Pondicherry University

Curriculum and Syllabus

BACHELOR OF TECHNOLOGY

B.Tech.

Computer Science and Engineering

2023-24

[Affiliated College]

REGULATIONS 2023-24

1. Conditions for Admission:

a) Candidates for admission to the first semester of the 8 semester B.Tech. degree programme should be required to have passed:

The Higher Secondary Examination of the (10+2) curriculum (Academic Stream) prescribed by the different State Boards/ Central Boards or any other examination equivalent there to with minimum of 45% marks (40% marks in case of candidates belonging to reserved category) in aggregate of subjects – Mathematics, Physics and any one of the following optional subjects: Chemistry / Biotechnology/ Computer Science / IT and equivalent/ Electronics/ Biology (Botany & Zoology) or Passed D.Voc Stream in the same or allied sector or an Examination of any University or Authority recognized by the Executive Council of the Pondicherry University as equivalent thereto.

b) Candidates for admission through Lateral entry into second year (third semester)of the 8 semester B.Tech. degree programme should be required to have passed :

Passed Minimum THREE years / TWO years (Lateral Entry) Diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category) in ANY branch of Engineering and Technology.

OR

Passed B.Sc. Degree from a recognized University as defined by UGC, with at least 45% marks (40% marks in case of candidates belonging to reserved category) and passed 10+2 examination with Mathematics as a subject.

OR

Passed D.Voc. Stream in the same or allied sector.

(The Universities/colleges will offer suitable bridge courses such as Mathematics, Physics, Engineering drawing, etc., for the students coming from diverse backgrounds to achieve desired learning outcomes of the programme)

2. AgeLimit:

As per applicable AICTE norms.

3. Duration of Programme:

The Bachelor of Technology degree programme shall extend over a period of 8 semesters spread over 4 academic years – two semesters constituting one academic year. The duration

of each semester shall normally be 15 weeks excluding examinations.

4. Program Structure

The medium of instruction is English.

A student admitted to the B.Tech. programme in a particular branch of engineering will earn the degree in that branch by fulfilling all the requirements prescribed in the regulations during the course of study.

The student is also permitted to opt for earning an **Honors degree in the same discipline of Engineering or a Minor degree** in another discipline of engineering in addition to the degree in his own discipline of engineering. The student will be allowed to exercise this option at the end of first year based on his academic performance in the first year. The students admitted through lateral entry can exercise this option at the end of third semester, based on the GPA scored in the third semester examination.

The student opting for B.Tech. degree with **Honors or B.Tech. degree with Minor** is required to earn additional 20 credits starting from the third semester. The students admitted in the second year through lateral entry and opting for Honors / Minor degree will earn the additional 20 credits starting from the fourth semester.

5. Eligibility for the award of B.Tech. Degree:

No candidate shall be eligible for the award of the degree of Bachelor of Technology, unless he/she has undergone the course for a period of 8 semesters (4 academic years) / 6 semesters (3 academic years for Lateral Entry candidates) in the Faculty of Engineering and has passed the prescribed examinations in all the semesters. Details regarding the possible exit for a B.Tech. Student – in line with one of the goals of the National Education Policy (NEP) 2020 are provided in section 13.

6. Branches of Study:

Branch I - Civil Engineering

Branch II – Mechanical Engineering

Branch III - Electronics & Communication Engineering

BranchIV - ComputerScience&Engineering

Branch V – Electrical & Electronics Engineering

Branch VI – Chemical Engineering

Branch VII - Electronics & Instrumentation Engineering

Branch VIII –Information Technology

Branch IX - Instrumentation & Control Engineering

Branch X– Biomedical Engineering

Branch XI - Robotics and Automation

Branch XII – Food Technology

Branch XIII - CSE (Internet of Things & Cyber security including Block chain Technology)

Branch XIV – Artificial Intelligence and Machine Learning

Branch XV – Artificial Intelligence and Data Science

or any other branch of study as and when offered. The branch allocation shall be ordinarily done at the time of admission of the candidate to the first semester.

7. Course Structure and Subjects of Study:

Definition of Credit:

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
2 Hours Practical (P) per week	1 Credit

Range of Credits: The total credits of all the branches for the four-year B. Tech. degree Programme shall be in the range of160 to 172 (Minor variation is allowed as per AICTE guidelines). ″Minor Degree or Honors will cumulatively require additional 20 credits in the specified area in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline".

The subjects of study shall include theory, practical courses and project work/internships as given in the curriculum and shall be in accordance with the prescribed syllabus.

The curriculum of every programme will have courses that are categorized as follows:

(i) Humanities, Social Sciences and Management Courses (HSM)

(ii) Basic Science Courses (BSC)

(iii) Engineering Science Courses (ESC)

(iv) Professional Core Courses (PCC)

(v) Professional Elective Courses (PEC)

(vi) Open Elective Courses (OEC)

(vii) Professional Activity Courses (PAC)

(viii) Mandatory non-Credit Courses (MCC)

Each course will have either one or more of three components namely Lecture (L), Tutorial (T) and Practice (P). Each course is assigned credits as detailed below:

(i) Theory courses will carry either 3 or 4 credits - 3 credits for courses with 3 lecture periods per week and 4 credits for courses with 3 lecture periods and 1 tutorial period per week.

(ii) All Elective courses including online courses will carry maximum 3 credits. The student can earn the credits towards the Open Elective Courses (OEC) by completing the online courses offered in NPTEL anytime between third and seventh semester on prior approval of the courses by the Academic Courses Committee of the Institute. Credits earned through the NPTEL courses will be confined to 2 or 3 credits and subject to a maximum of 9 credits during the entire programme of study.

(iii) Practical courses will normally carry either 1 or 1.5 credits – 1.5 credits for courses with 3 practice periods per week and 1 credit for courses with 2 practice periods per week.

(iv) Out of total credits required for successful completion of the degree, 14 to 22 credits can be assigned for Project work and/or Internship.

(v) Mandatory non-credit courses carry zero credit.

8. Examinations:

The theory and practical examinations shall comprise continuous internal assessment throughout the semester in all subjects as well as university examinations conducted by Pondicherry University at the end of the semester (November / December or April /May).

8.1. Evaluation Scheme

All Credit courses are evaluated for 100 marks comprising of Internal assessment and end-semester exam.

For Theory Course, the weightage of internal assessment is 40% and end semester examination is 60%

For Practical course, the weightage of internal assessment is 60% and end semester examination is 40%

For Project, the weightage of internal assessment is 60% and end semester examination is 40%

8.2. Internal Assessment (Theory)

Total Internal Assessment mark for a theory course is 40 marks. The breakup is as follows:

Criteria	Maximum Marks
a) Internal Assessment Tests	30
b) Percentage of Attendance	5
c) Assignment(s)	5
Total	**40**

Marks for Attendance are as follows:

Below 75%	0
75% - 80%	1
81% - 85%	2
86% - 90%	3
91% - 95%	4
96% - 100%	5

The Principal of the College/Institute schedules the Internal Assessment tests for all courses. All faculty members are expected to conduct this Internal Assessment tests for 1.30 hours duration and evaluate and required to upload the marks to the Controller of Examinations of University. Colleges are also requested to preserve the answer sheets of Internal Assessment tests until declaration of results by the University.

8.3. Internal Assessment (Practical's)

Faculty in-charge of Lab courses shall evaluate the practical course for 60 marks. The break up is as follows:

Criteria	Maximum Marks
a) Laboratory exercises and Record	30
c) Mid Semester exam (Average of 2 exams)	15
c) Internal Viva voce	5
d) Percentage of Attendance	10
Total	**60**

Marks for Attendance is as follows:

Below 75%	0
75% - 80%	2
81% - 85%	4
86% - 90%	6
91% - 95%	8
96% - 100%	10

8.4. Internal Assessment (Project)

The Project work carried out in the eighth semester shall be assessed as follows:

Criteria	Marks
a) Continuous assessment (Guide)	25
b) Project Evaluation Committee	35
Total	**60**

8.5 Requirement for appearing for University Examination

The Controller of Examinations (COE) of Pondicherry University schedules the End-Semester exams for all theory and practical courses based on the University academic calendar. A detailed Exam Time Table shall be circulated to all Colleges at least 15 days before the start of exams. Question Papers shall be set externally based on BOS approved syllabus.

A candidate shall be permitted to appear for university examinations at the end of any semester only if:

i) He / She secures not less than 75% overall attendance arrived at by taking into account the total number of periods in all subjects put together offered by the institution for the semester under consideration.
(*Candidates who secure overall attendance greater than 60% and less than 75% have to pay a condonation fee as prescribed by University along with a medical certificate obtained from a medical officer not below the rank of Assistant Director*)

ii) He / She earns a progress certificate from the Head of the institution for having satisfactorily completed the course of study in all the subjects pertaining to that semester

iii) His / Her conduct is found to be satisfactory as certified by the Head of the institution.
A candidate who has satisfied the requirement (i) to (iii) shall be deemed to have satisfied the course requirements for the semester.

8.6 End Semester Exam Evaluation Pattern

Course	**Maximum marks**
a) Theory course (Sec A, Sec B and Sec C) Questions from all units of syllabus	60 marks
b) Practical course (Based on Lab exercises/Record/ Practicals /Viva)	40 marks
c) Internship /Project Work (Based on Seminar/Project Work/Project report/Presentation and viva voce)	40 marks

8.7 Consolidation of Marks and PassingMinimum

The Controller of Examinations of the University consolidates the Internal Assessment marks uploaded by the Colleges and marks secured by students in the end-semester examination.

A student shall be declared to have passed the examination in a subject of study only if he/she secures not less than **40% marks individually both in internal assessment and end- semester examination or an aggregate of 40%.**

A candidate who has been declared "Fail" in a particular subject may reappear for that subject during the subsequent semesters and secure pass marks. However, there is a provision for revaluation of failed or passed subjects provided he/she fulfills the following norms for revaluation.

a) Applications for revaluation should be filed within 15 days from the date of declaration of resultsor 7days from the date of receipt of grade sheet whichever is earlier.
b) The candidate should have attended all the internal assessments conducted by the college as well as all the end semester examinations conducted by the University.
c) If a candidate has failed in more than two papers in the end semester examinations, his/her representation for revaluation will not be considered.
d) The request for revaluation must be made in the prescribed format duly recommended by the Head of the Institution along with the revaluation fee prescribed by theUniversity.

A student shall be declared to have passed the examination in a subject of study only **if he/she secures not less than 40% marks in the end-semester examination and secures an overall aggregate of 40%.**

8.8. Arrear Exams

A student who failed to secure 40% marks in aggregate is declared as "Fail" and he is eligible to take up a supplementary examination by registering to the said course in the following semester. All other candidates who failed due to shortage of attendance and those seeking to improve the grade shall repeat the course.

8.9. Letter Grades and Calculation of CGPA

Total Marks Secured by a student in each course shall be converted into a letter grade. The following Table shows the seven letter grades and corresponding meaning and the grade points for the calculation of Cumulative Grade Point Average (CGPA).

Each course(Theory/Practical)is to be assigned 100 marks, irrespective of the number of credits, and the mapping of marks to grades may be done as per the following table:

Range of Marks	Assigned Grade	Grade Points
91-100	A^+	10
81-90	A	9
71-80	B^+	8
61-70	B	7
51-60	C^+	6
46-50	C	5
40-45	D	4
<40	F	0
Not Applicable	F^R (Fail due to shortage of attendance and therefore, to repeat the course)	0

Note: -F- denotes failure in the course; - F^R - denotes absent / detainedas per AICTE norms. After the results are declared, grade sheets will be issued to the students.The grade sheets will contain the following details:

a) The college in which the candidate has studied.
b) The list of courses enrolled during the semester and the grades scored.
c) The Grade Point Average (GPA) for the semester and t he Cumulative Grade Point Average (CGPA)of all enrolled subjects from first semester onwards.
d) GPA is the ratio of sum of the products of the number of credits (C) of courses registered and the corresponding Grades Points (GP) scored in those courses, taken for all the courses and sum of the number of credits of all the courses.

$$\mathbf{GPA} = \sum(\mathbf{C} \times \mathbf{GP}) / \sum \mathbf{C}$$

CGPA will be calculated in a similar manner, considering all the courses enrolled from first semester. F^R grades are to be excluded for calculating GPA and CGPA.

e) The conversion of CGPA into percentage marks is as follows

$$\% \text{ Mark} = (\text{CGPA} - 0.5) \times 10$$

9. Procedure for completing the B.Tech. course:

A candidate can join/rejoin the course of study of any semester only at the time of its normal

commencement and only if he/she has satisfied the course requirements for the previous semester and further has registered for the university examinations of the previous semester in all the subjects as well as all arrear subjects if any.

However, the entire B.Tech. course should be completed within 7 years (14 semesters) and six years (12 semesters) for students admitted under lateral entry.

10. Award of Class and Rank in B.Tech. degree:

i) A candidate who satisfies the course requirements for all semesters and who passes all the examinations prescribed for all the eight semesters (six semesters for lateral entry candidates) within a maximum period of 7 years (6 years for lateral entry candidates) reckoned from the commencement of the first semester to which the candidate was admitted shall be declared to have qualified for the award of B.Tech. degree.

ii) A candidate who qualifies for the award of the B.Tech. degree passing in all subjects pertaining to the semesters 3 to 8 in his/her first appearance within 6 consecutive semesters (3 academic years) and in addition secures a CGPA of 8.50 and above for the semesters 3 to 8 shall be declared to have passed the examination in **FIRST CLASS** with **DISTINCTION**.

iii) A candidate who qualifies for the award of the B.Tech. degree by passing in all subjects relating to semesters 3 to 8 within a maximum period of eight semesters after his/her commencement of study in the third semester and in addition secures CGPA not less than 6.5 shall declared to have passed the examination in **FIRST CLASS**.

iv) All other candidates who qualify for the award of B.Tech. degree shall be declared to have passed the examination in **SECOND CLASS**.

v) For the Award of University ranks and Gold Medal for each branch of study, the CGPA secured from the 1st to 8th semester alone should be considered and it is mandatory that the candidate should have passed all the subjects from the1st to 8th semester in the first attempt. Rank certificates would be issued to the first ten candidates in each branch of study.

11. Provisions for Honors/Minor degree along with B.Tech. degree:

1. <u>B.Tech. with Honors Degree in the same Engineering discipline</u>

a. The student shall be given an option to earn a Honors degree in the same discipline of engineering at the end of first year based on his academic performance in the first year.

b. A student is eligible to exercise this option if he has passed all the subjects offered in

the first year in the first attempt itself and has earned a CGPA of not less than 7.5.

c. Honors degree in a particular discipline of engineering shall be offered for a batch of students if and only if a minimum of 5 eligible students opt for it.

d. The student is required to earn an additional 20 credits (over and above the prescribed maximum credits in the curriculum) starting from the third semester onwards to become eligible for the award of Honors degree. 20 credits shall be earned by the student by completing 5 additional courses of 4 credits each, one in each of the 5 semesters starting from the third to seventh semester. The syllabus of these 5 courses are framed so as to cover advanced topics in that discipline of engineering.

e. The students admitted in the second year through Lateral Entry Scheme will also be given a chance to opt for Honors degree. Eligibility to avail this option is CGPA of 7.5 and above with no arrears in the third Semester. The student will join the existing batch of students in the fourth semester and earn 16 credits by registering the prescribed courses offered up to the seventh semester. The respective BoS will decide on a suitable course in lieu of the course offered in the third semester to facilitate the student to earn the remaining 4 credits.

f. A student is eligible to get the Honors degree only on completing the programme in 'First Class with Distinction' class.

g. A student can exercise the option to withdraw from the Honors degree at any time after entry.

h. Details about the courses completed and credits earned for Honors degree will appear only in the 'Eighth Semester Grade Sheet' and 'Consolidated Grade Sheet'. These details will be listed under the heading 'Credits Earned for Honors degree'. In the case of students who have either withdrawn from Honors degree or become ineligible for Honors degree by not securing 'First Class with Distinction', the credits earned for the courses registered and successfully completed for Honors degree will be listed under the heading 'Additional Credits Earned'.

i. The CGPA will be calculated for all the courses credited by the students inclusive of major and honors courses

j. Nomenclature of Honors Degree is 'B.Tech.(Honors) in XXX ', where XXX is Discipline in which the student has enrolled.

2. <u>B.Tech. with Minor degree in another Engineering discipline</u>

a) The student shall be given an option to earn a minor degree in another discipline of engineering of his choice at the end of first year based on his academic performance in the first year.

b) A student is eligible to exercise this option if he has passed all the subjects offered in the first year in the first attempt itself and has earned a CGPA of not less than 7.5.

c) Minor degree in a particular discipline of engineering shall be offered for a batch of students if and only if a minimum of 5 eligible students opt for it.

d) The student is required to earn an additional 20 credits (over and above the prescribed maximum credits in the curriculum) starting from the third semester onwards to become eligible for the award of minor degree. 20 credits shall be earned by the student by completing 5 additional courses of 4 credits each, one in each of the 5 semesters starting from the third to seventh semester. The curricular content of these 5 courses are framed in such a way that that these courses will essentially cover the core minimum knowledge required to be fulfilled for award of degree in the discipline of engineering in which the student chooses to earn the minor degree.

e) The students admitted in the second year through Lateral Entry Scheme will also be given a chance to opt for Minor degree. Students with a CGPA of 7.5 and with no arrears in the third semester are eligible to avail this option. The student will join the existing batch of students in the fourth semester and earn 16 credits by registering for prescribed courses offered up to seventh semester. The respective BoS will decide on a suitable course in lieu of the course offered in the third semester to facilitate the student to earn the remaining 4 credits.

f) A student can exercise the option to withdraw from the Minor degree at any time after entry.

g) Details about the courses completed and credits earned for Minor degree will appear only in the 'Eighth Semester Grade Sheet' and 'Consolidated Grade Sheet'.These details will be listed under the heading 'Credits Earned for Minor degree'. In the case of students who have withdrawn from Minor degree, the credits earned for the courses registered and successfully completed for Minor degree will be listed under the heading 'Additional Credits Earned'.

h) Nomenclature of Minor Degree is 'B.Tech. in XXX with Minor in YYY', where XXX is Discipline in which the student is enrolled and YYY is Discipline which the student has opted as Minor.

i) The CGPA will be calculated for all the courses credited by the students inclusive of major and minor courses.

12. Provision for withdrawal:

Based on the recommendation of the Head of the Institution, a candidate with valid reasons may be granted permission by the University to withdraw from writing the entire semester examination as one Unit. The withdrawal application shall be valid only if it is made earlier than the commencement of the last theory examination pertaining to that semester. Withdrawal shall be permitted only once during the entire course. A candidate who has withdrawn is also eligible to be awarded DISTINCTION provided he/she satisfies the other necessary conditions. But, they are not eligible to be awarded a rank.

13. Provisions for exit in B.Tech. course:

(For courses where AICTE specifies exit in the model curriculum)

The curriculum and the syllabus for all B.Tech programmes have been planned in compliance with the NEP guidelines proposed by AICTE. Accordingly, students joining B.Tech programmes shall have all benefits NEP offers in terms of exercising exit option during the course of study. Every B.Tech programme governed under this school board shall adopt the NEP guidelines, as and when proposed/amended by AICTE, and the following scheme will be applied for all such B.Tech programmes specified by AICTE.

NEP 2020 suggests that a student can exercise exits at multiple stages of the course of study. As per AICTE norms, a student can have two possible exits before the completion of the Full Engineering degree and may get a UG Diploma /Certificate or B.Sc. degree in the relevant discipline if he/she fulfils the following conditions: (Subject to change as per AICTE guidelines)

1. **UG Diploma/Certificate in the relevant branch of study**

   A student should be able to get a UG Diploma if he/she completes:

   a. 50% of the credits for B.Tech. (80-85 credits)

   b. 50% of the program core courses

   c. Students exiting the program after earning 50% credit requirements will be awarded a UG Diploma provided they secure an additional 6 credits through summer internships/apprenticeship of 2 months duration.

   d. Students admitted through lateral entry cannot exercise the exit option as he will not be able to meet out the 50% Credits for B.Tech. degree.

2 **B.Sc. in the relevant branch of study**

A student should be able to get a B.Sc. degree if he/she completes:

(i) 75% of the credits for B.Tech. (minimum 120 credits) and atleast 3 years in the

program.

(ii) 100% of the core program courses.

(iii) Students exiting the program after earning 75% credit requirements will be awarded a B.Sc. provided they secure an additional 6 credits through 2 summer internships/apprenticeship for 2 months each.

(iv) With B.Sc. degree, the student is eligible for entry into programs which take B.Sc. degree as eligibility criteria.

2.1 Award of Class in B.Sc. degree

A candidate who satisfies the course requirements for all semesters and who passes all the examinations within a maximum period of 6 years (5 years for lateral entry candidates) reckoned from the commencement of the first semester to which the candidate was admitted shall be declared to have qualified for the award of B.Sc. degree in the relevant discipline.

i) A candidate who qualifies for the award of the B.Sc. degree passing in all subjects pertaining to semesters the 3 to 6 in his/her first appearance within 4 consecutive semesters (2 academic years) and in addition secures a CGPA of 8.50 and above for the semesters 3 to 6 shall be declared to have passed the examination in **FIRST CLASS** with **DISTINCTION**.

ii) A candidate who qualifies for the award of the B.Sc. degree by passing in all subjects relating to semesters 3 to 6 within a maximum period of six semesters after his/her commencement of study in the third semester and in addition secures CGPA not less than 6.5 shall declared to have passed the examination in **FIRST CLASS.**

iii) All other candidates who qualify for the award of B.Sc. degree shall be declared to have passed the examination in **SECOND CLASS**.

2. Re-entry to complete the program

A student exiting with B.Sc. should be entitled to re-enrol in the programme of the same Engineering discipline. Only students admitted to the B.Tech. programme and exercised an exit option are eligible for readmission to the B.Tech. programme under the same discipline.It is suggested that all credits will be transferred, if the student enrols back within a limited period (3 years) of exiting. In case a student enrols after that, then the decision on the transfer of credits should be based on the changes in the curriculum the student studied. A candidate after exit may rejoin the course only at the commencement of the semester at which he/she discontinued, provided he/she pays the prescribed fees to the University. The total period of completion of the B.Tech. course reckoned from the commencement of the first semester to

which the candidate was admitted shall not in any case exceed 7 years, including of the period of discontinuance.

3. Completion Possibility in other Institutions

A student can earn B.Sc. in one institution (Engineering) and complete the degree program in another institution (same Engineering discipline only).

(Note: If these exit options are accepted for multipleB.Tech. programs, it is suggested that AICTE actively communicate these to the industry and other bodies, so they recognize these and accept them as bona-fide credentials for the purposes of recruitment and/or eligibility for admission to programs, appearing in competitive examinations, etc.)

14. Revision of Regulations and Curriculum:

The University may from time-to-time revise, amend or change the regulations of curriculum and syllabus as and when found necessary.

GENERAL COURSE STRUCTURE & THEME

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
2 Hours Practical (P) per week	1 Credit

B. Range of Credits: In the light of the fact that a typical Model Four-year Under Graduate degree program in Engineering has about 163 credits, the total number of credits proposed for the four-year B. Tech/B.E. in Computer Science and Engineering (Engineering and Technology) is kept as169.

C. Structure of UG Program in Computer Science and Engineering (CSE): The structure of UG programming Computer Science and Engineering (CSE) shall have essentially the following categories of courses with the breakup of credits as given:

S.No.	Category	Credit Breakup for CSE students
1	Humanities and Social Sciences including Management courses	**13**
2	Basic Science courses	**26**
3	Engineering Science courses including Workshop, Drawing, Basics of Electronics/Electrical/Mechanical/Computer etc.	**24**
4	Professional Core courses	**68**
5	Professional Elective courses relevant to chosen Specialization/ Branch	**12**
6	Open Electives from other Technical and /or Emerging subjects	**9**
7	Project work, Seminar and Internship in Industry or elsewhere	**17**
8	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	(non-credit)
	Total	**169**

D. Course code and Definition:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
C	Credits
CSBS	Basic Science Courses
CSES	Engineering Science Courses
CSHS	Humanities and Social Sciences including Management Courses
CSPC	Professional Core Courses
CSHL	Humanities and Social Sciences Lab Courses
CSBL	Basic Science Lab Courses
CSEL	Engineering Science Lab Courses
CSPL	Professional Core Lab Courses

CSH	Honor Courses
CSM	Minor Courses
CSPE	Professional Elective Courses
CSOE	Open Elective Courses
CSPROJ	Mini Project / Capstone Project/Seminar/Internship
CSMC	Mandatory Courses
CSAU	Audit Courses

- **Course level coding scheme:** Three-digit number(odd numbers are for the odd semester courses and even numbers are for even semester courses) used as suffix with the Course Code for identifying the level of the course. Digit at hundred's place signifies the year in which course is offered. e.g.
  101, 102 … etc. for first year.
  201, 202 …. etc. for second year.
  301, 302 … etc. for third year.
- **Category-wise Courses**

HUMANITIES & SOCIAL SCIENCES COURSES [CSHS]

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	CSHL104	Design Thinking	I	0	0	2	1
2.	CSHS201	English	II	2	0	2	3
3.	CSHS205	Universal Human Values-II	II	2	1	0	3
4.	CSHS305	Principles of Management	III	3	0	0	3
5.	CSHS405	Organizational Behaviour	IV	3	0	0	3
Total Credits							**13**

******

BASIC SCIENCE COURSES [CSBS]

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	CSBS101	Mathematics-I	I	3	1	2	4
2.	CSBS102	Physics	I	3	0	0	3
3.	CSBL101	Physics Lab	I	0	0	4	2
4.	CSBS202	Mathematics-II	II	3	1	0	4
5.	CSBS203	Chemistry	II	3	0	0	3
6.	CSBL201	Chemistry Lab	II	0	0	4	2
7.	CSBS304	Mathematics-III	III	3	0	0	3
8.	CSBS702	Biology	VII	2	1	0	3
Total Credits							**24**

ENGINEERING SCIENCE COURSES [CSES]

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	CSES103	Basic Electronics Engineering	I	3	0	0	3
2.	CSEL102	Basic Electronics Lab	I	0	0	4	2
3.	CSEL103	Engineering Graphics &Design Lab	I	1	0	4	3
4.	CSES204	Programming for Problem Solving	II	3	0	0	3
5.	CSEL202	Programming for Problem Solving Lab	II	0	0	4	2
6.	CSEL203	Workshop Lab	II	1	0	4	3
7.	CSES301	Microprocessor and Microcontroller	III	3	0	0	3
8.	CSES303	Digital Electronics and Systems	III	3	0	0	3
9.	CSEL301	Microprocessor and Microcontroller Lab	III	0	0	4	2
10.	CSEL303	Digital Electronics and Systems Lab	III	0	0	4	2
Total Credits							**26**

PROFESSIONAL CORE COURSES [CSPC]

S.No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	CSPC302	Data Structures and Algorithms	III	3	0	0	3
2.	CSPL302	Data Structures and Algorithms Lab	III	0	0	4	2
3.	CSPL304	IT Workshop (SciLab /MATLAB)	III	1	0	4	3
4.	CSPC401	Discrete Mathematics	IV	3	1	0	4
5.	CSPC402	Computer Organization and Architecture	IV	3	0	0	3
6.	CSPC403	Design and Analysis of Algorithms	IV	3	0	0	3
7.	CSPC404	Advanced Programming in JAVA	IV	3	0	0	3
8.	CSPL401	Computer Organization and Architecture Lab	IV	0	0	4	2
9.	CSPL402	Design and Analysis of Algorithms Lab	IV	0	0	4	2
10.	CSPL403	JAVA Programming Lab	IV	0	0	4	2
11.	CSPC501	Computer Networks	V	3	0	0	3
12.	CSPC502	Database Systems	V	3	0	0	3

13.	CSPC503	Theory of Computation	V	3	1	0	4
14.	CSPC504	Operating Systems	V	3	0	0	3
15.	CSPL501	Computer Networks Lab	V	0	0	4	2
16.	CSPL502	Database Systems Lab	V	0	0	4	2
17.	CSPL503	Operating Systems Lab	V	0	0	4	2
18.	CSPC601	Web Technology	VI	3	0	0	3
19.	CSPC602	Compiler Design	VI	3	0	0	3
20.	CSPC603	Distributed Computing System	VI	3	0	0	3
21.	CSPC604	Artificial Intelligence and Machine Learning	VI	3	1	0	4
22.	CSPL601	Web Technology Lab	VI	0	0	4	2
23.	CSPL602	Complier Design Lab	VI	0	0	4	2
24.	CSPC701	Cyber Security	VII	3	0	0	3
25.	CSPL701	Cyber Security Lab	VII	0	0	4	2
Total Credits							**68**

PROFESSIONAL ELECTIVE COURSES [CSPE]

S.No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	CSPEXXX	Professional Elective–I	V	3	0	0	3
2.	CSPEXXX	Professional Elective-II	VI	3	0	0	3
3.	CSPEXXX	Professional Elective-III	VII	3	0	0	3
4.	CSPEXXX	Professional Elective-IV	VIII	3	0	0	3
Total Credits							**12**

*****

OPEN ELECTIVE COURSES [CSOE]

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	CSOEXXX	Open Elective–I	VII	3	0	0	3
2.	CSOEXXX	Open Elective-II	VIII	3	0	0	3
3.	CSOEXXX	Open Elective-III	VIII	3	0	0	3
Total Credits							**9**

PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSEWHERE

S. No	Course Code	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	CSPROJ603	Mini Project	VI	0	0	6	3
2.	CSPROJ702	Seminar	VII	0	0	2	1
3.	CSPROJ703	Capstone Project -I	VII	0	0	12	6
4.	CSPROJ801	Capstone Project-II	VIII	0	0	12	6
5.	CSPROJ802	Internship	VIII	0	0	0	1
Total Credits							**17**

MANDATORY COURSES [CSMC]

S.No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	-	Induction Program (UHV)	I	3 Weeks			0
2.	CSMC406	Environmental Sciences	IV	3	-	-	0
3.	CSMC505	Constitution of India	V	3	-	-	0
Total Credits							**0**

COMMUNITY ENGAGEMENT/ AUDIT COURSES [CSAU]

S.No.	Course Code	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	CSAU105	IDEA Workshop Lab	I	2	0	4	0
2.	CSAU204	Sports and Yoga	II	2	0	0	0
Total Credits							**0**

S.No	Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1.	Humanities and Social Sciences (HS)	**1**	**6**	**3**	**3**	**-**	**-**	**-**	**-**	**13**
2.	Basic Sciences (BS)	**9**	**9**	**3**	**-**	**-**	**-**	**3**	**-**	**24**
3.	Engineering Sciences (ES)	**8**	**8**	**10**	**-**	**-**	**-**	**-**	**-**	**26**
4.	Professional Core (PC)	**-**	**-**	**8**	**19**	**19**	**17**	**5**	**-**	**68**
5.	Professional Electives (PE)	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**3**	**12**
6.	Open Electives (OE)	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**6**	**09**
7.	Project Work/Seminar/ Internship (PROJ)	**-**	**-**	**-**	**-**	**-**	**3**	**7**	**7**	**17**
8.	Mandatory Courses (MC) /Audit Courses (AU)	**0**	**0**	**-**	**0**	**0**	**-**	**-**	**-**	**0**
		18	**23**	**24**	**22**	**22**	**23**	**21**	**16**	**169**

INDUCTION PROGRAM

The Essence and Details of Induction program can also be understood from the 'Detailed Guide on Student Induction program', as available on AICTE Portal,(Link:https://www.aicteindia.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf).

Induction program(mandatory)	**Three-weekduration**
Induction program for students to be offered right at the start of the first year.	• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./ Branch & Innovations

Mandatory Visits /Workshop / Expert Lectures

a. It is mandatory to arrange one industrial visit every semester for the student of each branch

b. It is mandatory to conduct a One-week workshop during the winter break after fifth semester on Professional/Industry/ Entrepreneurial Orientation.

c. It is mandatory to organize at least one expert lecture per semester for each branch by inviting resource persons from domain specific industry.

CURRICULUM

SEMESTER I						
3 WEEK ORIENTATION PROGRAMME						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
Theory						
1.	CSBS101	Mathematics-I	3	1	0	4
2.	CSBS102	Physics	3	0	0	3
3.	CSES103	Basic Electronics Engineering	3	0	0	3
Practical						
4.	CSBL101	Physics Lab	0	0	4	2
5.	CSEL102	Basic Electronics Lab	0	0	4	2
6.	CSEL103	Engineering Graphics & Design Lab	1	0	4	3
7.	CSHL104	Design Thinking	0	0	2	1
8.	CSAU105	IDEA Lab Workshop	2	0	4	0
Total Credits						**18**

SEMESTER II						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
Theory						
1.	CSHS201	English	2	0	2	3
2.	CSBS202	Mathematics-II	3	1	0	4
3.	CSBS203	Chemistry	3	0	0	3
4.	CSES204	Programming for Problem Solving	3	0	0	3
5.	CSHS205	Universal Human Values-II	2	1	0	3
Practical						
6.	CSBL201	Chemistry Lab	0	0	4	2
7.	CSEL202	Programming for Problem Solving Lab	0	0	4	2
8.	CSEL203	Workshop/Manufacturing Lab	1	0	4	3
9.	CSAU204	Sports and Yoga	2	0	0	0
Total Credits						**23**

SEMESTER III						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
Theory						
1.	CSES301	Microprocessor and Microcontroller	3	0	0	3
2.	CSPC302	Data Structures and Algorithms	3	0	0	3
3.	CSES303	Digital Electronics and Systems	3	0	0	3
4.	CSBS304	Mathematics-III	3	0	0	3
5.	CSHS305	Principles of Management	3	0	0	3
Practical						
6	CSEL301	Microprocessor and Microcontroller Lab	0	0	4	2
7	CSPL302	Data Structure and Algorithms Lab	0	0	4	2
8	CSEL303	Digital Electronics and System Lab	0	0	4	2
9	CSPL304	IT Workshop (SciLab/MATLAB)	1	0	4	3
Total Credits						**24**

SEMESTER IV						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
Theory,						
1.	CSPC401	Discrete Mathematics	3	1	0	4
2.	CSPC402	Computer Organization & Architecture	3	0	0	3
3.	CSPC403	Design & Analysis of Algorithms	3	0	0	3
4.	CSPC404	Advanced Programming in JAVA	3	0	0	3
5.	CSHS405	Organizational Behaviour	3	0	0	3
6.	CSMC406	Environmental Sciences	3	-	-	0
Practical						
7	CSPL401	Computer Organization & Architecture Lab	0	0	4	2
8	CSPL402	Design & Analysis of Algorithms Lab	0	0	4	2
9	CSPL403	JAVA Programming Lab	0	0	4	2
Total Credits						**22**

SEMESTER V						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
Theory						
1.	CSPC501	Computer Networks	3	0	0	3
2.	CSPC502	Database Systems	3	0	0	3
3.	CSPC503	Theory of Computation	3	1	0	4
4	CSPC504	Operating System	3	0	0	3
5	CSPEXXX	Professional Elective-I	3	0	0	3
6	CSMC505	Constitution of India	3	-	-	0
Practical						
7	CSPL501	Computer Networks Lab	0	0	4	2
8	CSPL502	Database Systems Lab	0	0	4	2
9	CSPL503	Operating Systems Lab	0	0	4	2
Total Credits						**22**

SEMESTER VI						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
Theory						
1.	CSPC601	Web Technology	3	0	0	3
2.	CSPC602	Compiler Design	3	0	0	3
3.	CSPC603	Distributed Computing System	3	0	0	3
4.	CSPC604	Artificial Intelligence and Machine Learning	3	1	0	4
5.	CSPEXXX	Professional Elective-II	3	0	0	3
Practical						
6.	CSPL601	Web Technology Lab	0	0	4	2
7.	CSPL602	Compiler Design Lab	0	0	4	2
8	CSPROJ603	Mini Project	0	0	6	3
Total Credits						**23**

SEMESTER VII						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
Theory						
1.	CSPC701	Cyber Security	3	0	0	3
2.	CSBS702	Biology	2	1	0	3
3.	CSPEXXX	Professional Elective-III	3	0	0	3
4.	CSOEXXX	Open Elective-I	3	0	0	3
Practical						
5.	CSPL701	Cyber Security Lab	0	0	4	2
6.	CSPROJ702	Seminar	0	0	2	1
7.	CSPROJ703	Capstone Project-I	0	0	12	6
Total						**21**

SEMESTER VIII						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
Theory						
1.	CSPEXXX	Professional Elective-IV	3	0	0	3
2.	CSOEXXX	Open Elective-II	3	0	0	3
3.	CSOEXXX	Open Elective-III	3	0	0	3
Practical						
4.	CSPROJ801	Capstone Project-II	0	0	12	6
5	CSPROJ802	Internship	0	0	2	1
Total						**16**

HONOR Courses							
S.No	**Semester**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
THEORY							
1.	III	CSH01	Programming with C++	3	1	0	4
2.	IV	CSH02	System Software	3	1	0	4
3.	V	CSH03	Unix and Shell programming	3	1	0	4
4.	VI	CSH04	Computer Graphics	3	1	0	4
5.	VII	CSH05	Digital Image Processing	3	1	0	4
Total Credits							**20**

MINOR Courses							
S.No	**Semester**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
THEORY							
1.	III	CSM01	Data Structures	3	1	0	4
2.	IV	CSM02	Principles of Operating Systems	3	1	0	4
3.	V	CSM03	Principles of Database Systems	3	1	0	4
4.	VI	CSM04	Internet Programming	3	1	0	4
5.	VII	CSM05	Network Technology	3	1	0	4
Total Credits							**20**

LIST OF PROFESSIONAL ELECTIVE COURSES: VERTICALS

S. No	Course Code	Course Title	Periods			Credits
			Lecture	Tutorial	Practical	
1.	CSPE101	Software Engineering	3	0	0	3
2.	CSPE102	Software Project Management	3	0	0	3
3.	CSPE103	Open Source Software	3	0	0	3
4.	CSPE104	Software Testing and Quality Assurance	3	0	0	3
5.	CSPE105	Object Oriented Analysis and Design	3	0	0	3
6.	CSPE201	Human Computer Interaction	3	0	0	3
7.	CSPE202	Multimedia and Animation	3	0	0	3
8.	CSPE203	UI and UX Design	3	0	0	3
9.	CSPE204	Augmented Reality/ Virtual Reality	3	0	0	3
10.	CSPE205	Graphics and Image Processing	3	0	0	3
11.	CSPE301	Cloud Computing	3	0	0	3
12.	CSPE302	Big Data Analytics	3	0	0	3
13.	CSPE303	Building Cloud and Big Data Applications	3	0	0	3
14.	CSPE304	Parallel Computing	3	0	0	3
15.	CSPE305	Open Multi Processing	3	0	0	3
16.	CSPE401	Mobile Computing	3	0	0	3
17.	CSPE402	Mobile Application Development	3	0	0	3
18.	CSPE403	Wireless Sensor Networks	3	0	0	3
19.	CSPE404	Next Generation Networks	3	0	0	3
20.	CSPE405	Internet of Things	3	0	0	3
21.	CSPE501	Optimization Techniques	3	0	0	3
22.	CSPE502	Deep Learning	3	0	0	3
23.	CSPE503	Knowledge Engineering	3	0	0	3
24.	CSPE504	Natural Language Processing	3	0	0	3
25.	CSPE505	Artificial Neural Networks	3	0	0	3
26.	CSPE601	Information Security	3	0	0	3
27.	CSPE602	Modern Cryptography	3	0	0	3
28.	CSPE603	Cryptocurrency and Block chain Technologies	3	0	0	3
29.	CSPE604	Digital and Mobile Forensics	3	0	0	3
30.	CSPE605	Ethical Hacking	3	0	0	3

LIST OF OPEN ELECTIVE COURSES [CSOE]

S.No	Code No.	Course Title	Hours per week			Total Credits
			Lecture	Tutorial	Practical	
1.	CSOE001	Data Structures	3	0	0	3
2.	CSOE002	Fundamentals of Database	3	0	0	3
3.	CSOE003	Essentials of Operating Systems	3	0	0	3
4.	CSOE004	Fundamentals of Cloud Computing	3	0	0	3
5.	CSOE005	Linux Programming	3	0	0	3

CSBS101 MATHEMATICS - I

L	T	P	C
3	1	0	4

Course Objective:

- To comprehend the mathematical concepts of matrices, ordinary differential equations, multivariable calculus and problem-solving.

