	-	-	-	1	-	-	-
CO5	-	2	-	-	1	-	-	-	-	-	2	-
AVG_CO	1	3	2	1	2	2	1	-	1	-	1	1

CSM002 (R20): DATA STRUCTURES & ALGORITHMS

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

- ★ For a given algorithm student will able to analyse the algorithms to determine the time and computation complexity and justify the correctness.
- ★ For a given Search problem (Linear Search and Binary Search) student will able to implement it.
- ★ For a given problem of Stacks, Queues and linked list student will able to implement it and analyse the same to determine the time and computation complexity.
- ★ 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.
- ★ Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

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.

Array Data Structure: Array ADT and its operations, Time complexity.

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: 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.

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

Hashing: Hash function, Open addressing and separate chaining.

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, Tree traversals.

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

REFERENCE BOOKS:

1) Data Structures and Algorithms by Alfred V Aho, John E Hopcroft, Jeffrey D Uiiman, Pearson Education.
2) "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
3) Classic Data Structures by Debasis Samanta, PHI Publications.
4) Data Structures LIPSCHUTZ, Schaum publications.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	-	-	3	-	-	3	-	-	-
CO2	-	3	-	-	3	2	-	-	-	-	-	3
CO3	2	3	-	2	2	2	2	-	-	-	-	-
CO4	-	3	3	-	-	-	-	-	1	-	-	-
CO5	-	2	-	-	1	-	-	-	-	-	2	-
AVG_CO	1	3	2	1	2	2	1	-	1	-	1	1

CSEM003 (R20): JAVA PROGRAMMING

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

- ★ 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
- ★ Design and develop java programs, analyse, and interpret object-oriented data and report results.
- ★ Design an object-oriented system, AWT components and multithreaded processes as per needs and specifications.
- ★ Participate and succeed in competitive examinations like GATE, Engineering services, recruitment interviews etc.

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	-	-	3	-	-	3	-	-	-
CO2	-	3	-	-	3	2	-	-	-	-	-	3
CO3	2	3	-	2	2	2	2	-	-	-	1	-
CO4	2	3	3	-	-	-	-	-	1	-	-	-
CO5	1	2	-	-	1	-	-	-	-	-	2	-
AVG_CO	1	3	2	1	2	2	1	-	1	-	1	1

CSEM004 (R20): COMPUTER ORGANIZATION & ARCHITECTURE

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

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.

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.

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.

REFERENCE 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 Carl Hamacher, 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.
5) "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
6) "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	-	-	3	-	-	3	-	-	-
CO2	-	3	-	-	3	2	-	-	-	-	-	3
CO3	2	3	-	2	2	2	2	-	-	1	-	-
CO4	-	3	3	-	-	-	-	1	1	-	-	-
CO5	1	2	-	-	1	-	-	-	-	1	2	-
AVG_CO	1	3	2	1	2	2	1	-	1	-	1	1

CSEM005 (R20): DATA BASE MANAGEMENT SYSTEMS

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

- 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.

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

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.

CO-PO/PSO MAPPING MATRIX:

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CO1	3	3	3	-	-	3	-	-	3	-	-	-
CO2	-	3	-	-	3	2	-	-	-	-	-	3
CO3	2	3	-	2	2	2	2	-	-	-	-	-
CO4	-	3	3	-	-	-	-	-	1	-	-	-
CO5	-	2	-	-	1	-	-	-	-	-	2	-
AVG_CO	1	3	2	1	2	2	1	-	1	-	1	1

CSEM006 (R20): COMPUTER NETWORKS

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

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

- Build an understanding of the fundamental concepts of data communication and computer networking.
- Understand how errors detected and corrected that occur in transmission
- How collisions to be handled when many stations share a single channel
- Know about routing mechanisms and different routing protocols
- Understand transport layer functions
- Know about different application layer protocols

COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

- ★ Describe the basis and structure of an abstract layered protocol model
- ★ Independently understand basic computer network technology.
- ★ Identify the different types of network topologies and protocols.
- ★ Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
- ★ Identify the different types of network devices and their functions within a network
- ★ Understand and building the skills of subnetting and routing mechanisms.
- ★ Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation
- ★ Understand how the Internet works today.

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.

CO-PO/PSO MAPPING MATRIX:

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CO1	3	3	3	-	-	3	-	-	3	-	-	-
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CO3	2	3	-	2	2	2	2	1	-	-	1	-
CO4	-	3	3	-	1	-	-	-	1	-	-	-
CO5	-	2	-	-	1	-	1	-	-	-	2	-
AVG_CO	1	3	2	1	2	2	1	-	1	-	1	1

HONOURS DEGREE COURSES

NETWORKING DOMAIN

B.Tech. COMPUTER SCIENCE & ENGINEERING

HONOURS DEGREE COURSES NETWORKING DOMAIN

CSHT101 (R20): NETWORK SECURITY

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

- To understand basic security topics, including symmetric and public key cryptography
- To explain the basic number theory required for cryptographic applications, and manually encrypt/decrypt and sign/verify signatures using cryptographic approaches.
- To identify different security attacks and threats
- To understand various protocols for network security to protect against the threats in the networks.