Course Outcomes:

- To solve practical problems using Matrix algebra.
- To solve various types of ordinary differential equations, including higher-order linear equation.
- To compute partial derivatives, determine total derivatives, Jacobians, employ Taylor series, and find extremes of functions of two variables.
- To demonstrate proficiency in evaluating double integration and triple integration and using them to compute area and volume.
- To apply Green's theorem, Stoke's theorem and Gauss divergence theorem.

UNIT I (12 Hrs)

LINEAR ALGEBRA(MATRICES): Rank of a matrix - Consistency of a system of linear equations - Characteristic equation of a matrix - Eigen values and Eigen vectors - Properties of Eigen values and Eigen vectors - Cayley-Hamilton theorem (excluding proof)- Verification- Application (Finding Inverse and Power of a matrix)- Diagonalization of a matrix by orthogonal and similarity transformation- Quadratic form – Nature of Quadratic Form- Orthogonal reduction of quadratic form to canonical form.

UNIT II (12 Hrs)

ORDINARY DIFFERENTIAL EQUATIONS: Differential Equations of First Order- Exact equations- Leibnitz's linear equations- Bernoulli's equation- Equations solvable for p- Clairaut's equation- Differential equations of Higher order- Linear differential equations of higher order with constant coefficients- Euler's linear equation of higher order with variable coefficients- Method of variation of parameters.

UNIT III (12 Hrs)

MULTIVARIABLE CALCULUS (DIFFERENTIATION): Partial differentiation- Partial derivatives of first order and higher order- Partial differentiation of implicit functions- Euler's theorem on homogeneous functions - Total derivative - Jacobian Properties - Taylor's series for functions of two variables- Maxima and minima of functions of two variables.

UNIT IV (12 Hrs)

MULTIVARIABLE CALCULUS (MULTIPLE INTEGRALS): Double integration (Cartesian form and Polar form)- constant limits- variable limits- over the region R- Change of variables in double integrals (Cartesian to polar)- Application of double integral- Area by double integration- Change of Order of Integration- Triple Integration (Cartesian- Spherical and Cylindrical)- constant limits- variable limits- over the region R- Application of triple integral- Volume by triple integration.

UNIT V (12 Hrs)

MULTIVARIABLE CALCULUS (VECTOR CALCULUS): Vector Differential Operator- Gradient - Properties - Directional derivative - Divergence and Curl Properties and relations- Solenoidal and Irrotational vector fields - Line integral and Surface integrals - Integral Theorems (excluding Proof) - Green's theorem - Stoke's theorem - Gauss divergence theorem.

Text Books:

1. Veerarajan T., "Engineering Mathematics - I & II ", Tata McGraw-Hill, New Delhi, 2014 & 2015.
2. Dr. M.K. Venkataraman, "Engineering Mathematics – Volume I and Volume II", The National Publishing Company, Chennai 2008.

References:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Bali N.P and Manish Goyal., "A Text Book of Engineering Mathematics", Laxmi Publications(P) Ltd, 2011.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 9th Edition, 2011.
4. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.

ONLINE / NPTEL Courses:

1. Differential equations for engineers: https://nptel.ac.in/courses/111106100
2. Calculus of Several Real Variables: https://nptel.ac.in/courses/111104125
3. Engineering Mathematics - I: https://nptel.ac.in/courses/111105121
4. Matrix Analysis with Applications: https://nptel.ac.in/courses/111107112

CSBS102 PHYSICS

L	T	P	C
3	0	0	3

Course Objective:

- To learn the fundamental concepts of oscillations, waves, optics, applications of real life optical systems, communication and other applications.

Course Outcomes:

- To understand physical characteristics of SHM and obtaining solution of the oscillator using differential equations.
- To gain knowledge on transverse and longitudinal waves in one dimension.
- To acquire skills to identify and apply formulas of optics and wave physics.
- To apply principles of interference, diffraction and polarization gain knowledge on interferometers.
- To gain knowledge on lasers to engineering situations.

UNIT I (9 Hrs)

SIMPLE HARMONIC MOTION - DAMPED AND FORCED SIMPLE HARMONIC OSCILLATOR: Mechanical and electrical simple harmonic oscillators - complex number notation and phasor representation of simple harmonic motion - damped harmonic oscillator – heavy - critical and light damping - energy decay in a damped harmonic oscillator - quality factor - forced mechanical and electrical oscillators - electrical and mechanical impedance - steady state motion of forced damped harmonic oscillator - power absorbed by oscillator.

UNIT II (9 Hrs)

NON-DISPERSIVE TRANSVERSE AND LONGITUDINAL WAVES IN ONE DIMENSION AND INTRODUCTION TO DISPERSION: Transverse wave on a string - the wave equation on a string - Harmonic waves - reflection and transmission of waves at a boundary - impedance matching - standing waves and their Eigen frequencies - longitudinal waves and the wave equation for them - acoustics waves and speed of sound - standing sound waves. Waves with dispersion - water waves - superposition of waves and Fourier method - wave groups and group velocity.

UNIT III (9 Hrs)

THE PROPAGATION OF LIGHT AND GEOMETRIC OPTICS: Fermat's principle of stationary time and its applications e.g. in explaining mirage effect -laws of reflection and refraction - Light as an electromagnetic wave and Fresnel equations - reflectance and transmittance - Brewster's angle - total internal reflection - evanescent wave. Mirrors and lenses and optical instruments based on them - transfer formula and the matrix method.

UNIT IV (9 Hrs)

WAVE OPTICS: Huygens' principle - superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment - Newton's rings - Michelson interferometer - Mach- Zehnder interferometer, Farunhofer diffraction from a single slit and a circular aperture - the Rayleigh criterion for limit of resolution and its application to vision, Diffraction gratings and their resolving power.

UNIT V (9 Hrs)

LASERS: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion - different types of lasers, gas lasers (He-Ne - CO_2) - solid-state lasers (ruby - Neodymium) - dye lasers,Properties of laser beams, mono-chromaticity - coherence - directionality and brightness - laser speckles - applications of lasers in science - engineering and medicine.

Text Books:

1. David Halliday, Robert Resnick, Jearl Walker, "Fundamentals of Physics", John Wiley & Sons Inc.USA 11th Edition, 2018.
2. Arthur Beiser, "Concepts of Modern Physics", Mc-Graw Hill Publications Private Limited, 7th Edition, 2017.
3. N.Subramanyam, "Waves and oscillations", Vikas Publishing house,2nd Edition, 2009.

References:

1. Renk, Karl.F, "Basics of laser physics", Springer international publishing, 2nd Edition, 2017.
2. H. J. Pain, Patricia Rankin, "Introduction to vibration and waves", Wiley, 1st Edition, 2015.
3. David Halliday, Robert Resnick and Jearl Walker, "Fundamentals of Physics", Wiley publications, 2013.

ONLINE/NPTEL Courses:

1. Engineering Physics I (Theory): https://nptel.ac.in/courses/122103011
2. Waves and Oscillations: https://nptel.ac.in/courses/115106119
3. Modern Optics: https://nptel.ac.in/courses/115105104

CSES103 BASIC ELECTRONICS ENGINEERING

L	T	P	C
3	0	0	3

Course Objective:

- To learn the fundamental skills in construction of electronics circuit design and develop various electronic systems.

Course Outcomes:

- To understand the semiconductor physics of the intrinsic, p and n materials.
- To understand the function and operation of diodes, transistors and amplifiers.
- To analyze the performances of BJT & FETs and its uses in amplifiers and oscillators.
- To analyze and design the operational amplifiers circuits.
- To understand the architecture, functions & their applications of IC 741 OP-Amp.

UNIT I (9 Hrs)

SEMI CONDUCTORS AND DIODES: Conductors - Semiconductors - Intrinsic Semiconductors - Extrinsic Semi Conductors. Diode Theory, Basic Ideas - ideal Diode - Forward and Reverse Bias - Diode Equation - Volt-Ampere Characteristic- Special diodes, symbol of zener diode - operation - V-I characteristics - symbol of photo diode - working principle - LED symbol and principle.

UNIT II (9 Hrs)

RECTIFIERS: Half-wave Rectifier - Full-wave and Bridge Rectifier - derivation of Ripple factor - efficiency of Half-wave -Full-wave and Bridge rectifiers, Merits and demerits of Half-wave - Full-wave and Bridge rectifiers - Comparisons of rectifiers.

UNIT III (9 Hrs)

BIPOLAR JUNCTION &, FIELD-EFFECT TRANSISTORS: Symbols of PNP and NPN transistors and their working principles -Transistor - Construction & working - Input and output characteristics of CB and CE configuration - Transistor as an Amplifier -Principle and working of Hartley oscillator and RC phase shift oscillator - Construction and working of JFET & MOSFET.

UNIT IV (9 Hrs)

DIGITAL CIRCUITS: Boolean algebra – Reduction of Boolean expressions - De-Morgan's theorem – Logic gates -Implementation of Boolean expressions - Flip flops - RS - JK - T and D Combinational logic - Half adder - Full adder and Subtractors, Sequential logic - Ripple counters and shift registers.

UNIT V (9 Hrs)

OPERATIONAL AMPLIFIERS: Characteristics of Op-Amps, Introduction to Op-amp - Op-amp Block Diagram - ideal and practical Op-Amps specifications - 741 Op-Amps & its features - Op-amp parameters & Measurement - Applications of Op-Amps: Inverting and Non-inverting amplifier - Integrator and differentiator - Comparators.

Text Books:

1. Albert Malvino and David J Bates, "Electronic Principles", Tata McGraw–Hill, 9th Edition, 2021. (Unit 1 & 2)
2. Boyelstad, "Electronic Devices and Circuits Theory", Pearson Education, 11th Edition, 2013.(Unit 1, 2 & 3)
3. Morris Mano, "Digital design", PHI Learning, 4thEdition, 2016. (Unit 4)
4. Ramakanth A. Gayakwad, "Op-Amps and Linear Integrated Circuits", PHI, 4th Edition, 2015. (Unit 5)
5. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International Pvt.Ltd., 5th Edition, 2018.(Unit 5)

References:

1. Robert L.Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson/PHI, 10th Edition, 2010.
2. David A.Bell, "Electronic Devices and Circuits", Oxford, 5th Edition, 2009.
3. S.Salivahanan, Kumar, Vallavaraj, "Electronic Devices and Circuits", TATA McGraw Hill, 2nd Edition, 2003.
4. David A, "Operational Amplifiers & Linear ICs", Oxford Uni. Press, 3rd Edition, 2005. (Unit 5)

ONLINE / NPTEL Courses:

1. Introduction to Basic Electronics: https://archive.nptel.ac.in/courses/122/106/122106025/
2. Basic Electronics: https://archive.nptel.ac.in/courses/108/101/108101091/

CSBL101 PHYSICS LAB

L	T	P	C
0	0	4	2

Course Objective:

- To understand the working principles of spectrometer, polarimeter, curvature of lens and determination of optical absorption.

Course Outcomes:

- To understand and experiment Newtons rings.
- To understand the principles, concepts abd comparison of results with theoretical calculations.
- To understand measurement technology, usage of new instruments and real time applications in engineering studies.
- To state various laws which they have studied through experiments.
- To describe principles of optical fibre communication.

LIST OF EXPERIMENTS

1. Radius of curvature of a Lens - Newton's rings.
2. Thickness of a thin object by air – wedge.
3. Spectrometer – resolving power of a prism.
4. Spectrometer - determination of wavelength using grating.
5. Spectrometer - ordinary and extraordinary rays by calcite prism.
6. Laurant's Half shade polarimeter – determination of specific rotatory power.
7. Determination of wavelength of a laser source using transmission grating, reflection grating vernier calipers and particle size determination.
8. Determination of numerical aperture and acceptance angle of an optical fiber.
9. Determination of optical absorption coefficient of materials using laser.
10. Compact disc - determination of width of the groove using laser.

(Total Periods:45)

CSEL102 BASIC ELECTRONICS LAB

L	T	P	C
0	0	4	2

Course Objective:

- To design and analyze electronic circuits such as diodes, rectifiers, Zener diode, BJT, FET. To verify the basic logic operations and simple arithmetic circuits using logic gates.

Course Outcomes:

- To understand the characteristics of basic electronic devices.
- To apply problem-solving skills, recognize and utilize the characteristics of diodes, rectifiers & transistors.
- To construct the adder, subtractor, multiplier circuits to verify their functionalities.
- To interpret the Op-Amp based inverting and non-inverting amplifier circuit.
- To integrate diverse applications of Op-Amp in differentiator, integrator, adder & subtractor circuits.

LIST OF EXPERIMENTS

1. Measurement of different signal parameters using oscilloscope.
2. V-I characteristics of ordinary p-n junction diode.
3. Full wave rectifier, with and without filter.
4. Zener diode as a voltage regulator.
5. Input and output characteristics of BJT.
6. Input and output characteristics of FET.
7. Realization of basic gates using Universal logic gates.
8. Construction of simple Decoder & Multiplexer circuits using logic gates.
9. Construction of simple arithmetic circuits-Adder, Subtractor.
10. Op-Amp based inverting and non-inverting amplifier.
11. Op-Amp based differentiator and integrator.
12. Op-Amp based adder and subtractor.

(Total Periods:45)

CSEL103 ENGINEERING GRAPHICS AND DESIGN LAB

L	T	P	C
1	0	4	3

Course Objective:

- To provide the basic knowledge about Engineering Drawing and learn the concepts of projections, technical drawing, dimensioning and specifications.

Course Outcomes:

- To understand the visual aspects of Engineering Design.
- To understand Engineering Graphics Standards.
- To illustrate Solid Modelling.
- To understand Computer-Aided geometric design
- To understand creation of design working drawings.
- To understand Engineering Communication inspect.

UNIT I

INTRODUCTION: Introduction, Conics and Special Curves.

UNIT II

PROJECTIONS: Projection of points, lines and planes.

UNIT III

SOLIDS: Projection of solids, section of solids, surface development in Engineering Design and Graphics Lab.

UNIT IV

ISOMETRIC: Isometric and Orthographic projections.

UNIT V

AUTOCAD: Introduction to computer aided drafting, hardware, overview of application software – 2D drafting commands (Auto CAD) for simple shapes – Dimensioning.

Text Books:

1. Bhatt N.D., Panchal V.M. and Ingle P.R., "Engineering Drawing", Charotar Publishing House, 2014.
2. Lakhwinder Pal Singh and Harwinder Singh, "Engineering Drawing Principles and Applications", Cambridge University Press Education, 2021.
3. Agrawal B. and Agrawal C. M., "Engineering Graphics", TMH Publication, 2012.
4. K. Venugopal, "Engineering Drawing and Graphics + Auto CAD", New Age International Publication Ltd., 4^{th} Edition, 2004.

References:

1. Narayana, K.L. and P Kannaiah, “Engineering Drawing”, Scitech Publishers, 2008.
2. CAD Software Theory and User Manuals.

(Total Periods:45)

CSHL104 DESIGN THINKING

L	T	P	C
0	0	2	1

Course Objective:

- To understand the new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing innovative products.

Course Outcomes:

- To compare and classify the various learning styles and memory techniques and apply them in their engineering education.
- To analyze emotional experience and inspect emotional expressions to better understand users while designing innovative products.
- To develop new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing innovative products.
- To explore real-time innovative engineering product designs and choose appropriate frameworks, strategies,techniques during prototype development.
- To perceive individual differences, its impact on everyday decisions and create a better customer experience.

UNIT I (9 Hrs)

AN INSIGHT TO LEARNING: Understanding the Learning Process - Kolb's Learning Styles - Assessing and Interpreting - Remembering Memory:Understanding the Memory process, Problems in retention - Memory enhancement techniques - Emotions - Experience and Expression - Understanding Emotions - Experience and Expression -Assessing Empathy, Application with Peers.

UNIT II (9 Hrs)

BASICS OF DESIGN THINKING: Definition of Design Thinking - Need for Design Thinking - Objective of Design Thinking - Concepts and Brainstorming - Stages of Design Thinking Process (explain with examples) – Empathize - Define - Ideate - Prototype - Test. Being Ingenious and Fixing Problem - Understanding Creative thinking process - Understanding Problem Solving - Testing Creative Problem Solving.

UNIT III (9 Hrs)

PROCESS OF PRODUCT DESIGN: Process of Engineering Product Design - Design Thinking Approach - Stages of Product Design - Examples of best product designs and functions - Assignment – Engineering Product - Design Prototyping and Testing- Rapid Prototype Development process - Testing - Sample Example, Test Group Marketing.

UNIT IV (9 Hrs)

CELEBRATING THE DIFFERENCE: Understanding Individual differences and Uniqueness - Group Discus- sion and Activities to encourage the understanding - acceptance and appreciation of Individual differences. Design Thinking and Customer Centricity - Practical Examples of Customer Challenges - Use of Design Thinking to Enhance Customer Experience - Parameters of Product experience - Alignment of Customer Expectations with Product Design.

UNIT V (9 Hrs)

FEEDBACK, RE-DESIGN AND RE-CREATE: Feedback loop - Focus on User Experience - Address ergonomic challenges - user focused design - rapid prototyping and testing - final product - final Presentation - Solving Practical Engineering Problem through Innovative Product Design and Creative Solution.

Text Books:

1. Burgelman, Christensen, and Wheelwright, "Strategic Management of Technology and Innovation", 5th Edition, McGraw Hill Publications, 2017.
2. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons, 2013.

References:

1. E Balaguruswamy, "Developing Thinking Skills (The way to Success)", Khanna Book Publishing Company, 2022.
2. Hasso Plattner, Christoph Meinel and Larry Leifer , "Design Thinking: Understand –Improve– Apply", Springer, 2011.
3. Jeanne Liedtka, Andrew King and Kevin Bennett, "Book - Solving Problems with Design Thinking - Ten Stories of What Works", Columbia Business School Publishing, 2013.

(Total Periods:45)

CSAU105 IDEA WORKSHOP LAB

L	T	P	C
2	0	4	0

Course Objective:

- To learn skill tools and inventory associated with the IDEA Lab. To build useful standalone system/ project with Mechanical and Electronic fabrication process.

Course Outcomes:

- To understand the working of tools and inventory associated with the IDEA lab
- To understand the working of mechanical and electronic fabrication processes and designing the standalone project and report preparation.

UNIT I

DESIGNING AND INTRODUCTION TO HAND AND POWER TOOLS: Electronic component familiarization, Electronic system design flow.Schematic design and PCB layout and Gerber creation using Eagle CAD. Documentation: Doxygen, Google Docs, Overleaf. Version control tools - GIT and GitHub. Basic 2D and 3D designing using CAD tools: FreeCAD, Sketchup, Prusa Slicer, FlatCAM, Inkspace, OpenBSP and VeriCUT. Introduction to basic hand tools: Tape measure, combination square, Vernier caliper, hammers, fasteners, wrenches, pliers, saws, tube cutter, chisels, vice and clamps, tapping and threading. Adhesives Introduction to Power tools: Power saws, band saw, jigsaw, angle grinder, belt sander, bench grinder, rotary tools. Various types of drill bits.

UNIT II

CIRCUIT PROTOTYPING AND MECHANICAL CUTTING AND JOINING PROCESS: Familiarization and use of basic measurement instruments - DSO including various triggering modes, DSO probes, DMM, LCR bridge, Signal and function generator. Logic analyzer and MSO. Bench power supply (with 4-wire output) Circuit prototyping - breadboard, Zero PCB, Manhattan' style, custom PCB. Single, double and multilayer PCBs. Single and double-sided PCB prototype fabrication in the lab. Soldering using soldering iron/station. Soldering using a temperature controlled reflow oven. Automated circuit assembly and soldering using pick and place machines. Mechanical cutting processes - 3-axis CNC routing, basic turning, milling, drilling and grinding operations, Laser cutting, Laser engraving etc. Basic welding and brazing and other joining techniques for assembly. Concept of Lab aboard a Box.

UNIT III

ELECTRONIC CIRCUIT BUILDING AND 3D PRINTING: Electronic circuit building blocks including common sensors. Arduino and Raspberry Pi programming and use. Digital Input and output. Measuring time and events. PWM. Serial communication. Analog input. Interrupts programming. Power Supply design (Linear and Switching types), Wireless power supply, USB PD, Solar panels, Battery types and charging. 3D printing and prototyping technology –3D printing using FDM, SLS and SLA. Basics of 3D scanning, point cloud data generation for reverse engineering. Prototyping using subtractive cutting processes. 2D and 3D Structures for prototype building using Laser cutter and CNC routers. Basics of IPR and patents; Accessing and utilizing patent information in IDEA Lab.

UNIT IV

Discussion and implementation of a mini project.

UNIT V

Documentation of the mini project (Report and video).

Laboratory Activities:

List of Lab activities and experiments

1. Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
2. Machining of 3D geometry on soft material such as soft wood or modelling wax.
3. 3D scanning of computer mouse geometry surface. 3D printing of scanned geometry using FDM or SLA printer.
4. 2D profile cutting of press fit box/casing in acrylic (3 or 6 mm thickness)/cardboard, MDF (2 mm) board using laser cutter and engraver.
5. 2D profile cutting on plywood /MDF (6-12 mm) for press fit designs.
6. Familiarity and use of welding equipment.
7. Familiarity and use of normal and wood lathe.
8. Embedded programming using Arduino and/or Raspberry Pi.
9. Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.

Text Books:

1. Chris Hackett, Weldon Owen, "The Big Book of Maker Skills: Tools and Techniques for Building Great Tech Projects", 2018.
2. Sean Michael Ragan, Weldon Owen "The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product", 2017.
3. Paul Horowitz and Winfield Hill, "The Art of Electronics", Cambridge University Press, 3rd Edition.

References:

1. Paul Sherz and Simon Monk. "Practical Electronics for Inventors" McGraw Hill, 4th Edition, 2016.
2. Charles Platt, "Encyclopedia of Electronic Components (Volume 1,2 and 3)", Shroff Publishers, 2012.
3. John H. Moore, Christopher C. Davis, Michael A. Coplan and Sandra C. Greer, "Building Scientific Apparatus",Cambridge University Press, 4th Edition, 2009.
4. Simon Monk "Programming Arduino: Getting Started with Sketches", McGraw Hill, 2nd Edition, 2016.
5. Simon Monk and Duncan Amos, "Make Your Own PCBs with EAGLE: From Schematic Designs to Finished-Boards", McGraw Hill Education, 2017.

CSHS201 ENGLISH

L	T	P	C
2	0	2	3

Course Objective:

- Build the competence in English grammar and vocabulary for effective communication by developing Reading, Writing, Listening and Speaking skills of students.

Course Outcomes:

- To enhance communication skills through formal and informal mode.
- To apply the technical writing and communication skills in their academic and professional life.
- To gain self-confidence with improved command over English.
- To understand the technical aspects of communication for better performance in extra curricular activities, recruitment process and prospective jobs.
- To develop and deliver professional presentations.

UNIT I (9 Hrs)

FUNDAMENTALS OF COMMUNICATION SKILLS: Importance of communication through English - Process of communication and factors that influence speaking - Importance of audience and purpose - Principles of communication - comparing general communication and business communication - Professional communication - barriers to communication - strategies to overcome communication barriers - formal and informal communication.

UNIT II (9 Hrs)

WRITING SKILLS: Basics of Grammar - Placing of Subject and Verb - Sentence Structures - Use of Phrases and Clauses in sentences - Importance of proper punctuation - Creating coherence - Techniques for writing precisely - Parts of Speech - Uses of Tenses - Active and Passive - Modes of Writing.

UNIT III (9 Hrs)

VOCABULARY BUILDING AND WRITING: The Concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance with prefixes and suffixes - Synonyms & Antonyms -Words often confused - One-word substitutes - Idioms and Phrasal Verbs - Abbreviations of Scientific and Technical Words.

UNIT IV (9 Hrs)

SPEAKING SKILLS: Introduction to Phonetic Sounds & Articulation - Word Accent - Rhythm and Intonation - Interpersonal Communication - Oral Presentation - Body Language and Voice Modulation (Para linguistics and Non-Verbal) - Negotiation and Persuasion - Group Discussion - Interview Techniques (Telephonic and Video Conferencing).

UNIT V (9 Hrs)

TECHNICAL WRITING: Job Application - CV Writing - Business Letters - Memos - Minutes - Notices - Report Writing Structures - E-mail Etiquette - Blog Writing.

Text Books:

1. Ludlow R. and Panton F., "The Essence of Effective Communication", Prentice Hall, 2020.
2. Kul Bhushan Kumar & R. S. Salaria, "Effective Communication Skills", Khanna Publishing House, 2018.
3. Dr. Bikram K. Das et al., "An Introduction to Profession English and Soft Skills", Cambridge University Press, 2009.

References:

1. Michael Mccarthy and Felicity O Dell, "English Vocabulary in Use", McCarthy M, Cambridge University Press, 3rd Edition, 2017.
2. Raman M. Sharma S, "Technical Communication: Principles and Practice", Raman, Oxford University Press, 2nd Edition, 2012.

ONLINE/ NPTEL Courses:

1. English Language and Literature: https://nptel.ac.in/courses/109103020
2. Business English Communication: https://nptel.ac.in/courses/109106129
3. Technical English: https://nptel.ac.in/courses/109106066

CSBS202 MATHEMATICS-II

L	T	P	C
3	1	0	4

Course Objective:

- To formulate and solve partial differential equations, Laplace, Fourier transforms within the Engineering domain.

Course Outcomes:

- To formulate and solve various types of partial differential equations.
- To understand the Laplace transform and its properties.
- To apply Laplace transforms to solve ordinary differential equations with constant coefficients and simultaneous ordinary differential equations.
- To understand and apply Fourier transform techniques, including Fourier integral theorem, properties of Fourier transforms, convolution, and Parseval's identity.
- To apply Fourier series and harmonic analysis, enabling them to analyze and synthesize periodic signals and functions in various engineering and mathematical applications.

UNIT I (12 Hrs)

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equations, Solutions of standard types of first order partial differential equations, Lagrange s linear equation, Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II (12 Hrs)

LAPLACE TRANSFORM: Existence conditions, Transforms of elementary functions , Properties, Transform of unit step function and unit impulse function , Transforms of derivatives and integrals , Transforms of Periodic Functions ,Initial and final value theorems.

UNIT III (12 Hrs)

INVERSE LAPLACE TRANSFORM: Inverse Laplace Transforms Properties, Convolution theorem, Application - Solution of ordinary differential equations with constant coefficients - Solution of simultaneous ordinary differential equations.

UNIT IV (12 Hrs)

FOURIER TRANSFORM: Fourier Integral theorem (statement only) , Fourier transform and its inverse, Properties: Fourier sine and cosine transforms, Properties, Convolution and Parseval's identity.

UNIT V (12 Hrs)

FOURIER SERIES: Dirichlet s conditions , Expansion of periodic functions into Fourier series- Change of interval, Half-range Fourier series, Root mean square value - Parseval's theorem on Fourier coefficients, Harmonic analysis.

Text Books:

1. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2015.
2. Veerarajan T, "Transforms and Partial Differential Equations", Tata McGraw-Hill, New Delhi, 2012.

References:

1. Bali N.P and Manish Goyal., "A Text Book of Engineering Mathematics", Laxmi Publications(P) Ltd, 2011.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 9th Edition, 2011.
3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.

ONLINE / NPTEL Courses:

1. Laplace Transform: https://nptel.ac.in/courses/111106139
2. Partial Differential Equations: https://nptel.ac.in/courses/111101153
3. Advanced Engineering Mathematics: https://nptel.ac.in/courses/111107119

CSBS203 CHEMISTRY

L	T	P	C
3	0	0	3

Course Objective:

- To understand the concepts of atomic structures, spectroscopic techniques, chemical equilibrium, periodic properties and stereo chemistry.

Course Outcomes:

- To analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- To rationalise bulk properties and processes using thermodynamic considerations.
- To distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- To rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- To understand the major chemical reactions those are used in the synthesis of molecules.

UNIT I (9 Hrs)

ATOMIC AND MOLECULAR STRUCTURE: Schrodinger equation - Particle in a box solutions and their applications for conjugated molecules and nano particles - Forms of the hydrogen atom wave functions and the plots to explore their spatial variations - Molecular orbitals of diatomic molecules and plots of the multicentre orbitals - Pi-molecular orbitals of butadiene and aromaticity - Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties - Band structure and role of doping of solids.

UNIT II (9 Hrs)

SPECTROSCOPIC TECHNIQUES AND APPLICATIONS: Principles of spectroscopy and selection rules - Electronic spectroscopy of Fluorescence and its applications in medicine - Applications of Vibrational and rotational spectroscopy of diatomic molecules - Nuclear magnetic resonance imaging and surface characterization techniques.

UNIT III (9 Hrs)

USE OF FREE ENERGY IN CHEMICAL EQUILIBRIUM: Thermodynamic functions-energy, entropy and free energy- Applications of Cell potentials - Nernst equation, acid-base, oxidation-reduction and solubility equilibrium - Use of free energy considerations in metallurgy through Ellingham diagrams. Inter molecular forces and poten- tial energy: surfaces- Ionic, dipolar and Van Der Waals interactions - Equations on state of real gases and critical phenomena.

UNIT IV (9 Hrs)

PERIODIC PROPERTIES: Effective nuclear charge - variations of s, p, d and f orbital and energies of atoms in the periodic table, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability and molecular geometries.

UNIT V (9 Hrs)

STEREO CHEMISTRY: Representations of 3 dimensional structures - structural isomers and stereoisomers, symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis- Organic reactions and synthesis of a drug molecule: Introduction to reactions involving substitution, addition, elimination, oxidation and reduction - Synthesis of a commonly used drug molecule.

Text Books:

1. Manisha Agrawal, "Chemistry-I", Khanna Book Publishing Co., 1st Edition, 2021.
2. P.W.Atkins, Julio de Paula and James Keeler, "Physical Chemistry", Oxford University, 11th Edition, 2018.
3. B. H. Mahan, "University chemistry", Pearson Education, 4th Edition, 2013.
4. C.N.Banwell, "Fundamentals of Molecular Spectroscopy", 3rd Edition, 2008.

References:

1. K.P.C. Volhardt and N. E. Schore, "Organic Chemistry: Structure and Function", 5th Edition, 2022.

ONLINE/ NPTEL Courses:

1. Spectroscopic Techniques for Pharmaceutical and Biopharmaceutical Industries: https://nptel.ac.in/courses/104102113
2. Engineering Chemistry I: https://archive.nptel.ac.in/courses/122/106/122106028
3. Quantum Chemistry of Atoms and Molecules: https://nptel.ac.in/courses/104101124

CSES204 PROGRAMMING FOR PROBLEM SOLVING

L	T	P	C
3	0	0	3

Course Objective:

- To acquire the knowledge of programming in Python. To learn the concepts, principles, functions and develop an application.

Course Outcomes:

- To understand the basic concepts and working principles of Python Programming.
- To develop algorithmic solutions to simple computational problems.
- To understand the structure of solving problems using programming.
- To explore the concepts of compound data using Python lists, tuples, dictionaries.
- To explore the various multimedia features using python.

UNIT I (9 Hrs)

INTRODUCTION: History - Features - Working with Python - Installing Python - basic syntax - Data types - variables - Manipulating Numbers - Text Manipulations - Python Build in Functions.

UNIT II (9 Hrs)

COMPONENTS OF PYTHON PROGRAMMING: Python objects and other languages - operator Basics - Numbers - String - List - Tuples - Dictionaries - Files - Object Storage - Type Conversion - Type Comparison - Statements - Assignments - Control Statements.

UNIT III (9 Hrs)

FUNCTIONS AND MODULES: Functions Definition and Execution - Arguments - Return Values - Advanced Function Calling - Modules - Importing modules - Packages - Creating a module.

UNIT IV (9 Hrs)

OBJECT ORIENTED AND EXCEPTION HANDLING: Classes and Objects - creating a class - class methods - class inheritance. Exceptions Handling-Build in Exceptions- Files, File operations, reading a file content, writing a file, change position, controlling file I/O, Manipulating file paths.

UNIT V (9 Hrs)

APPLICATIONS: Working with PDF and Word Documents - Working with CSV Files and JSON Data - Sending Email and Text Messages - Manipulating Images - Using Python for Multimedia.

Text Books:

1. Allen B.Downey, "Think Python: How to Think Like a Computer Scientist", Shroff O Reilly Publishers, 2nd Edition, 2016.
2. Guido Van Rossum and Fred L. Drake Jr, "An Introduction to Python", Network Theory Ltd., 2011.
3. Martin C.Brown, "The Complete reference - Python", Tata McGraw Hill Indian Edition, 2010.

References:

1. Eric Matthes, "A Hands-On, Project-Based Introduction To Programming", 2nd Edition, 2019.
2. Budd T A, "Exploring Python", Tata McGraw Hill Education, 2011.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.

ONLINE/ NPTEL Courses:

1. Programming, Data Structures and Algorithms using Python: https://nptel.ac.in/courses/106106145
2. The Joy of Computing using Python: https://nptel.ac.in/courses/106106182
3. Python for Data Science: https://nptel.ac.in/courses/106106212

CSHS205 UNIVERSAL HUMAN VALUES II

L	T	P	C
2	1	0	3

Course Objective:

- To highlight the plausible implications of such a holistic understanding in terms of ethical human conduct, trustful, mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Outcomes:

- To have a holistic vision of life.
- To enhance a socially responsible behavior.
- To understand the responsibility of an environmental work.
- To understand the Competence and Capabilities for Maintaining Health and Hygiene.
- To appreciate the aspiration for excellence (merit) and gratitude for all.

UNIT I (9 Hrs)

INTRODUCTION TO VALUE EDUCATION: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity the Basic Human Aspirations, Happiness and Prosperity Current Scenario, Method to Fulfil the Basic Human Aspirations.

UNIT II (9 Hrs)

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

UNIT III (9 Hrs)

HARMONY IN THE FAMILY AND SOCIETY: Harmony in the Family, the Basic Unit of Human Interaction, Trust, Foundational Value in Relationship, Respect, Right Evaluation, Other Feelings, Justice in Human to Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

UNIT IV (9 Hrs)

HARMONY IN THE NATURE/EXISTENCE: Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence. Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion.

UNIT V (9 Hrs)

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

Text Books:

1. Premvir Kapoor, "Professional Ethics and Human Values", Khanna Book Publishing Company, New Delhi, 2022.
2. R R Gaur,R Asthana, G P Bagaria, "The Textbook - A Foundation Course in Human Values and Professional Ethics", Excel Books, New Delhi, 2nd Revised Edition, 2019.
3. RR Gaur, R Asthana, G P Bagaria, "The Teacher's Manual- Teachers Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, 2019.

References:

1. Annie Leonard, "The Story of Stuff", 2011.
2. A.N. Tripathi,"Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. Mohandas Karamchand Gandhi, "The Story of My Experiments with Truth", FP classic, 2009.
4. A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, "VanVidya: EkParichaya", 1999.

CSBL201 CHEMISTRY LAB

L	T	P	C
0	0	4	2

Course Objective:

- To experiment various methods of volumetric analysis - Redox, Iodometric, complexometric, Neutralization etc. and use of conductivity meter for measurement of conductance of water sample..

Course Outcomes:

- To illustrate the principles of physical chemistry relevant to the study of rate of reactions.
- To estimate rate constants of reactions from concentration of reactants/products as a function of time.
- To measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.
- To understand the changes in matter and acquire scientific skills in the laboratory.
- To synthesize a small drug molecule and analyze a salt sample.

LIST OF EXPERIMENTS

1. Determination of surface tension and viscosity.
2. Thin layer chromatography.
3. Ion exchange column for removal of hardness of water.
4. Determination of chloride content of water.
5. Determination of cell constant and conductance of solutions.
6. Potentiometry - determination of redox potentials and emfs.
7. Synthesis of a polymer/drug.
8. Determination of the partition coefficient of a substance between two immiscible liquids.
9. Saponification/acid value of an oil.
10. Chemical analysis of a salt.
11. Lattice structures and packing of spheres.
12. Determination of the rate constant of a reaction.
13. Colligative properties using freezing point depression.
14. Models of potential energy surfaces.
15. Chemical oscillations- Iodine clock reaction.
16. Adsorption of acetic acid by charcoal.
17. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

(Total Periods : 45)

EXPERIMENTS THAT MAY BE PERFORMED THROUGH VIRTUAL LABS:

S. No.	Experiment Name	Experiment Link(s)
1	Determination of surface tension and viscosity.	http://pcv-au.vlabs.ac.in/ physical- which has to be broken of_Organic_Solvents/
2	Ion exchange column for removal of hardness of water.	http://icv-au.vlabs.ac.in/inorganic-chemistry/Water_Analysis_Determination_of_Chemical_Parameters/
3	Determination of chloride content of water.	http://vlabs.iitb.ac.in/vlabs dev/labs/nitk_labs/Environmental_Engineering_1/ experiments/determination-of-chloride-nitk/simulation.html
4	Colligative properties using freezing point depression.	http://pcv-au.vlabs.ac.in/ physical- chemistry/Cryoscopy/
5	Determination of the rate constant of a reaction.n.	http://pcv-au.vlabs.ac.in/ physical- chemistry/EMF_Measurement/
6	Determination of cell constant and conductance of solutions.	http://icv-au.vlabs.ac.in/ inorganic- chemistry/ Water_Analysis_Determination_of_Physical_Parameters/
7	Potentiometry - determination of redox potentials and emfs.	http://pcv-au.vlabs.ac.in/ physical- chemistry/EMF_Measurement/
8	Saponification/acid value of an oil	http://biotech01.vlabs.ac.in/bio chemistry/ Estimation_of_Saponification_Value_of_Fats_or_Oils/
9	Lattice structures and packing of spheres.	https://vlab.amrita.edu/ ?sub=1&brch=2 82&sim=370&cnt=1

CSEL202 PROGRAMMING FOR PROBLEM SOLVING LAB

L	T	P	C
0	0	4	2

Course Pre-requisite:

- Basic Programming language

Course Objective:

- To develop a application using python libraries and packages.

Course Outcomes:

- To develop a application for simple real life problems.
- To write programs using python statements and expressions.
- To write programs by implementing functions and strings in python.
- To demonstrate a application by dealing with an exceptions
- To explore Pygame tool by developing a gaming application.

LIST OF EXPERIMENTS

1. Identification and solving of simple real life or scientific or technical problems. (Electricity Billing, Retail shop billing, Sin series etc).
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets &Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, Scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter s age validity, student mark range validation)
11. Exploring Pygame tool.Developing a game activity using Pygame like bouncing ball, car race etc.

(Total Periods:45)

CSEL203 WORKSHOP/MANUFACTURING LAB

L	T	P	C
1	0	4	3

Course Objective:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

Course Outcomes:

- To fabricate components with their own hands.
- To relate practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- To design small devices of their interest by assembling different components.
- To practice Arc Welding and Gas Welding.
- To develop a casted products.

Course Content:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods.
2. CNC machining, Additive manufacturing.
3. Fitting operations & power tools.
4. Electrical & Electronics.
5. Carpentry.
6. Plastic moulding, glass cutting.
7. Metal casting.
8. Welding (arc welding & gas welding), brazing.

Practicals:

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical & Electronics
5. Welding shop (Arc welding + Gas welding)
6. Casting
7. Smithy
8. Plastic moulding & Glass Cutting

EXPERIMENTS THAT MAY BE PERFORMED THROUGH VIRTUAL LABS:

S. No.	Experiment Name	Experiment Link(s)
1	Welding shop (Arc welding + Gas welding).	http://mm- coep.vlabs.ac.in/ LaserSpotWelding/Theory.html? domain=Mechanical%20Engineering &lab=Welcome %20to %20Micromachining %20laboratory
2	Casting	http://fab- coep.vlabs.ac.in/exp7/Theory.html? domain=Mechanical %20Engineering&lab=Welcome%20tO %20FAB%20laboratory

(Total Periods:45)

CSAU204 SPORTS AND YOGA

L	T	P	C
2	0	0	0

Course Objective:

- To expose the students in variety of physical, yogic activities and stimulating their continued inquiry about Yoga, physical education, health and fitness.

Course Outcomes:

- To practice physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
- To learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
- To learn breathing exercises and healthy fitness activities.
- To understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
- To perform yoga movements in various combination and forms.

UNIT I

Introduction to Physical Education - Olympic Movement - Physical Fitness - Wellness and Lifestyle.

UNIT II

Fundamentals of Anatomy & Physiology in Physical Education - Sports and Yoga - Kinesiology - Biomechanics & Sports

UNIT III

Postures - Yoga - Yoga & Lifestyle

UNIT IV

Training and Planning in Sports - Psychology & Sports - Doping

UNIT V

Sports Medicine - Sports/Games

References:

1. Dr. Sudhakara.G, “Modern Trends in Physical Education, Sports and Yogic Science”, 2020.
2. Swami Vivekananda, “PatanjaliÆs Yoga Sutras”, paperback, 2019.
3. B.K.S. Iyengar, “Light On Yoga”, 2006.
4. Health and Physical Education NCERT (11^{th} and 12^{th}Classes)

CSES301 MICROPROCESSOR AND MICROCONTROLLER

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic Electronics Engineering

Course Objective:

- To learn the fundamentals of microprocessors and applications, interfacing the external devices to the processor according to the user requirements, enabling to create novel products and solutions for real time problems.

Course Outcomes:

- To understand the inner working components of 8085 Microprocessor.
- To understand 8085 Interrupts and 8237 DMA controller.
- To understand different types of Memory mapping and Interfacing.
- To understand the components of 8086 Microprocessor.
- To understand the organization of 8051 Microcontroller and Interfacing.

UNIT I (9 Hrs)

INTEL 8085 MICROPROCESSOR: Introduction - Need for Microprocessors, Evolution, Intel 8085 Hardware - Architecture, Pin description, Internal Registers, Arithmetic and Logic Unit, Control Unit, Instruction word size - Addressing modes, Instruction Set, Assembly Language Programming - Stacks and Subroutines, Timing Diagrams, Evolution of Microprocessors, 16-bit, 32-bit microprocessors and 64 bit microprocessor.

UNIT II (9 Hrs)

INTEL 8085 INTERRUPTS AND DMA: 8085 Interrupts - Software and Hardware Interrupts - 8259 Programmable Interrupt Controller - Data Transfer Techniques - Synchronous - Asynchronous and Direct Memory Access (DMA) and 8237 DMA Controller- 8253 Programmable Interval Timer.

UNIT III (9 Hrs)

MEMORY & I/O INTERFACING: Types of memory - Memory mapping and addressing , Concept of I/O map, types - I/O decode logic, Interfacing key switches and LEDs - 8279 Keyboard/Display Interface - 8255 Programmable Peripheral Interface - Concept of Serial Communication - 8251 UART/ USART - RS232C Interface.

UNIT IV (9 Hrs)

INTEL 8086 MICROPROCESSOR: Introduction - Intel 8086 Hardware, Pin description, External memory Addressing, Bus cycles, Interrupt Processing - Addressing modes, Instruction set, Assembler Directives.

UNIT V (9 Hrs)

MICROCONTROLLER: Intel 8051 Microcontroller - Introduction Architecture, Memory Organization, Special Function Registers, Pins and Signals, Timing and control, Port Operation - Memory and I/O interfacing, Interrupts - Instruction Set and Programming.

Text Books:

1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Applications with 8085", Penram International Publications, 6th Edition, 2020.
2. Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2008.

References:

1. A. P. Godse and D.A Godse, "Microprocessors and Microcontrollers", Technical Publications, 3rd Edition, 2023.
2. Barry B. Brey, "The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386 and 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III Pentium 4 – Architecture, Programming and Interfacing", PHI, 8th Edition, 2019.
3. N. Senthil Kumar, M Saravanan and S. Jeevananthan, "Microprocessors and Microcontrollers" , Oxford University Press, 2nd Edition, 2016.
4. Ajay V Deshmukh, "Microcontrollers – Theory and Applications", Tata McGraw- Hill, 7th Edition, 2007.

ONLINE/ NPTEL Courses:

1. Microelectronics: Devices To Circuits: https://onlinecourses.nptel.ac.in/noc21_ee86
2. Microelectronics: Devices To Circuits: https://nptel.ac.in/courses/108107142
3. Basics of software defined Radios: https://onlinecourses.nptel.ac.in/noc22_ee78

CSPC302 DATA STRUCTURE AND ALGORITHMS

L	T	P	C
3	0	0	3

Course Objective:

- To impart knowledge about the importance of data structures in programming and to familiarise basic searching and sorting algorithms.

Course Outcomes:

- To comprehend the basics of algorithms and understand the operations performed using arrays.
- To understand the linear data structures and its applications.
- To realize the properties of tree data structure and its importance in searching large database.
- To understand graph data structure and its applications.
- To know the need for hash tables.

UNIT I (9 Hrs)

INTRODUCTION: Data structures: Definition, Types - Algorithm: Definition, Properties, Analyzing algorithms: Space and Time Complexity-Arrays: One dimensional array, multidimensional array, Applications. Searching Algorithms: Linear search, Binary Search, Fibonacci search. Sorting Algorithms: Selection Sort, Bubble Sort, Quick Sort, Insertion sort, Heap Sort and Merge Sort.

UNIT II (9 Hrs)

STACK,QUEUE AND LINKED LISTS: Stacks: Definition – Operations - Applications of stack. Queues: Definition - Operations - Priority queues – De-queues – Applications of queue. Linked List: Singly Linked List, Doubly Linked List, Circular Linked List, Linked stacks, Linked queues, Applications of Linked List – Dynamic storage management.

UNIT III (9 Hrs)

TREE: Definition - Binary tree – Terminology – Representation – Operations - Applications – Binary search tree – AVL tree. B Trees: B Tree indexing - Operations on a B Tree - B + Tree Indexing. Trie - Trie operations.

UNIT IV (9 Hrs)

GRAPH: Definition – Terminology – Representation - Traversals – Applications - Spanning tree, Shortest path and Transitive closure, Topological sort. Set: Definition - Representation - Operations on sets – Applications

UNIT V (9 Hrs)

HASH TABLE: Tables: Rectangular tables - Jagged tables – Inverted tables - Symbol tables – Static tree tables - Dynamic tree tables - Hash tables-Overflow handling- Files: Sequential organization – Indexed organization.

Text Books:

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Galgotia Book Source, Pvt. Ltd., 2004.
2. D. Samanta, Classic Data Structures, 2nd, Prentice-Hall of India, Pvt. Ltd., India, 2012.

References:

1. Thomas Cormen, Charles Lieserson, Ronald L Rive stand Clifford Stein, "Introduction to Algorithms", MIT Press/McGraw-Hill, 4th Edition, 2022.
2. John Canning, Alan Broder, Robert Lafore, "Data Structures & Algorithms in Python", Addison-Wesley Professional,1st Edition, 2022.

ONLINE/ NPTEL Courses:

1. Programming, Data Structures and Algorithms Using Python: https: //onlinecourses.nptel.ac. in/noc23 cs95
2. Introduction to Programming, Data Structures and Algorithms Using Python: https: //onlinecourses.nptel.ac.in/noc2 3_cs15
3. Programming, Data Structures and Algorithms using Python for beginners: https: //nptel.ac.in /courses/106106145

CSES303 DIGITAL ELECTRONICS AND SYSTEM

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic Electronics Engineering

Course Objective:

- To design combinational logic circuits and Sequential logic circuits, including multiplexers, decoders, encoders, adders, subtractors, Flip Flops and Latches. To learn the basics of IoT devices and types of boards.

Course Outcomes:

- To understand various combinational digital circuits using logic gates.
- To understand sequential circuits and analyze the design procedures.
- To understand Verilog HDL and hierarchial modeling concepts.
- To understand various protocols of IoT using various sensors and actuators.
- To design and develop system using Rasperry Pi/Arduino.

UNIT I (9 Hrs)

COMBINATIONAL LOGIC: Combinational Circuits – Karnaugh Map, Analysis and Design Procedures of combinational circuit, Magnitude Comparator, Parity generator/checker, Decoder, Encoder, Implementation of combinational logic using Multiplexers, Demultiplexers.

UNIT II (9 Hrs)

SYNCHRONOUS SEQUENTIAL LOGIC: Introduction to Sequential Circuits – Flip-Flops, operation and excitation tables, Triggering of Flip Flop, Analysis and design of clocked sequential circuits – Design of Moore/Mealy models, state minimization, state assignment, circuit implementation- Implementation of combinational logic/sequential logic design using standard ICs, PROM, PLA and PAL.

UNIT III (9 Hrs)

DIGITAL DESIGN WITH VERILOG HDL: Modules – instances – Data types – Arrays – System tasks – directives – Modules and Ports – Gate-Level Modeling – Dataflow Modeling – Behavioral Modeling - Design of Multiplexers, counters and full adders – Introduction - Hierarchical Modeling concepts – 4-bit ripple carry counter.

UNIT IV (9 Hrs)

SENSORS AND ACTUATORS: Introduction to the Concept of IoT Devices – IoT Devices Versus Computers, IoT Configurations, IoT Basic Components, IoT Architecture - State of the Art,Functional View, Information View, Deployment and Operational View, Integration of Sensors and Actuators with Arduino.

UNIT V (9 Hrs)

DESIGN AND DEVELOPMENT: Introduction to Arduino – Arduino Board, Arduino types - Micro, UNO, NANO, Modules - WiFi, Bluetooth Node ESP, Raspberry: Raspberry Pi Board Types, IDE programming - Interfaces and Raspberry Pi with Python Programming.

Text Books:

1. A. P. Godse and D. A. Godse, "Digital Principles and System Design", Technical Publications, 4th Edition, 2021.
2. M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog", Pearson Education, 6th Edition, 2018.
3. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.

References:

1. Charles H. Roth, Larry L. Kinney and Raghunandan G. H, "Fundamentals of Logic Design", Cengage India Private Limited, 1st Edition, 2019.
2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.
3. Jan Holler, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand, David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012 (for Unit 4).

ONLINE/ NPTEL Courses:

1. Digital Circuits: https://onlinecourses.nptel.ac.in/noc23_ee115
2. Digital Circuits Design: https://onlinecourses.nptel.ac.in/noc22_ee110
3. Microelectronics: Devices To Circuits: https://nptel.ac.in/courses/108107142

CSBS304 MATHEMATICS - III

L	T	P	C
3	0	0	3

Pre-requisite:

- Basic Knowledge in Maths & Statistics

Course Objective:

- To learn the foundations of probabilistic and statistical methods in engineering field.

Course Outcomes:

- To understand the fundamental concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- To understand and apply measures of central tendency, dispersion, moments, skewness, kurtosis, correlation, regression, and rank correlation for effective data analysis and interpretation.
- To attain proficiency in curve fitting techniques and conduct significance tests for large samples.
- To perform t-tests for means, correlation tests, F - test, and Chi-square tests for goodness of fit and independence of attributes.
- To apply the fundamental principles of experimental design classifications in the field of engineering.

UNIT I (9 Hrs)

BASIC PROBABILITY: Sample Space and Events, Axioms of Probability, Conditional Probability, Bayes' Theorem, Independent Events, Random Variables, Discrete and Continuous Random Variables – Probability Mass Function - Probability Density Function – Cumulative Distribution Function - Expectation and Variance, Standard Probability Distributions (Problems only): Bernoulli, Binomial, Poisson, Geometric, Multinomial, Uniform , Exponential, Gamma, Erlang and Normal Distribution.

UNIT II (9 Hrs)

BASIC STATISTICS: Measures of Central tendency – Mean – Median – Mode; Measure of Dispersion – Range – Variance – Standard Deviation; Moments, Skewness and Kurtosis, Correlation and regression, Rank Correlation.

UNIT III (9 Hrs)

APPLIED STATISTICS (LARGE SAMPLES): Curve Fitting by the Method of Least Squares- Fitting of straight lines, second degree parabolas and more general curves. **Test of Significance:** Large Sample Test for Single Proportion, Difference of Proportions, Single Mean, Difference of Means and Difference of Standard Deviations.

UNIT IV (9 Hrs)

APPLIED STATISTICS (SMALL SAMPLES): Student's' t-Tests - Test for Single Mean, Difference of Means and Correlation Coefficients, Test for ratio of variances (F - Test), Chi-square Test for goodness of fit and Independence of Attributes.

UNIT IV (9 Hrs)

DESIGN OF EXPERIMENTS: One-Way and Two-way Classifications- Completely randomized design- Randomized block design- Latin square design -2 factorial designs.

Text Books:

1. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003.
2. S. Ross, "A First Course in Probability", Pearson Education India,9th Edition, 2013.

References:

1. Bali N.P and Manish Goyal, "A Textbook Of Engineering Mathematics", Laxmi Publications(P) Ltd, 10th Edition, 2019.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition, 2018.
3. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2017.
4. William Feller, "An Introduction to Probability Theory and its Applications", (WSE) Vol. 1, 3rd Edition, 2013.

ONLINE/ NPTEL Courses:

1. Probability and Statistics: https://nptel.ac.in/courses/111105090
2. Advanced Engineering Mathematics: https://nptel.ac.in/courses/111107119
3. Introduction to Probability Theory and Statistics: https://nptel.ac.in/courses/111102160

CSHS305 PRINCIPLES OF MANAGEMENT

L	T	P	C
3	0	0	3

Course Objective:

- To provide a foundational understanding of Management principles and practices. To introduce the field of management, its historical development and its importance in organizations.

Course Outcomes:

- To understand the introductory management concepts.
- To understand the basic knowledge on international aspect of management.
- To understand the organization structure and Human resource management.
- To understand motivation theories leadership and communication process.
- To understand the controlling concept of management.

UNIT I (9 Hrs)

INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS: Definition of Management - Science or Art, Manager Vs Entrepreneur, types of managers managerial roles and skills, Evolution of Management - Scientific, human relations, system and contingency approaches, Types of Business organization - Sole proprietorship, partnership, company, public and private sector enterprises, Organization culture and Environment - Current trends and issues in Management.

UNIT II (9 Hrs)

PLANNING: Nature and purpose of planning - Planning process, Types of planning, Objectives - Setting objec- tives, Policies, Planning premises, Strategic Management, Planning Tools and Techniques, Decision making steps andprocess - types of decisions and decision making conditions, Decision making styles, Effective decision making.

UNIT III (9 Hrs)

ORGANISING: Nature and purpose - Formal and informal organization, Organization chart, Organization structure, Types, Line and staff authority - Departmentalization, delegation of authority, Centralization and decentralization, Job Design, Human Resource Management - HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management.

UNIT IV (9 Hrs)

LEADING: Foundations of individual and group behaviour - Motivation, Motivation theories, Motivational techniques, Job satisfaction - Job enrichment, Leadership, types and theories of leadership, Communication - Process of communication, Barrier in communication, Effective communication, Communication and IT.

UNIT V (9 Hrs)

CONTROLLING: System and process of controlling - Budgetary and non, Budgetary control techniques, Use of computers and IT in Management control, Productivity problems and management, Control and performance, Direct and preventive control, Reporting.

Text Books:

1. Stephen A. Robbins and David A. Decenzo and Mary Coulter, "Fundamentals of Management", Pearson Education, 11th Edition, 2019.
2. Stephen P. Robbins and Mary Coulter, "Management", Prentice Hall India Pvt. Ltd., 13th Edition, 2017.

References:

1. PC Tripathy, PN Reddy and Ashish Bajpai, "Principles of Management", Tata Mcgraw Hill, 7thEdition, 2021.
2. Harold Koontz and Heinz Weihrich, "Essentials of management", Tata McGraw Hill, 11thEdition, 2020.
3. Robert Kreitner and Mamata Mohapatra, "Management", Biztantra, 2008.

ONLINE/ NPTEL Courses:

1. Management Information System: https://onlinecourses.nptel.ac.in/noc23_mg87
2. Management Information System: https://nptel.ac.in/courses/110105148

CSEL301 MICROPROCESSOR AND MICROCONTROLLER LAB

L	T	P	C
0	0	4	2

Course Pre-requisite:

- Basic Electronics Engineering

Course Objective:

- To enrich assembly language programming knowledge using 8085, 8086,8051 microprocessor and microcontroller.

Course Outcomes:

- To understand the inner working components of the microprocessor and microcontrollers.
- To develop assembly language program using 8085 instruction set.
- To develop assembly language program using 8086 instruction set.
- To develop assembly language program using 8051 instruction set.
- To develop various I/O programs for 8085, 8086 and 8051.

LIST OF EXPERIMENTS

Experiment using 8085 Microprocessor:

1. Study of 8085 Microprocessor Trainer Kit
2. 8-bit Arithmetic Operations (Addition, Subtraction, Multiplication and Division)
3. Block Operations (Move, Exchange, Compare, Insert and Delete)
4. Code Conversions
5. Digital Clock simulation
6. Moving Display
7. Serial Communication
8. Interrupt Programming
9. Elevator Simulation
10. Traffic Light Control

Experiments using 8086 Microprocessor with MASM:

11. Arithmetic Operations
12. Sorting and Searching

Experiments using 8051 Microcontroller

13. Arithmetic operations
14. ADC & DAC Interfacing
15. Stepper Motor and DC Motor Interface

(Total Periods:45)

CSPL302 DATA STRUCTURE AND ALGORITHMS LAB

L	T	P	C
0	0	4	2

Course Pre-requisite:

- Basic knowledge in programming

Course Objective:

- To enable students write programs using various data structures, analyse and understand the benefits of choosing the right data structure.

Course Outcomes:

- To write programs for search and sorting algorithms.
- To write programs for implementing stacks, queues and linked list.
- To write programs for searching using tree data structure.
- To write programs for identifying shortest path in a network.
- To write programs that implements hash tables.

LIST OF EXPERIMENTS

1. Searching Algorithms (With the Number of Key Comparisons) - Sequential, Binary and Fibonacci Search Algorithms on an Ordered List
2. Sorting Algorithms: Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Heap Sort and Merge Sort.
3. Implementation of Stack and Its Operations.
4. Application of Stack for Converting an Arithmetic Expression into Postfix Form and Evaluation of Postfix Expression.
5. Implementation of Queue, Circular Queue, Priority Queue, Dequeue and Their Operations.
6. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List.
7. Implementation of Binary Tree and Binary Traversal Techniques.
8. Implementation of Graph Traversal Techniques.
9. Implement Dijkstra's Algorithm to Obtain the Shortest Paths.
10. Implementation of Hash Tables and its Operations.

(Total Periods:45)

CSEL303 DIGITAL ELECTRONICS AND SYSTEM LAB

L	T	P	C
0	0	4	2

Course Pre-requisite:

- Basic Electronics and Engineering

Course Objective:

- To design the combinational circuits, sequential circuits and implementation using arduino/raspberry pi board modules.

Course Outcomes:

- To understand the binary number systems and Boolean algebra.
- To design combinational logic using only of universal gates, MSI gates and PLDs.
- To design and implement sequential logic circuits of any complexity.
- To design and implement real time application using Raspberry Pi.
- To design and implement GPS module Interfacing.

LIST OF EXPERIMENTS

DIGITAL ELECTRONICS:

1. Implementation of binary adder/subtractor circuits.
2. Implementation of code converters.
3. Implementation of encoder and decoder circuits.
4. Implementation of functions using Multiplexers/Demultiplexers.
5. Implementation of shift register.
6. Implementation of the synchronous/Asynchronous counters.

ARDUINO/ RASPBERRY Pi:

7. Introduction to Arduino platform and programming.
8. Communicate between Arduino and Raspberry Pi using any wireless medium.
9. Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi.
10. Raspberry Pi Based Oscilloscope.
11. Controlling Raspberry Pi with WhatsApp.
12. Setting up Wireless Access Point using Raspberry Pi.

(Total Periods:45)

CSPL304 IT WORKSHOP (SCI LAB / MATLAB)

L	T	P	C
1	0	4	3

Course Pre-requisite:

- Programming for problem solving

Course Objectives:

- To introduce the students with the basic features of SCI LAB/MATLAB for problem solving using array operations, control structures and Mathematical functions like matrix generation, Plotting with multiple data sets, line styles, colors.

Course Outcomes:

- To write fundamental programs in SCI LAB/MATLAB, creating variables and mathematical functions.
- To understand how to program matrix operations, array operations and how to solve the system of linear equations.
- To understand the fundamentals concepts of basic Plotting consisting of simple and multiple data sets in one plot.
- To understand how to program M-file scripts, M- file functions, Input –output Arguments and program control flow operators, loops, flow structures.
- To develop the debugging process and debugging M-files.

LIST OF EXPERIMENTS

1. Programs using mathematical, relational expressions and the operators.
2. Vectors and Matrices: Programs using array operations and matrix operations (such as matrix multiplication).
3. Selection Statements: Experiments on if statements, with else and elseif clauses and switch statements.
4. Programs using control Structures.
5. Programs based on scripts and user-defined functions.
6. Programs on Built-in text manipulation functions and conversion between string and number types.
7. Programs based on two main data structures: cell arrays and structures.
8. Programs based on Data Transfer.
9. Programs based on Advanced Functions.
10. Introduction to Object-Oriented Programming and Graphics.
11. Programs based on Advanced Plotting Techniques.
12. Programs based on sound files and image processing.
13. Solving problems listed in Mathematics I/II/III.

(Total Periods:45)

CSPC401 DISCRETE MATHEMATICS

L	T	P	C
3	1	0	4

Course Pre-requisite:

- Mathematics I, II

Course Objectives:

- To learn the fundamentals of set operations, Cartesian products, binary equivalence relations, functions, and their properties.
- To learn the fundamental concepts of Combinatorics and Graph theory.

Course Outcomes:

- To analyse and comprehend Cantor's diagonal argument and understand the Power Set theorem.
- To apply the Chinese Remainder Theorem to solve systems of congruences and real-world problems.
- To solve the problems on combinatorial concepts such as permutations, combinations and matching algorithms to graph theory problems.
- To interpret and evaluate formulas using interpretations in first-order logic.
- To analyse the homomorphism and isomorphism between algebraic structures and Calculate expectations, variances, probabilities in Bernoulli trials and conditional probability scenarios using Bayes' Theorem.

UNIT I (12 Hrs)

SET, RELATIONS, FUNCTIONS: Operations and Laws of Sets, Cartesian Products,Binary Relation and functions, Partial Ordering Relation - Equivalence Relation - Image and Size of a Set - Sum and Product of Functions - Bijective functions - Inverse and Composite Function - Finite and infinite Sets - Countable and uncountable Sets-Cantor's diagonal argument and The Power Set theorem.

UNIT II (12 Hrs)

PROOF STRATEGIES AND MODULAR ARITHMETIC: Proof Methods and Strategies- Forward Proof - Proof by Contradiction - Proof by Contraposition - Proof of Necessity and Sufficiency - Case analysis - Induction -Extended Euclid's Greatest Common Divisor algorithm - The Fundamental Theorem of Arithmetic - Modular arithmetic - Co-primality (or Euler's totient function)- Chinese Remainder Theorem.

UNIT III (12 Hrs)

COMBINATORICS AND GRAPHS: Permutation and Combination - Inclusion-Exclusion - pigeon-hole principle -generating functions - Recurrence - Connected components - Paths - Cycles - Trees - Hamiltonian/Eulerian Walks - Coloring - Planarity - Matching.

UNIT IV (12 Hrs)

LOGIC: Languages of Propositional logic and First-order logic - expressing natural language sentences in languages of propositional and first-order logic - expressing natural language predicates in the language of first-order logic. Semantics of First-order logic- interpretation and its use in evaluating a formula.

UNIT V (12 Hrs)

ALGEBRA: Group, Permutation Groups, Cosets, Normal Subgroups, Ring, Field, Finite fields, Fermat's little theorem, Homomorphisms, Isomorphisms.

Text Books:

1. Rosen, K. H, "Discrete Mathematics and Its Applications", 8th Edition, 2019.
2. Liu, C.L. and Mohapatra, D.P., "Elements of Discrete Mathematics", Tata McGraw-Hill, 2008.
3. Huth, M.and Ryan M., "Logic in Computer Science: Modelling and Reasoning about Systems", Cambridge University Press, 2nd Edition, 2004.

References:

1. Mitzenmacher.M, and Upfal.E, "Probability and computing: Randomization and probabilistic techniques in algorithms and data analysis", Cambridge University Press, 2017.
2. Shoup.V, "A computational introduction to number theory and algebra", Cambridge University Press, 2009.
3. Bóna.M, "A Walk Through Combinatorics: An Introduction to Enumeration and Graph Theory", 2006.
4. Herstein.I.N, "Topics in algebra", John Wiley and Sons, 2006.

ONLINE/NPTEL Courses:

1. Discrete Mathematics: https://nptel.ac.in/courses/106103205
2. Introduction-Discrete Mathematics: https://nptel.ac.in/courses/106108227
3. Discrete Mathematics: https://nptel.ac.in/courses/111106086

CSPC402 COMPUTER ORGANIZATION AND ARCHITECTURE

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Problem solving and programming

Course Objective:

- To learn the basic components of computer, instruction set architecture, memory hierarchy, super scalar processor and multicore systems.

Course Outcomes:

- To understand the components of a basic computer.
- To understand the key components of a CPU and how the instructions are executed.
- To analyze the execution time taken in a pipelined processor.
- To understand the need of memory hierarchy and efficiency achieved due to the use of cache.
- To interpret how the data is stored and input-output is performed in computers.

UNIT I (9 Hrs)

INTRODUCTION: Role of abstraction, Basic functional units of a computer, Von-Neumann model of computation, Moore's law, form Notion and perance- Data representation and basic operations.

UNIT II (9 Hrs)

INSTRUCTION SET ARCHITECTURE (RISC-V): CPU registers, Instruction format and Encoding, addressing modes, Instruction set, Instruction types, Instruction Decoding and Execution, Basic Instruction cycle, Reduced Instruction Set Computer (RISC), Complex Instruction Set Computer (CISC), RISC-V instructions - X86 Instruction set.

UNIT III (9 Hrs)

PROCESSOR: Revisiting clocking methodology, Amdahl's law, Building a data path and control, single cycle processor, multi-cycle processor, instruction pipelining, Notion of ILP, data and control hazards and mitigations - Limits of ILP.

UNIT IV (9 Hrs)

MEMORY HIERARCHY: SRAM/DRAM, Locality of reference, Caching - different indexing mechanisms, trade-offs related to block size, associativity, cache size, processor, cache interactions for a read/write request, basic optimizations - write through/writeback caches, average memory access time, cache replacement policies, memory interleaving.

UNIT V (9 Hrs)

STORAGE AND I/O: Introduction to magnetic disks, flash memory- I/O mapped I/O and memory mapped I/O - I/O data transfer techniques - programmed I/O, Interrupt-driven I/O and DMA.

Text Books:

1. Carl Hamacher, ”Computer Organization and Embedded Systems”, McGrawHill Higher Education, 6th Edition, 2022.
2. David A. Patterson and John L. Hennessy, ”Computer Organization and Design: The Hardware/Software Interface”, Elsevier, 5th Edition, 2014.

References:

1. Vincent P. Heuring and Harry F. Jordan, ”Computer System Design and Architecture”, Pearson Education, 2nd Edition, 2016.
2. Smruti Ranjan Sarangi, ”Computer Organisation & Architecture”, McGraw Hill, 2014.
3. Mano M. Morris, ”Computer System Architecture”, Pearson, 2007.

Online Simulators and Tools:

1. RIPES: https://freesoft.dev/program/108505982
2. GEM5:https://www.gem5.org/documentation/learning_gem5/introduction

ONLINE/NPTEL Courses:

1. Introduction to computer System and its submodules: https://nptel.ac.in/courses/106103068
2. Computer Organization and Architecture: https://nptel.ac.in/courses/106106166
3. Computer Organization and Architecture A Pedagogical Aspect:https://nptel.ac.in/courses/106103180

CSPC403 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic Knowledge in Data Structure.

Course Objective:

- To demonstrate various algorithm analysis and design techniques by applying them to find solutions to real world problems.

Course Outcomes:

- To understand and derive the time and space complexities of algorithms.
- To understand the divide-and-conquer and greedy techniques.
- To formulate and design the Dynamic Programming approach.
- To apply Backtracking technique to solve real world problems.
- To design and analyze Branch and Bound technique.

UNIT I (9 Hrs)

INTRODUCTION: Algorithm: Definition and Pseudocode - Asymptotic Notations – Worst Case, Best Case And Average Case Analysis; Big Oh, Omega and Theta Notations; Analyzing Control Structures. Analysis of Sorting and Searching algorithms: Heap, Shell, Radix, Insertion, Selection and Bubble Sort; Sequential, Binary And Fibonacci Search. Recursive Algorithms, Analysis of Non-Recursive and Recursive Algorithms, Solving Recurrence Equations.

UNIT II (9 Hrs)

DIVIDE AND CONQUER,GREEDY APPROACHES: Divide and Conquer: General Method – Binary Search – Maximum And Minimum – Merge Sort - Quick Sort – Strassen's Matrix Multiplication. Greedy Method: General Method – Knapsack Problem – Minimum Spanning Tree Algorithms – Single Source Shortest Path Algorithm – Scheduling, Optimal Storage on Tapes, Optimal Merge Patterns.

UNIT III (9 Hrs)

DYNAMIC PROGRAMMING: General Method – Multi-Stage Graphs – All Pair Shortest Path Algorithm – 0/1 Knapsack and Travelling Salesman Problem – Chained Matrix Multiplication.

UNIT IV (9 Hrs)

BACKTRACKING : The General Method – 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycle – Knapsack Problem.

UNIT V (9 Hrs)

BRANCH AND BOUND: Least Cost (LC) Search – The 15-Puzzle Problem – Control Abstractions For LC-Search – Bounding – FIFO Branch and-Bound - 0/1 Knapsack Problem – Travelling Salesman Problem. Introduction to NP-Hard and NP-Completeness.

Text Books:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Galgotia Publications, Pvt. Ltd., 2nd Edition, 2008.
2. Gilles Brassard and Paul Bratley, Fundamentals of Algorithmics, Theory and Practice PHI, 2010.
3. Thomas H. Corman, Charles E. Leiserson, Ronald and L. Rivest, Introduction to Algorithms, Prentice-Hall of India, 2nd Edition, 2003.

References:

1. Gajendra Sharma, "Design and Analysis of Algorithms", Khanna Publishing House, New Delhi, 4th Edition, 2015.
2. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis, and Internet Examples", Wiley, 2nd Edition, 2006.

ONLINE/NPTEL Courses:

1. Design and Analysis of Algorithms: https://nptel.ac.in/courses/106101059
2. Introduction Design and Analysis of Algorithms: https://nptel.ac.in/courses/106106131
3. Overview of DAA: https://nptel.ac.in/courses/106101060

CSPC404 ADVANCED PROGRAMMING IN JAVA

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic knowledge in programming

Course Objective:

- To learn the concepts of OOPS principles, packages, interfaces, generic classes and GUI applications using JavaFX.

Course Outcomes:

- To apply the concepts of classes and objects to solve simple problems.
- To develop programs using inheritance, packages and interfaces.
- To apply exception handling mechanisms and multithreaded model to solve real world problems.
- To build Java applications with I/O packages, string classes, Collections and generics concepts.
- To integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications.

UNIT I (9 Hrs)

INTRODUCTION TO OOP AND JAVA: Overview of OOP – Object oriented programming paradigms, Features of Object Oriented Programming, Java Buzzwords- Overview of Java - Data Types, Variables and Arrays, Operators, Control Statements, Programming Structures in Java, Defining classes in Java, Constructors- Methods -Access specifiers.

UNIT II (9 Hrs)

INHERITANCE, PACKAGES AND INTERFACES: Overloading Methods – Objects as Parameters, Returning Objects, Static, Nested and Inner Classes- Inheritance: Basics, Types of Inheritance, Super keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, final with Inheritance - Packages and Interfaces- Packages, Packages and Member Access, Importing Packages, Interfaces.

UNIT III (9 Hrs)

EXCEPTION HANDLING AND MULTITHREADING: Exception Handling basics, Multiple catch Clauses, Nested try Statements, Java's Built-in Exceptions, User defined Exception- Multithreaded Programming- Java Thread Model, Creating a Thread and Multiple Threads, Priorities, Synchronization, Inter Thread Communication, Multithreading.

UNIT IV (9 Hrs)

GENERIC PROGRAMMING AND STRING HANDLING: I/O Basics, Reading and Writing Console I/O, Reading and Writing Files- Generics, Generic Programming, Generic classes, Generic Methods, Bounded Types, Restrictions and Limitations - Strings: Basic String class, methods and String Buffer Class.