COURSE OUTCOMES:

After successful completion of the course, the learners would be able to

- ★ Develop Concept of Security needed in Communication of data through computers and networks along with Various Possible Attacks.
- ★ Understand Various Encryption mechanisms for secure transmission of data and management of key required for required for encryption.
- ★ Understand authentication requirements and study various authentication mechanisms
- ★ Understand network security concepts and study different Web security mechanisms.

UNIT I

Introduction:

Security Concepts and Terminology, TCP/IP and OSI Network Security, Need for Security – Attacks, Services and Mechanisms, Classical encryption Techniques, Block ciphers.

Secret Key Cryptography:

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

Number Theory:

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, Kerberos Systems.

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

Network Attacks and Network Security Threats:

Denial-of-service/Distributed denial-of-service attacks, Back door, Spoofing, Man-in-the-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

IP Security: IP Security Overview, IP Security Architecture, Authentication header, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange (IKE).

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

TEXT BOOKS:

1) William Stallings, "Cryptography and Network security: Principles and Practices", Pearson/PHI.
2) Cryptography and Network Security; McGraw Hill; Behrouz A Forouzan
3) Network Security: Private Communications in a Public World, M. Speciner, R. Perlman, C. Kaufman, Prentice Hall, 2002.

REFERENCE BOOKS:

1) W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education.
2) Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.
3) Eric Cole, Dr. Ronald Kurtz and James W. Conley, Network Security Bible, Wiley Publishers, 2009.

CO-PO/PSO MAPPING MATRIX:

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CO4	-	3	3	-	-	-	-	-	1	-	-	-
CO5	-	2	-	-	1	-	-	-	-	-	2	-
AVG_CO	1	3	2	1	2	2	1	-	1	-	1	1

CSHT102 (R20): CYBER SECURITY

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

- To understand different threats, harms and vulnerabilities involved in computers and cyberspace.
- To study the access control and authentication methods to prevent different types of attacks in networks and web.
- To understand the security concepts in the design of operating systems and networks.
- To learn security countermeasures like cryptography, firewalls, IDS & IPS systems and privacy principles & policies.
- To study the security requirements and privacy issues in databases and cyberspace.

COURSE OUTCOMES:

The students will be able to:

- ★ Analyze cyber-attacks, types of threats, harms and vulnerabilities and also how to protect them self and ultimately the entire Internet community from such attacks.
- ★ Determine and comprehend the security concepts in the design of operating systems and networks.
- ★ Apply security solutions like cryptography, firewalls, IPS and IDS systems to manage security and privacy issues.
- ★ Describe security requirements and privacy issues in databases and cyberspace. Analyze about privacy principles and policies.
- ★ Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.

UNIT-I

INTRODUCTION TO CYBER SECURITY: Introduction - Computer Security - Threats - Harm - Vulnerabilities - Controls - Authentication - Access Control and Cryptography.

THE WEB: User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks.

UNIT-II

SECURITY IN OPERATING SYSTEM & NETWORKS: Security in Operating Systems - Security in the Design of Operating Systems - Rootkit - Network security attacks - Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

UNIT-III

SECURITY COUNTERMEASURES: Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management.

UNIT-IV

DATABASES: Introduction to Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.

UNIT-V

PRIVACY IN CYBERSPACE : Privacy Concepts - Privacy Principles and Policies - Authentication and Privacy - Data Mining -Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies - Where the Field Is Headed.

TEXT BOOK:

1) Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition, Pearson Education, 2015.

REFERENCE BOOKS:

1) George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
2) MarttiLehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
3) Nelson Phillips and Enfinger Steuart, ―Computer Forensics and Investigations, Cengage Learning, New Delhi, 2009.

CO-PO/PSO MAPPING MATRIX:

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CO1	**3**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**-**	**3**	**-**	**3**	**-**	**-**	**-**	**3**	**-**	**3**	**-**
CO3	**2**	**2**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**-**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**3**	**-**	**3**	**-**
AVG_CO	**3**	**2**	**2**	**-**	**3**	**-**	**-**	**-**	**2**	**-**	**2**	**-**

CSEHT103 (R20): TCP/IP

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

- This course provides a solid foundation for understanding the communication process of the Internet.
- The student will understand the fundamental concepts of computer networking in the context of the TCP/IP model and protocols.
- To study classful and classless addressing, IPV4,IPv6, UDP, TCP, congestion control and flow control.

COURSE OUTCOMES:

At the end of this course student will:

- ★ Summarize basic principles of IPv4 and its Addressing mechanisms
- ★ Understand UDP Services and Applications in Transport Layer
- ★ Describe the services, and features of TCP
- ★ Discuss various Flow, Error and Congestion control mechanisms of TCP
- ★ Understand the Principles of IPv6 Addressing,IPv6 and ICMPv6 Protocols

UNIT – I

The OSI Model and the TCP/IP Protocol Suite - Protocol Layers, The OSI Model, TCP/IP Protocol suite and Addressing. Designing Applications, standardized process

Link layer: point to point protocol, Ethernet and IEEE LAN/MAN standards

UNIT II

IPV4 Addresses- Introduction, Classfull and Classless Addressing

Internet Protocol Version4 (IPv4) – Datagrams, Fragmentation, Options, Checksum, Security, IP Package

IPv6 Addressing – Introduction, Address Space Allocation, Global Unicast Addresses, Auto configuration and Renumbering.

IPv6 Protocol - Introduction, Packet Format, Transition from IPv4 to IPv6.

ARP- Introduction,ARP cache,ARP frame format, ARP examples, proxy ARP

UNIT-III

ICMPV4 and ICMPV6– Introduction, Error Messages, Informational Messages, Neighbor Discovery Messages, Group Membership Messages

Broadcasting and Local Multicasting: Introduction, Broadcasting, multicasting, IGMP and MLD

UNIT IV

Introduction to the Transport Layer – Transport Layer Services and Protocols.

Transmission Control Protocol: TCP Services, Features, Segment, TCP Connection, Windows in TCP.

Flow Control, Error Control, Congestion Control, TCP Timers, Options and TCP Package.

User Datagram Protocol (UDP)–Introduction, User Datagram, UDP Services and Applications, UDP Package

UNIT V

Application Layer: Domain Name System, HTTP, SMTP, SNMP, FTP, DHCP

REFERENCE BOOKS:

1) TCP/IP Illustrated, Volume 1 The Protocols W. Richard Stevens
2) TCP/IP Protocol Suite, Behrouz A. Forouzan, 4th Edition, Tata McGraw-Hill Edition.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	-	-	-	-	-	3	-
CO2	2	3	3	-	-	-	-	-	-	-	2	-
CO3	-	2	-	3	-	-	-	-	-	-	-	-
CO4	1	3	3	-	3	-	-	-	-	-	1	-
CO5	2	3	2	-	-	3	-	-	-	-	-	-
AVG_CO	2	3	2	1	1	1	-	-	-	-	1	-

CSEHT104 (R20): DIGITAL FORENSICS

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

- To understand the digital logic.
- To learn and understand the operating system concepts
- To learn and understand the basics of Computer hardware knowledge.

COURSE OUTCOMES:

After completion of the course, students will able to:

1) Describe Forensic science and Digital Forensic concepts
2) Determine various digital forensic Operandi and motive behind cyber attacks
3) Interpret the cyber pieces of evidence, Digital forensic process model and their legal perspective.
4) Demonstrate various forensic tools to investigate the cybercrime and to identify the digital pieces of evidence
5) Analyze the digital evidence used to commit cyber offences.

UNIT-1

Introduction: Understanding of forensic science, digital forensic, The digital forensic process, Locard's exchange principle, Scientific models..

UNIT II:

Understanding of the technical concepts: Basic computer organization, File system, Memory organization concept, Data storage concepts

UNIT III:

Digital Forensics Process Model: Introduction to cybercrime scene, Documenting the scene and evidence, maintaining the chain of custody, forensic cloning of evidence, Live and dead system forensic, Hashing concepts to maintain the integrity of evidence, Report drafting.

UNIT IV:

Computer Operating system Artifacts: Finding deleted data, hibernating files, examining window registry, recycle bin operation, understanding of metadata, Restore points and shadow copies.

UNIT V:

Legal aspects of digital forensics: Understanding of legal aspects and their impact on digital forensics, Electronics discovery

Case Study: Understanding of Internet resources, Web browser, Email header forensic, social networking sites

TEXT BOOK:

1) The basics of digital Forensics (Latest Edition) – The primer for getting started in digital forensics by John Sammons – Elsevier Syngress Imprint

REFERENCE BOOKS:

1) Cyber security – Understanding of cybercrimes, computer forensics and Legal perspectives by Nina Godbole and Sunit Belapure – Wiley India Publication
2) Practical Digital Forensics – Richard Boddington [PACKT] Publication, Open source community.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	3	-	-	-	-	-	3	-	-	-
CO2	-	2	-	-	3	-	-	2	2	-	-	-
CO3	3	2	-	-	-	-	-	-	3	-	-	-
CO4	-	-	2	-	-	-	-	-	2	-	-	-
CO5	-	3	-	-	-	-	-	-	1	-	-	-
AVG_CO	1	2	1	-	1	-	-	1	3	-	-	-

HONOURS DEGREE COURSES

AI & ML DOMAIN

B.Tech. COMPUTER SCIENCE & ENGINEERING

HONOURS DEGREE COURSES AI & ML DOMAIN

CSHT201 (R20): ARTIFICIAL NEURAL NETWORKS

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

- To understand the biological neural network and to model equivalent neuron models.
- To understand the architecture, learning algorithms.
- To know the issues of various feed forward and feedback neural networks.
- To explore the Neuro dynamic models for various problems.