UNIT V (9 Hrs)

JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS: JavaFX Events and Controls- Event Basics, Handling Key and Mouse Events- Controls, Checkbox, ToggleButton, RadioButtons , ListView, ComboBox, Choice-Box, Text Controls, ScrollPane. Layouts, FlowPane, HBox and VBox, BorderPane, StackPane, GridPane Menus: Basics, Menu, Menu bars, MenuItem.

Text Books:

1. Herbert Schildt, "Java: The Complete Reference", McGraw Hill Education, 11th Edition, 2019.
2. Herbert Schildt, "Introducing JavaFX 8 Programming", McGraw Hill Education, 1st Edition, 2015.

References:

1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, Prentice Hall, 11th Edition, 2018.

ONLINE/NPTEL Courses:

1. Object Oriented System Development using UML: https://nptel.ac.in/courses/106105224
2. Java: https://nptel.ac.in/courses/106105225

CSHS405 ORGANIZATIONAL BEHAVIOUR

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic knowledge in organization and management

Course Objectives:

- To learn organizational behaviour,management practices and solving organizational challenges to understand the important issues pertaining to individual.

Course Outcomes:

- To analyze the inter personnel communication process to increase their effectiveness
- To evaluate the development of basic conflict resolutions
- To examine what makes an organization, how organization evolve and what makes them effective
- To appraise their ability to manage, lead and work with other people in an organizational setting
- To understand the organizational behaviour in dynamics.

UNIT I (9 Hrs)

FOCUS AND PURPOSE: Definition, need and importance of organizational behaviour – Nature and scope – Frame work – Organizational behaviour models.

UNIT II (9 Hrs)

INDIVIDUAL BEHAVIOUR: Personality, types, Factors influencing personality, Theories – Learning,Types of learners,The learning process, Learning theories – Organizational behavior modification, Misbehaviour, Types, Management Intervention- Emotions Emotional Labour, Emotional Intelligence, Theories- Attitudes, Characteristics, Components, Formation, Measurement Values- Perceptions, Importance, Factors influencing perception, Interpersonal perception, Impression Management Motivation,importance,Types – Effects on work behavior.

UNIT III (9 Hrs)

GROUP BEHAVIOUR: Organization structure – Formation – Groups in organizations, Influence, Group dynamics – Emergence of informal leaders and working norms, Group decision making techniques, Team building, Interpersonal relations, Communication – Control.

UNIT IV (9 Hrs)

LEADERSHIP AND POWER: Meaning, Importance, Leadership styles – Theories, Leaders Vs Managers – Sources of power, Power centers – Power and Politics.

UNIT V (9 Hrs)

DYNAMICS OF ORGANIZATIONAL BEHAVIOUR: Organizational culture and climate, Factors affecting organizational climate, Importance- Job satisfaction, Determinants, Measurements, Influence on behavior- Organizational change, Importance, Stability Vs Change , Proactive Vs Reaction change, the change process, Resistance to change, Managing change- Stress, Work Stressors, Prevention and Management of stress, Balancing work and Life- Organizational development, Characteristics,objectives.

Text Books:

1. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, "Essentials of Organizational Behaviour", Pearson, 2019.

References:

1. K. Aswathappa, "Organizational Behavior", Himalaya Publishing House, 2018.
2. Richard L, "Organization Theory and Design", South Western College Publishing, 11th Edition, 2012.
3. S.TrevisCerto, "Modern Management Concepts and Skills", Pearson Education, 2018.

ONLINE/NPTEL Courses:

1. Understanding Organizational Behaviour: https://nptel.ac.in/courses/110105033
2. Organizational Behaviour: https://nptel.ac.in/courses/110106145
3. Organizational Behaviour - II: https://nptel.ac.in/courses/110105154

CSMC406 ENVIRONMENTAL SCIENCES

L	T	P	C
3	0	0	0

Course Pre-requisite:

- Basic Science Courses

Course Objective:

- To work and produce most efficient, economical, eco-friendly finished products, to solve various engineering problems applying ecosystem to produce eco–friendly products.

Course Outcomes:

- To understand the basic concepts of industrial management.
- To understand the importance of air and noise pollution.
- To analyze the importance of solid and water pollution.
- To understand the importance of renewable sources of solar energy.
- To understand the environmental management in fabrication industry and solid waste management.

UNIT I (9 Hrs)

ECOSYSTEM: Structure of ecosystem-Biotic & Abiotic components- Food chain and food web- Aquatic (Lentic and Lotic) and terrestrial ecosystem- Carbon, Nitrogen, Sulphur, Phosphorus cycle- Global warming, Causes, effects, process, Green House Effect, Ozone depletion.

UNIT II (9 Hrs)

AIR AND, NOISE POLLUTION: Definition of pollution and pollutant-Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler)- Air Pollutants: Types, Particulate Pollutants- Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator)- Gaseous Pollution Control, Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler- Noise pollution, sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000.

UNIT III (9 Hrs)

WATER AND SOIL POLLUTION : Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD- Definition, calculation- Waste Water Treatment, Primary methods, sedimentation, froth flotation, Secondary methods- Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method- Membrane separation technology, RO (reverse osmosis).

UNIT IV (9 Hrs)

RENEWABLE SOURCES OF ENERGY SOLAR ENERGY: Basics of Solar energy- Flat plate collector (Liquid & Air). Theory of flat plate collector- Importance of coating- Advanced collector- Solar pond- Solar water heater, solar dryer- Solar stills- Biomass: Overview of biomass as energy source- Thermal characteristics of biomass as fuel- Anaerobic digestion- Biogas production mechanism- Utilization and storage of biogas- New Energy Sources, Need of new sources- Different types new energy sources- Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion) Concept, origin and power plants of geothermal energy.

UNIT V (9 Hrs)

SOLID WASTE MANAGEMENT, ISO 14000 & ENVIRONMENTAL MANAGEMENT: Solid waste generation- Sources and characteristics of Municipal solid waste, E- waste, Biomedical waste- Air quality act 2004, air pollution control act 1981 and Water Pollution and Control Act 1996- Structure and role of Central and state pollution Control Board- Concept of Carbon Credit, Carbon Footprint- Environmental management in fabrication industry- ISO14000: Implementation in industries, Benefits.

Text Books:

1. S.C. Sharma & M.P. Poonia, "Environmental Studies", Khanna Publishing House, New Delhi, 2021.
2. Arceivala, Soli Asolekar, Shyam, "Waste Water Treatment for Pollution Control and Reuse", Mc-Graw Hill Education India Pvt. Ltd., New York, 2007.
3. Nazaroff, William, Cohen, Lisa, "Environmental Engineering Science", Willy, New York, 2000.
4. O.P. Gupta, "Elements of Environmental Pollution Control", Khanna Publishing House, New Delhi.

References:

1. Aldo Vieira, Da Rosa, "Fundamentals of renewable energy processes", Academic Press Oxford, 2013.
2. Patvardhan, A.D, "Industrial Solid Waste", Teri Press, 2013.
3. Metcalf and Eddy, "Waste Water Engineering", Mc-Graw Hill, 2013.
4. Keshav Kant, "Air Pollution & Control", Khanna Publishing House, 2018.

ONLINE/NPTEL Courses:

1. Introduction to Environmental Engineering: https://nptel.ac.in/courses/103107084
2. Environmental Quality Monitoring & Analysis: https://nptel.ac.in/courses/103106162
3. Basic Environmental Engineering and Pollution Abatement: https://nptel.ac.in/courses/103107215
4. Environmental Air Pollution: https://nptel.ac.in/courses/105104099

CSPL401 COMPUTER ORGANIZATION AND ARCHITECTURE LAB

L	T	P	C
0	0	4	2

Course Pre-requisite:

- Digital Electronics and Systems

Course Objective:

- To learn the performance issues related to pipelining, cache using architectural simulator and analyze the memory access patterns and its impact

Course Outcomes:

- To analyze the behaviour of memory, ports and add-on cards.
- To execute ARM/RISC assembly language program 4-function calculator etc.,
- To design Arithmetic logic units and different types of memory blocks.
- To analyze the operational behaviour of FPGA.
- To analyze the impact of standard programs or benchmarks using architectural simulators.

LIST OF EXPERIMENTS

1. Computer Anatomy-Memory, Ports, Motherboard and add-on cards.
2. Write programs in ARM/RISC assembly language and test these on an instruction set simulator.
3. Generate some interesting numbers (example - Happy numbers,Autonomic numbers, Hardy- Ramanujan numbers etc.)
4. Implement a 4-function calculator.
5. Sort an integer array using merge sort (recursive).
6. Evaluate an arithmetic expression specified as a string (using recursive functions).
7. Implement a simple game.
8. Write or generate sequence of instructions and observe the overall pipeline stalls with and without data hazards, control hazards, and with/without data forwarding.
9. Rearrange the sequence of instructions or the program so that the pipeline stalls will be minimized.
10. Configure the simulator [gem5 is preferred] to operate on the binaries of the benchmark as the input.
11. Design a simple ARM/RISC processor for a small subset of instructions and implement on FPGA board.

(Total: 45 Periods)

CSPL402 DESIGN AND ANALYSIS OF ALGORITHM LAB

L	T	P	C
0	0	4	2

Course Pre-requisite:

- Basic Knowledge in data structures and programming

Course Objective:

- To enable students write programs using various algorithms design techniques and understand their significance.

Course Outcomes:

- To choose and implement the searching/sorting techniques
- To find solutions using right algorithm design technique.
- To implement backtracking algorithms for solving Knapsack problem.
- To analyze the algorithm complexity and the computation time of algorithms.
- To apply branch and bound technique to solve optimisation problems.

LIST OF EXPERIMENTS

Programs to implement the following :

1. Implement binary search using Divide-and-Conquer technique.
2. Implement quick sort and merge sort using Divide-and-Conquer technique.
3. Find the maximum and minimum element in an array using Divide-and-Conquer technique.
4. Implement and analyse the time complexity of any of the sorting algorithm and represent it graphically.
5. Implement Strassen's multiplication using Divide and Conquer technique.
6. Implement Knapsack problem using Greedy technique.
7. Implement Single-Source Shortest Path algorithm using Greedy technique.
8. Implement Prim's algorithm using greedy technique.
9. Implement Kruskal algorithm using greedy technique.
10. Implement Multi-Stage Graphs using Dynamic Programming technique.
11. Implement Floyd's algorithm using Dynamic Programming technique.
12. Implement Traveling Salesman algorithm using Dynamic Programming technique.
13. Implement 8 Queens algorithm using Backtracking technique.
14. Implement Hamiltonian cycle algorithm using Backtracking technique.
15. Implement Traveling Salesman problem using Branch-and-Bound technique.

(Total: 45 Periods)

CSPL403 JAVA PROGRAMMING LAB

L	T	P	C
0	0	4	2

Course Pre-requisite:

- Programming for Problem solving

Course Objective:

- To write program for implementing constructors and destructors and develop applications using database connectivity.

Course Outcomes:

- To demonstrate the usage of control structure, modularity, classes, I/O and the scope of the class members
- To develop solutions to problems demonstrating usage of data abstraction,encapsulation.
- To develop an simple application using Inheritance concepts.
- To implement solutions to various I/O operations,Threads,Exceptions and String manipulations
- To develop applications using event handling.
- To develop a design for simulating calculator application.

LIST OF EXPERIMENTS

1. Program to implement constructors and destructors with array of objects.
2. Program to demonstrate function overloading.
3. Program to implement different types of inheritances like multiple, Multilevel and hybrid.
4. I/O Program to demonstrate the use of abstract classes.
5. Program to demonstrate I/O streams and functions.
6. Program to perform all possible type conversions.
7. Program to demonstrate exception handling technique.
8. Program to implement networking concepts.
9. Program to design and implement JDBC.
10. Program to design an event handling event for simulating a simple calculator.
11. Build GUI based application development using JavaFX.

(Total: 45 Periods)

CSPC501 COMPUTER NETWORKS

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic knowledge in computer.

Course Objective:

- To learn the fundamental concepts of networks and OSI layers. To analyze various routing algorithms and security algorithms in networks.

Course Outcomes:

- To understand the fundamentals of network and transmission media.
- To understand the error detection, correction codes and datalink layer protocols.
- To understand the various routing algorithms and Internetworking.
- To enhance the knowledge of sockets and congestion control techniques.
- To enhance the knowledge in IDS and cryptographic techniques.

UNIT I (9 Hrs)

PHYSICAL LAYER: Introduction- Uses, Network Hardware, Software, Reference Models - Theoretical Basis for Communication - Electromagnetic Spectrum, Radio Transmission, Digital Modulation, Baseband Transmission - Transmission Media, Wireless Transmission.

UNIT II (9 Hrs)

DATALINK LAYER: Design Issues - Services, Framing, Error Control, Flow Control - Error Detection and Correction Codes, Hamming Code, Cyclic Redundancy Check - Data Link Layer Protocols, Simplex Protocol , Slid- ing Window Protocols - Medium Access Control Sublayer, Channel Allocation Problem, Multiple Access Protocols, ALOHA, CSMA Protocols, Collision-Free Protocols, Wireless LAN Protocols - Ethernet MAC Sublayer Protocol, 802.11 MAC Sublayer Protocol - Data Link Layer Switching, Uses of Bridges, Learning Bridges, Repeaters, Hubs, Bridges, Switches, Routers and Gateways.

UNIT III (9 Hrs)

NETWORK LAYER: Design Issues- Routing Algorithms, The Optimality Principle, Shortest Path Algorithm, Flood- ing, Distance Vector Routing, Link State Routing - Congestion Control Approaches, Traffic-Aware Routing, Admis-sion Control, Traffic Throttling, Load Shedding - Internetworking, Tunneling, Internetwork Routing, IPv4, IP Ad- dresses, IPv6.

UNIT IV (9 Hrs)

TRANSPORT LAYER: Services- Berkeley Sockets, Example - Elements of Transport Protocols Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, UDP – TCP Segment Header, Connection Establishment, Connection Release, Sliding Window, Timer Management - Congestion Control.

UNIT V (9 Hrs)

APPLICATION LAYER: DNS, E-Mail, WWW, Architecture, HTTP, Content Delivery, Server Farms and Web Prox- ies, Peer-To-Peer Networks, Firewalls - Intrusion Detection System - Network Security - Introduction to Cryptography, Substitution Ciphers, Transposition Ciphers, Public Key Algorithms, RSA, Symmetric Algorithm.

Text Books:

1. A.S.Tanenbaum and D.J.Wetherall, "Computer Networks" , Pearson, 6th Edition, 2021.
2. Behrouz A. Ferouzon "Data Communication and Networking with TCP/IP Protocol Suite", McGraw Hill, 6th Edition, 2022.

References:

1. J.F.Kurose and K.W. Ross, "Computer Networking: A Top-down approach", Pearson, 7th Edition , 2017.
2. Larry L. Peterson and Bruce S. Davie, "Computer Networks- A System Approach", Elsevier, 5th Edition, 2012.

ONLINE / NPTEL Courses:

1. Computer Networks: https://nptel.ac.in/courses/106105080
2. Emergence of Networks & Reference Models: https://nptel.ac.in/courses/106105081
3. Introduction on Computer Networks: https://nptel.ac.in/courses/106106091

CSPC502 DATABASE SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite:

- Knowledge in Engineering

Course Objective:

- To design and implement database schema, query languages for an application using RDBMS concepts such as transactions and concurrency control.

Course Outcomes:

- To understand RDBMS concepts.
- To design and develop database applications.
- To design ER-models to represent simple database application and improve the database design by normalization.
- To understand the working of database including data storage, indexing and query processing.
- To study non-relational and distributed database management systems with a focus on query optimization.

UNIT I: (9 Hrs)

INTRODUCTION: Introduction to Data Models (Relational, Semi structured, ER), Relational Data Model- Relational Algebra, Relational Calculus or Connection to First Order Logic (Optional).

UNIT II: (9 Hrs)

SQL INTERACTING WITH DATABASE: DDL, Insert/Delete/Update, Simple Queries (select/ project/ join/ aggregate queries), Complex queries (With Clause, Nested Sub queries, Views) - Programming in a standard language and interfacing with a DB backend.

UNIT III: (9 Hrs)

DATABASE DESIGN AND BIG DATA: Key-value Stores and Semi-structured Data, JSON and Mongo DB, other combinations. Introduction to ER model: Mapping from ER to relational model, Functional Dependencies, Normalization (BCNF, Optionally 3NF).

UNIT IV: (9 Hrs)

PHYSICAL DESIGN AND QUERY PROCESSING: Overview of Physical Storage (Hard Disks, Flash/SSD/RAM) – sequential vs random I/O, Reliability via RAID, Storage Organization (Records, Pages and Files) – Database Buffers, Database Metadata, Indexing, B+-Trees- Query Processing: External sort, Joins using nested loops, indexed nested loops.

UNIT V: (9 Hrs)

QUERY OPTIMIZATION AND TRANSACTION PROCESSING: Overview of Query Optimization - equivalent expressions, concept of cost based optimization, Concept of transactions and schedules, ACID properties, Conflict - Serializability, Concurrency control- locks, 2PL, Strict 2PL, optional- isolation level, Recovery using undo and redo logs.

Text Books:

1. Silberschatz, Korth and Sudarshan, "Database System Concepts", McGraw-Hill (Indian Edition released), 7th Edition, 2021.
2. RP Mahapatra, "Database Management Systems", Khanna Publishing House, 2020.
3. Krishnan, "Database Management Systems", McGraw Hill Higher Education, 3rd Edition, 2002.

References:

1. Relational algebra calculator: https://dbis-uibk.github.io/relax/landing
2. SQL: PostgreSQL/MySQL/MariaDB, or SQLite in browser
3. B+-tree visualization: https://www.cs.usfca.edu/ galles/visualization/BPlusTree.html
4. MongoDB
5. Various DB systems playground: https://www.pdbmbook.com/playground

ONLINE/NPTEL Courses:

1. Introduction to Database Systems: https://nptel.ac.in/courses/106106220
2. Databse Systems: https://nptel.ac.in/courses/106106095
3. Basic Database Queries: https://nptel.ac.in/courses/106104021

CSPC503 THEORY OF COMPUTATION

L	T	P	C
3	1	0	4

Course Pre-requisite:

- Discrete Mathematics, Digital Electronics and System, Design and Analysis of Algorithms

Course Objective:

- To learn the concepts of automata computation, decision problems with limitations of computational models, algebraic formalisms of languages.

Course Outcomes:

- To understand models and abstractions: automata as a basic model of computation
- To understand Link between languages, automata, and decision problems.
- To understand layering as a means of tackling complexity, layering applied to the Internet.
- To understand algebraic formalisms of languages such as regular expressions, context-free grammar.
- To understand algorithms and computability through the lens of Turing machines.

UNIT I (12 Hrs)

FINITE AUTOMATON: Alphabets, formal languages and problems. Regular languages and automata models- Deterministic Finite automaton, Formal argument of correctness, Regular languages -Properties of regular languages, Closure, properties, product construction, Limitations of Automata Nonregularity, Pumping Lemma, Non-Deterministic Finite Automaton, Subset construction, Equivalence with DFAs.

UNIT II (12 Hrs)

REGULAR EXPRESSIONS: Equivalence with regular languages- Algorithms for regular languages, Minimization and its algorithm. Myhill- Nerode relations, Characterization of regular languages.

UNIT III (12 Hrs)

GRAMMARS, CONTEXT-FREE LANGUAGES AND MACHINE MODELS: Grammars and the motivation from language theory- Context-free grammars, closure properties- Chomsky Normal Form for CFGs. PDAs - Empty-stack vs Final state acceptance conditions - Equivalence of PDAs and CFGs. Limitations of PDA computation, non-context-free language - Pumping Lemma for CFLs, Deterministic CFLs and PDAs, CYK Algorithm for parsing of CFLs.

UNIT IV (12 Hrs)

TURING MACHINES AND COMPUTABILITY: Modeling computation using Turing Machines - Equivalent models - Church Turing Hypothesis - Decidability and Turing recognizability (i.e., recursive and recursively enumerable)- Closure properties - Undecidability by diagonalization, Reductions to show undecidability.

UNIT V (12 Hrs)

RESOURCE BOUNDED TURING MACHINES & INTRO TO COMPLEXITY: Basic complexity classes- Time bounded classes Post's correspondence problem, undecidable problems, Polytime reductions, NP-completeness, Cook-Levin Theorem without proof.

Text Books:

1. Michael Sipser, "Introduction to the Theory of Computation", Cengage Publications, 3rd Edition 2012.
2. John Hopcroft, Rajeev Motwani, Jeffrey D. Ullmann, "Introduction to Automata, Theory, Languages and Computation".Pearson Publications, 3rd Edition, 2008.

References:

1. R.B. Patel, "Theory of Computation", Khanna Book Publishing, 2020.
2. Harry Lewis, Christos Papadimitriou, "Elements of the Theory of Computation", Prentice Hall, Pearson Publisher, 2nd Edition, 1997.

ONLINE/NPTEL Courses:

1. What is theory of computation? Set membership problem, basic notions like alphabet, strings, formal languages: https://nptel.ac.in/courses/106104028
2. Introduction- Theory of Computation: https://nptel.ac.in/courses/106104148
3. Grammers and Natural Language Processing: https://nptel.ac.in/courses/106106049

CSPC504 OPERATING SYSTEMS

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Programming Languages, Data Structures and Algorithms, Computer Organization and Architecture.

Course Objective:

- To learn the details of the abstractions, interfaces provided by the OS for program execution and execution requirements, processes, threads, memory management, files. To analyse concurrency and related synchronization based solutions.

Course Outcomes:

- To understand the role, functionality of the layering systems software components
- To understand the design and usage of the OS API and OS services.
- To understand process management, concurrency and thread introduction.
- To understand problems arising due to concurrency and related synchronization based solutions.
- To have Hands-on practical experience with usage of the OS API and basics of OS mechanisms.

UNIT I (9 Hrs)

INTRODUCTION TO OPERATING SYSTEMS: Application requirements, The systems stack and role of OS, resources, abstractions and interfaces, Components overview of an OS, Examples of different types of OS - Basic organization of hardware components, Von Neumann architecture -Processes: Process abstraction, Process Control Block (PCB),Design of system calls - Invocation and basic OS handling, Process control system calls, fork, wait, getpid, getppid and variants, The limited direct execution model.

UNIT II (9 Hrs)

MEMORY MANAGEMENT: Address bus and memory access, Memory view of a process, heap, stack, code, data - Process memory usage requirements, virtual memory and related system calls (mmap, munmap, sbrk, mprotect) -Address translation mechanisms: static mapping, segmentation, paging Page faults, page sharing, read/write permissions, swapping, process vs OS memory - Memory bookkeeping and management - motivation and mechanisms (process and OS) - Case studies: malloc and role of OS for program to process.

UNIT III (9 Hrs)

PROCESS MANAGEMENT AND CONCURRENCY: The process lifecycle, source code to execution, The OS mode of execution, limited direct execution recap, interrupts, system calls, switch mechanism and PCB state- Scheduling policies, scheduling metrics, goals and examples (interactive vs. real-time, priority)- Motivation, application, process and OS use cases- Introduction to threads and the pthread API.

UNIT IV (9 Hrs)

SYNCHRONIZATION: Synchronization primitives, limitations of software solutions, atomic Instructions, test-and-set, spinlocks, mutexes, condition variables, semaphores- Introduction to the pthread synchronization API- Case studies, producer-consumer, reader, writers, barriers- Discussion on issues with concurrency: race conditions, deadlocks, order violation.

UNIT V (9 Hrs)

FILE SYSTEMS: Persistence and the File abstraction, Hardware view- Hard disk architecture and its interfacing, Process view - System calls for file handling, Roles and responsibilities of file system, File system design details- file and file system metadata, directory structure, caching optimizations, File System case study (the Unix file system etc.).

Text Books:

1. Andrew S. Tannenbaum and Herbert Bos, "Modern Operating Systems", Pearson Education India, 4th Edition 2014.
2. Avi Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", Wiley India; John Wiley & Sons, 9th Edition, 2013.

References:

1. William Staling, "Operating Systems: Internals and Design Principles", Prentice Hall, 7th Edition, 2012.
2. D M Dhamdhere, "Operating Systems:A Concepts Based Approach", McGraw-Hill Education, 3rd Edition, 2017.

ONLINE/NPTEL Courses:

1. Introduction to Operating Systems: https://nptel.ac.in/courses/106106144
2. Operating System Fundamentals: https://nptel.ac.in/courses/106105214
3. Operating Systems: https://nptel.ac.in/courses/106108101

CSMC505 CONSTITUTION OF INDIA

L	T	P	C
3	0	0	0

Pre-requisite:

- Basic Knowledge of Indian History

Course Objective:

- To learn about the Constitution of India and the structure.

Course Outcomes:

- To create the awareness of The Constitution.
- To understand the structures, roles and functions of the Union Government.
- To understand the structures, roles and functions of the State Government.
- To understand the structures, roles and functions of the Local Administration.
- To understand about the Election Commission.

UNIT I

THE CONSTITUTION - INTRODUCTION: The History of the Making of the Indian Constitution, Preamble and the Basic Structure, and its interpretation, Fundamental Rights and Duties and their interpretation- State Policy Principles.

UNIT II

UNION GOVERNMENT: Structure of the Indian Union-President, Role and Power, Prime Minister and Council of Ministers, Lok Sabha and Rajya Sabha.

UNIT III

STATE GOVERNMENT: Governor, Role and Power, Chief Minister and Council of Ministers, State Secretariat.

UNIT IV

LOCAL ADMINISTRATION: District Administration, Municipal Corporation, Zila Panchayat.

UNIT V

ELECTION COMMISSION: Role and Functioning, Chief Election Commissioner, State Election Commission.

Text Books:

1. Dr. B. Mahadevan, Chinmaya Vishwa Vidyapeeth, Dr. Vinayak Rajat Bhat, Dr. Nagendra Pavana R.N., Chinmaya Vishwa Vidyapeeth, Dr. Anil Sahasrabudhe, Subhash Kak, Dr. S. Sadagopan, "Introduction to Indian Knowledge System: Concepts and Applications", IIIT Bangalore, 2022.

References:

1. DD Basu Lexis Nexis, "Introduction to the Constitution of India", 23rd Edition, 2018.
2. B.L. Fadia Sahitya Bhawan, "The Constitution of India", New Edition, 2017.
3. Rajeev Bhargava, "Ethics and Politics of the Indian Constitution", Oxford University Press, 2008.

CSPL501 COMPUTER NETWORKS LAB

L	T	P	C
0	0	4	2

Course Pre-requisite:

- Programming Language

Course Objective:

- Practice the tools like ping and trace route to explore various Internet paths to popular servers using NS-2/NS-3 simulator to evaluate performance of network under various conditions.

Course Outcomes:

- To understand the network configuration of the computer.
- To write socket programming for client server using TCP/UDP.
- To gain knowledge in how to Install and configure some network applications.
- To gain knowledge in how to use tools like ping and trace route to explore various Internet paths to popular server.
- To gain knowledge in how to use NS-2/NS-3 to simulate a mesh of at least 4 nodes and 3 links to evaluate performance under various conditions.

LIST OF EXPERIMENTS

1. Use Linux tools like ifconfig, dig, ethtool, route, netstat, nslookup, and ip to understand the networking configuration of the computer that the student is working on.
2. Check the connectivity of a computer using the ping command.
3. Print the computers that are forwarding the packets from your computer to the server using the command traceroute.
4. Mount the volume of a remote computer using the “net use” command.
5. Examine the packets in the network using Wireshark application.
6. Send messages from one machine to another machine using Socket.
7. Simulate a chatting application using Socket.
8. Implement File Transfer Protocol in Java language.
9. Examine the log files of a web server and find the frequently visited websites.
10. Analyse the Distance Vector Routing protocol in NS2.
11. Analyse the Link State Routing protocol in NS2.
12. Use a tool like Wireshark to capture packets and examine the packets
13. Implementation of a Program For CRC and Hamming Code for Error Handling.
14. Socket programming: write a simple client server program using TCP and UDP sockets.
15. Implementation of a socket program for Echo/Ping/Talk commands.
16. Use tools like ping and trace route to explore various Internet paths to popular servers.
17. Write a code simulating ARP /RARP protocols.

(Total Periods:45)

CSPL502 DATABASE SYSTEMS LAB

L	T	P	C
0	0	4	2

Course Pre-requisite:

- Programming language, Basic understanding of DBMS Concepts

Course Objective:

- Design and implement database schema for an application using DBMS concepts using query languages.

Course Outcomes:

- To design and implement database schema for an application using DBMS concepts.
- To write SQL queries for tasks of various complexities.
- To write an application program that uses a database system as the backend.
- To demonstrate the working of a DBMS including Data storage, indexing, Query processing, concurrency control and recovery mechanism.
- To illustrate an application development using MongoDB.

LIST OF EXPERIMENTS

1. Write SQL queries for various tasks. Platform can be PostgreSQL preferably, or MySQL.
2. Practice interfacing with a database from a program using connectors like JDBC/ODBC.
3. Simple exercises on MongoDB.
4. Exercise in ER design for an application starting with natural language description.
5. Convert ER design to tables.
6. Write a PL/SQL block to accept conditions as inputs from the user.
7. Write a PL/SQL block that handles all types of exceptions.
8. Examine query plans for sample queries by using the Explain feature of database systems.
9. Simple exercises to show benefit of indices.
10. Application Development Using MongoDB :Hospital Management System & Railway Reservation System.

(Total Periods:45)

CSPL503 OPERATING SYSTEMS LAB

L	T	P	C
0	0	4	2

Course Pre-requisite:

- Basic Programming language, Data Structures and Algorithms

Course Objective:

- The program execution and requirements processes, threads, memory management, files and to impart Hands-on practical experience in different OS concepts.

Course Outcomes:

- To understand the role, functionality and layering of the system software components.
- To understand the design and usage of OS API and OS services.
- To understand the details of the abstractions and interfaces provided by the OS for program.
- To understand problems arising due to concurrency and related synchronization based solutions.
- To demonstrate the usage of OS API and basics of OS services.

LIST OF EXPERIMENTS

1. Usage of tools — unix shell commands (file commands, ps, ls, top), text editor (nano, vi, gedit, emacs)
2. C programming language refresher — header files, compilation and linking using GCC, program execution, functions, argument passing, structures, pointers, file handling.
3. Usage of tools — GCC, GDB, Objdump, shell scripts
4. Simple strace usage to showcase different interfaces (stdlib, system call)
5. Tools usage — ps, pstree, top
6. Usage of process control system calls to identity process identifiers, create process hierarchies, launch new executables, control exit sequence of parent and child processes.
7. Familiarity with files in the / proc / pid/ directory
8. (Virtual) addresses of variables and initialized pointers.
9. Use of malloc() and demonstration of per-process virtual addresses
10. Tools usage — strace, free, top, htop, vmstat, /proc/pid/maps
11. Free memory statistics correlated with malloc(). Number of system calls and malloc() usage.
12. Implement a custom memory allocator using system calls
13. User mode programs to demonstrate LDE
14. Demonstration of process execution interleaving in different orders
15. Simulation based analysis of scheduling policies
16. Tools usage — nice/proc/pid/status
17. Creation of threads using the pthread API and modification of shared variables with and without Synchronization
18. Using spinlock, mutexes and condition variables to implement semaphores, barriers (using the threads API)

19. Implement solutions to the producer-consumer, readerwriters problems using the different synchronization primitives
20. Develop synchronization solutions for applications that use shared data (e.g., ordering of threads, concurrent hash tables, etc.)
21. Using shared memory and semaphores implement synchronized access to a shared memory area across processes (e.g., a message queue).
22. Command line tools usage - state, file, du, df, fsck
23. Implementation of file utilities (e.g., find, grep) using the system call API.
24. Implement a simple file system to handle files on an emulated disk (via a large file) — file system API, superblock, inode and data block management.

(Total Periods:45)

CSPC601 WEB TECHNOLOGY

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic Programming Language
- Computer Networks

Course Objectives:

- To introduce the basic concepts of web programming and internet protocol.To demonstrate the client-server model, uses of scripting languages,to create of web sites and develop simple web applications.

Course Outcomes:

- To understand HTML, CSS and JavaScript.
- To create simple PHP scripts.
- To design and deploy simple web-applications.
- To create simple database applications.
- To handle multimedia components

UNIT I (9 Hrs)

WEBSITE BASICS: Internet Overview - Fundamental computer network concepts, Web Protocols, URL, Domain Name- Web Browsers and Web Servers- Working principle of a Website, Creating a Website, Client side and server side scripting.

UNIT II (9 Hrs)

WEB DESIGNING: HTML – Form Elements, Input types and Media elements - CSS3, Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Multiple Column Layout, User Interface.

UNIT III (9 Hrs)

CLIENT-SIDE PROCESSING AND SCRIPTING: JavaScript Introduction – Variables and Data Types-Statements – Operators, Literals, Functions Objects, Arrays- Built-in Objects- Regular Expression, Exceptions, Event handling, Validation -JavaScript Debuggers.

UNIT IV (9 Hrs)

SERVER SIDE PROCESSING AND SCRIPTING: PHP - Working principle of PHP, PHP Variables, Constants, Operators, Flow Control and Looping - Arrays - Strings - Functions - File Handling - File Uploading, Email Basics - Email with attachments - PHP and HTML, Simple PHP scripts, Databases with PHP.

UNIT V (9 Hrs)

SERVLETS AND DATABASE CONNECTIVITY: Servlets- Java Servlet Architecture, Servlet Life cycle, Form GET and POST actions - Sessions – Cookies – Database connectivity – JDBC Creation of simple interactive applications, Simple database applications.

Text Books:

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", O'Reilly publishers, 3rd Edition, 2014.
2. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web - How to Program", Pearson Education, 5th Edition, 2012.
3. Jeffrey C. Jackson, "Web Technologies-A Computer Science Perspective", Pearson Education, 2006.

References:

1. James F. Kurose, "Computer Networking: A Top-Down Approach", Pearson Education, 6th Edition, , 2012.
2. Steven Holzener , "PHP – The Complete Reference", Mc-Graw Hill, 1st Edition, 2017.
3. Fritz Schneider, Thomas Powell , "JavaScript – The Complete Reference", McGraw Hill Publishers, 3rd Edition, 2017.

ONLINE/NPTEL Courses:

1. HTML: https://nptel.ac.in/courses/106104072

CSPC602 COMPILER DESIGN

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Programming Languages
- Formal Languages and Automata theory

Course Objective:

- To learn the process involved in functionality, translation and interpretation modules of a compiler.

Course Outcomes:

- To understand the basic components of a compiler and the role of Lexical Analyzer and parser.
- To understand different parsing techniques.
- To demonstrate the use of SDT in code generation.
- To apply code optimization techniques.
- To design and develop a simple code generator.

UNIT I (9 Hrs)

INTRODUCTION TO COMPILERS: Compiler, Interpreter, phases of Compilation, bootstrapping,cross-compilation, Lexical analysis, Regular Expressions (RE), Deterministic finite automata (DFA), Traversing a DFA for recognizing tokens, Generating a lexical analyzer using LEX/Flex, Parsing- Concept of parsing, CFG, Derivation, Parse tree, Ambiguity.

UNIT II (9 Hrs)

PARSING TECHNIQUES: Overview of top-down, bottom-up parsing, Handles and pruning, Introduction to shift reduce parsing, Constructing SLR parsing tables, SLR, CLR, LALR, Top-down parsing, Left factoring, Elimination of Left-recursion, Backtracking, Predictive parsing, Recursive descent parsing, LL(1) parsing, Generating a parser using a parser generator such as ANTLR, JavaC, YACC/BISON.

UNIT III (9 Hrs)

SYNTAX DIRECTED TRANSLATION: Syntax trees, S,L attributes definition, the need of semantic analysis, syntax directed translation schemes (SDTS), Intermediate Code generation, Intermediate forms,Polish notation & 3AC, types, Translation of assignment, Boolean expression & Flow of control statements.

UNIT IV (9 Hrs)

CODE OPTIMIZATION: Organization of code Optimizer, Basic blocks, flow graphs, Optimization of basic blocks, sources of optimization, DAG, Representation of Basic blocks, Global data flow analysis.

UNIT V (9 Hrs)

CODE GENERATION: Machine dependent code generation, The target machine, Simple code generator, Register allocation and assignment, Peephole Optimization.

Text Books:

1. Alfred V.Aho, Lam, Ravi Sethi, and Jeffrey D. Ullman, "Compilers: Principles, Techniques, and Tools", Addison-Wesley, 2nd Edition, 2006.

References:

1. Andrew Appel and Jens Palsberg, "Modern Compiler Implementation in Java", Cambridge University Press, 2nd Edition, 2002.

ONLINE/NPTEL Courses:

1. Overview of Compiler: https://nptel.ac.in/courses/106108113
2. Compiler Design: https://nptel.ac.in/courses/106105190

CSPC603 DISTRIBUTED COMPUTING SYSTEM

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Computer Networks
- Operating System

Course Objective:

- To familiarize with concepts of distributed computing, including its models, system architectures, communication protocols and fault tolerance mechanisms.To learn the agreement protocols and introduce the basic cloud computing concepts.

Course Outcomes:

- To explain the foundations of distributed systems.
- To solve synchronization and state consistency problems.
- To understand resource sharing techniques in distributed systems.
- To apply working model of consensus and reliability of distributed systems.
- To explain the fundamentals of cloud computing.

UNIT I: (9 Hrs)

INTRODUCTION: Definition- Relation to Computer System Components, Motivation, Message, Passing Systems versus Shared Memory Systems, Primitives for Distributed Communication, Synchronous versus Asynchronous Executions, Design Issues and Challenges, Model of Distributed Computations - Distributed Program, Model of Distributed Executions, Models of Communication Networks, Global State of Distributed System.