COURSE OUTCOMES: Upon completing this course, the student will be able to

- ★ Understand the similarity of Biological networks and Neural networks
- ★ Perform the training of neural networks using various learning rules.
- ★ Understanding the concepts of forward and backward propagations.
- ★ Understand and Construct the Hopfield models.

UNIT-I

Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

UNIT-II

Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment

Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

UNIT-III

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

UNIT – IV

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification

UNIT-V:

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm **Hopfield Models** – Hopfield Models, restricted boltzmen machine.

TEXT BOOKS:

1) Neural Networks a Comprehensive Foundations, Simon S Haykin, PHI Ed.
2) Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

REFERENCE BOOKS:

1) Neural Networks in Computer Intelligence, Li Min Fu TMH 2003
2) Neural Networks -James A Freeman David M S Kapura Pearson Ed., 2004.
3) Artificial Neural Networks – B. Vegnanarayana Prentice Hall of India P Ltd 2005

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	1	3	1	-	-	-	-	1	2
CO2	2	3	2	2	3	1	-	-	-	-	1	2
CO3	3	3	3	2	3	2	-	-	1	1	2	2
CO4	3	3	3	3	3	1	-	-	1	1	2	2

CSEHT202 (R20): DEEP LEARNING

L-3	T-0	P-0	M-100	C-4

COURSE OBJECTIVES:

- Understanding the basics concepts of deep learning.
- Analysis knowledge on various deep learning algorithms.
- Understanding of CNN and RNN to model for real world applications.
- Understanding the various challenges involved in designing deep learning algorithms for varied applications

COURSE OUTCOMES:

CO1: Understanding the basics concepts of deep learning.

CO2: Emphasizing knowledge on various deep learning algorithms.

CO3: Understanding of CNN and RNN to model for real world applications.

CO4: Understanding the various challenges involved in designing deep learning algorithms for varied applications

UNIT I:

INTRODUCTON TO DEEP LEARNING: Introduction to Deep Learning: Basics: Biological Neuron, Idea of computational units, McCulloch- Pitts unit and thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability. Convergence theorem for Perceptron Learning Algorithm. (12)

UNIT II:

FEEDFORWARD NETWORKS Feed forward Networks: Multilayer Perceptron, Gradient Descent, Back propagation, Empirical Risk Minimization, regularization, autoencoders. (10)

UNIT III:

CONVOLUTIONAL NETWORKS Convolutional Networks: The Convolution Operation - Variants of the Basic Convolution Function - Structured Outputs - Data Types - Efficient Convolution Algorithms - Random or Unsupervised Features- LeNet, AlexNet (14)

UNIT IV:

RECURRENT NEURAL NETWORKS Recurrent Neural Networks: Bidirectional RNNs - Deep Recurrent Networks Recursive Neural Networks - The Long Short-Term Memory and Other Gated RNNs (12)

UNIT V:

DEEP GENERATIVE MODELS Deep Generative Models: Boltzmann Machines - Restricted Boltzmann Machines - Introduction to MCMC and Gibbs Sampling gradient computations in RBMs - Deep Belief Networks- Deep Boltzmann Machines (9)

REFERENCE BOOKS:

1) Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.

2) Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009): 1127.

3) N.D. Lewis, "Deep Learning Made Easy with R: A Gentle Introduction for Data Science", January 2016.

4) Nikhil Buduma, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly publications, 2017.

5) Tariq Rashid, "Make your own neural network ", 2017.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	1	3	1	-	-	-	-	-	2
CO2	3	3	2	2	3	1	-	-	-	-	1	2
CO3	3	3	3	2	3	1	-	-	1	-	2	2
CO4	3	3	3	3	3	1	-	-	1	-	2	2
CO5	3	3	3	3	3	1	-	-	2	-	3	3

CSEHT203 (R20): SOFT COMPUTING

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

- To learn the basic concepts of Soft Computing
- To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
- To apply soft computing techniques to solve problems.

COURSE OUTCOMES:

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

- ★ Apply suitable soft computing techniques for various applications.
- ★ Apply and evaluate fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
- ★ Understand genetic algorithms to combinatorial optimization problems.
- ★ Analysis neural network for classification and clustering problems for real world and soft computing problems.

UNIT I: INTRODUCTION TO SOFT COMPUTING (18 periods)

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems- Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems- Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II: ARTIFICIAL NEURAL NETWORKS (15 periods)

Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization -Hamming Neural Network - Hopfield Neural Network- Bi- directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT III: FUZZY SYSTEMS (18 periods)

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations -Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.

UNIT IV: GENETIC ALGORITHMS (20 periods)

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators -Convergence of Genetic Algorithm.

UNIT V: HYBRID SYSTEMS **(20 periods)**

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture- Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

TEXT BOOKS:

1) N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.
2) S.N.Sivanandam, S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd., 2nd Edition, 2011.
3) S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt. Ltd., 2017.

REFERENCE BOOKS:

1) Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, Neuro-Fuzzy and Soft Computing, Prentice-Hall of India, 2002.
2) Kwang H.Lee, First course on Fuzzy Theory and Applications, Springer, 2005.
3) George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic-Theory and Applications, Prentice Hall, 1996.
4) James A. Freeman and David M. Skapura, Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	2	2	2	2	1	-	-	-	-	-
CO2	2	2	3	1	2	2	1	-	1	1	-	-
CO3	2	2	2	2	3	3	1	-	-	-	-	-
CO4	2	2	3	1	3	3	1	-	1	1	3	-
CO5	2	2	3	2	2	2	1	-	1	1	-	-

CSEHT204 (R20): ADVANCED PYTHON PROGRAMMING

L-3	T-1	P-0	M-100	C-4

PREREQUISITES:

Basic Knowledge of Python Programming

COURSE OBJECTIVES:

The course should enable the students:

- Describe the semantics of Python programming language and Illustrate the process of structuring the data using lists, dictionaries, tuples, strings and sets.
- Illustrate the Object-oriented Programming concepts in Python.
- Demonstrate the basic database design for storing data as part of a multi-step data gathering, analysis, and processing.
- Familiarize the basics of machine learning using an approachable, and also understand the advantage of using Python libraries for implementing Machine Learning models.

UNIT-I: **10 periods**

Introduction to Python, use IDLE to develop programs, Basic coding skills, working with data types and variables, working with numeric data, working with string data, Python functions, Boolean expressions, selection structure, iteration structure, working with lists, work with a list of lists, work with tuples, work with dates and times, get started with dictionaries

UNIT-II: **10 periods**

Classes in Python: OOPS Concepts, Classes and objects, Classes in Python, Constructors, Data hiding, Creating Classes, Instance Methods, Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Custom Exception Classes, Iterators, generators and decorators.

UNIT-III: **8 periods**

I/O and Error Handling In Python : Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data From a File, Additional File Methods, Handling IO Exceptions, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions, Working with Directories.

UNIT-IV: 10 Periods

An Introduction to relational databases: SQL statements for data manipulation, Using SQLite Manager to work with a database, Using Python to work with a database, Creating a GUI that handles an event, working with components.

UNIT-V: 10 Periods

Implement Machine Learning algorthims: Usage of Numpy for numerical Data, Usage of Pandas for Data Analysis, Matplotlib for Python plotting, Seaborn for Statical plots, interactive Dynamic visualizations, SciKit for Machine learning.

TEXT BOOKS:

1) Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
2) Haltermanpython
3) Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010

ONLINE RESOURCES:

1) https://www.w3schools.com/python
2) https://docs.python.org/3/tutorial/index.html
3) https://www.python-course.eu/advanced_topics.php

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	2	3	2	-	-	-	-	3	2	3
CO2	3	2	1	2	2	-	-	-	-	3	3	2
CO3	3	1	3	3	2	-	-	-	-	3	2	3
CO4	1	2	3	2	3	-	-	-	-	3	3	2
CO5	3	3	3	2	3	-	-	-	-	2	2	3

HONOURS DEGREE COURSES

SOFTWARE ENGINEERING DOMAIN

B.Tech. COMPUTER SCIENCE & ENGINEERING

HONOURS DEGREE COURSES SOFTWARE ENGINEERING DOMAIN

CSHT301 (R20): SOFTWARE TESTING

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

- To study fundamental concepts in software testing.
- To discuss various software test design technique.

COURSE OUTCOMES:

At the end of this course student will:

CO1-List various test levels, test types and be able to apply specific (automated) testing methods to the projects.

CO2-Discuss about the path testing and static techniques and tools for testing.

CO3-Distinguish characterstics of static and design techniques.

CO4-Demonstrate Test organization, Test plans, estimates, and strategies, Test progress monitoring and control, Configuration management, Risk and testing, Incident management.

CO5-Demonstrate various tools for testing.

Unit I

Introduction: Fundamentals of testing, Why is testing necessary, What is testing? Testing principles, Fundamental test process, The psychology of testing

Testing throughout the software life cycle, Software development models, Test levels, Test types: the targets of testing, Maintenance testing

Unit II

Model for Testing, consequences of Bugs, Taxonomy of Bugs. Flow graphs and Path testing: Basics Concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

Static techniques, Reviews and the test process, Review process, Static analysis by tools.

Unit III

Test design techniques: Identifying test conditions and designing test cases, Categories of test design techniques, Specification-based or black-box techniques, Structure-based or white-box techniques, Experience-based techniques, Choosing a test technique

Unit IV

Test management: Test organization, Test plans, estimates, and strategies, Test progress monitoring and control, Configuration management, Risk and testing, Incident management

Unit V

Tool support for testing: Types of test tool, Effective use of tools: Potential benefits and risks, Introducing a tool into an organization.