UNIT II: (9 Hrs)

LOGICAL TIME AND GLOBAL STATE: Logical Time - Physical Clock Synchronization - NTP, Framework for a System of Logical Clocks, Scalar Time, Vector Time, Message Ordering and Group Communication - Message Ordering Paradigms, Asynchronous Execution with Synchronous Communication, Synchronous Program Order on Asynchronous System, Group Communication, Causal Order, Total Order, Global State and Snapshot Recording Algorithms - Introduction, System Model and Definitions, Snapshot Algorithms for FIFO Channels.

UNIT III: (9 Hrs)

DISTRIBUTED MUTEX AND DEADLOCK: Distributed Mutual exclusion Algorithms - Introduction, Preliminaries, Lamport's algorithm, Ricart, Agrawala's Algorithm, Token-Based Algorithms, Suzuki-Kasami's Broadcast Algorithm, Deadlock Detection in Distributed Systems- Introduction, System Model, Preliminaries, Models of Deadlocks, Chandy - Misra - Haas Algorithm for the AND model and OR Model.

UNIT IV: (9 Hrs)

CONSENSUS AND RECOVERY: Consensus and Agreement Algorithms- Problem Definition, Overview of Results, Agreement in a Failure, Free System(Synchronous and Asynchronous), Agreement in Synchronous Systems with Failures, Checkpointing and Rollback Recovery- Introduction, Background and Definitions, Issues in Failure Recovery, Checkpoint - based Recovery, Coordinated Checkpointing Algorithm, Algorithm for Asynchronous Checkpointing and Recovery.

UNIT V: (9 Hrs)

CLOUD COMPUTING: Definition of Cloud Computing, characteristics of Cloud, Cloud Deployment Models, Cloud Service Models, Driving Factors and Challenges of Cloud, virtualization, Load Balancing, scalability and elasticity, replication, monitoring, cloud Services and platforms - Compute Services, storage Services, Application Services.

Text Books:

1. Rajiv Misra and Yashwant Singh Patel, "Cloud and Distributed Computing : Algorithms and Systems", Wiley Emerging Technology series, 2020.
2. Arshdeep Bagga and Vijay Madisetti, "Cloud Computing - A Hands on Approach", Universities Press, 2014.
3. Kshemkalyani Ajay D and Mukesh Singhal, "Distributed Computing - Principles, Algorithms and Systems", Cambridge Press, 2011.
4. Coulouris George, Dollimore Jean, et al, "Distributed Systems Concepts and Design", Pearson Education, 5^{th} Edition, 2017.

References:

1. Tanenbaum A S and Van Steen M, "Distributed Systems", 4^{th} Edition, 2023
2. Liu M L, "Distributed Computing - Principles and Applications", Pearson Education, 2004.

ONLINE/ NPTEL Courses:

1. Distributed Computing Systems- Basic Concepts: https://nptel.ac.in/courses/106106107
2. Cloud Computing and Distributed Systems: https://nptel.ac.in/courses/106104182
3. Cloud computing: https://nptel.ac.in/courses/106105167

CSPC604 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

L	T	P	C
3	1	0	4

Course Pre-requisite:

- Basic Mathematics, Basic programming knowledge.

Course Objective:

- To understand various machine learning concepts, artificial intelligence and neural networks.

Course Outcomes:

- To use appropriate search algorithms for problem solving.
- To apply reasoning under uncertainty.
- To build supervised learning models.
- To build ensembling and unsupervised models.
- To build deep learning neural network models.

UNIT I: (12 Hrs)

INTRODUCTION TO AI: AI Applications- Problem solving, Problem solving agents, Search Algorithms, Uninformed Search Strategies, Heuristic search strategies, Local Search and Optimization Problems, Adversarial Search, Constraint Satisfaction Problems (CSP).

UNIT II: (12 Hrs)

KNOWLEDGE AND REASONING: Logical Agents, First Order Logic, Knowledge representation, planning, Acting under uncertainty, Bayesian inference, Na¨ıve Bayes models- Probabilistic reasoning, Bayesian networks, Exact inference in BN, Approximate inference in BN, Causal networks.

UNIT III: (12 Hrs)

SUPERVISED LEARNING: Introduction to Machine Learning, Linear Regression Models- Least Squares, Sin- gle & Multiple Variables, Bayesian linear regression, Gradient Descent, Linear Classification Models- Discriminant function, Probabilistic Discriminative Model, Logistic Regression, Probabilistic Generative model, Support Vector Machine, Decision Tree, Random Forest Algorithm.

UNIT IV: (12 Hrs)

ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING: Combining Multiple Learners- Model Combination Schemes, Voting - Ensemble Learning, Bagging, Boosting, stacking, Unsupervised learning- K-means, Instance Based Learning: KNN, Gaussian Mixture Models and Expectation Maximization.

UNIT V: (12 Hrs)

NEURAL NETWORKS: Perceptron, Multilayer Perceptron, Activation functions, Network Training, Gradient Descent Optimization, Stochastic Gradient Descent, Error Back Propagation, Shallow Networks to Deep Networks, Unit Saturation , ReLU, Hyperparameter Tuning, Batch Normalization, Regularization, Dropout.

Text Books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education, 4th Edition, 2021.
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 4th Edition, 2020.
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

References:

1. Mariusz Flasiński, "Introduction to Artificial Intelligence", Springer, 2021.
2. Russell/Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 4th Edition, 2022.
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016
4. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014
5. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013
6. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.

ONLINE/ NPTEL Courses:

1. An Introduction to Artificial Intelligence: https://nptel.ac.in/courses/106102220
2. Introduction to Machine Learning: https://nptel.ac.in/courses/106105152
3. Machine Learning for Engineering and Science Applications: https://nptel.ac.in/courses/106106198

CSPL601 WEB TECHNOLOGY LAB

L	T	P	C
0	0	4	2

Course Objectives:

- To practice HTML design and development of client side program in Javascript. To apply various server side scripting.

Course Outcomes:

- To understand HTML design and development of client side program in Javascript.
- To develop web applications using JavaScript, HTML and CSS.
- To apply Server side scripting using JSP.
- To validate the application using PHP.
- To develop an E-commerce applications using Scripting languages.

LIST OF EXPERIMENTS

1. Creation of college website using HTML.
2. Implementation of various types of CSS.
3. Implementation of Client Side Scripting using JavaScript.
4. Implementation of Server Side Scripting to Session and Application objects using Servlets.
5. Implement Database Connectivity using JSP.
6. Configuration of web servers: Apache and Internet Information Server(IIS).
7. Validate a form using PHP regular expression.
8. Developing E-commerce application.

(Total Periods:45)

CSPL602 COMPILER DESIGN LAB

L	T	P	C
0	0	4	2

Course Objective:

- To practice the test-cases in MMC and then inspect the generated code.
- To learn parser to parser program.

Course Outcomes:

- To understand the test-cases in MMC and then inspect the generated code.
- To understand lexer to recognize valid tokens.
- To understand parser to parser program.
- To understand type-checker for a syntactically correct input MMC program.

LIST OF EXPERIMENTS

1. Write a Lex Program to scan reserved word & Identifiers of C Language
2. Generate Yacc specification for a few syntactic categories.
   (a) Program to recognize a valid arithmetic expression that uses operator +,-, * and /.
   (b) Program to recognize a valid variable which starts with a letter followed by any number of letter or digits.
   (c) Implementation of calculator using lex and yacc.
3. Implement Predictive Parsing algorithm
4. Implement SLR(1) Parsing algorithm
5. Design LALR bottom up parser for the given language
6. Write a program for implementing the functionalities of predictive parser for a mini language
7. Write a program for constructing of LL (1) parsing.
8. Write a program for constructing recursive descent parsing.
9. Convert the bnf rules into yacc form and write code to generate abstract syntax tree.
10. Write a program to generate three address code.
11. Implementation of simple code optimization techniques.

(Total Periods:45)

CSPC701 CYBER SECURITY

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic Programming Language, Computer Networks

Course Objective:

- To learn the importance of cyber security and various attacks on digital systems.To explore various vulnerabilities in web applications, networks and Internet Infrastructure.

Course Outcomes:

- To understand the importance of cyber security.
- To understand the concepts of authentication, authorization and privileges of Cyber security.
- To acquire knowledge about security in application layer and its mitigation techniques.
- To understand perimeter protection and Intrusion detection system.
- To explore various malware and its analysis.

UNIT I (9 Hrs)

INTRODUCTION TO CYBER SECURITY: Introduction and basic Terminology Cyber Security and CIA Triad, Cyber Threats to CIA, Cyber-Attack surfaces, Recent Cyber- Security incidents and high-level analysis - Basic Cryptography - Role of Cryptography in ensuring confidentiality for data at rest, data in motion, and data in process - Symmetric and Asymmetric Cryptography, Needs, Symmetric and Asymmetric algorithm outlines (RSA, DH, DES, AES) - Role of cryptography in Data Integrity, non-repudiation Hashing and Digital Signature - hash function (MD5, SHA-256), Understanding digital signature and its role, Digital Certificate and PKI - Importance of the role of a proper Pseudo Random Number Generator.

UNIT II (5 Hrs)

AUTHENTICATION, AUTHORIZATION AND PRIVILEGE: Importance of strong Authentication – distinction between authorization and authorization - importance of authorization-access control – Mandatory and Discretionary Access control - role based authorization – privilege and privilege escalation.

UNIT III (13 Hrs)

APPLICATION SECURITY: Application Security- Basic application vulnerabilities (Buffer overflow, Integer Overflow, format string vulnerability) – Basic mitigations of buffer overflow – platform bases – compiler based, secure programming practice - Web Client Security, Same Origin Principle – DOM, Java Script Vulnerability – Cookies and Cookie Attributes Secure, http only–Concept of session and session ID– Session hijacking vulnerability–http vs. https and SSL/TLS and version issue - Web Server Security – XSS, CSRF, SQL Injection, Command Injection concepts.

UNIT IV (9 Hrs)

PERIMETER PROTECTION AND INTRUSION DETECTION: Vulnerabilities in DNS, Routing and IP protocols especially in IPv4 and suggested remedies with DNSSEC, S-BGP, and IPSec - Perimeter Protection And Intrusion Detection- Host Intrusion Detection techniques, To look for and how an SIEM tool can consolidate such indicators into a management console- Network Intrusion Detection – signature based vs. behavior based, Snort, Intrusion Detection System.

UNIT V (9 Hrs)

BASIC MALWARE ANALYSIS: Firewall vs. Intrusion detection tool – Firewall rules and customization techniques. Basic Malware Analysis- Various malware classes and their characteristics - Difference between static analysis and dynamic analysis - Signature vs. behavioral detection techniques.

Text Books:

1. Debtoru Chatterjee, "Cyber Crime and its Prevention in Easy Steps", Khanna Publishing House, 2022.
2. Debtoru Chatterjee, "Cyber Attacks and Counter-Measures Made Simple", Khanna Publishing House, 2022.
3. Ross J. Anderson, "Security Engineering", Wiley, 3rd Edition, 2020.
4. William Stallings, "Cryptography and Network Security", Pearson Education, 7th Edition, 2017.

References:

1. D Stuttard and M Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", Wiley publisher, 2011.
2. Peter Kim, "The Hacker Playbook: Practical Guide to Penetration Testing (vol. 1 and 2)", Createspace Independent Pub, 2015.
3. Jeeva Jose, "Introduction to Security of Cyber-Physical Systems", Khanna Publishing, 1st Edition, 2022.
4. Er.Harsh Bothra, "Mastering Hacking The Art of Information Gathering & Scanning", Khanna Book Publishing House, 1st Edition, 2019.

CSBS702 BIOLOGY

L	T	P	C
2	1	0	3

Course Objective:

- To discuss the concepts of molecular taxonmony, genetics laws, metabolism, BioMolecules, Microbiology with its importance and classifications are discussed.

Course Outcomes:

- To understand the underlying criteria, such as morphological, biochemical and ecological.
- To understand the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring.
- To explore all forms of life have the same building blocks and yet the manifestations are asdiverse as one can imagine.
- To understand the enzyme action and factors affecting their activity.
- To identify and classify microorganisms.

UNIT I (9 Hrs)

CLASSIFICATION: Classification outline based on (a) cellularity- Unicellular or multicellular (b) ultra structure prokaryotes or eukaryotes (c) Energy and Carbon utilisation - Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitats- acquatic or terrestrial.

UNIT II (9 Hrs)

GENETICS: Mendel's laws, Concept of segregation & independent assortment. Concept of allele. Recessiveness, and dominance. Single gene disorders in humans – Sickle cell disease, Phenylketonuria

UNIT III (9 Hrs)

BIOMOLECULES : Carbohydrates: Types, Structural & functional importance. Lipids: Classification - Simple, compound, & derived, Importance of lipid soluble vitamins. Amino acids – general structure, essential amino acids. Proteins - Levels of protein structure, structural & functional importance of proteins, Enzymes- Definition, Enzyme Activity & Units, Specific Activity, Specificity, Factors affecting enzyme activity. Nucleic acids: Types and importance.

UNIT IV (9 Hrs)

METABOLISM: Introduction: Food chain & energy flow. Definitions - Anabolism & Catabolism. Photosynthesis: Reaction and importance. Glycolysis & TCA cycle. ATP – the energy currency of cells.

UNIT V (9 Hrs)

MICROBIOLOGY: Concept of single celled organisms. Concept of species & strains. Identification & classification of microorganisms. Virus – Definition, types, examples.

References:

1. Campbell, N.A., Reece, J.B, Urry, Lisa, Cain, M,L, Wasserman, S.A, Minorsky, P.V, Jackson, R.B, "Biology: A global approach", Pearson Education, 12th Edition, 2020.
2. E.E. Stumpf, P.K; Bruening, G; Doi, R.H, "Outlines of Biochemistry", Conn, John Wiley and Sons, 5th Edition, 2016.
3. David L. Nelson, "Principles of Biochemistry", 7th Edition, 2021.
4. Stent, G. S.,Satish Kumar Jain and Calender, "Molecular Genetics", Freeman and company, CBS Publisher, 2010
5. Amita Jain, Jyotsna Agarwal, et al., "Microbiology", 2018.

CSPL701 CYBER SECURITY LAB

L	T	P	C
0	0	4	2

Course Pre-requisite:

- Programming Language , Computer Networks

Course Objective:

- To practice the library functions to use RSA, AES, SHA- 256 and show the result of encryption, Hashing etc.

Course Outcomes:

- To understand the library functions to use RSA, AES, SHA- 256 and show the result of encryption, Hashing etc.
- To practice to use digital certificate and show the various components and their significance.
- To practice to install Wazuh, snort and monitor a host.
- To practice Basic malware functions and indicators of compromise.
- To understand and apply the security techniques in simulation environment and security tools.

LIST OF EXPERIMENTS

1. Using library functions to use RSA, AES, SHA- 256 and show the result of encryption, Hashing etc.
2. Taking apart a digital certificate and show the various components and their significance.
3. Exercise on 2 factor authentication
4. Exercise on privilege escalation example
5. Buffer overflow, integer overflow and format string vulnerability testing in vulnerable applications.
6. DVWA based command injection. SQL injection, XSS and CSRF.
7. To install Wazuh and monitor a host.
8. To install snort and monitor a network.
9. Use static analysis tools to find how an executable can be analyzed.

(Total: 45 Periods)

CSPROJ703 CAPSTONE PROJECT I

L	T	P	C
0	0	12	6

Course Pre-requisite:

- Mini project

Course Objective:

- To gain domain knowledge, technical skills to solve potential business/research problems and to prepare the project reports and presentation.

Course Outcomes:

- To understand Domain knowledge and technical skill set required for solving industry / research problems.
- To provide solution architecture, module level designs, algorithms.
- To implement, test and deploy the solution for the target platform.
- To prepare detailed technical report, demonstrate and present the work.
- To publish work in reputed indexing journal or patent.

Project Guidelines:

The students shall individually / or as group work(3 to 4 members) on business/research domains and related problems approved by the Department / Organization that offered the project.

The student can select any topic which is relevant to his/her specialization of the programme. The student should continue the work on the selected topic as per the formulated methodology.

At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work, results and discussion, conclusion and references should be prepared as per the format prescribed by the University and submitted to the Head of the department.

The students will be evaluated based on the report and viva-voce examination by a panel of examiners as per the Regulations.

CSPROJ801 CAPSTONE Project II

L	T	P	C
0	0	12	6

Course Pre-requisite:

- Mini project
- CapStone Project I

Course Objective:

- To gain domain knowledge, technical skills to solve potential business/research problems.To publish work in indexed journal/patent and prepare reports and presentation.

Course Outcomes:

- To gain domain knowledge and technical skill set required for solving industry / research problems.
- To provide solution architecture, module level designs, algorithms.
- To implement, test and deploy the solution for the target platform.
- To prepare detailed technical report, demonstrate and present the work.
- To publish work in reputed indexing journal or patent.

Project Guidelines:

The students shall individually / or as group work(3 to 4 members) on business/research domains and related problems approved by the Department / organization that offered the project.

The student can select any topic which is relevant to his/her specialization of the programme. The student should continue the work on the selected topic as per the formulated methodology.

At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work, results and discussion, conclusion and references should be prepared as per the format prescribed by the University and submitted to the Head of the department. The students will be evaluated based on the report and viva-voce examination by a panel of examiners as per the Regulations.

CSH01 PROGRAMMING WITH C++

L	T	P	C
3	1	0	4

Course Pre-requisite:

- Basic programming language

Course Objective:

- To learn C++ programming concepts using constructors, inheritance, polymorphism, virtual functions, files, pointers and exception handling.

Course Outcomes:

- To understand the basic concepts of object-oriented programming.
- To explore the structure of classes, objects, memory and operators.
- To explore various types of inheritance and virtual functions.
- To understand the file stream classes, manipulators and pointers.
- To explore knowledge in templates and exception handling.

UNIT I (12 Hrs)

INTRODUCTION: : Introduction to object-oriented programming- Structure, Characteristics. C++ Declarations, Types, Datatypes, Operators, Typecasting- Functions – Operator Overloading, Function overloading, Inline functions.

UNIT II (12 Hrs)

CLASSES AND OBJECTS: : Structures and Classes, Classes and Constructors, Destructors, complex class, this pointer, Overloading Unary Operators- Objects and Memory Structure- Class Intricacies- Static and Dynamic Memory Allocation, Static members, Overloaded/Copy Constructors.

UNIT III (12 Hrs)

INHERITANCE & POLYMORPHISM: Inheritance – uses, Constructors in Inheritance- Types of inheritance – Polymorphism – Virtual functions, Abstract class, Function Binding, Virtual Base Class.

UNIT IV (12 Hrs)

FILES AND POINTERS: I/O stream classes, Manipulators – Files with I/O streams, File opening models, Error handling during I/O, Interaction with File System – Typecasting – Pointers to Members.

UNIT V (12 Hrs)

TEMPLATES AND EXCEPTION HANDLING: Templates- Function, Class Templates, Standard Template library, Applications – Exception handling – User Defined Exception.

Text Books:

1. Yashwant Kanetker, "Let Us C ++", BPB publishers, 2021.
2. Balagurusamy, E, "Object-Oriented Programming with C++", 8th Edition, 2020.

References:

1. Ashok N.Kamthane, "Object Oriented Programming with ANSI and Turbo C++", Pearson Edition, 2011.
2. Deitel & Deitel, C++ How to program, Prentice Hall, 8^{th} Edition, 2011.

ONLINE/NPTEL Courses:

1. Data Structure: https://nptel.ac.in/courses/106105080
2. Object oriented: https://onlinecourses.swayam2.ac.in/aic20_sp01

CSH02 SYSTEM SOFTWARE

L	T	P	C
3	1	0	4

Course Pre-requisite:

- Basic understanding of Computers.
- Computer Organization and Architecture.

Course Objectives:

- To understand the design principles of assemblers, linkers, loaders and system software tools.

Course Outcomes:

- To understand the system software concepts and its architectures.
- To understand the functions of assemblers and its features.
- To understand the design and implementation of linkers and loaders.
- To understand the concepts of macroprocessors.
- To understand the system software tools.

UNIT I (12 Hrs)

INTRODUCTION: System software and Machine Architecture – The Simplified Instructional Computer (SIC) - Machine architecture - Data and Instruction formats - Addressing modes - Instruction sets - I/O and Programming.

UNIT II (12 Hrs)

ASSEMBLERS: Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers - Implementation example - MASM assembler.

UNIT III (12 Hrs)

LOADERS AND LINKERS: Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features - Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker.

UNIT IV (12 Hrs)

MACRO PROCESSORS: Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters-Macro within Macro-Implementation example - MASM Macro Processor – ANSI C Macro language.

UNIT V (12 Hrs)

SYSTEM SOFTWARE TOOLS: Text editors - Overview of the Editing Process - User Interface – Editor Structure. - Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria.

Text Books:

1. Leland L. Beck, "System Software – An Introduction to Systems Programming",Pearson Education Asia, 3rd Edition, 2000.

REFERENCES:

1. D. M. Dhamdhere, "Systems Programming and Operating Systems", Tata McGraw-Hill, 2nd Edition, 1999.
2. John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 1972.

ONLINE/NPTEL Courses:

1. System Software: https://nptel.ac.in/courses/106105080 https://nptel.ac.in/courses/106105214

CSH03 UNIX AND SHELL PROGRAMMING

L	T	P	C
3	1	0	4

Course Pre-requisite:

- Basic programming language

Course Objectives:

- To learn unix and shell programming for handling files, filters and process.

Course Outcomes:

- To understand the basics of Unix commands and File directories.
- To demonstrate simple effective user interfaces using Shell commands.
- To explore knowledge in filters.
- To demonstrate the Shell script commands and debugging.
- To analyses the types processes and external commands.

UNIT I (12 Hrs)

INTRODUCTION TO UNIX: History - Unix Components - Using Unix - Commands in Unix - Some Basic Commands - Command Substitution - Giving Multiple Commands, File system – Basics of Files - File - Directories and File Names-Permissions - I Nodes- Directory Hierarchy, File Attributes and Permissions - File Command knowing the File Type - Chmod Command Changing File Permission.

UNIT II (12 Hrs)

USING THE SHELL: Command Line Structure - Met Characters - Creating New Commands - Command Arguments and Parameters - Program Output as Arguments - Shell Variables - More on I/O Redirection - Looping in Shell Programs.

UNIT III (12 Hrs)

FILTERS: Grep Family-Other Filters-Stream Editor Sed- AWK Pattern Scanning and processing Language-Good Files and Good Filters.

UNIT IV (12 Hrs)

SHELL PROGRAMMING: Shell Variables- Export Command- First Shell Script- Read Command-Positional parameters-Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures- Continue and Break Statement- Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs- Document-Sleep Command-Debugging Scripts- Script Command- Eval Command- Exec Command.

UNIT V (12 Hrs)

THE PROCESS: Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background Processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control.

Text Books:

1. M.G.Venkateshmurthy, "Introduction to Unix Shell Programming", Pearson Education, 2009.
2. Brian W. Kernighan & Rob Pike, "The Unix Programming Environment", Pearson Education, 1st Edition, 2015.

References:

1. Sumitabha Das, "Unix Concepts and Application", McGraw Hill, 4th Edition, 2017.
2. B.M.Harwani, "Unix and Shell programming", Oxford University press, 2013.

ONLINE/NPTEL Courses:

1. Unix & Shell: https://nptel.ac.in/courses/117106113

CSH04 COMPUTER GRAPHICS

L	T	P	C
3	1	0	4

Course Pre-requisite:

- Basic Computer Knowledge

Course Objectives:

- To learn basic graphic functions to represent 2D,3D geometric transformations using OpenGL library functions.

Course Outcomes:

- To understand the basic graphic functions and graphic output primitives.
- To understand 2D geometric transformations and viewing functions
- To understand 3D geometric transformations and viewing functions
- To explore OpenGL library functions.
- To understand colour representations, lighting models.

UNIT I (12 Hrs)

GRAPHIC OUTPUT PRIMITIVES: Absolute and Relative coordinate Specifications Point Function, Line Function, Line Drawing Algorithms, DDA, Bresenham's Line drawing algorithms- curve functions, Circle-Generating Algorithms- Midpoint Circle Algorithms, Ellipse Generating Algorithms, Midpoint Ellipse Algorithm- Polygon fill Area functions, Vertex Array, Pixel Array, bitmap, pixmap, Character Function.

UNIT II (12 Hrs)

TWO DIMENSIONAL GEOMETRIC TRANSFORMATIONS: Matrix Representations and Homogeneous Coordinates, Composite Transformations; 2D Viewing – Viewing Pipeline, Viewing coordinate, Reference frame; Window- to-View port coordinate Transformation, Two Dimensional Viewing Functions; Clipping Operations – Point, line, and Polygon Clipping Algorithms.

UNIT III (12 Hrs)

THREE-DIMENSIONAL GRAPHICS: 3D object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; 3D viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNIT IV (12 Hrs)

OPENGL LIBRARIES: Graphics Programming Interfaces- Graphics pipeline- Shades – programming Shaders- data flow in the programmable pipeline, OpenGL and GLSL version, OpenGL Extensions, Functions of GLSL, Efficiency of different drawing methods.

UNIT V (12 Hrs)

COLOUR REPRESENTATION & LIGHTING MODELS: Greyscale representation and intensities, colour models and spaces, colour interpolation-Lightning Models- light sources of local illumination, reflection by Phong, shading, shadows,opacity and transparency- Texture process.

Text Books:

1. Donald Hearn, M.Pauline Baker, and Warren Carithers, "Computer Graphics with OpenGL", Pearson Education, 4th Edition, 2013.
2. Karsten Lehn , Merijam Gotzes , Frank Klawonn, "Introduction to Computer Graphics: Using OpenGL and Java", Springer, 3rd Edition, 2023.

References:

1. James D. Foley, "Computer Graphics: Principles and Practice", Pearson Education, 2nd Edition, 2021.
2. John F Hughes, Andries Van Dam, Morgan McGuire, David F Sklar, James D Foley, Steven K Feiner and Kurt Akeley, "Computer Graphics", 2018.

ONLINE/NPTEL Courses:

1. Computer Graphics: https://onlinecourses.nptel.ac.in/noc21_cs97

CSH05 DIGITAL IMAGE PROCESSING

L	T	P	C
3	1	0	4

Course Objectives:

- To understand the concepts of Image Processing and to design applications.

Course Outcomes:

- To understand the fundamentals of image processing.
- To understand the image processing operations and transformations.
- To understand the image enhancement and restoration techniques.
- To understand various image compression techniques.
- To understand the aspects of image segmentation.

UNIT I (12 Hrs)

DIGITAL IMAGE FUNDAMENTALS: Nature of Image Processing and Its Applications – Image Representations – Image Types – Image Processing Operations – Image Acquisition – Image Sampling and Quantization – Image Quality –Image Storage and File Formats

UNIT II (12 Hrs)

IMAGE PROCESSING OPERATIONS: Need for Image Transforms – Fourier Transforms and Its Properties – Haar, slant, Hadamard Transforms and Its Applications.

UNIT III (12 Hrs)

IMAGE ENHANCEMENT AND RESTORATION: Need for Enhancements – Point operations – Histogram Techniques – Spatial filtering concepts – Frequency Domain Filtering – Image Smoothening – Image Sharpening - Image degradation and Noise Models – Introduction to Restoration Techniques.

UNIT IV (12 Hrs)

IMAGE PROCESSING ACTIVITIES: Image Compression: Compression Models and Measures – Coding Types – Types of Redundancy –Lossless Compression Algorithms – Lossy Compression Algorithms – Introduction to Compression Standards.

UNIT V (12 Hrs)

IMAGE SEGMENTATION: Detection of Discontinuities – Edge Detection – Thresholding –Region Based Segmentation – Introduction to Color Image Processing – Introduction to Morphological Operations and Image Processing Framework.

Text Books:

1. S. Sridhar, “Digital Image Processing”, Oxford Press, 1st Edition, 2011

References:

1. Anil Jain K, “Fundamentals of Digital Image Processing”, Prentice-Hall of India, 1989.
2. Sid Ahmed, “Image Processing”, McGraw-Hill, 1995.

ONLINE / NPTEL Courses:

1. Digital Image Processing of Remote Sensing Data:https://nptel.ac.in/courses/105107160
2. Computer Vision and Image Processing - Fundamentals and Applications: https://nptel.ac.in/courses/108103174

CSM01 DATA STRUCTURES

L	T	P	C
3	1	0	4

Course Pre-requisite:

- Basic knowledge of programming

Course Objective:

- To familiarize with basic data structures and their use in fundamental algorithms.

Course Outcomes:

- To understand the different concepts of data structure.
- To apply data structure in searching and sorting techniques.
- To understand the advanced data structures.
- To understand the performance of the algorithms.
- To understand the suitability of techniques for the given problems.

UNIT I (12 Hrs)

INTRODUCTION: Algorithmic Notation - Big Oh - Analyzing Algorithms. Arrays: One Dimensional, Multidimensional Array, Pointer Arrays. Linked List: Singly, Doubly and Circular Linked Lists.

UNIT II (12 Hrs)

SEARCHING AND SORTING: Linear Search, Binary Search, and Fibonacci Search. Sorting: Insertion Sort, Selection Sort, Bubble Sort and Heap Sort. Radix Sort, Bucket Sort, Shell Sort.

UNIT III (12 Hrs)

STACKS, QUEUES AND LINKED DATA STRUCTURES: Stacks: Definition – Operations - Applications of Stack. Queues: Definition - Operations – Priority Queues - De Queues – Applications of Queue. Linked Stacks, Linked Queues, Applications of Linked List – Dynamic Storage Management.

UNIT IV (12 Hrs)

TREES AND GRAPHS: Binary Tree, Terminology, Representation, Traversals, Applications – Binary Search Tree –Graph: Terminology, Representation, Traversals – Applications - Spanning Trees, Shortest Path And Transitive Closure, Topological Sort.

UNIT V (12 Hrs)

DIVIDE AND CONQUER, GREEDY METHOD: Divide and Conquer: General Method – Binary Search – Maximum and Minimum – Merge Sort – Quick Sort. Greedy Method: General Method – Knapsack Problem – Minimum Spanning Tree Algorithms – Single Source Shortest Path Algorithm.

Text Books:

1. D.Samanta, “Classic Data Structures”, MaakZoo Publisher, 2nd Edition, 2023.
2. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures”, Galgotia Book Source, Pvt. Ltd., 2004.

References:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Galgotia Publications Pvt. Ltd., 2008.

ONLINE/NPTEL Courses:

1. Introduction to data Structures and Algorithms: https://archive.nptel.ac.in/courses/106/102/106102064
2. Introduction to Programming, Data Structures and Algorithms Using Python: https: //onlinecourses. nptel.ac.in/noc2 3 cs15
3. Programming, Data Structures and Algorithms using Python for beginners: https: //nptel.ac.in /courses/106106145

CSM02 PRINCIPLES OF OPERATING SYSTEM

L	T	P	C
3	1	0	4

Course Pre-requisite:

- Basic computer knowledge

Course Objective:

- To learn the different functionalities of the operating systems.

Course Outcomes:

- To demonstrate and understand of computers and operating systems functions.
- To understand process management functions.
- To solve synchronization and deadlock problems.
- To compare various memory management schemes.
- To explain file systems concepts and i/o management.

UNIT I (12 Hrs)

INTRODUCTION TO COMPUTER AND OPERATING SYSTEM: Computer System Organization, Architecture – Operating System Structure, Operations – Process, Memory, Storage Management, Protection and Security – Computing Environments – Operating System Services – User Operating System Interface – System Calls – Types, System Programs, OS Structure, OS Generation, System Boot.

UNIT II (12 Hrs)

PROCESS, THREADS AND SCHEDULING: Process Concept – Scheduling, Operations on Processes – Cooperating Processes, Inter-Process Communication – Threads - Multithreading Models, Thread Libraries, Threading Issues, Scheduling Criteria, Scheduling Algorithms, Algorithm Evaluation.

UNIT III (12 Hrs)

PROCESS SYNCHRONIZATION AND DEADLOCKS: The Critical-Section Problem – Peterson's Solution – Synchronization Hardware – Mutex Locks - Semaphores – Classic Problems of Synchronization– Critical Regions – Monitors –Deadlocks – System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock.

UNIT IV (12 Hrs)

MEMORY MANAGEMENT: Introduction - Swapping – Contiguous Memory Allocation – Paging – Segmentation- Structure of the Page Table - Virtual Memory- Background – Demand Paging – Copy on Write – Page Replacement – Allocation of Frames – Thrashing.

UNIT V (12 Hrs)

INPUT/ OUTPUT AND FILES: Overview of Mass Storage Structure - Disk Structure - Disk Scheduling and Management-File System Interface – File Concept, Access Methods, Directory and Disk Structure- Directory Implementation - Allocation Methods- I/O Systems – I/O Hardware, Application I/O Interface, Kernel I/O Subsystem.

Text Books:

1. William Stallings, "Operating Systems: Internals and Design Principles", Prentice-Hall, 9th Edition, 2018.
2. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, "Operating Systems Concepts", Wiley, 9th Edition, 2012.

References:

1. Andrew Tanenbaum, "Modern Operating Systems", Prentice Hall, 3rd Edition, 2009.

ONLINE/NPTEL Courses:

1. Introduction to Operating Systems: https://nptel.ac.in/courses/106106144
2. Operating System Fundamentals: https://nptel.ac.in/courses/106105214
3. Operating Systems: https://nptel.ac.in/courses/106108101

CSM03 PRINCIPLES OF DATABASE SYSTEMS

L	T	P	C
3	1	0	4

Course Pre-requisite:

- Basic Knowledge in programming

Course Objective:

- To learn the physical and logical database designs, database modeling, relational, hierarchical, and network models.

Course Outcomes:

- To understand the concepts and features of database systems and master in design principles
- To transform an information model into a relational database schema and effectively organize the data using normalization
- To formulate solutions to a broad range of query and data update problems using SQL
- To understand the basics of query processing, optimization and fast retrieval techniques with the familiarity of transaction processing
- To understand the issues in concurrency control and familiarizing in different database architectures

UNIT I (12 Hrs)

INTRODUCTION TO DATABASE CONCEPTS: Database System: Definition, Purpose, Application, Data Abstraction, Database Architecture, Database Users, Database Administrators, Instances & Schema, Data Models. Entity Relationship Model: Overview, Definitions, ER Diagram, Mapping Cardinalities, Reduction to Relational Schema, Extended ER Features.

UNIT II (12 Hrs)

RELATIONAL MODEL AND DESIGN: Relational Model- Structure of Relational Database, Keys (Primary, Foreign, Candidate, Super).Relational Algebra- Definition and Operations. Relational Database Design- Overview, Normalization, Normal Forms (First, Second, Third, Boyce Codd), Decomposition using Functional Dependencies and Multi-Valued Dependencies.

UNIT III (12 Hrs)

SQL: SQL- Definition, Basic Structure, Datatypes, Basic Operations (DDL, DML, DCL), Set Operations, Aggregate Functions, Nested Sub-queries, Join Expression, Views, Transactions, Integrity Constraints, Authorization. PL-SQL- Definition, Basic Structure, Procedures, Functions, Cursors, Triggers, Packages.

UNIT IV (12 Hrs)

QUERY PROCESSING AND TRANSACTION: Query Processing- Basic Steps, Measures of Query Cost, Query Optimization. Indexing-Definition, Purpose, Types of Indexing, B Tree and B+ Tree. Hashing- Basic Concepts, Hash Function, Static and Dynamic Hashing. Transaction - Overview, Transaction States, ACID properties, Implementation of ACID properties, Serializability.

UNIT V (12 Hrs)

CONCURRENCY CONTROL AND SYSTEM ARCHITECTURE: Overview, Lock Types, Lock based Protocols, Deadlock Conditions and Handling, Recovery Systems- Introduction to Parallel Databases, Distributed Databases, Data Mining and Data Warehouse.

Text Books:

1. Elmasri and Navathe, "Fundamentals of Database Systems", 7th Edition, Addison-Wesley, 2022.
2. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", 7th Edition, McGraw Hill International Inc., 2019.

References:

1. Fred R McFadden, Jeffery A. Hoffer and Mary B. Prescott, "Modern Database Management", Addison Wesley, 2018.

ONLINE/NPTEL Courses:

1. Introduction to Database Systems: https://nptel.ac.in/courses/106106220
2. Database Systems: https://nptel.ac.in/courses/106106095
3. Basic Database Queries: https://nptel.ac.in/courses/106104021

CSM04 INTERNET PROGRAMMING

L	T	P	C
3	1	0	4

Course Pre-requisite:

- Basic programming knowledge

Course Objectives:

- To understand the principles of Design, develop and demonstrate interactive client and server side executable applications.

Course Outcomes:

- To describe the basic concepts of internet and HTML tags
- To create a client-side programs using JavaScript
- To develop Server-side programs using Servlets and JSP
- To construct web pages in PHP and to represent data in XML format
- To design an interactive web application using AJAX and Web services

UNIT I (12 Hrs)

INTERNET PROTOCOLS, HTML 5.0: The Internet – Basic Internet protocols – HTTP, SMTP, POP3, MIME and IMAP. Domain Name Server - World Wide Web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers –Web Browser. HTML- Anatomy of HTML document, Text Basics, rules, Images and Multimedia, Document layout and webs, formatted lists, Cascading Style Sheets, forms, tables, frames, and Executable content.

UNIT II (12 Hrs)

CLIENT-SIDE PROGRAMMING: Client-Side Programming- Java Script: An introduction to JavaScript–JavaScript DOM Model-Date syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers and Regular Expression.