REFERENCE BOOKS:

1) Foundation of software testing by Dorothy Graham Erik van Veenendaal & Isabel Evans
2) Software testing techniques – Boris Beizer, Dreamtech, second edition.
3) The Craft of software testing – Brian Marick, Pearson Education.
4) Introduction to Software Testing, P.Ammann & J.Offutt, Cambridge Univ. Press.
5) Win Runner in simple steps by Hakeem Shittu, 2007 Genixpress.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	1	2	-	-	-	-	3	3	1
CO2	3	1	1	2	2	-	-	-	-	2	2	3
CO3	2	3	3	3	2	-	-	-	-	2	3	1
CO4	3	2	1	3	3	-	-	-	-	3	3	3
CO5	1	3	3	2	3	-	-	-	-	2	3	1

CSHT302 (R20): SOFTWARE PROJECT MANAGEMENT

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES: The students will be able to:

- Resolve the process of managing software from conventional to modern.
- Analyze the architecture of a model based software and the process flow.
- Describe the process automation, process management and its discriminants.

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

- ★ Analyze and design the software architecture.
- ★ Apply, analyze, design and develop the software project.
- ★ Acquire the knowledge of managing, economics for conventional, modern and future software projects.
- ★ Sketch various artifacts sets for better understanding of software development.

UNIT-I

Introduction to Software Project Management: Introduction to Project and Project Management, Reasons for IT project failure, Triple constraint of IT project management, Management spectrum of project, Overview of project life cycle models.

Project Charter: Introduction, Project management process and their correlation with project lifecycle phases, Introduction to Project Integration management and seven processes, Project Charter.

UNIT-II

Project Scope Management: Introduction, Processes of scope management.

Project Human Resource Management: Introduction, Organizational structure – Function, Project and Matrix, Keys to managing people motivation theories and improving effectiveness, Project team selection.

UNIT-III

Project Time and Cost Management : Introduction, Development of project schedule, CPM and PERT, Activities their sequencing and dependencies, Project network diagrams, Development of Gantt Charts, Earned Value Management, Introduction to Constructive Cost Model (COCOMO).

Project Risk Management: Introduction, Risk Management Process, Risk Identification for IT projects, Qualitative and Quantitative approaches to Risk Analysis, Risk Strategies, Risk Monitoring and Control, Risk Response and Evaluation Project Quality Management.

UNIT-IV

Project Communication Management: Introduction, Project Communication Plan, Project metrics, Information distribution, Performance Reporting.

Project Change Management: Introduction, Impact of change, Change as a process, Change Management plan, dealing with resistance and conflict, Configuration management.

Project Procurement Management: Introduction, Processes Planning Purchases and Acquisition, Contracting, Request Seller Responses, Select Sellers, Contract Administration, Contract Closure, Outsourcing of products and services.

UNIT-V

Project Leadership and Ethics: Introduction, Project Leadership, Modern approaches, Styles of leadership, Ethical leadership, making sound ethical decisions in the situations of conflict.

Closure of a Project: Introduction, Project implementation, Administrative closure, Project Evaluation.

REFERENCE BOOKS:

1) Jack T Marchewka, Information Technology Project Management, (International Student Version), Wiley India.
2) Kathy Schwalbe, Project Management in IT, India Edition, Cengage Learning.
3) Bob Hughes, Mike Cotterell, Rajib Mall, Software Project Management, Mc GrawHill.
4) Pankaj Jalote, Software Project Management in Practice, Pearson, Education Asia.
5) Samuel J mantel et.el, Project Management Core Textbook, Wiley India.
6) Roger S. Pressman, Software Engineering: A practical Approach, Mc Graw Hill.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	3	2	-	-	-	-	-	-	2
CO2	3	2	2	2	2	-	-	-	-	-	-	2
CO3	2	2	3	3	2	-	1	-	-	-	-	2
CO4	3	2	3	2	2	-	-	-	-	2	-	2

CSHT303 (R20): SOFTWARE METRICS AND MEASUREMENT

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

- An overview of Software Metrics
- Knowledge of different metrics associated with Software Development and evaluation.

COURSE OUTCOMES:

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

1) Gain knowledge in:
   - ★ Measures
   - ★ Software quality.
2) Acquire skills in analyzing project implementation risks and make decisions appropriately to develop product.
3) Apply software metrics to measure the parameters of a project.

UNIT-I: **(Periods: 10)**

Measurement and Basics of Measurement - Measurement in Everyday Life, Measurement in Software Engineering, Scope of Software Metrics, Measurement and Models, Measurement Scales and Scale Types.

UNIT-II: **(Periods: 11)**

Goal-Based Frame Work for Software Measurement - Classifying Software Measures, Determining what to measure, Applying Frame Work, Software Measurement Validation

UNIT-III: **(Periods: 12)**

Measuring Internal Product Attributes – Size - Aspects of software size, Length, Reuse, Functionality, Complexity.

Structure - Types of structural measures, Control-flow structure, Modularity and information flow attributes.