UNIT III (12 Hrs)

SERVER-SIDE PROGRAMMING: Servlets- Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling Understanding Cookies- Database Connectivity: JDBC perspectives, JDBC program example. JSP-Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

UNIT IV (12 Hrs)

PHP AND XML: PHP- An introduction to PHP- Variables- Program control- Built-in functions-Connecting to Database – JSON (basics) - XML- Basic XML- Document Type Definition- XML Schema, DOM.

UNIT V (12 Hrs)

INTRODUCTION TO AJAX AND WEB SERVICES: AJAX: Ajax Client Server Architecture; Web Services-Introduction to Web Services, UDDI, SOAP, WSDL, Web Service Architecture, Developing and deploying web services.

Text Books:

1. Anuradha A. Puntambekar, "Internet Programming: A Complete Beginner's Guide", Technical Publication, 2020.
2. Uttam K.Roy, "Web Technologies", Oxford University Press, 1st Edition, 2012.
3. Deitel and Goldberg, "Internet and World Wide Web – How to Program", Pearson Education Asia, 5th Edition, 2011.

References:

1. Eric Newcomer, "Understanding Web Services: XML, WSDL, SOAP, and UDDI", Addison Wesley, Platinum Edition, 2002.

ONLINE/NPTEL Courses:

1. HTML: https://nptel.ac.in/courses/106104072

CSM05 NETWORK TECHNOLOGY

L	T	P	C
3	1	0	4

Course Objective:

- To learn the concepts of layered architecture of computer networks, ISO/OSI model, TCP/IP protocol suite, other network protocols and Network Security standards.

Course Outcomes:

- To identify the need for networking and understand the layered concept computer networks.
- To understand the basics concepts of data communication and physical medium.
- To understand about wired and wireless data link layer.
- To understand the devices needed for networking and discover the addressing techniques.
- To learn various standard protocols at different layers of the network.

UNIT I (12 Hrs)

NETWORKING FUNDAMENTALS: Need for networking – Types of Network – Internetworking – Network models – Layered architecture – OSI Protocol Stack – TCP/IP Protocol Suite – Addressing – Physical vs Logical – Port Addressing.

UNIT II (12 Hrs)

DATA COMMUNICATION AND PHYSICAL MEDIUM: Analog Vs Digital data – Transmission impairment – Data rate limits and performance – Transmission media – Guided Vs Unguided media – Characteristics – Virtual Circuit networks – Structure of a Switch.

UNIT III (12 Hrs)

DATA LINK LAYER: WIRED AND WIRELESS: Error detection and correction – Block coding - CRC - Flow and error control –Stop and Wait protocol – Go Back N ARQ protocol – Multiple Access – ALOHA – CSMA – CSMA/CD – CSMA/CA – FDMA – TDMA – CDMA –Ethernet Standard, Fast and Gigabit– IEEE standards - WLAN – IEEE 802.11 –Bluetooth.

UNIT IV (12 Hrs)

NETWORK AND TRANSPORT LAYER PROTOCOLS: Connecting Devices- Hubs – Repeaters – Bridges – Routers – 2/3 Layer Switches – Gateway –Network Layers- Logical Addressing – IPv4 Vs IPv6 – Internet Protocol –ARP – ICMP – IGMP – Unicast Vs Multicast – Transport Layer: UDP - TCP.

UNIT V (12 Hrs)

APPLICATION LAYER AND NETWORK SECURITY: Domain Name System – DNS records – Telnet – Email – FTP – WWW - Client Server – HTTP – SNMP – Network Security Services - IPSec – SSL – HTTPS – Firewalls – PGP.

Text Books:

1. Behrouz A. Forouzan, "Data Communications and Networking with TCP/IP protocol", McGraw Hill, 6th Edition, 2021.
2. Jochen Schiller, "Mobile Communications", Pearson Education, 2nd Edition, 2020.
3. James F. Kurose, Keith W. Ross, "Computer Networks–Top-down Approach", Pearson Education, 3rd Edition, 2013.

References:

1. Andres S. Tanenbaum, David J. Wetherall, Computer Networks, Prentice Hall, 6th Edition, 2020.

ONLINE/NPTEL Courses:

1. Computer Networks: https://nptel.ac.in/courses/106105080
2. Emergence of Networks & Reference Models: https://nptel.ac.in/courses/106105081
3. Introduction on Computer Networks: https://nptel.ac.in/courses/106106091

CSPE101 SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Knowledge in Computer Programming

Course Objective:

- To learn the SDLC model and the process involved in project estimation, scheduling, design and testing to develop quality software.

Course Outcomes:

- To compare various software life cycle models.
- To understand requirement analysis and modelling.
- To develop good software design for effective software development.
- To practice good coding and design test cases to test software systems.
- To understand software maintenance and emerging trends.

UNIT I (9 Hrs)

INTRODUCTION TO SOFTWARE ENGINEERING: Software Engineering - Software engineering practice - Software process-A Generic process model, Prescriptive Process Models - The Waterfall Model, Incremental Process models, Evolutionary Process models, Concurrent models, Evolutionary model, Evolutionary models, Specialized Process Models -Component - Based Development, Formal methods model, Unified process, Agile Development - Agile process, Extreme Programming, Agile process models.

UNIT II (9 Hrs)

REQUIREMENTS ANALYSIS & REQUIREMENTS MODELLING: Requirements Engineering, Eliciting requirements – Collaborative requirements gathering ,Quality function deployment, Building the Requirements model, Requirement Analysis, Scenario - Based Modelling, UML models, Data Modelling Concepts, Class-Based Modelling, Requirement modelling strategies - Flow-Oriented modelling, Creating a Behavioral model, Patterns for requirements modelling, Requirements modeling for Web Apps.

UNIT III (9 Hrs)

SOFTWARE DESIGN AND QUALITY: Design Process, Design Concepts, Design Model, Architectural Design, Component Based Design - Designing class- Based components, Cohesion, Coupling, Conducting component level design ,Component level design for Web Apps ,User Interface design, P attern based design, Web app design ,Software Quality - Cost of quality, Quality and security, Achieving software Quality, Elements of software Quality Assurance, Software reliability.

UNIT IV (9 Hrs)

SOFTWARE TESTING AND MANAGEMENT: Approach to Software Testing - Verification and validation ,Testing ,Unit testing ,Integration Testing ,Testing Strategies for Object Oriented Software, Validation testing, System testing, White box testing, Control structure testing, Black-Box Testing, Model-Based Testing .Software Configuration Management - SCM repository, SCM process, Managing software Projects, Process and Project Metrics, Estimation for software projects - Risk Management.

UNIT V (9 Hrs)

SOFTWARE MAINTENANCE AND TRENDS: Project Scheduling, Risk management, Software maintenance, Software Supportability, Characteristics of Software Maintenance, Reverse Engineering, Restructuring, Forward Engineering, Software Process Improvement - Approaches to SPI, Trends in Software Engineering-Identifying Soft trends, Technology Directions,Tools - Related trends

List of Experiments:

1. Identify a software system that needs to be developed.
2. Document the Software Requirements Specification (SRS) for the identified system.
3. Identify use cases and develop the Use Case model.
4. Test the software system for all the scenarios identified as per the use case diagram.
5. Improve the reusability and maintainability of the software system by applying appropriate design patterns.
6. Implement the modified system and test it for various scenarios.

Text Books:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill, 8^{th} Edition, 2019.
2. Rajib Mall, "Fundamentals of Software Engineering", PHI Learning Pvt. Ltd., 5^{th} Edition, 2018.

References:

1. Ian Sommerville, "Software Engineering", Pearson Publishers, 10^{th} Edition, 2016.

ONLINE/ NPTEL Courses:

1. Software Engineering : https://onlinecourses.nptel.ac.in/noc22_cs106
2. Software Engineering : https://nptel.ac.in/courses/106105182

CSPE102 SOFTWARE PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Software Engineering

Course Objective:

- To learn the software project planning, evaluation, estimation techniques,to learn about the activity planning and risk management principles.

Course Outcomes:

- To understand Project Management principles while developing software.
- To explore extensive knowledge about the basic project management concepts, framework and the process models.
- To obtain adequate knowledge about software process models and software estimation techniques.
- To describe and estimate the risk involved in various project activities.
- To determine the checkpoints,project reporting structure, project progress and tracking mechanisms using project management principles.

UNIT I (9 Hrs)

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 (9 Hrs)

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 (9 Hrs)

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 (9 Hrs)

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 (9 Hrs)

STAFFING IN SOFTWARE PROJECTS: Managing people, Organizational behavior, Best methods of staff selection, Motivation, 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.

List of Experiments:

1. Develop a PERT chart for Library Management System.
2. Project estimation using CRM method.
3. Project Cost estimation using COCOMO model.
4. Identify risk assessment for Student Registry system using Monte Carlo simulation.
5. Identify risk assessment for any simple project using Monte Carlo simulation.
6. Develop a PERT chart for Credit card processing system.
7. Identify risk management for any simple organization.

Text Books:

1. Bob Hughes, Mike Cotterell and Rajib Mall "Software Project Management" 5^{th} Edition, Tata McGraw Hill, New Delhi, 2012.

References:

1. Gopalaswamy Ramesh,"Managing Global Software Projects ", McGraw Hill Education (India), 14^{th} Reprint 2013.
2. Robert K. Wysocki,"Effective Software Project Management", Wiley Publication, 1^{st} Edition, 2011.
3. Walker Royce,"Software Project Management",Addison-Wesley, 13^{th} Edition 2004.

ONLINE/ NPTEL Courses:

1. Software Project Management:https://nptel.ac.in/courses/106105218
2. Software Engineering:https://nptel.ac.in/courses/106105182

CSPE103 OPEN SOURCE SOFTWARE

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Operating System
- Basics of Programming

Course Objective:

- Be exposed to the context in operation of free and open source software (FOSS) communities, associated software projects and learn scripting languages like Python,Perl and Ruby.

Course Outcomes:

- To install and run open-source operating systems.
- To understand information about Free and Open Source Software projects from software releases and from sites on the internet.
- To build and modify one or more Free and Open Source Software packages.
- To explore various programming techniques.
- To explore software to interact with Free and Open Source Software development projects.

UNIT I (9 Hrs)

PHILOSOPHY: Notion of Community, Guidelines for effectively working with FOSS community, Benefits of Community based Software Development –Requirements for being open, free software, Open source software, Four degrees of freedom, FOSS Licensing Models, FOSS Licenses, GPL, AGPL, LGPL, FDL, Implications, FOSS examples.

UNIT II (9 Hrs)

LINUX: Linux Installation and Hardware Configuration, Boot Process, Linux Loader (LILO), The Grand Unified Boot loader (GRUB), Dual-Booting Linux and other Operating System, Boot-Time Kernel Options, X Windows System Configuration, System Administration, Backup and Restore Procedures, Strategies for keeping a Secure Server.

UNIT III (9 Hrs)

FOSS PROGRAMMING PRACTICES: GNU debugging tools, Using source code versioning and managing tools, Review of common programming practices and guidelines for GNU/Linux and FOSS, Documentation.

UNIT IV (9 Hrs)

PROGRAMMING TECHNIQUES: Application programming, Basics of X Windows server architecture, QT programming, GTK + Programming, Python programming, Open source equivalent of existing Commercial software.

UNIT V (9 Hrs)

PROJECTS AND CASE STUDIES: Linux for portable Devices, Creation of Bootable CD and USB from command line, Case Studies – Samba, Libre office, Assistive technology.

List of Experiments:

1. Installation of UNIX Operating System.
2. Write a python program to simulate the following unix commands: a)mv b)cp (Use system calls).
3. Write a python program that simulates ls Command (Use system calls / directory API).
4. Write an awk program to print sum, avg of students marks.
5. Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word. c) Repeat d) Part using awk.
6. Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers.
7. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
8. Write a shell script that determines the period for which a specified user is working on the system.
9. Write an interactive file-handling shell program. Let it offer the user the choice of copying, removing, renaming, or linking files. Once the user has made a choice, have the program ask the user for the necessary information, such as the file name, new name and so on.

Text Books:

1. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell", OReilly Media, 6th Edition, 2009.

References:

1. Philosophy of GNU URL: http://www.gnu.org/philosophy/
2. Linux Administration URL: http://www.tldp.org/LDP/lame/LAME/ linux-admin-made-easy/
3. The Python Tutorial available at http://docs.python.org/2/tutorial/
4. Perl Programming book at http://www.perl.org/books/beginning-perl/
5. Ruby programming book at http://ruby-doc.com/docs/ProgrammingRuby/
6. Version control system URL: http://git-scm.com/
7. Samba: URL : http://www.samba.org/
8. Libre office: http://www.libreoffice.org/

ONLINE/ NPTEL Courses:

1. The Joy of Computing Using Python : https://onlinecourses.nptel.ac.in/noc23 cs20
2. The Joy of Computing Using Python : https://nptel.ac.in/courses/106106182
3. Introduction To Operating Systems : https://onlinecourses.nptel.ac.in/noc22 cs78
4. Introduction To Operating Systems :https://nptel.ac.in/courses/106106144

CSPE104 SOFTWARE TESTING AND QUALITY ASSURANCE

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Software Engineering

Course Objective:

- Explore different software testing processes, types, testing software quality and its standards.

Course Outcomes:

- To understand how to detect, classify, prevent and remove defects with software testing fundamentals.
- To understand the effective strategies of testing, the methods and technologies of software testing.
- To analyze appropriate testing strategies and develop test cases.
- To understand object oriented software testing.
- To explore various software quality standards & techniques.

UNIT I (9 Hrs)

SOFTWARE TESTING FUNDAMENTALS: Need for Testing, SDLC and Testing, Functional and Non-Functional Testing, Verification and Validation, Testing levels, Unit, Integration, System and Acceptance Testing, Testing and Debugging, Test Case Design, Test Management (Planning, Monitoring and Reporting): Weyuker's Adequacy Axioms, Metrics and SDLC.

UNIT II (9 Hrs)

TESTING TYPES: White Box, Black Box and Grey Box, White box testing techniques, Statement coverage, Branch Coverage, Condition coverage, Decision/Condition coverage, Multiple condition coverage, Dataflow coverage, Mutation testing, Black box testing techniques, Boundary value analysis, Equivalence partitioning, Syntax testing, Finite state testing.

UNIT III (9 Hrs)

TESTING OBJECT ORIENTED (OO) SOFTWARE: Challenges, Differences from Testing non-OO Software, Testing and SDLC, Testing Strategies, Test Case Design, Testing Methods, Class testing strategies, Class Modality, State based Testing, Message Sequence Specification.

UNIT IV (9 Hrs)

SOFTWARE QUALITY: Introduction, Quality and SDLC, Software Quality Assurance (SQA), SQA Plan, Team, Characteristics, Documentation, Review and Audits, Software Quality Models (McCall, FURBS and GQM), Software Quality Measurement Metrics, Product quality, Process quality and Maintenance metrics, Quality Cost, Quality Control.

UNIT V (9 Hrs)

SOFTWARE QUALITY STANDARD: CMM Model, ISO 9000 Series, Introduction to PCMM, CMMI and Six Sigma concept. Testing Specialized Environment, Testing Client-Server applications, Testing GUI, Testing compilers and language processors, Testing Realtime Systems. Testing Tools, Automated Tools for Testing, WinRunner, Load Runner, Static code analyzers, Test case generators, GUI Capture/Playback.

List of Experiments:

1. A program written in C language for matrix multiplication fails.Introspect the causes for its failure and write down the possible reasons for its failure.
2. Take any system(e.g ATM system) and study its system specifications and report the various bugs.
3. Write the test cases for Banking application.
4. Create a test plan document for Library Management System.
5. Study of any testing tool(e.g Win runner).
6. Study of any web testing tool(e.g Selenium).
7. Study of any bug tracking tool(e.g Bugzilla, bugbit).
8. Study of any test management tool(e.g Test Director).
9. Study of any open soource-testing tool(e.g Test Link).

Text Books:

1. Roger S. Pressman, "Software Engineering. A Practitioners Approach", McGraw- Hill International Edition, 9^{th} Edition, 2019.
2. Glenford J. Myers, Tom Badgett, Corey Sandler, and Todd M. Thomas, "The Art of Software Testing", John Wiley & Sons, 3^{rd} Edition, 2011.

References:

1. William E. Perry, "Effective Methods for Software Testing", John Wiley & Sons, 3^{rd} Edition, 2006.
2. Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education (Singapore)Pt Ltd 3^{rd} Edition, 2002.
3. Robert V.Binder, "Testing Object-Oriented Systems: Models Patterns and Tools", Addison Wesley,3^{rd} Edition, 2000.

ONLINE/ NPTEL Courses:

1. Software Testing: https://nptel.ac.in/courses/106105150
2. Software Testing: https://nptel.ac.in/courses/106101163

CSPE105 OBJECT ORIENTED ANALYSIS AND DESIGN

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Software Engineering
- Java Programming

Course Objective:

- To learn the concept of Object oriented software development process to get acquainted with UML diagrams , Object Oriented Analysis Processess

Course Outcomes:

- To understand object oriented software development process.
- To understand object oriented methodologies & UML diagrams.
- To apply object oriented analysis processes for projects.
- To understand object oriented Design.
- To apply design patterns to develop software.

UNIT I (9 Hrs)

OBJECT ORIENTED METHODOLOGIES: Software development Life Cycle - Traditional cycle models , Object Oriented approach - Rambaugh Object Modeling Technique , Booch Methodology, Jacobson methodology , Rational Unified Process (RUP) - Unified Modeling Language (UML) – UML Models.

UNIT II (9 Hrs)

UML DIAGRAMS: Use case diagram - UML class diagram -interaction diagram - state diagram - activity diagram - Requirements for ATM banking system , case study.

UNIT III (9 Hrs)

OBJECT ORIENTED ANALYSIS: Use case driven Object analysis – approaches for identifying classes – identifying objects, relationships attributes, methods for ATM banking system ,Object oriented design process – Design axioms.

UNIT IV (9 Hrs)

OBJECT ORIENTED DESIGN: Designing Classes, Methods , Access layer object storage and object interoperability – Access layer for the ATM banking system -View layer ,Designing interface objects , Prototyping User interface, View layer for the ATM. banking system

UNIT V (9 Hrs)

DESIGN PATTERNS: Design Patterns – Describing design patterns, Catalog of design patterns, Organizing the catalog, Creational pattern, Abstract factory , structural pattern - Adapter , behavioral pattern - chain of responsibility

List of Experiments:

UML Programs

1. Use Case diagram
2. Class Diagram
3. Sequence Diagram
4. Collaboration Diagram
5. State Diagram
6. Activity Diagram
7. Component Diagram
8. Deployment Diagram
9. Test Design.

List of Case Studies and problems that may be considered are:

10. College Information System.
11. Hostel Management.
12. ATM System
13. Credit card processing system
14. Library Management system

Text Books:

1. Ali Bahrami,"Object Oriented systems development", Paperback-Bigbook, 2017
2. Carol Britton and Jill Doake, "A student Gide to Object Oriented Development", Elsevier, Butterworth – Heinemann, 8^{th} Edition, 2007.

References:

1. Craig Larman,"Applying UML and Patterns: An Introduction to object-oriented Analysis and Design and iterative development", 3^{rd} Edition, Pearson Education, 2005.
2. Mike O'Docherty "Object-Oriented Analysis & design – understanding system development with UML 2.0", John Wiley, 2005.
3. Grady Booch, James Rumbagh, Ivar Jacobson,"The UML user Guide", Pearson Education, 2005
4. Timothy C. Lethbridge, Robert Laganiere,"Object-Oriented Software Engineering – A practical software development using UML and Java", Tata McGraw-Hill, New Delhi, March 2003.

ONLINE/NPTEL Courses:

1. Object Oriented System Development using UML, Java and Patterns: https://nptel.ac.in / courses/106105224

CSPE201 HUMAN COMPUTER INTERACTION

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic Knowledge about Interacting with the Computers

Course Objective:

- Understanding various components of Human Computer Interaction domain and learning the process of building effective interaction.

Course Outcomes:

- To understand the terminologies associated with HCI.
- To acquire skills in designing usable interfaces.
- To understand personalization in the interaction process.
- To get insights about the importance of accessible interfaces.

UNIT I (9 Hrs)

INTRODUCTION TO HCI: Definition and scope of HCI - Historical Perspective - Theories and methods in HCI- Importance of HCI in software development.

UNIT II (9 Hrs)

HCI DESIGN PRINCIPLES AND FRAMEWORK: : : Introduction to design principles- Models of Interaction- HCI frameworks- Basics of Ergonomics - Interaction styles- Interactivity- User experience- Fundamentals of Interaction design- User Interaction design principles.

UNIT III (9 Hrs)

USER-CENTERED DESIGN AND INTERACTION DESIGN: Introduction to user-Centric design – Case studies, Historical evolution, Issues and challenges and current trend. Computational user models (classical) – GOMS, KLM, Fitts' law, Hick-Hymans law - Computational user models (contemporary) – 2D and 3D pointing, Constrained navigation, Mobile typing, Touch interaction.

UNIT IV (9 Hrs)

USABILITY EVALUATION: User centric design evaluation – Overview of evaluation techniques, Expert evaluation, User evaluation, Model-based evaluation with case studies-Accessibility in HCI.

UNIT V (9 Hrs)

FUTURE TRENDS IN HCI: Emerging technologies- Artificial intelligence- AR/VR- Multimodal interaction- Interaction in Wearable devices- Accessibility and Inclusive design- Ethical consideration in HCI.

List of Experiments:

1. Take a Product of Your choice and Perfrom Schneiderman's Golden Rules Analysis
2. Perform Content Navigation without using Mouse and Make a Report
3. Perform a Comparative analysis of Accessibility with a case study of your choice
4. Evaluate an existing interface using Nielsen's usability heuristics.
5. Create an interactive prototype using a tool like Sketch or Figma.

Text Books:

1. Samit Bhattacharya, Human-Computer Interaction: User-Centric Computing for Design, 2019, 935316804X, McGraw-Hill.
2. Alan Dix, Janet E. Finlay, Gregory D. Abowd and Russel Beale. (2003). Human-Computer Interaction (3rd Edition), Pearson.

References:

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen and Steven Jacobs. (2009). Designing the User Interfaces: Strategies for Effective Human-Computer Interaction, 5th Edition, Pearson.

ONLINE /NPTEL Courses:

1. Human Computer Interaction-https://onlinecourses.nptel.ac.in/noc20_cs45/

CSPE202 MULTIMEDIA AND ANIMATION

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Knowledge of computer System
- Basic Programming Knowledge

Course Objective:

- Introduce the fundamental elements of multimedia to learn representations, perceptions ,applications and emphasize hands-on in digital media.

Course Outcomes:

- To understand the basics of Multimedia platform.
- To understand different types of file formats in Multimedia.
- To use different standard animation techniques for 2D and 3D applications.
- To deploy multimedia tools on various platforms.
- To understand about various Multimedia Applications.

UNIT I (9 Hrs)

INTRODUCTION TO MULTIMEDIA: Definitions- Elements, Multimedia Hardware and Software, Distributed multimedia systems-challenges- Security,sharing / distribution,Storage, Retrieval, processing, Computing- Multimedia metadata- Multimedia databases, Hypermedia, Multimedia Learning.

UNIT II (9 Hrs)

MULTIMEDIA FILE FORMATS AND STANDARDS: File formats – Text-,Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web.

UNIT III (9 Hrs)

MULTIMEDIA AUTHORING: Authoring metaphors,Tools Features and Types: Card and Page Based Tools, Icon and Object Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools, Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing Tools, audio Editing Tools, Digital Movie Tools, Creating interactive presentations, virtual learning, Simulations.

UNIT IV (9 Hrs)

ANIMATION: Principles of animation- Staging-squash and stretch, timing, onion skinning, secondary action, 2D, 2 ½ D, and 3D animation, Animation techniques- Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, Vector animation, Stop motion, Motion graphics, Fluid Simulation, Skeletal animation, Skinning Virtual Reality, Augmented Reality.

UNIT V (9 Hrs)

MULTIMEDIA APPLICATIONS: Multimedia Big data computing- social networks, smart phones, surveillance, Analytics, Multimedia Cloud Computing, Multimedia streaming cloud, Media on demand, Security and forensics, Online social networking, Multimedia ontology, Content based retrieval from digital libraries.

List of Experiments:

Working with Image Editing tools:

1. Install tools like GIMP/ InkScape / Krita / Pencil and perform editing operations:
    - Use different selection and transform tools to modify or improve an image
    - Create logos and banners for home pages of websites.

    Working with Audio Editing tools:
    - Install tools like, Audacity / Ardour for audio editing, sound mixing and special effects like fade-in or fade-out etc.,
    - Perform audio compression by choosing a proper codec.

    Working with Video Editing and conversion tools:
2. Install tools like OpenShot / Cinelerra / HandBrake for editing video content.
    - Edit and mix video content, remove noise, create special effects, add captions.
    - Compress and convert video file format to other popular formats.

    Working with Video Editing and conversion tools:
3. Install tools like OpenShot / Cinelerra / HandBrake for editing video content.
    - Edit and mix video content, remove noise, create special effects, add captions.
    - Compress and convert video file format to other popular formats.

    Working with web/mobile authoring tools:
4. Adapt / KompoZer/ BlueGriffon / BlueFish / Aptana Studio/ NetBeans / WordPress /Expression Web:
    - Design simple Home page with banners, logos, tables quick links etc
    - Provide a search interface and simple navigation from the home page to the inside pages of thewebsite.
    - Design Responsive web pages for use on both web and mobile interfaces

    Working with Animation tools:
5. Install tools like, Krita, Wick Editor, Blender:
    - Perform a simple 2D animation with sprites
    - Perform simple 3D animation with keyframes, kinematics:Working with Mobile UI animation tools: Origami studio / Lottie / Framer etc.,

    Working with E-Learning authoring tools:
6. Install tools like EdApp / Moovly / CourseLab/ IsEazy and CamStudio/Ampache, VideoLAN:
    - Demonstrate screen recording and further editing for e-learning content.
    - Create a simple E-Learning module for a topic of your choice.

    Creating VR and AR applications:
    - Any affordable VR viewer like Google Cardboard and any development platform like Openspace 3D / ARCore etc.

Text Books:

1. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, “Fundamentals of Multimedia”, Springer Texts in Computer Science, 3*rd* Edition, 2021. (UNIT-I, II, III).

References:

1. Emilio Rodriguez Martinez, Mireia Alegre Ruiz, "UI Animations with Lottie and After Effects: Create, render, and ship stunning After Effects animations natively on mobile with React Native", Packt Publishing, 2022.
2. Mohsen Amini Salehi, Xiangbo Li, "Multimedia Cloud Computing Systems", Springer Nature,1st Edition, 2021.
3. Gerald Friedland, Ramesh Jain,"Multimedia Computing", Cambridge University Press, 2018.
4. John M Blain, "The Complete Guide to Blender Graphics: Computer Modeling & Animation", CRC press, 3rd Edition, 2016.
5. Prabhat K.Andleigh, Kiran Thakrar, "Multimedia System Design", Pearson Education, 1st Edition, 2015.
6. Rick parent, "Computer Animation: Algorithms and Techniques", Morgan Kauffman, 3rd Edition, 2012.
7. Rogers David, "Animation: Master – A Complete Guide (Graphics Series)", Charles River Media, 2006.

ONLINE /NPTEL Courses

1. Multimedia and Animation- https://nptel.ac.in/courses/106102065
2. Multimedia Design- https://archive.nptel.ac.in/courses/107/101/107101001

CSPE203 UI AND UX DESIGN

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Software Engineering
- Basics of Programming

Course Objective:

- To Learn the process of user experience designer research and analysis skills and design an effective and compelling digital experiences across different platforms.

Course Outcomes:

- To gain the basic knowledge of basic designing.
- To understand the concepts of UI design.
- To understand the concepts of UX design.
- To implement Wireframe, prototype and testing.
- To adopt research methodologies on UI and UX design.

UNIT I (9 Hrs)

FOUNDATIONS OF DESIGN: UI vs. UX Design - Core Stages of Design Thinking , Divergent and Convergent Thinking ,Brainstorming and Game storming , Observational Empathy .

UNIT II (9 Hrs)

FOUNDATIONS OF UI DESIGN: Visual and UI Principles - UI Elements and Patterns, Interaction Behaviors and Principles, Branding, Style Guides.

UNIT III (9 Hrs)

FOUNDATIONS OF UX DESIGN: Introduction to User Experience - Why You Should Care about User Experience, Understanding User Experience, Defining the UX Design Process and its Methodology, Research in User Experience Design, Tools and Method used for Research, User Needs and its Goals, Know about Business Goals.

UNIT IV (9 Hrs)

WIREFRAMING, PROTOTYPING AND TESTING: Sketching Principles - Sketching Red Routes , Responsive Design, Wireframing, Creating Wireflows, Building a Prototype, Building High-Fidelity Mockups, Designing Efficiently with Tools, Interaction Patterns, Conducting Usability Tests, Other Evaluative User Research Methods, Synthesizing Test Findings, Prototype Iteration.

UNIT V (9 Hrs)

RESEARCH, DESIGNING, IDEATING & INFORMATION ARCHITECTURE: Identifying and Writing Problem Statements, Identifying Appropriate Research Methods, Creating Personas, Solution Ideation, Creating User Stories, Creating Scenarios, Flow Diagrams, Flow Mapping, Information Architecture.

List of Experiments:

1. Designing a Responsive layout for an societal application
2. Exploring various UI Interaction Patterns
3. Developing an interface with proper UI Style Guides
4. Developing Wireflows diagram for application using open source software
5. Exploring various open source collaborative interface Platform
6. Hands on Design Thinking Process for a new product
7. Create a Sample Pattern Library for that product (Mood board, Fonts, Colors based on UI principles)
8. Identify a customer problem to solve
9. Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping
10. Sketch, design with popular tool and build a prototype and perform usability testing and identify improvements

Text Books:

1. Joel Marsh, "UX for Beginners", O'Reilly,Grey scale publishers, 2022.
2. Jon Yablonski, "Laws of UX using Psychology to Design Better Product & Services" ,O'Reilly, 2021.

References:

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interface" ,3rd Edition, O'Reilly, 2020.
2. Steve Schoger, Adam Wathan, "Refactoring UI", 2018.
3. Steve Krug, "Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile", 3rd Edition, 2015.
4. https://www.nngroup.com/articles/
5. https://www.interaction-design.org/literature.

ONLINE /NPTEL Courses:

1. UI & UX Design- https://onlinecourses.nptel.ac.in/noc21_ar05
2. User Inteface Designhttps://archive.nptel.ac.in/courses/124/107/124107008/

CSPE204 AUGMENTED REALITY/VIRTUAL REALITY

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Java Programming
- Multimedia and Animation

Course Objective:

- Learn the basic principles of virtual reality applications, different gaming toolkits and to develop AR/VR applications.

Course Outcomes:

- To understand the basic concepts of AR and VR.
- To understand the tools and technologies related to AR/VR.
- To gain knowledge on VR programming.
- To develop AR/VR applications in different domains.
- To gain knowledge about AR/VR.

UNIT I (9 Hrs)

INTRODUCTION: Introduction to Virtual Reality and Augmented Reality – Definition, Introduction to Trajectories and Hybrid Space, Three I's of Virtual Reality , Virtual Reality Vs 3D Computer Graphics, Benefits of Virtual Reality, Components of VR System, Introduction to AR- AR Technologies-Input Devices, 3D Position Trackers, Types of Trackers, Navigation and Manipulation Interfaces, Gesture Interfaces, Types of Gesture Input Devices, Output Devices, Graphics Display, Human Visual System, Personal Graphics Displays, Large Volume Displays,Sound Displays, Human Auditory System.

UNIT II (9 Hrs)

VR MODELING: Modeling – Geometric Modeling, Virtual Object Shape, Object Visual Appearance, Kinematics Modeling – Transformation Matrices, Object Position, Transformation Invariants, Object Hierarchies, Viewing the 3D World, Physical Modeling, Collision Detection, Surface Deformation – Force Computation, Force Smoothing and Mapping, Behavior Modeling, Model Management.

UNIT III (9 Hrs)

VR PROGRAMMING: VR Programming – Toolkits and Scene Graphs, World ToolKit, Java 3D, Comparison of World ToolKit and Java 3D

UNIT IV (9 Hrs)

APPLICATIONS: Human Factors in VR – Methodology and Terminology, VR Health and Safety Issues, VR and Society-Medical Applications of VR, Education, Arts and Entertainment, Military VR Applications, Emerging Applications of VR – VR Applications in Manufacturing, Applications of VR in Robotics, Information Visualization, VR in Business,VR in Entertainment, VR in Education.

UNIT V (9 Hrs)

AUGMENTED REALITY: Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation- Navigation-Wearable devices

List of Experiments:

1. Study of tools like Unity, Maya, 3DS MAX, AR toolkit, Vuforia and Blender.
2. Use the primitive objects and apply various projection types by handling camera.
3. Download objects from asset store and apply various lighting and shading effects.
4. Model three dimensional objects using various modelling techniques and apply textures over them.
5. Create three dimensional realistic scenes and develop simple virtual reality enabled mobile applications which have limited interactivity.
6. Add audio and text special effects to the developed application.
7. Develop VR enabled applications using motion trackers and sensors incorporating full haptic interactivity.
8. Develop AR enabled applications with interactivity like E learning environment, Virtual walkthroughs and visualization of historic places.
9. Develop simple MR enabled gaming applications.

Text Books:

1. Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences for mobile", Packt Publisher, 2018.
2. William R. Sherman, Alan B.Craig, "Understanding Virtual Reality – Interface, Application,Design ", Morgan Kaufmann, 2^{nd} Edition, 2018.
3. Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley, 2016.

References:

1. Ali A. Ghorbani, Wei Lu, "Network Intrusion Detection and Prevention: Concepts and Techniques", Springer, 2010.
2. Paul E. Proctor, "The Practical Intrusion Detection Handbook", Prentice Hall , 2001.
3. Ankit Fadia and Mnu Zacharia, "Intrusiion Alert", Vikas Publishing house Pvt., Ltd, 2007.
4. Earl Carter, Jonathan Hogue, "Intrusion Prevention Fundamentals", Pearson Education, 2006.

Online/ NPTEL courses:

1. Augmented and Virtual Reality courses- https://elearn.nptel.ac.in/shop/iit-workshops/completed/foundation-course-on-virtual-reality-and-augmented-reality/
2. Virtual Reality- https://archive.nptel.ac.in/courses/121/106/121106013/

CSPE205 GRAPHICS AND IMAGE PROCESSING

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic knowledge in Computer Design.

Course Objective:

- To learn two dimensional graphical structures, the components of Graphics and Image Processing applications. To design innovative applications.

Course Outcomes:

- To describe acquainted Graphics and Image Processing domains.
- To understand the major intricacies of Graphics and Image Processing.
- To understand verbal descriptions to images and vice versa.

UNIT I (9 Hrs)

GRAPHICS SYSTEMS AND GRAPHICAL USER INTERFACE: Pixel Resolution types of video display devices- Graphical input devices, Output devices, Hard copy devices, Direct screen interaction, Logical input function, GKS User dialogue, Interactive picture construction techniques.

UNIT II (9 Hrs)

GEOMETRIC DISPLAY PRIMITIVES AND ATTRIBUTES: Geometric Display Primitives and Attributes- Geometric display primitives,Points Lines and Polygons,Point display method, Line drawing methods. 2D Transformations and Viewing- Transformations types matrix representation, Concatenation,Scaling Rotation, Translation, Shearing, Mirroring, Homogeneous coordinates. Window to view port transformations- Windowing And Clipping, Point Lines Polygons, boundary intersection methods.

UNIT III (9 Hrs)

DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS: Digital Image Fundamentals and Transforms- Nature of Image processing, related fields, Image representations,Image types,Image processing operations, Applications of Image processing, Imaging system, Image Acquisition, Image Sampling and Quantization, Image quality, Image storage and file formats, Image processing operations, Image Transforms, need for Transforms, Fourier Transforms and its properties- Introduction to Walsh, Hadamard, Discrete Cosine, Haar, Slant, SVD, KL and Hotelling Transforms.

UNIT IV (9 Hrs)

IMAGE ENHANCEMENT AND RESTORATION: Image Enhancement and Restoration- Image Quality and need for Enhancements, Point operations, Histogram Techniques, Spatial filtering concepts, Frequency Domain Filtering, Image Smoothening, Image Sharpening, Image degradation and Noise Models Introduction to Restoration Techniques.

UNIT V (9 Hrs)

IMAGE COMPRESSION: Image Compression- Compression Models and measures, coding types, Types of Redundancy, Lossless compression algorithms, Lossy compression algorithms, Introduction to compression standards. Image Segmentation- Detection of Discontinuities, Edge Detection, Thresholding, Region Based Segmentation-Introduction to Color Image Processing- Introduction to Morphological operations.

List of Experiments:

1. Implement Bresenham's line drawing algorithm for all types of slope.
2. Clip a line using Cohen-Sutherland algorithm
3. Analysis of spatial and intensity resolution of images.
4. Intensity transformation of images.
5. Transforms (Walsh, Hadamard, DCT, Haar)
6. Image Enhancement-Spatial filtering
7. Image Enhancement- Filtering in frequency domain
8. Image segmentation Edge detection, line detection and point detection

Text Books :

1. S. Sridhar, "Digital Image Processing", Oxford Press, 1st Edition, 2011.
2. Donald D. Hearn, M. Pauline Baker and Warren Carithers, "Computer Graphics with OpenGL", Pearson Education, 4th Edition, 2010.

References :

1. Gonzalez R. C and Woods R.E., "Digital Image Processing", Pearson Education, 2nd Edition, 2002.
2. Newmann W.M. and Sproull R.F., "Principles of Interactive Computer Graphics", Tata McGraw-Hill, 2nd Edition, 2000.
3. Foley J.D., Van Dam A, Fiener S.K. and Hughes J.F., "Computer Graphics", Addison-Wesley, 2nd Edition, 1993.
4. Anil Jain K, "Fundamentals of Digital Image Processing", Prentice-Hall of India, 1989.

ONLINE /NPTEL Courses:

1. https://onlinecourses.nptel.ac.in/noc21_ee23

CSPE301 CLOUD COMPUTING

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Database Management System

Course Objective:

- To learn the concepts of Cloud System Architecture, Application, Abstraction and Virtualization.

Course Outcomes:

- To learn the cloud computing architecture.
- To understand the architecture, services and applications of cloud computing.
- To understand the abstraction and virtualization of various applications.
- To understand the cloud management and cloud security.
- To write case studies using Web services and Amazon web services.

UNIT I (9 Hrs)

INTRODUCTION TO CLOUD COMPUTING: Overview - Roots of Cloud Computing, Layers and Types of Cloud, Desired Features of a Cloud, Benefits and Disadvantages of Cloud Computing, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks, Assessing the role of Open Standards.

UNIT II (9 Hrs)

CLOUD ARCHITECTURE, SERVICES AND APPLICATIONS: Exploring the Cloud Computing Stack - Connecting to the Cloud, Infrastructure as a Service, Platform as a Service, Using PaaS Application Frameworks, Software as a Service, Identity as a Service, Compliance as a Service.

UNIT III (9 Hrs)

ABSTRACTION AND VIRTUALIZATION: Introduction to Virtualization Technologies - Load Balancing and Virtualization, Understanding Hyper visors, Understanding Machine Imaging, Porting Applications, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Context.

UNIT IV (9 Hrs)

MANAGING & SECURING THE CLOUD: Administrating the Clouds - Cloud Management Products, Emerging Cloud Management Standards, Securing the Cloud, Securing Data, Establishing Identity, Presence.

UNIT V (9 Hrs)

CASE-STUDIES: Using Google Web Services, Using Amazon Web Services, Using Microsoft Cloud Services.

List of Experiments:

1. Install Virtualbox/VMware/ Equivalent open source cloud Workstation with different flavours of Linux or Windows OS on top of windows 8 and above.
2. Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs
3. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
4. Use the GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Install Hadoop single node cluster and run simple applications like wordcount.
8. Creating and Executing Your First Container Using Docker.
9. Run a Container from Docker Hub

Text Books:

1. Buyya R, Broberg J, Goscinski A, "Cloud Computing: Principles and Paradigm", John Wiley & Sons, 1st Edition, 2011.
2. Sosinsky B, "Cloud Computing Bible", Wiley Edition, 1st Edition, 2011.

References:

1. Naresh Kumar Sehgal, Pramod Chandra P. Bhatt, John M. Acken "Cloud Computing with Security and Scalability Concepts and Practices", Springer, 3rd Edition, 2023.
2. Smooth S., Tan N., "Private Cloud Computing", Morgan Kauffman , 1st Edition, 2011.
3. Miller Michael, "Cloud Computing: Web Based Applications that Change the Way You Work and Collaborate Online", Pearson Education India.
4. Linthicium D,"Cloud Computing and SOA Convergence in Enterprise", Pearson Education India.

ONLINE/NPTEL Courses:

1. https://freevideolectures.com/course/4639/nptel-cloud-computing/23
2. https://www.digimat.in/nptel/courses/video/106105167/L01.html

CSPE302 BIG DATA ANALYTICS

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basis of Programming
- Database Management System

Course Objectives:

- To learn the concepts of data analytics, data management and practice in various applications like HDFS, MapReduce, Hadoop, YARN etc.,

Course Outcomes:

- To describe big data and use cases from selected business domains
- To explore NoSQL big data management
- To install, configure, and run Hadoop and HDFS
- To perform map-reduce analytics using Hadoop
- To use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

UNIT I (9 Hrs)

UNDERSTANDING BIG DATA: Introduction to Big Data - Convergence of key trends, Unstructured Data, Industry Examples of Big Data, Web Analytics, Big Data Applications, Big Data Technologies. Introduction to Hadoop – Open Source Technologies, Cloud and Big Data, Mobile Business Intelligence, Crowd Sourcing Analytics, Inter and Trans Firewall Analytics.

UNIT II (9 Hrs)

NoSQL DATA MANAGEMENT: Introduction to NoSQL - Aggregate Data Models, Key-Value and Document Data Models, Relationships, Graph databases, Schemaless Databases, Materialized Views. Distribution Models - Master-Slave Replication, Consistency. Cassandra - Cassandra Data Model, Cassandra Examples, Cassandra Clients

UNIT III (9 Hrs)

MAPREDUCE APPLICATIONS: MapReduce Workflows - Unit Tests with MRUnit, Test Data and Local Tests, Anatomy of MapReduce Job Run, classic Map-reduce, YARN, Failures in Classic Map-Reduce and YARN, Job Scheduling, Shuffle and Sort, Task Execution, MapReduce Types, Input Formats, Output Formats.

UNIT IV (9 Hrs)

BASICS OF HADOOP: Data Format – Analyzing Data with Hadoop, Scaling out, Hadoop Streaming, Hadoop Pipes, Design of Hadoop Distributed File system (HDFS),HDFS Concepts, Java Interface, Data Flow, Hadoop I/O, Data Integrity, Compression, Serialization, Avro – File-Based Data Structures, Cassandra, Hadoop Integration. Introducing Apache Spark - Spark Shell, Spark Context.

UNIT V (9 Hrs)

HADOOP RELATED TOOLS: Hbase – Data Model and Implementations, HBase clients, HBase Examples, Praxis.Pig – Grunt, Pig Data Model, Pig Latin, Developing and Testing Pig Latin scripts.Hive, Data types and File Formats, HiveQL Data Definition, HiveQL Data Manipulation, HiveQL Queries.

List of Experiments:

1. Downloading and installing Hadoop; Understanding different Hadoop modes. Startup scripts, Configuration files.
2. Hadoop Implementation of file management tasks, such as Adding files and directories, retrieving files and Deleting files
3. Implement of Matrix Multiplication with Hadoop Map Reduce
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
5. Installation of Hive along with practice examples.
6. Installation of HBase, thrift Practice examples
7. Practice importing and exporting data from various databases.
8. Distributed Cache and Map Side Join, Reduce side Join and Running a Spark Application Word count in Hadoop and Spark Manipulating RDD
9. Inverted Indexing in Spark Sequence alignment problem in Spark Implementation of Matrix algorithms in Spark SQL programming, Building Spark Streaming application.

Text Books:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Tom White, "Hadoop: The Definitive Guide", O'Reilley, 3rd Edition, 2012.
4. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

References:

1. Seema Acharya, Subashini Chellappan " Big Data and Analytics", Wiley India Pvt. Ltd, 2nd Edition 2019.
2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
3. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.

ONLINE/NPTEL Courses:

1. Big Data Concepts: https://onlinecourses.nptel.ac.in/noc20cs92

CSPE303 BUILDING CLOUD AND BIG DATA APPLICATIONS

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Big Data, Distributed Computing

Course Objective:

- The course presents the principles of cloud architecture models & Infrastructure. Provide Bigdata and use cases from selected business domains.

Course Outcomes:

- To describe the basic concept and characteristics of cloud computing
- To understand the concept of virtualization and data center automation
- To analyze the different cloud software utility architecture
- To describe big data and use cases from selected business domains.
- To explain NoSQL big data management

UNIT I (9 Hrs)

CLOUD COMPUTING ARCHITECTURE AND MODEL: Technologies for Network Based System - System Models for Distributed and Cloud Computing, NIST Cloud Computing Reference Architecture. Cloud Models - Characteristics, Cloud Services, Cloud models (IaaS, PaaS, SaaS), Public Vs Private Cloud, Cloud Solutions, Cloud Ecosystem, Service Management, Computing on Demand.

UNIT II (9 Hrs)

VIRTUAL MACHINE: Basics of Virtualization - Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data-center Automation.

UNIT III (9 Hrs)

SOFTWARE UTILITY APPLICATION: Software Utility Application Architecture - Characteristics of SaaS, Software Utility Application, Cost Versus Value. Software Application Framework – Common Enablers, Conceptual view to Reality, Business Profits, Implementing Database System for Multitenant Architecture.

UNIT IV (9 Hrs)

UNDERSTANDING BIG DATA: Introduction to Big Data - Convergence of key trends, Unstructured Data, Industry Examples of Big Data, Web Analytics, Big Data Applications, Big Data Technologies. Introduction to Hadoop - Open Source Technologies, Cloud and Big Data, Mobile Business Intelligence, Crowd Sourcing Analytics, Inter and Trans Firewall Analytics.

UNIT V (9 Hrs)

NOSQL DATA MANAGEMENT: Introduction to NoSQL - Aggregate Data Models, Key-Value and Document Data Models, Relationships, Graph Databases, Schemaless Databases, Materialized Views, Distribution Models, Master-slave Replication, Consistency. Cassandra - Cassandra Data Model, Cassandra Examples, Cassandra Clients.

List of Experiments:

1. Cisco simulator – VLAN design, Routing, Sub netting, Gateway configuration.
2. Virtual box based Webserver creation, access webpage from 2nd VM on another subnet work.
3. EC2 AWS – S3 bucket based static webpages.
4. EC2 AWS – Instance Creation, Migration.
5. EC2 AWS – Web application using Beanstalk.
6. AWS – Local balancing and auto scaling.
7. IBM Blue Mix - Mobile Application development
8. DaaS – Deployment of a basic web app and add additional functionality(Java scripts based)
9. PaaS – IOT – Mobile sensor based IOT application hosted via PaaS environment
10. SaaS – Deployment of any SaaS application for a online collaborative tool
11. Deployment of Open stack or Virtual box from the scratch
12. Automating Open stack deployment using Chef/Puppet configuration for 4 node/ 5 node/ HA clusters
13. Hadoop as a Service

Text Books:

1. Rajkumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing Principles and Paradigms", Wiley Publications, 2017.
2. Alfredo Mendoza, "Utility Computing Technologies, Standard, and Strategies", Artech House INC, 2017.
3. Kai Hwang, Geoffrey C Fox and Jack G Dongarra, "Distributed and Cloud Computing,From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2016.
4. Arshdeep Bahga, Vijay Madisetti, "Cloud Computing", University Press, 2016.
5. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.

References:

1. Seema Acharya, Subashini Chellappan " Big Data and Analytics", Wiley India Pvt. Ltd, 2nd Edition, 2019.
2. James Turnbull, "The Docker Book", O'Reilly Publishers, 2014.
3. Krutz, R. L., Vines, R. D, "Cloud security. A Comprehensive Guide to Secure Cloud Computing", Wiley Publishing, 2010.
4. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy: an enterprise perspective on risks and compliance", O'Reilly Media, Inc., 2009.
5. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier / Morgan Kaufmann, 2005.

ONLINE/NPTEL Courses:

1. Big Data: http://www.nitttrc.edu.in/nptel/courses/video/106106156/L23.html

CSPE304 PARALLEL COMPUTING

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Data Structures and Algorithms, Database Management System, Computer Networks

Course Objectives:

- To learn the challenges of efficient execution of large-scale parallel applications and to apply various algorithms for application development.

Course Outcomes:

- To understand the principles of parallel programming platform.
- To understand the principles of various parallel algorithms.
- To analyze the parallel modelling programming techniques.
- To implement parallel programming using message passing paradigm.
- To apply various algorithm and develop an application.

UNIT I (9 Hrs)

INTRODUCTION: Introduction - Motivation, Scope, Parallel Programming Platforms, Implicit Parallelism, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Communication Cost in Parallel Machines, Routing Mechanism for Interconnection Networks.

UNIT II (9 Hrs)

PRINCIPLES OF PARALLEL ALGORITHM: Decomposition Techniques - Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for containing Interaction overheads. Parallel Algorithm Models – Basic communication Operations, One-to-All Broadcast and All-to-One Reduction, Scatter and Gather, Improving the speed of some communication Operations.

UNIT III (9 Hrs)

ANALYTICAL MODELLING OF PARALLEL PROGRAMS: Sources of Overhead in Parallel Programs - Performance metrics for parallel systems, Effect of Granularity and Data Mapping on Performance, Scalability of Parallel Systems, Minimum analysis of Parallel Programs, Other Scalability Metrics.

UNIT IV (9 Hrs)

PROGRAMMING USING MESSAGE PASSING PARADIGM: Principles of Message Passing Programming – The Building Blocks, Send and Receive Operations. MPI - The Message Passing Interface, Topologies and Embedding, Overlapping Communication with Computation, Collective Communication and Computation Operations, Groups and Communicators.

UNIT V (9 Hrs)

PARALLEL ALGORITHMS AND APPLICATIONS: Dense Matrix Algorithms - Matrix Vector Multiplication, Matrix-Matrix Multiplication, Solving a System of Linear Equations. Sorting - Issues in Sorting on Parallel Computers, Sorting Networks, Bubble Sort and its Variants, Quick sort, Bucket and Sample Sort, Other Sorting Algorithms.

List of Experiments:

1. Open MP - Basic Programs such as Vector addition, Dot product.
2. Open MP - Loop-work sharing and section work-sharing.
3. Open MP - Combined parallel loop reduction and orphaned parallel loop reduction.
4. Open MP - Matric multiply.
5. MPI - Basics of MPI
6. MPI - Communication between MPI process.
7. MPI - Advanced Communication between MPI process.
8. MPI - Collective operation with synchronization.
9. MPI - Collective operation with data movement.
10. MPI - Collective operation with collective computation.
11. MPI - Non blocking operation.

Text Books:

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, "Introduction to Parallel Computing", Pearson, 2^{nd} Edition, 2004.

References:

1. Peter S. Pacheco, "An introduction to Parallel Programmin", Morgan Kaufmann, 1^{st} Edition, 2011.
2. Fayez Gebali, "Algorithms and Parallel Computing", Wiley series, 2011.

ONLINE/NPTEL Courses:

1. Parallel Computing: https://onlinecourses.nptel.ac.in/noc22cs21

CSPE305 OPEN MULTI PROCESSING

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic programming knowledge

Course Objective:

- • To learn openMP programming concepts, features, performance, troubleshooting and its future.

Course Outcomes:

- To understand the basic concepts of OpenMP program.
- To explore the features in OpenMP languages.
- To analyze the performance using OpenMP.
- To understand the troubleshooting process in OpenMP.
- To understand the real working of OpenMP and its future.

UNIT I (9 Hrs)

INTRODUCTION: Shared Memory Parallel Computers, Cache memory is not shared, Implications of Private Cache Memory characteristics. Origin of OpenMP, Creating an OpenMP program-Overview of OpenMP –First OpenMP program- Matrix Multiplication, keeping sequential and Parallel Programs as a single source code.

UNIT II (9 Hrs)

OPENMP LANGUAGE FEATURES: Parallel Construct -Sharing the work among Threads in an OpenMP program, Loop, Sections, Single , Workshare ,Combined Parallel work-sharing constructs-Clauses to control Parallel and work-sharing Constructs- OpenMP synchronization Constructs- More OpenMP clauses-Advanced OpenMP constructs.

UNIT III (9 Hrs)

PERFORMANCE USING OPENMP: Performance Considerations for Sequential Programs –Measuring OpenMP performance-Best Practices-Additional Performace Considerations-Case study.

UNIT IV (9 Hrs)

TROUBLESHOOTING: Introduction-Common Misunderstandings and frequent errors-Deeper Trouble ,Memory Consistency problems, Incorrect use of flush–Debbugging OpenMP codes.

UNIT V (9 Hrs)

OPENMP REAL WORKING AND FUTURE: The Basics of Compilation-OpenMP translation-OpenMP runtime systems- Future of OpenMP ,Architectural challenges-OpenMP in distributed memory systems-Increasing the expressivity of OpenMP.

List of Experiments:

1. Develop openMp program to control number of threads on multiple nesting levels.
2. Develop OpenMP program to implement different Clauses (nowait,collapse,map,default map).
3. Develop OpenMP program to implement different constructs (parallel Sections,single,workshare.master).
4. Implement Task and task wait constructs using OpenMP program.
5. Implement Target construct problems using OpenMP program.
6. Implement lock routine check up program using OpenMP.

Text Books:

1. Barbara Chapman,Gabriele Jost,and Ruud Van Der Pas, "Using Open MP" , The MIT Press, 2021.

References:

1. Michael Klemm and Jim Cownie ,"High Performance Parallel Runtimes" De Gruyter Oldenbourg , 2021.
2. Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press, 2006.
3. Michael Jay Quinn, "Parallel Programming in C with MPI and OpenMP", McGraw-Hill, 2003.
4. M.J. Quinn, "Parallel Computing – Theory and Practice", McGraw-Hill, 1994.
5. OpenMP Programmer's Manual.
6. MPI Programmer's Manual

ONLINE/NPTEL Course:

1. High Performance Computing: https://archive.nptel.ac.in/courses/106/108/106108055

CSPE401 MOBILE COMPUTING

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Computer Networks

Course Objective:

- To learn about mobile computing trends and wireless application protocol and study about various application languages and mobile application development platforms

Course Outcomes:

- To understand various mobile computing techniques
- To explore the knowledge about the mobile Internet
- To familiarize with various mobile computing trends and wireless protocols.
- To understand various application languages and mobile application development platforms.
- To explore knowledge in Wireless LAN, Mobile Internet Connectivity and Personal Area Network.

UNIT I (9 Hrs)

AN OVERVIEW: Mobile communication-Mobile computing Mobile Computing Architecture-Mobile devices-Mobile System Networks – Data dissemination – Mobile management- security. MOBILE DEVICES AND SYSTEM Mobile phones – Digital Music players – Handheld Pocket computers – Handheld devices –Smart systems – Limitations of mobile devices – Automotive systems.

UNIT II (9 Hrs)

GSM AND SIMILAR ARCHITECTURES: GSM – services and architectures – Radio interfaces –Protocols – Localization – Calling – Handover – Security – New data services – General packet radio service- High speed circuit switched data – DECT. WIRELESS MEDIUM ACCESS CONTROL BASED COMMUNICATION-Medium Access Control – Introduction to CDMA –based Systems – Spread spectrum in CDMA Systems – Coding methods in CDMA – IS-95 cdmOne System – IMT – 2000 – i-mode – OFDM

UNIT III (9 Hrs)

MOBILE IP NETWORK LAYER AND MOBILE TRANSPORT LAYER: IP and mobile Network layers –Packet Delivery and Handover Management – Location management – Registration –Tunneling and Encapsulation - Route Optimization - Dynamic Host Configuration Protocol. Conventional TCP/IP Transport Layer Protocols – Indirect TCP – Snooping TCP – Mobile TCP – Other methods of mobile TCP – layer transmission – TCP over 2.5G/3G Mobile networks

UNIT IV (9 Hrs)

MOBILE DEVICES: SERVER AND MANAGEMENT: Mobile agent – Application server – Gateways –Portals -Service Discovery – Device management – Mobile file systems-Security.MOBILE AD HOC AND WIRELESS SENSOR NETWORKS-Introduction to mobile Ad hoc network – MANET –Wireless Sensor Networks –Applications.

UNIT V (9 Hrs)

WIRELESS LAN, MOBILE INTERNET CONNECTIVITY AND PERSONAL AREA NETWORK: WirelessLAN(Wi-Fi) Architecture and Protocol layers- WAP 1.1 and WAP 2.0 Architecture – XHTML MP (Extensible Hypertext Markup Language Mobile Profile) - Bluetooth enabled devices network – layers in Bluetooth protocol- Security in Bluetooth protocol- IrDA – ZigBees -Mobile application languages and mobile application development platforms

List of Experiments:

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

Text Books:

1. Raj Kamal,"Mobile Computing", Oxford Higher education, 2011.
2. William Stallings,"Wireless Communication and Networks", Pearson Education, 2009.
3. J.Schiller, "Mobile Communication", Pearson Education, 2014.

References:

1. LotherMerk, Martin.S.Nicklaus and Thomas Stober, "Principle of Mobile Computing", Springer, 2^{nd} Edition, 2003.

ONLINE/ NPTEL Courses:

1. Mobile Computing: https://nptel.ac.in/courses/106106147
2. Advanced 3G and 4G Wireless Mobile Communications: https://nptel.ac.in/courses/117104099

CSPE402 MOBILE APPLICATION DEVELOPMENT

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Computer Networks, Digital Electronics

Course Objective:

- To understand the mobile application features and deploy applications to the android phone features.

Course Outcomes:

- To gain the knowledge about various types of Wireless Data Networks and Voice Networks.
- To understand the architectures, the challenges and the Solutions of Wireless Network.
- To communication Realize the role of Wireless Protocols in shaping the future Internet.
- To develop simple Mobile Application using Android.
- To develop Mobile Platforms Application using various platforms.

UNIT I (9 Hrs)

INTRODUCTION: Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA.

UNIT II (9 Hrs)

MOBILE TELECOMMUNICATION AND NETWORK LAYER: Introduction to Cellular Systems - GSM – Services & Architecture – GPRS -UMTS – Architecture – Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR- AODV - Hybrid routing –ZRP- Multicast Routing- ODMRP-MOBILE TRANSPORT AND APPLICATION LAYER :Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML.

UNIT III (9 Hrs)

MOBILE DATABASES: Issues in Transaction Processing-Transaction Processing Environment-Centralized Environment-Client-server Environment-Distributed Environment-Mobile Environment -Data Dissemination-Transaction Processing in Mobile Environment-Atomicity Relaxation-Consistency Relaxation-Isolation Relaxation-Durability Relaxation.

UNIT IV (9 Hrs)

MOBILE APPLICATION DEVELOPMENT USING ANDROID: Mobile Applications Development - Understanding the Android Software Stack – Android Application Architecture –The Android Application Life Cycle – The Activity Life Cycle Creating Android Activity -Views- Layout -Creating User Interfaces with basic views- linking activities with Intents.

UNIT V (9 Hrs)

MOBILE PLATFORMS AND APPLICATIONS: Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.

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. Write an application that draws basic graphical primitives on the screen.
4. Develop an application that makes use of databases.
5. Develop an application that makes use of Notification Manager
6. Develop a real time Mobile application. (Mini Project)
7. Develop a simple Graphic application.

Text Books:

1. Prasant Kumar Pattink, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt.Ltd, 2nd Edition, 2016.
2. J. Schiller, "Mobile Communication" , Pearson Education, 2nd Edition, 2014.

References:

1. Iti Saha Misra, "Wireless Communication and Networks:3G and Beyond",McGraw Hill Education (India) Private Ltd, New Delhi,2nd Edition,2017.
2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to wireless and Mobile System", Thomas Asia Pvt Ltd, 2005.
3. William .C.Y.Lee, "Mobile Cellular Telecommunication –Analog and Digital System" TataMcGtaw Hill Edition, 2nd,2006.
4. Golden Richard, Frank Adelstein, Sandeep KS Gupta, Golden Richard and Loren Schwiebert, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional Publishing, 2005.

ONLINE/ NPTEL Courses:

1. Mobile Computing: https://nptel.ac.in/courses/106106147
2. Advanced 3G and 4G Wireless Mobile Communications: https://nptel.ac.in/courses/117104099

CSPE403 WIRELESS SENSOR NETWORKS

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Computer Networks

Course Objective:

- To learn various protocols for wireless communication networks.

Course Outcomes:

- To understand the functioning of wireless communication system.
- To understand recent wireless technologies.
- To demonstrate multiple access techniques for Wireless Communication.
- To understand wireless personal area networks.
- To evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks.

UNIT I (9 Hrs)

OVERVIEW OF WIRELESS COMMUNICATION: Cellular communication- Different generations and standards in cellular communication system- Satellite communication including GPS-wireless local loop- Cordless phone-paging systems- RFID.

UNIT II (9 Hrs)

RECENT WIRELESS TECHNOLOGIES: Multicarrier modulation- OFDM- MIMO system- Diversity multiplexing trade-off, MIMO-OFDM system, Smart antenna- Beam forming and MIMO-cognitive radio-Software defined radio-Communication relays, Spectrum sharing.

UNIT III (9 Hrs)

MULTIPLE ACCESS TECHNIQUES IN WIRELESS COMMUNICATION: Contention-multiple access schemes -FDMA -TDMA-CDMA- SDMA and Hybrid- Contention based multiple access schemes (ALOHA and CSMA).

UNIT IV (9 Hrs)

WIRELESS PERSONAL AREA NETWORKS: Bluetooth, UWB and ZigBee- Wireless local area networks (IEEE 802.11,Network architecture,Medium access methods,WLAN standards), Wireless metropolitan area networks (WiMAX).

UNIT V (9 Hrs)

AD-HOC WIRELESS NETWORKS: Design Challenges in Ad-hoc wireless networks- Concept of cross layer design-Security in wireless networks-Energy constrained networks- MANET and WSN. Wireless system protocols : Mobile network layer protocol (mobile IP,IPv6,dynamic host configuration protocol)- Mobile transport layer protocol (traditional TCP,Classical TCP improvements)- Support for mobility (wireless application protocol).

List of Experiments:

Use any Simulation tool to demonstrate the following Experiments:

1. Create a sample wireless topology.
2. Create a mobile Ad-hoc networks.
3. Implement an Ad-hoc On-demand Distance Vector protocol.
4. Implement a Transmission Control Protocol.
5. Implement an User Datagram Protocol.
6. Implement a Low Energy Adaptive Hierarchy protocol.
7. Implement a Power Efficient Gathering in Sensor Information System.
8. Implement a Sensor Protocol for Information via Negotiation (SPIN).

Text Books:

1. Iti Saha Misra, "Wireless Communication and Networks:3G and Beyond",McGraw Hill Education (India) Private Ltd, New Delhi, 2nd Edition,2017.
2. Sanjay Kumar, "Wireless Communication the Fundamental and Advanced Concepts", River Publishers, Denmark, 2015.
3. Waltenegus Dargie , Christian Poellabauer, "Fundamentals of Wireless Sensor Networks - Theory and Practice", John Wiley & Sons Publications, 2011.

References:

1. J. Schiller, "Mobile Communication" , Pearson Education, 2nd Edition,2014.
2. Vijay K Garg, "Wireless Communications and Networks", Morgan Kaufmann Publishers, USA 2013.
3. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2nd Edition, 2010.

ONLINE/ NPTEL Courses:

1. Wireless Ad Hoc and Sensor Networks: https://nptel.ac.in/courses/106105160
2. Introduction to Wireless and Cellular Communications: https://nptel.ac.in/courses/106106167

CSPE404 NEXT GENERATION NETWORKS

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Computer Networks
- Wireless Sensor Networks

Course Objective:

- The objective of this course is to learn the advantages and disadvantages of existing networks and future generation networks.

Course Outcomes:

- To understand the design of routing mechanism to meet out the desired QoS in NGN.
- To analyse IMS architecture, services, convergent management issues in NGN.
- To analyse various methods of providing connection-oriented services over a NGN with reference to MPLS.
- To analyse various multicasting services with reference to VPNs, VLANs, pseudo wires, VPLS and typical applications.
- To understand the various NGN management modules.

UNIT I (9 Hrs)

WIRELESS IP: Evolution of public mobile services - Motivations for IP based services, Wireless IP network Architecture 3GPP packet data network architecture. Introduction to next generation networks – Opportunities and challenges. Technologies-Networks and services-Future trends.

UNIT II (9 Hrs)

IMS AND CONVERGENT MANAGEMENT: IMS Architecture - IMS services-QoS Control and Authentication-Network and Service management for NGN-IMS advantages-Next Generation OSS Architecture - Standards important to OSS architecture-Information framework- OSS interaction with IMS-NGN OSS function/ information view reference model-DMTF CIM.

UNIT III (9 Hrs)

MPLS and VPN: Technology overview –MPLS & QoS- MPLS services and components –layer 2 VPN-layer 2 internetworking-VPN services, Signaling-layer 3 VPN –Technology overview-Remote Access and IPsec integration with MPLS VPN – GMPLS

UNIT IV (9 Hrs)

MULTICAST: MPLS Multicast VPN overview – Applications- Examples-IPv6 and MPLS- Technology overview-Future of MPLS –Integrating IP and optical networks- Future layer 3 services-future layer 2 services-edge computing-Fog-5G-SDN.

UNIT V (9 Hrs)

NGN MANAGEMENT: MPLS Multicast VPN overview – Applications, Examples, IPv6 and MPLS- Technology overview, Future of MPLS –Integrating IP and optical networks, Future layer 3 services, future layer 2 services.

List of Experiments:

1. To practise the system configuration.
2. To practise network configuration.
3. To practise connecting a PC in a network using physical medium to get connectivity.
4. Demonstrate to connect two computer without connecting devices.
5. Demonstrate to connect two computer with connecting devices.
6. Demonstrate to establish client-server connection with using of windows server 2008.
7. Use of policies in Windows Server 2008 7. Overview of Router.
8. Demonstrate the use of router to make a connection.
9. Overview of router.
10. Implement IP Subnetting in IPV4.
11. Implement IP routing using RIP.
12. Implement IP routing using IGRP.

Text Books:

1. Monique J. Morrow, "Next Generation Networks", CISCO Press, 2007.
2. Robert Wood, "MPLS and Next Generation Networks: Foundations for NGN and Enterprise Virtualization", CISCO Press, 2006.

References:

1. Thomas Plavyk, "Next generation Telecommunication Networks, Services and Management", Wiley & IEEE Publications, 2010.
2. Neill Wilkinson, "Next Generation Network Services", John Wiley Publications, 2002.

ONLINE/ NPTEL Courses:

1. Networks and Systems: https://nptel.ac.in/courses/108106075

CSPE405 INTERNET OF THINGS

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Computer Networks
- Python Programming

Course Objective:

- To learn IoT concepts, architecture and protocols.

Course Outcomes:

- To understand the architectural overview of IoT.
- To apply basic knowledge and understanding of Architecture and protocols.
- To gain knowledge in network IEEE standards.
- To understand the various IoT Protocols like Datalink, Network, Transport, Session, Service layers.
- To understand the IoT Reference Architecture and Real World Design Constraints.

UNIT I (9 Hrs)

OVERVIEW OF IOT: An Architectural Overview– Building an architecture- Main design principles-needed capabilities- An IoT architecture outline- Standards considerations. M2M and IoT Technology.Fundamentals- Devices and gateways- Local and wide area networking- Data management-Business processes in IoT- Everything as a Service(XaaS)- M2M and IoT Analytics-Knowledge Management.

UNIT II (9 Hrs)

REFERENCE MODEL: IoT Architecture-State of the Art – Introduction, State of the art- Reference Model and architecture- IoT reference Model - IoT Reference Architecture- Introduction-Functional View-Information View-Deployment and Operational View- Other Relevant architectural views.Real-World Design Constraints- Introduction-Technical Design constraints-Hardware is popular again-Data representation and visualization, Interaction and remote control.

UNIT III (9 Hrs)

IoT DATA LINK LAYER & NETWORK LAYER PROTOCOLS: PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15)-WirelessHART- ZWave- Bluetooth Low Energy- Zigbee Smart Energy,DASH7 - Network Layer-IPv4-IPv6- 6LoWPAN- 6TiSCH-ND- DHCP- ICMP- RPL- CORPL- CARP.

UNIT IV (9 Hrs)

TRANSPORT & SESSION LAYER PROTOCOLS: Transport Layer (TCP- MPTCP- UDP-DCCP-SCTP)-(TLS-DTLS) – Session Layer HTTP-CoAP- XMPP-AMQP-MQTT.

UNIT V (9 Hrs)

SERVICE LAYER PROTOCOLS & SECURITY: Service Layer -OneM2M-ETSI M2M-OMA-BBF – Security in IoT Protocols – MAC 802.15.4 - 6LoWPAN- RPL- Application Layer.

List of Experiments:

1. Introduction to Arduino platform and programming
2. Interfacing Arduino to Zigbee module
3. Interfacing Arduino to GSM module
4. Interfacing Arduino to Bluetooth Module
5. Introduction to Raspberry PI platform and python programming
6. Interfacing sensors to Raspberry PI
7. Communicate between Arduino and Raspberry PI using any wireless medium
8. Setup a cloud platform to log the data
9. Log Data using Raspberry PI and upload to the cloud platform.
10. Design an IoT based system

Text Books:

1. Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri, "Internet of Things: Architectures, Protocols and Standards", 1st Edition, 2018.
2. BK Tripathy and J.Anuradha, "Internet Of Things (IoT) Technologies Applications Challenges And Solutions", Taylor & Francis, 1st Edition, 2017.

References:

1. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM, MUMBAI, 1st Edition, 2015.
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", Academic Press, 1st Edition,2014.
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", Springer, 1st Edition, 2011.

ONLINE/ NPTEL Courses:

1. Introduction to internet of things : Data Analysis And Applications: https://nptel.ac.in/courses/106105166
2. Introduction to Industry 4.0 and Industrial Internet of Things: https : //nptel.ac.in/courses/106105195

CSPE501 OPTIMIZATION TECHNIQUES

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Artificial Intelligence and Machine Learning

Course Objective:

- To introduce the basic concepts of linear,non-programming a interior point and dynamic programming.

Course Outcomes:

- To understand the linear programming model and acquire management skills.
- To apply the theory of optimization methods and algorithms.
- To understand non linear programming.
- To analyze karmarkar's algorithm and applying optimization techniques in problems of Engineering and Technology.
- To understand dynamic programming and appreciate variety of performance measures for various optimization problems.

UNIT I (9 Hrs)

LINEAR PROGRAMMING: Introduction- Formulation of linear programming model- Graphical solution- Solving LPP using simplex algorithm-Revised Simplex Method.

UNIT II (9 Hrs)

ADVANCES IN LPP: Dual theory- Dual simplex method- Sensitivity analysis- Transportation problems- Assignment problems- Traveling sales man problem- Data Envelopment Analysis.

UNIT III (9 Hrs)

NON LINEAR PROGRAMMING: Classification of Non Linear programming-Lagrange multiplier method- Karush, Kuhn Tucker conditions- Reduced gradient algorithms-Quadratic programming method-Penalty and Barrier method.

UNIT IV (9 Hrs)

INTERIOR POINT METHODS: Karmarkar's algorithm- Projection Scaling method-Dual affine algorithm-Primal affine algorithm Barrier algorithm.

UNIT V (9 Hrs)

DYNAMIC PROGRAMMING: Formulation of Multi stage decision problem- Characteristics- Concept of sub- Optimization and the principle of optimality-Formulation of Dynamic programming- Backward and Forward recursion-Computational procedure-Conversion of final value problem in to Initial value problem.

List of Experiments:

1. Formulate engineering system design problem as an optimization problem.
2. Problem formulated in Experiment No. 1 should be solved graphically and identify the nature of problem.
3. By using excel solver solve unconstrained and constrained optimization problems by creating excel worksheets.
4. Solve LPP by two-phase simplex method numerically and verify the results by using simulation software
5. Solve quadratic programming problem numerically and verify results by using simulation software.
6. Verify the descent conditions for a given search direction for unconstrained optimization problem and calculate step size along search direction using Equal Interval Search method numerically and verify results by using simulation software
7. Solve nonlinear optimization problems by using numerical optimization methods (indirect) Newtons methods verify the results by using simulation software.

Text Books:

1. Sultan Chand and Sons, "Operations Research", Sultan Chand and Sons, 2019.
2. L. R. Foulds,"Optimization Techniques",Softcover reprint of the original, 1st Edition, 2011.
3. Chander Mohan and Kusum Deep,"Optimization Techniques", New Age Science Ltd, 2009.

References:

1. Philips, Ravindran and Solberg, "Operations Research", John Wiley, 2019.
2. Ronald L.Rardin, "Optimization in Operation Research", Pearson Education Pvt.Ltd., 2018.

ONLINE/ NPTEL Courses:

1. Linear Programming Problems : https://nptel.ac.in/courses/111102012
2. Nonlinear programming: https://nptel.ac.in/courses/111107104

CSPE502 DEEP LEARNING

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Artificial Neural networks
- Machine Learning

Course Objective:

- To enable design and deployment of deep learning models for machine learning problems.

Course Outcomes:

- To understand basics of deep learning.
- To implement various deep learning models.
- To realign high dimensional data using reduction techniques.
- To analyze optimization and generalization in deep learning.
- To explore the deep learning applications.

UNIT I (9 Hrs)

INTRODUCTION TO MACHINE LEARNING: Linear models (SVMs and logistic regression)- Intro to Neural Nets: Shallow network - Connect and Train a network: loss functions, Back propagation and stochastic gradient descent- Neural networks as universal function approximates.

UNIT II (9 Hrs)

HISTORY OF DEEP LEARNING : A Probabilistic Theory of Deep Learning- Back propagation and regularization- Batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks Convolutional Networks- Generative Adversarial Networks (GAN)- Semi supervised Learning.

UNIT III (9 Hrs)

LINEAR AND MANIFOLDS: Auto encoders and CNN - Introduction to Convent - Architectures – AlexNet, VGG, Inception, ResNet -Training a Convent: Weights initialization, Batch normalization, Hyper parameter optimization.

UNIT IV (9 Hrs)

OPTIMIZATION IN DEEP LEARNING: Non-convex optimization for deep networks- Stochastic Optimization- Generalization in neural networks- Spatial Transformer Networks- Recurrent networks-LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning.

UNIT V (9 Hrs)

APPLICATIONS OF DEEP LEARNING: Images segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative adversarial networks – Video to Text with LSTM models –Attention models for Computer Vision – Case Study: Named Entity Recognition – Opinion Mining using Recurrent Neural Networks – Parsing and Sentiment Analysis using Recursive Neural Networks –Sentence Classification using Convolutional Neural Networks – Dialogue Generation with LSTMs.