UNIT-IV: **(Periods: 11)**

Measuring External Product Attributes: Modeling Software Quality, Measuring Aspects of Quality. Object-Oriented Metrics: Object-Oriented Concepts and Constructs, Design and Complexity metrics, Productivity Metrics, Quality and Quality Management Metrics.

UNIT-V: **(Periods: 11)**

Software Quality Metrics Overview - Product Quality Metrics, In-Process Quality Metrics, Metrics for Software Maintenance, Examples of Metrics Programs,

Collecting Software Engineering Data, Applying the Seven Basic Quality Toolsin Software Development.

TEXT BOOKS:

1) Fenton, Pfleeger, *"Software Metrics,"* 2nd Edition, Thomson, 2005.
2) Stephen H. Kan, *"Metrics and Models in Software Quality Engineering,"* 2nd Edition, Addison Wesley, 2011.

REFERENCE BOOKS:

1) Linda M. Laird and Carol Brennan, "Software Measurement and Estimation - A Practical Approach," IEEE Computer Science Press and Wiley Inter Science, 2006.
2) C Ravindranath Pandian: "Software Metrics: A guide to Planning Analysis and Implementation," Auerbach Publications, 2005.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	-	2	2	-	-	-	-	-	-	-
CO2	2	2	1	2	-	-	-	-	-	-	-	-
CO3	3	2	2	1	2	-	-	1	-	-	-	1
CO4	3	3	1	3	2	2	-	1	-	-	-	1
CO5	2	3	3	3	2	-	-	-	-	-	-	2

CSHT304 (R20): SOFTWARE VERIFICATION AND VALIDATION

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

The student should be able to

- Understand the principles of verification and validation
- Appreciate the different verification and validation techniques
- Understand the various stages of testing
- Appreciate the use of tools for verification and validation
- Appreciate the benefits of using metrics for verification and validation

COURSE OUTCOMES:

At the end of this course, the students should be able to:

- ★ Identify the different techniques for verification and validation
- ★ Use available traceability analysis tools on sample requirements
- ★ Modify existing coverage analysers in terms of functionality or features used
- ★ Design system test cases
- ★ Use test case generators and test management tools

UNIT I INTRODUCTION

Principles of verification and validation – software architecture frameworks – model driven architecture – verification, validation and accreditation.

UNIT II METHODS OF SOFTWARE VERIFICATION

Verification and validation life cycle – traceability analysis – interface analysis – design and code verification – test analysis - Reviews – inspections - walkthroughs – audits – tracing – formal proofs –Model based verification and validation - Program verification techniques – formal methods of software verification – clean room methods.

UNIT III TESTING

Stages of Testing: Test Planning – Test design – Test case definition – Test procedure – Test reporting –Unit testing: white box, black box and performance testing –

System testing: Function, performance, interface, operations, resource, security, portability, reliability, maintainability, safety, regression and stress testing – integration testing – acceptance testing: capability, constraint testing - structured testing – structured integration testing

UNIT IV TOOLS FOR SOFTWARE VERIFICATION

Tools for verification and validation: static analyser – configuration management tools – reverse engineering tools – tracing tools – tools for formal analysis – tools for testing – test case generators –test harnesses – debuggers – coverage analysers – performance analysers – test management tools.

UNIT V ADVANCED APPROACHES

Automatic approach for verification and validation – UML – systems modeling language validating UML behavioral diagrams — metrics for verification and validation.

REFERENCE BOOKS:

1) Avner Engel, Verification, Validation & Testing of Engineered Systems, Wiley series in systems Engineering and Management, 2010.
2) ESA Board for Software Standardisation and Control (BSSC), Guide to software verification and Validation, European Space Agency ESA PSS-05-10 Issue 1 Revision 1, 1995
3) Marcus S. Fisher, Software Verification and Validation: An Engineering and Scientific Approach, Springer, 2007
4) Mourad Debbabi, Hassaine F, Jarrya Y., Soeanu A., Alawneh L., Verification and Validation in Systems Engineering, Springer, 2010

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	2	3	2	-	-	-	-	3	2	-
CO2	3	2	1	2	2	-	-	-	-	3	3	-
CO3	3	1	3	3	2	-	-	-	-	3	-	3
CO4	1	2	3	2	3	-	-	-	-	3	3	2
CO5	3	3	3	2	3	-	-	-	-	-	2	-

HONOURS DEGREE COURSES

DIGITAL IMAGE PROCESSING DOMAIN

B.Tech. COMPUTER SCIENCE & ENGINEERING

HONOURS DEGREE COURSES DIGITAL IMAGE PROCESSING DOMAIN

CSHT401 (R20): DIGITAL IMAGE AND VIDEO PROCESSING

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To study video processing

COURSE OUTCOMES:

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

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.

Image enhancement:

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

Unit – II

Color and multispectral image processing

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

Unit – III

Image compression

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.

Unit IV

Image Segmentation:

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

Fundamentals of Video Coding:

Inter-frame redundancy, motion estimation techniques – full search, fast search strategies, forward and backward motion prediction, frame
classification – I, P and B; Video sequence hierarchy – Group of pictures, frames, slices, macro-blocks and blocks; Elements of a video encoder and decoder; Video coding standards – MPEG and H.26X.

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.

CO-PO/PSO MAPPING MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	3	-	-	3	-	-	3	-	-	-
CO2	-	3	-	3	-	3	3	-	-	-	-	-
CO3	-	-	-	2	2	2	2	-	-	-	-	-
CO4	-	3	3	-	-	-	-	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	-	2	2
AVG_CO	1	2	2	1	1	2	1	1	1	1	1	1

CSEHT402 (R20): SOFT COMPUTING

L-3	T-1	P-0	M-100	C-4

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.

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.

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 – BackpropagationMutilayerPerceptrons – 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.

REFERENCE BOOKS:

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.

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CO1	3	3	-	-	3	-	3	-	-	-	-	-
CO2	3	3	3	-	3	-	3	-	3	-	3	-
CO3	-	3	3	-	3	-	3	-	-	-	-	-
CO4	2	2	-	-	2	-	2	-	-	-	-	-
CO5	3	3	3	-	3	-	3	-	3	-	3	-
AVG_CO	3	3	2	-	3	-	3	-	2	-	2	-

CSEHT403 (R20): COMPUTER VISION

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

- Computer Vision focuses on development of algorithms and techniques to analyze and interpret the visible world around us.
- This requires understanding of the fundamental concepts related to multi-dimensional signal processing, feature extraction, pattern analysis visual geometric modeling, stochastic optimization etc.
- Knowledge of these concepts is necessary in this field, to explore and contribute to research and further developments in the field of computer vision.
- Applications range from Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.

COURSE OUTCOMES:

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

- ★ Implement fundamental image processing techniques required for computer vision.
- ★ Perform shape analysis.
- ★ Implement boundary tracking techniques.
- ★ Apply chain codes and other region descriptors.
- ★ Apply Hough Transform for line, circle, and ellipse detections.
- ★ Apply 3D vision techniques.
- ★ Implement motion related techniques.
- ★ Develop applications using computer vision techniques.

UNIT-I

Digital Image Formation and low-level processing Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

UNIT-II

Depth estimation and Multi-camera views Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration.

UNIT-III

Feature Extraction Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

UNIT-IV

Image Segmentation Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection.

Pattern Analysis Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA; Non-parametric methods.

UNIT-V

Motion Analysis Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.

Shape from XLight at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges.

REFERENCE BOOKS:

1) Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2) Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003
3) Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004
4) Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006
5) R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992
6) K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990

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CO1	3	3	-	-	-	-	-	-	-	-	-	-
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CO4	-	3	3	-	3	-	-	-	-	-	-	-
CO5	-	3	3	-	-	3	-	-	-	-	-	-
AVG_CO	1	3	3	1	1	1	-	-	-	-	-	-

CSEHT404 (R20): NATURAL LANGUAGE PROCESSING

L-3	T-1	P-0	M-100	C-4

COURSE OBJECTIVES:

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics
- To apply the NLP techniques to IR applications

COURSE OUTCOMES:

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

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

UNIT-I

Sound: Biology of Speech Processing; Place and Manner of Articulation; Word Boundary Detection; Argmax based computations; HMM and Speech Recognition.

UNIT-II

Words and Word Forms : Morphology fundamentals; Morphological Diversity of Indian Languages; Morphology Paradigms; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields.

UNIT-III

Structures : Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents; Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Attachment Ambiguity resolution.

UNIT-IV

Meaning : Lexical Knowledge Networks, Wordnet Theory; Indian Language Wordnets and Multilingual Dictionaries; Semantic Roles; Word Sense Disambiguation; WSD and Multilinguality; Metaphors; CoREFERENCE BOOKS.

UNIT-V

Web 2.0 Applications: Sentiment Analysis; Text Entailment; Robust and Scalable Machine Translation; Question Answering in Multilingual Setting; Cross Lingual Information Retrieval (CLIR).

TEXT BOOKS:

1) Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.
2) Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
3) Jurafsky, Dan and Martin, James, Speech and Language Processing, Second Edition, Prentice Hall, 2008.
4) Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.
5) Radford, Andrew et. al., Linguistics, An Introduction, Cambridge University Press, 1999.

REFERENCE BOOKS:

1) Breck Baldwin, Language Processing with Java and Ling Pipe Cookbook, Atlantic Publisher, 2015.
2) Richard M Reese, Natural Language Processing with Java, O_Reilly Media, 2015.
3) Nitin Indurkhya and Fred J. Damerau, Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4) Tanveer Siddiqui, U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press, 2008

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CO4	-	3	3	-	-	3	-	-	-	-	-	-
CO5	-	3	3	-	-	-	-	-	-	-	-	-
AVG_CO	-	3	3	-	-	1	-	-	-	-	-	-

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