List of Experiments:

1. Write a program to implement Support Vector Machine algorithm to classify the iris data set. Print both correct and wrong predictions.
2. Build a simple neural network model for regression.
3. Write a program to implement deep learning Techniques for image segmentation.
4. Build a feed forward neural network for prediction of logic gates.
5. Write a program for Time-Series Forecasting with the LSTM Model.
6. Write a program to predict a caption for a sample image using LSTM.

Text Books:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
2. Michael Nielsen, "Neural Networks and Deep Learning", Determination Press, 2015.
3. CosmaRohillaShalizi, "Advanced Data Analysis from an Elementary Point of View", 2015.

References:

1. Jon Krohn, Beyleveld Grant and Bassens Aglaé, "Deep Learning Illustrated: A Visual, Interactive, Guide to Artificial Intelligence", Addison-wesley, 2019.
2. Hyatt Saleh, "Applied Deep Learning with PyTorch", Packt Publishing, 2019.
3. Pradeep Pujari, Md. and Rezaul Karim, Mohit Sewak, "Practical Convolutional Neural Networks",Packt Publishing, February 2018.
4. Ragav Venkatesan and Baoxin Li, "Convolutional Neural Networks in Visual Computing (Data Enabled Engineering)", CRC Press, September 2017.

ONLINE/ NPTEL Courses:

1. Deep Learning : https://nptel.ac.in/courses/106105215
2. Deep Learning : https://nptel.ac.in/courses/106106201

CSPE503 KNOWLEDGE ENGINEERING

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basics of Artificial Intelligence

Course Objective:

- To deal with knowledge acquisition, representation, validation, inference, explanation and maintenance.

Course Outcomes:

- To understand the basics of Knowledge Engineering.
- To apply methodologies and modelling for agent design and development.
- To design and develop ontologies.
- To apply reasoning with ontologies and rules.
- To understand learning and rule learning.

UNIT I (9 Hrs)

REASONING UNDER UNCERTAINTY: Introduction – Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods - Evidence-based reasoning – Intelligent Agent – Mixed-Initiative Reasoning – Knowledge Engineering.

UNIT II (9 Hrs)

METHODOLOGY AND MODELING : Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment – Believability Assessment – Drill-Down Analysis, Assumption-based Reasoning, and What-If Scenarios.

UNIT III (9 Hrs)

ONTOLOGIES DESIGN AND DEVELOPMENT: Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features – Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching.Design and Development Methodologies – Steps in Ontology Development – Domain Understanding and Concept Elicitation – Modelling-based Ontology Specification.

UNIT IV (9 Hrs)

REASONIING WITH ONTOLOGIES AND RULES: Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching – Partially Learned Knowledge – Reasoning with Partially Learned Knowledge.

UNIT V (9 Hrs)

LEARNING AND RULE LEARNING: Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal definition of Generalization. Modelling, Learning and Problem Solving – Rule learning and Refinement – Overview – Rule Generation and Analysis – Hypothesis Learning.

List of Experiments:

1. Implementation of Missionaries and Cannibals Problem using rule-based approach.
2. Implementation of First Order Logic
3. Implementation of Bayesian networks.
4. Implementation of Semantic Networks.
5. Developing a Fuzzy Inference system
6. Construction of Ontology for a given domain.
7. Implementation of Frames.
8. Develop an expert system for classification of Animals with Property Inheritance
9. Mini Project using Fuzzy Rules and Machine Learning

Text Books:

1. Ela Kumar, "Knowledge Engineering", IK International Publisher House, 2018.
2. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, "Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning", Cambridge University Press, 1st Edition, 2016.

References:

1. Michael K. Bergman,"Knowledge Representation and Reasoning", 2018.
2. King , "Knowledge Management and Organizational Learning", Springer, 2009.
3. Ronald J. Brachman, Hector J. Levesque,"Knowledge Representation and Reasoning", Morgan Kaufmann, 2004.

ONLINE/ NPTEL Courses:

1. Knowledge Management: https://nptel.ac.in/courses/110105076
2. Knowledge Representation and Reasoning: https://nptel.ac.in/courses/106106140

CSPE504 NATURAL LANGUAGE PROCESSING

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Artificial Intelligence and Neural Networks

Course Objective:

- To read, understand and decode human words in a valuable manner.

Course Outcomes:

- To understand 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 (9 Hrs)

INTRODUCTION: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology- Transducers for lexicon and rules- Tokenization, Detecting and Correcting Spelling Errors-Minimum Edit Distanceg.

UNIT II (9 Hrs)

WORD LEVEL ANALYSIS: Unsmoothed N-grams- Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging- Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III (9 Hrs)

SYNTACTIC ANALYSIS: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for gram- mar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG- Probabilistic CYK-Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

UNIT IV (9 Hrs)

SEMANTICS AND PRAGMATICS: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis-Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT V (9 Hrs)

DISCOURSE ANALYSIS AND LEXICAL RESOURCES: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer- Lemmatizer- Penn Treebank, Brill's Tagger-WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

List of Experiments:

1. Word Analysis
2. Word Generation
3. Morphology
4. N-Grams Smoothing
5. POS Tagging: Hidden Markov Model
6. POS Tagging: Viterbi Decoding

Text Books:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: "An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
2. Steven Bird, Evan Klein and Edward Loper, "Natural Language Processing with Python", O'Reilly Media, 1st Edition, 2009.
3. S.N.Sivanandham and M Paulraj, "Introduction to Artificial Neural Networks", Vikas Pubishing, 2023.

References:

1. Breck Baldwin, "Language Processing with Java and LingPipe 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", Chapman and Hall/CRC Press,2nd Edition, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

ONLINE/ NPTEL Courses:

1. Applied Natural Language Processing : https://nptel.ac.in/courses/106106211
2. Natural Language Processing : https://nptel.ac.in/courses/106105158

CSPE505 ARTIFICIAL NEURAL NETWORKS

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Computer Networks

Course Objective:

- To introduce models of ANN for solving simple pattern recognition problems.

Course Outcomes:

- To understand the building blocks of Neural networks.
- To provide the application areas of neural networks.
- To develop neural network models.
- To provide knowledge of learning networks.
- To design and develop applications using neural networks.

UNIT I (9 Hrs)

INTRODUCTION: Biological Neuron – Artificial Neural Model - Types of activation functions – Architecture: Feed forward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem- XOR Problem, Multilayer Networks. Learning: Learning Algorithms- Error correction and Gradient Descent Rules- Learning objective of TLNs, Perceptron Learning Algorithm- Perceptron Convergence Theorem.

UNIT II (9 Hrs)

SUPERVISED LEARNING: Perceptron learning and Non Separable sets, alpha -Least Mean Square Learning, MSE Error surface-Steepest Descent Search- μ-LMS approximate to gradient descent- Application of LMS to Noise Cancelling, Multi-layered Network Architecture, Back propagation Learning Algorithm-Practical consideration of BP algorithm.

UNIT III (9 Hrs)

SUPPORT VECTOR MACHINES AND RADIAL BASIS FUNCTION: Learning from Examples, Statistical Learning Theory, Support Vector Machines, SVM application to Image Classification, Radial Basis Function Regularization theory, Generalized RBF Networks- Learning in RBFNs- RBF application to face recognition.

UNIT IV (9 Hrs)

ATTRACTOR NEURAL NETWORKS: Associative Learning, Attractor Associative Memory, Linear Associative memory, Hopfield Network- Application of Hopfield Network- Box neural Network, Simulated Annealing, Boltzmann Machine - Bidirectional Associative Memory.

UNIT V (9 Hrs)

SELF-ORGANIZATION FEATURE MAP: Maximal Eigenvector Filtering, Extracting Principal Components Generalized Learning Laws, Vector Quantization, Self organization, Feature Maps, Application of SOM, Growing Neural Gas.

List of Experiments:

1. Write a MATLAB program to plot a few activation functions that are being used in neural networks
2. Generate AND NOT function using McCulloch-Pitts neural net by a MATLAB program
3. Generate XOR function using McCulloch-Pitts neuron.
4. Write a MATLAB program for perceptron net for an AND function with bipolar inputs and targets.
5. Write a MATLAB program to illustrate ART neural network.

Text Books:

1. Satish Kumar,"Neural Networks", McGraw Hill Education,2nd Edition, 2017.

References:

1. B. Yegnanarayana, "Artificial Neural Networks", PHI, 2012.
2. J.M. Zurada, "Introduction to Artificial Neural Systems", Jaico Publications, 2010.

ONLINE/ NPTEL Courses:

1. Neural Networks and Applications : https://nptel.ac.in/courses/117105084
2. Fuzzy Logic and Neural Networks : https://nptel.ac.in/courses/127105006
3. Neural Networks for Signal Processing :https://nptel.ac.in/courses/108108148

CSPE601 INFORMATION SECURITY

L	T	P	C
3	0	0	3

Pre-requisite:

- Computer Networks

Course Objective:

- To learn principle concepts of Information security, investigation techniques, security analysis and design with applications.

Course Outcomes:

- To master information security governance, and related legal and regulatory issues.
- To be familiar with how threats to an organization are discovered, analyzed.
- To be familiar with network security threats and counter measures.
- To be familiar with network security designs using available secure solutions (such as PGP, SSL, IPSec, etc).
- To be familiar with advanced security issues and technologies (such as DDoS attack detection and containment, and anonymous communications).

UNIT I (9 Hrs)

FUNDAMENTALS: Introduction to Information Security - Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components , Balancing Security and Access, SDLC, Security SDLC

UNIT II (9 Hrs)

SECURITY INVESTIGATION: Need for Security - Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues.

UNIT III (9 Hrs)

SECURITY ANALYSIS: Risk Management- Identifying and Assessing Risk, Assessing and Controlling Risk, Trends in Information Risk Management, Managing Risk in an Intranet Environment.

UNIT IV (9 Hrs)

LOGICAL DESIGN: Blueprint for Security - Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity.

UNIT V (9 Hrs)

PHYSICAL DESIGN: Security Technology - IDS, Scanning and Analysis Tools, Cryptography - Access Control Devices, Physical Security, Security and Personnel issues.

List of Experiments:

1. Installation of Wire shark, tcpdump and observe data transferred in client-server communication using UDP/TCP and identify the UDP/TCP datagram.
2. Experiment Eavesdropping, Dictionary attacks, MITM attacks
3. Experiment with Sniff Traffic using ARP Poisoning
4. Demonstrate intrusion detection system using any tool.
5. Explore network monitoring tools
6. Study to configure Firewall, VPN

Text Books:

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, 2022.

References:

1. Matt Bishop, Elisabeth Sullivan, Michelle Ruppel, "Computer Security Art and Science", Addison-Wesley/Pearson Education, 2019.
2. Stuart Collier, Mark;Endler, David, "Hacking Exposed", Open University publications, 2nd Edition, 2013.
3. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.

Online / NPTEL Courses:

1. Cryptography and Network Security- https://archive.nptel.ac.in/courses/106/105/106105162
2. Introduction to Information Security- https://archive.nptel.ac.in/noc/courses/noc15/SEM1/noc15-cs03

CSPE602 MODERN CRYPTOGRAPHY

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Computer security
- Algorithms and Data structures

Course Objective:

- To provide instruction about the concepts of cryptography, Notions of attacks, random oracles, pseudo random permutation, block ciphers and message authentication codes.

Course Outcomes:

- To interpret the basic principles of cryptography and general cryptanalysis.
- To determine the concepts of symmetric encryption and authentication.
- To identify the use of public key encryption, digital signatures, and key establishment.
- To articulate the cryptographic algorithms to compose, build and analyze simple cryptographic solutions.
- To express the use of Message Authentication Codes.

UNIT I (9 Hrs)

INTRODUCTION: Basics of Symmetric Key Cryptography- Basics of Asymmetric Key Cryptography, Hardness of Functions- Notions of Semantic Security (SS) and Message Indistinguishability (MI)- Proof of Equivalence of SS and MI, Hard Core Predicate, Trap-door permutation, Goldwasser-Micali Encryption- Goldreich-Levin Theorem- Relation between Hardcore Predicates and Trap-door permutations.

UNIT II (9 Hrs)

FORMAL NOTIONS OF ATTACKS: Attacks under Message Indistinguishability- Chosen Plaintext Attack (IND-CPA), Chosen Ciphertext Attacks (IND-CCA1 and IND-CCA2), Attacks under Message Non-malleability- NM-CPA and NM- CCA2, Inter-relations among the attack model.

UNIT III (9 Hrs)

RANDOM ORACLES: Provable Security and asymmetric cryptography- Hash functions-One-way functions: Weak and Strong one-way functions, Pseudo-random Generators (PRG), Blum-Micali-Yao Construction, Construction of more powerful PRG, Relation between One-way functions and PRG, Pseudo random Functions (PRF).

UNIT IV (9 Hrs)

BUILDING A PSEUDO RANDOM PERMUTATION: LubyRackoff Construction- Formal Definition, Application of the LubyRackoff Construction to the construction of Block Ciphers, The DES in the light of LubyRackoff Construction.

UNIT V (9 Hrs)

MESSAGE AUTHENTICATION CODES: Left or Right Security (LOR)- Formal Definition of Weak and Strong MACs, Using a PRF as a MAC, Variable length MAC- Public Key Signature Schemes- Formal Definitions, Signing and Verification, Formal Proofs of Security of Full Domain Hashing. Assumptions for Public Key Signature Schemes- One-way functions Imply Secure One-time Signatures, Shamir's Secret Sharing Scheme, Formally Analyzing Cryptographic Protocols, Zero Knowledge Proofs and Protocols.

List of Experiments:

1. Implement Feige-Fiat-Shamir identification protocol.
2. Implement GQ identification protocol.
3. Implement Schnorr identification protocol
4. Implement Rabin one-time signature scheme.
5. Implement Merkle one-time signature scheme.
6. Implement Authentication trees and one-time signatures.
7. Implement GMR one-time signature scheme.

Text Books:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", PHI, 8th Edition, 2019.
2. Hans Delfs and Helmut Knebl, Introduction to Cryptography: Principles and Applications, Springer Verlag, 2015.
3. Wenbo Mao, "Modern Cryptography, Theory and Practice", Pearson Education, 2013.

References:

1. OdedGoldreich, "Foundations of Cryptography", CRC Press, Volume 1 and Volume 2, 2014.

Online / NPTEL Courses :

1. Modern Cryptography- https://onlinecourses.nptel.ac.in/noc22_cs03
2. Cryptography and Network Security- https://nptel.ac.in/courses/106105031

CSPE603 CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Distributed systems
- Cryptography

Course Objective:

- To understand the basics of Blockchain, Bitcoin cryptocurrency, consensus, hyperledger fabric/Ethereum and apply it in various blockchain applications.

Course Outcomes:

- To understand emerging abstract models for Blockchain Technology.
- To identify major research challenges and technical gaps in crypto currency domain.
- To understand the function of Blockchain as a method of securing distributed ledgers.
- To apply hyperledger Fabric and Ethereum platform to implement the Block chain application.
- To explore various applications of Blockchain.

UNIT I (9 Hrs)

INTRODUCTION TO BLOCK CHAIN: Block chain- Public Ledgers, Block chain as Public Ledgers - Block in a Block chain, Transactions- The Chain and the Longest Chain - Permissioned Model of Block chain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree

UNIT II (9 Hrs)

BITCOIN AND CRYPTOCURRENCY: A basic crypto currency, Creation of coins, Payments and double spending, FORTH – The precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.

UNIT III (9 Hrs)

BITCOIN CONSENSUS: Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW, Bitcoin PoW, Attacks on PoW, Monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool- Permissioned model and use cases.

UNIT IV (9 Hrs)

HYPERLEDGER FABRIC & ETHEREUM: Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

UNIT V (9 Hrs)

BLOCK CHAIN APPLICATIONS: Smart contracts, Truffle Design and issue- DApps- NFT. Block chain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.

List of Experiments:

1. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on cloud to run.
2. Create and deploy a block chain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chain code, and perform invoke and query on your block chain network.
3. Interact with a block chain network. Execute transactions and requests against a block chain network by creating an app to test the network and its rules.
4. Deploy an asset-transfer app using block chain. Learn app development within a Hyperledger Fabric network.
5. Use block chain to track fitness club rewards. Build a web app that uses Hyperledger Fabric to track and trace member rewards.

Text Books:

1. Bashir and Imran, "Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks",Packet Publishing, 2017.
2. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media, 2014.

References:

1. Daniel Drescher, "Blockchain Basics", 1st Edition, Apress, 2017
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. "Bitcoin and cryptocurrency technologies: a comprehensive introduction", Princeton University Press, 2016.
3. Melanie Swan, "Blockchain: Blueprint for a New Economy", O'Reilly Media, 2015.
4. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Blockchain", Packt Publishing, 2018.

Online /NPTEL Courses:

1. Cryptocurrency and Blockchain Technologies- https://onlinecourses.nptel.ac.in/noc22_cs44
2. Blockchain Technologies- https://nptel.ac.in/courses/106104220

CSPE604 DIGITAL AND MOBILE FORENSICS

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Cyber Security
- Basics of Knowledge Programming

Course Objective:

- To understand the basics of digital forensics, techniques, crime investigation, forensic readiness, iOS forensics and android forensics.

Course Outcomes:

- To obtain knowledge on digital forensics.
- To know about digital crime and investigations.
- To understand the Origins of forensics Science.
- To investigate, identify and extract digital evidence from iOS devices.
- To investigate, identify and extract digital evidence from Android devices.

UNIT I (9 Hrs)

INTRODUCTION TO DIGITAL FORENSICS: Forensic Science – Digital Forensics, Digital Evidence, Digital Forensics Process, Introduction, Identification Phase, Collection Phase, Examination Phase, Analysis Phase – Presentation Phase

UNIT II (9 Hrs)

DIGITAL CRIME AND INVESTIGATION: Digital Crime – Substantive Criminal Law, General Conditions, Offenses, Investigation Methods for Collecting Digital Evidence, International Cooperation to Collect Digital Evidence.

UNIT III (9 Hrs)

DIGITAL FORENSIC READINESS: Introduction – Law Enforcement versus Enterprise Digital Forensic Readiness, Rationale for Digital Forensic Readiness, Frameworks, Standards and Methodologies, Enterprise Digital Forensic Readiness, Challenges in Digital Forensics

UNIT IV (9 Hrs)

iOS FORENSICS: Mobile Hardware and Operating Systems - IOS Fundamentals, Jail breaking, File System, Hardware, IPhone Security, IOS Forensics, Procedures and Processes,Tools, Oxygen Forensics, MobilEdit, iCloud.

UNIT V (9 Hrs)

ANDROID FORENSICS: Android basics – Key CodesADB, Rooting Android, Boot Process, File Systems, Security, Tools, Android Forensics, Forensic Procedures, ADB, Android Only Tools, Dual Use Tools, Oxygen Forensics MobilEdit, Android App Decompiling.

List of Experiments:

1. Installation of Sleuth Kit on Linux. List all data blocks. Analyze allocated as well as unallocated blocks of a disk image.
2. Data extraction from call logs using Sleuth Kit.
3. Data extraction from SMS and contacts using Sleuth Kit.
4. Install Mobile Verification Toolkit or MVT and decrypt encrypted iOS backups.
5. Study of Computer Forensics and different tools used for forensic investigation
6. How to Recover Deleted Files using Forensics Tools
7. Find Last Connected USB on your system (USB Forensics)
8. Live Forensics Case Investigation using Autopsy
9. How to Collect Email Evidence in Victim PC
10. Study the steps for hiding and extract any text file behind an image file/ Audio file using Command Prompt.
11. Extract installed applications from Android devices.

Text Books:

1. Chuck Easttom, "An In-depth Guide to Mobile Device Forensics", 1st Edition, CRC Press, 2022
2. Andre Arnes, "Digital Forensics", Wiley, 2018.

References:

1. Vacca, J, "Computer Forensics, Computer Crime Scene Investigation", Charles River Media, 2nd Edition, 2005.

Online/ NPTEL Courses:

1. ACM Summer School in Information Security and Forensics-https://nptel.ac.in/courses/128106006

CSPE605 ETHICAL HACKING

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Computer networking
- Information Security

Course Objective:

- To learn the basics of computer based vulnerabilities and to practice tools to perform ethical hacking to expose the vulnerabilities.

Course Outcomes:

- To express knowledge on basics of computer based vulnerabilities.
- To gain understanding on different foot printing, reconnaissance and scanning methods.
- To demonstrate the enumeration and vulnerability analysis methods.
- To gain knowledge on hacking options available in Web and wireless applications.
- To acquire knowledge on the options for network protection.

UNIT I (9 Hrs)

INTRODUCTION: Ethical Hacking Overview - Role of Security and Penetration Testers, Penetration-Testing Methodologies, Laws of the Land - Overview of TCP/IP, The Application Layer, The Transport Layer, The Internet Layer, IP Addressing , Network and Computer Attacks, Malware, Protecting Against Malware Attacks, Intruder Attacks, Addressing Physical Security.

UNIT II (9 Hrs)

FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS: Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering, Footprinting Tools, Network Scanning Concepts, Port-Scanning Tools, Scanning Techniques, Scanning Beyond IDS and Firewall.

UNIT III (9 Hrs)

ENUMERATION AND VULNERABILITY ANALYSIS: Enumeration Concepts - NetBIOS Enumeration, SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts,Desktop and Server OS Vulnerabilities, Windows OS Vulnerabilities, Tools for Identifying Vulnerabilities in Windows, Linux OS Vulnerabilities, Vulnerabilities of Embedded Oss.

UNIT IV (9 Hrs)

SYSTEM HACKING: Hacking Web Servers - Web Application Components, Vulnerabilities, Tools for Web Attackers and Security Testers Hacking Wireless Networks, Components of a Wireless Network, Wardriving, Wireless Hacking, Tools of the Trade .

UNIT V (9 Hrs)

NETWORK PROTECTION SYSTEMS: Access Control Lists - Cisco Adaptive Security Appliance Firewall, Configuration and Risk Analysis Tools for Firewalls and Routers, Intrusion Detection and Prevention Systems, Network-Based and Host-Based IDSs and IPSs, Web Filtering, Security Incident Response Teams, Honeypots.

List of Experiments:

1. Install Backtrack Linux / Metasploitable/ Windows XP.
2. Practice the basics of Foot printing and Reconnaissance.
3. Developing and implementing malwares.
4. Aggregates information from public databases using online free tools like Paterva's Maltego.
5. Information gathering using tools like Robtex.
6. Scan the target using tools like Nessus.
7. View and capture network traffic using Wireshark.
8. Study Sql injection and Session hijacking

Text Books:

1. Patrick Engebretson, "The Basics of Hacking and Penetration Testing" SYNGRESS, Elsevier, 2013.
2. Dafydd Stuttard and Marcus Pinto"The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", Wiley,2011.
3. Michael T. Simpson, Kent Backman, and James E. Corley, "Hands-On Ethical Hacking and Network Defense, Course Technology", Delmar Cengage Learning, 2010.

References:

1. Justin Seitz, "Black Hat Python: Python Programming for Hackers and Pentesters", No Starch Press, 2014.

Online/ NPTEL Courses:

1. Ethical Hacking- https://nptel.ac.in/courses/106105217
2. Computer Networks and internet protocol- https://archive.nptel.ac.in/courses/106 105/106105183/

CSOE001 DATA STRUCTURES

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic programming language

Course Objective:

- To learn data structures concepts, sorting and searching applications, lists, arrays, stacks, queues, trees, graphs, hashing techniques.

Course Outcomes:

- To understand the basics of data structure concepts.
- To understand the concepts of sorting algorithms.
- To understand the concepts of queues and its applications.
- To underdstand the concept of tree and graph
- To develop the applications of data structures with hashing techniques.

UNIT I (9 Hrs)

BASICS: Abstract Data Type(ADT)- Introduction to data structures, representation, implementation. Stack and list- Representing stack- implementation, application, balancing symbols, conversion of infix to postfix expression, evaluating a postfix expression, recursive function call. Linked list ADT- implementation using arrays, limitations, linked list using dynamic variables, linked implementation of stacks, circular list, doubly linked lists.

UNIT II (9 Hrs)

SORTING: Efficiency of sorting- Bubble sort, Quick sort, Selection sort, Heap sort, Insertion sort, Shell sort, Merge sort, Radix sort.

UNIT III (9 Hrs)

QUEUES: Queue abstract data type- Array implementation, Circular queue, linked list implementation of queues, Priority queues, Double ended queues, Multiple stacks and queues, application.

UNIT IV (9 Hrs)

TREES: General trees, Binary tree, traversal methods, Expression trees, Game trees. Binary search trees, AVL trees, Splay trees, B Trees, B+ Trees, Tries, application.

UNIT V (9 Hrs)

HASHING: Introduction, Hash function, methods, Hash table implementation, Rehashing. Graph- Directed and undirected graph, Representation of graphs, Graph traversals: Depth first search, Breadth first search, Transitive closure, Spanning trees, application, Topological sorting.

List of Experiments:

1. Array implementation of Stack, Queue and Circular Queue ADTs
2. Implementation of Singly Linked List
3. Linked list implementation of Stack and Linear Queue ADTs
4. Implementation of Polynomial Manipulation using Linked list
5. Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues
9. Implementation of Dijkstra's Algorithm
10. Implementation of Prim's Algorithm
11. Implementation of Linear Search and Binary Search
12. Implementation of Insertion Sort and Selection Sort
13. Implementation of Merge Sort
14. Implementation of Open Addressing (Linear Probing and Quadratic Probing)

Text Books:

1. Mark Allen Weiss, "Data structures and algorithm analysis in C++", Pearson Education, 6^{th} Edition, 2011.
2. YedidyahLangsam, Moshe J Augenstein and Aaron M Tanenbaum, "Data Structures using C and C++", 2^{nd} Edition, Prentice Hall of India, 2009.

References:

1. G.A.V.Pai, "Data Structures and Algorithms – Concepts, Techniques and Applications", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Ellis Horowitz and SartajSahni, "Fundamentals of Data structures", Galgotia Publications, New Delhi, 2^{nd} Edition, 2008.
3. Alfred V. Aho, Jeffrey D. Ullman and John E. Hopcroft. "Data Structures and Algorithms", Addison Wesley, 1983

Online/NPTEL Courses:

- Introduction to Data Structures and Algorithms: https://nptel.ac.in/courses/106102064
- Data Structures: https://onlinecourses.swayam2.ac.in/cec19_cs04

CSOE002 FUNDAMENTALS OF DATABASE

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Basic programming language

Course Objective:

- To learn the fundamental concepts of Database Management System, ER Model for real time projects, Query with constraints, Nested queries and Transactions concepts.

Course Outcomes:

- To understand the Concepts of Database Management System.
- To design ER Model for Real Time projects.
- To understand Query with Constraints.
- To use Nested Queries.
- To understand the Transactions Concepts.

UNIT I (9 Hrs)

INTRODUCTION TO DATABASES AND TRANSACTIONS: Introduction to Database Systems- Overview, Data Models, Database System Architecture, Storage Management, Transaction Management, History of Database Systems, Introduction to Relational Model.

UNIT II (9 Hrs)

ENTITY-RELATIONSHIP MODEL: Basic Concepts, Constraints, Keys, Design Issues, Entity Relationship Diagram, Entity Sets, Design of E-R Database Schema, Case study- ER Modelling.

UNIT III (9 Hrs)

RELATIONAL MODEL: Structure of Relational Databases, Fundamental Relational-Algebra Operations, Additional Relational–Algebra Operations, Extended Relational-Algebra Operations, Null Values, Modification of the Databases.

UNIT IV (9 Hrs)

SQL: Introduction to SQL, SQL Data-Definition language- Basic Query Structure, Create Table Command, Integrity Constraints, Set Operations. Aggregate Functions, Null Values, Nested Sub-Queries, Views, Modification of Database, Joined Relations, Data-Definition Language-Normalization - 1NF, 2NF, 3NF and BCNF.

UNIT V (9 Hrs)

TRANSACTION MANAGEMENT AND CONCURRENCY: Transaction Management, ACID Properties, Serializability and Concurrency Control- Lock-Based Protocols, Recovery System- Failure Classification, Storage Structure, Recovery and Atomicity.

Text Books:

1. Avi Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", McGraw Hill Education, 7th Edition, 2019.
2. C.J. Date, "An Introduction to Database Systems", Pearson Education, 8th Edition, 2019.

Reference:

1. Hugh Darwen, "Introduction to Relational Database Theory", Addison Wesley, 3rd Edition, 2012.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGrawHill, 2003.

Online/NPTEL Courses:

1. Data Base Management System: https://onlinecourses.nptel.ac.in/noc22_cs91
2. Data Base Management System: https://nptel.ac.in/courses/106105175

CSOE003 ESSENTIALS OF OPERATING SYSTEMS

L	T	P	C
3	0	0	3

Course Objective:

- To learn the fundamentals of operating systems, process management, memory management, File, I/O Management, Storage management and Security.

Course Outcomes:

- To understand the fundamentals of operating system, processes.
- To understand the concept of process scheduling, synchronization and system deadlock handling.
- To understand the concepts of memory management and Virtual memory mangement.
- To understand basic file and I/O management techniques.
- To understand mass storage management and system security issues.

UNIT I (9 Hrs)

INTRODUCTION: Introduction to operating systems- Review of computer organization, Operating system structures, System calls, System programs, System structure, Virtual machines. Processes- Process concept, Process scheduling, Operations on processes, Cooperating processes, Inter-process communication, Communication in client-server systems, Concept of threads.

UNIT II (9 Hrs)

PROCESSOR MANAGEMENT: CPU Scheduling- Scheduling criteria, Scheduling algorithms. Process Synchronization- The critical-section problem, Synchronization hardware, Semaphores, Classic problems of synchronization. Deadlock- System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III (9 Hrs)

MEMORY MANAGEMENT: Memory Management- Background, Swapping, Contiguous memory allocation, Paging, Segmentation, Segmentation with paging. Virtual Memory- Background, Demand paging, Page replacement, Allocation of frames, Thrashing.

UNIT IV (9 Hrs)

FILE AND I/O MANAGEMENT: File-System Interface- File concept, Access methods, Directory structure, File system mounting, Protection. File-System Implementation- Directory implementation, Allocation methods, Free-space management, Efficiency and performance, Recovery Log, structured file systems, I/O Systems, I/O Hardware, Application I/O interface, kernel I/O subsystem, streams–performance.

UNIT V (9 Hrs)

STORAGE MANAGEMENT AND SECURITY: Mass Storage Structure- Disk scheduling, Disk management, Swap-space management, RAID, Disk attachment, Stable storage, Tertiary storage, System Protection and Security.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons(ASIA) Pvt. Ltd, 9th Edition, 2017.
2. D. M. Dhamdhere, "Operating Systems: A concepts based approach", Tata McGraw-Hill Publishing Company Ltd., 2nd Edition, 2006.

References:

1. Harvey M. Deital, "Operating Systems", 3rd3rd Edition, Pearson Education, 2004
2. Andrew S. Tannenbaum and Herbert Bos, "Modern Operating Systems", 4th Edition, Prentice Hall, 2014.

Online/NPTEL Courses:

1. Introduction to Operating System: https://nptel.ac.in/courses/106108101
2. Operating System Fundamentals: https://nptel.ac.in/courses/106105214

CSOE004 FUNDAMENTALS OF CLOUD COMPUTING

L	T	P	C
3	0	0	3

Course Objectives:

- To familiarize the core concepts of cloud computing, characteristics,service and deployment models.
- To design, deploy and manage virtualized resources in cloud environments, virtual machines, storage, and networking components.

Course Outcomes:

- To impart the principles and paradigm of Cloud Computing and understand the Service Model with reference to Cloud Computing.
- To understand the Cloud Computing architecture and implementation.
- To realize the role of Virtualization Technologies and acquire knowledge of how hypervisors are used in Virtual Machines.
- To comprehend Secure and perform identity management in the Cloud and to access and use the services in the Cloud.
- To understand the popular Cloud Service Providers.

UNIT I: (9 Hrs)

INTRODUCTION TO CLOUD COMPUTING: Overview- Roots of Cloud Computing, Layers and Types of Cloud, Desired Features of a Cloud, Benefits and Disadvantages of Cloud Computing, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks, Assessing the role of Open Standards.

UNIT II: (9 Hrs)

CLOUD ARCHITECTURE, SERVICES AND APPLICATIONS: Exploring the Cloud Computing Stack, Connecting to the Cloud, Infrastructure as a Service, Platform as a Service, Software as a Service, Identity as a Service, Compliance as a Service, Introduction to Virtualization Technologies, Cloud Management Products.

UNIT III: (9 Hrs)

AWS: Independently manage a Cloud Architecture through AWS Services, create a computing Infrastructure using Scalable Virtual Service, AWS technology into projects, the Amazon S3 Service, Features and Benefits by AWS.

UNIT IV: (9 Hrs)

MICROSOFT AZURE: Getting started with Azure, Websites and Cloud Services, Virtual Machines, Storage, Virtual Networks, Database.

UNIT V: (9 Hrs)

OPEN SOURCE TOOLS: OpenNebula , Eucalyptus, Apache CloudStack, Nimbus, GoGrid Cloud, PaaSmaker, Red Hat OpenShift Origin, Xen Cloud platform, Cloudify, Apache VCL, Google Drive, Google Docs-Dropbox.

Text Books:

1. Buyya R, Broberg J and Goscinski A, "Cloud Computing: Principles and Paradigm", 1st Edition, John Wiley & Sons, 2013.
2. Sosinsky B, "Cloud Computing Bible", 1st Edition, Wiley Edition, 2011.
3. Theo H.King, "AWS - The Ultimate Guide From Beginners To Advanced for the Amazon Web services", 2021.

References:

1. Miller Michael, "Cloud Computing: Web Based Applications that Change the Way You Work and Collaborate Online", Pearson Education India
2. Smooth S and Tan N., "Private Cloud Computing", Morgan Kauffman , 1st Edition, 2011.
3. Linthicium D, "Cloud Computing and SOA Convergence in Enterprise", Pearson Education India
4. N.Raghavendra Rao,"Enterprise management strategies in the Era of Cloud Computing", Business Science.

ONLINE/NPTEL Courses:

1. Cloud Computing: https://onlinecourses.nptel.ac.in/noc21_cs14
2. Google Cloud Computing Foundation Course: https://nptel.ac.in/courses/106105223

CSOE005 LINUX PROGRAMMING

L	T	P	C
3	0	0	3

Course Pre-requisite:

- Opreating Systems

Course Objective:

- To familiarize fundamentals of the Bourne again shell (bash), shell programming, pipes, input and output redirection Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts and to impart fundamentals of file concepts kernel support for file, File structure related system calls (file API's).

Course Outcomes:

- To use various Linux commands that are used to manipulate system operations at admin level and a prerequisite to pursue job as a Network administrator.
- To apply Shell Programming using Linux commands.
- To design and write application to manipulate internal kernel level Linux File System.
- To develop IPC-API's that can be used to control various processes for synchronization.
- To develop Network Programming that allows applications to make efficient use of resources available on different machines in a network.

UNIT I (9 Hrs)

INTRODUCTION TO LINUX AND LINUX UTILITIES: A brief history of LINUX, Architecture of LINUX, Features of LINUX, Introduction to vi editor. Linux commands- PATH, Man, Echo, Printf, Script, Passwd, Uname, Who, Date, Stty, Pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text Processing utilities and backup utilities , Tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio

UNIT II (9 Hrs)

INTRODUCTION TO SHELLS: Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell Environment Customization. Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

UNIT III (9 Hrs)

GREP: Operation, grep Family, Searching for File Content. Sed- Scripts, Operation, Addresses, commands, Applications, grep and sed - UNIX FILE STRUCTURE- Introduction to UNIX file system, inode (Index Node), File descriptors, System calls and device drivers. File Management - File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

UNIT IV (9 Hrs)

PROCESS AND SIGNALS: Process, Process Identifiers, Process structure- Process table, viewing processes, System processes, Process scheduling, Starting new processes - Waiting for a process, Zombie processes, Orphan process, fork, vfork, exit, wait, waitpid, exec, Signals functions, Unreliable signals, Interrupted system calls, kill, raise, Alarm, Pause, Abort, System, Sleep functions, Signal sets. File locking: Creating lock files, locking regions, Use of read and write with locking, Competing locks, Other lock commands, Deadlocks.

UNIT V (9 Hrs)

INTER PROCESS COMMUNICATION: Pipe, process pipes, The pipe call, Parent and child processes and named pipes - Fifos, Semaphores - Semget, Semop, Semctl, Message queues - Msgget, msgsnd, msgrcv, msgctl, Shared Memory - Shmget, shmat, shmdt, shmctl, ipc status commands. Socket- Socket Connections - Socket Attributes, Socket Addresses, Socket, Connect, Bind, Listen, Accept, Socket Communications.

Text Books:

1. W. Richard. Stevens , "Advanced Programming in the UNIX Environment", Pearson Education, 3rd Edition, 2013.
2. Behrouz A. Forouzan, Richard F. Gilberg.Thomson "Unix and shell Programming", 1st Edition, 2003.

References:

1. Robert Love, "Linux System Programming" O'Reilly Media, 2nd Edition, 2013.
2. W.R.Stevens, "Advanced Programming in the UNIX environment", Pearson Education, 2nd Edition, 2005.
3. W.R. Stevens, "UNIX Network Programming", PHI, 2003.
4. Graham Glass, King Ables,"UNIX for Programmers and Users", Pearson Education, 3rd Edition, 2021.

ONLINE/NPTEL Courses:

1. Linux- https://nptel.ac.in/courses/117106113