ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

COMPUTER SCIENCE AND ENGINEERING

FOR

B.TECH FOUR YEAR DEGREE PROGRAMME

(Applicable for the batches admitted from 2020 - 2021)

AR - 20

ADITYA INSTITUTE OF TECHNOLGY AND MANAGEMENT

(An Autonomous Institution)

Recognized Under 2(f) & 12(b) of UGC,

Approved by AICTE, Permanently Affiliated to JNTUGV, Vizianagaram,

Accredited by NBA (Tier – I) and NAAC with Grade 'A+',

K. Kotturu, Tekkali-532201, Srikakulam (Dist.), Andhra Pradesh. India – 532201.

Vision of the Institute

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

Mission of the Institute

Synergizing knowledge, technology and human resource, we impart the best quality education in Technology and Management. In the process, we make education more objective so that the efficiency for employability increases on a continued basis.

Vision of the Department

To become a pioneer in providing high quality education and research in the area of computer science and engineering.

Mission of the Department

M1: Enrich society and advance computer science and engineering by preparing graduates with the knowledge, ability, and skill to become innovators and leaders who are able to contribute for the aspirations of the country and society.

M2: Benefit humanity through research, creativity, problem solving, and application development.

M3: Share knowledge and expertise to benefit the country, the region, and beyond while inspiring people to engage in computing fields.

The **Programme Educational Objectives (PEOs)** for our Computer Science and Engineering program are to produce graduates who will:

PEO1. Be employed as a practicing engineer in fields such as design, development, testing and research or undertake higher studies.

PEO2. Engage in lifelong self-directed learning, a capacity that is vital for success in today's global and rapidly changing engineering environment.

PEO3. Create new methods / processes to meet the society needs with their knowledge.

PEO4. Conduct themselves as ethical and responsible professionals with good communication skills and demonstrate leadership skills

PROGRAM OUTCOMES (POs):

Engineering Graduates will be able to:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/Development Of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations Of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

By the completion of Computer Science program the student will be able to:

PSO1. Apply mathematical foundations, algorithmic principles, and theoretical computer science in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

PSO2. Demonstrate understanding of the principles and working of the hardware and software aspects of computer systems.

PSO3. Use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations

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Permanently Affiliated to JNTUK, Kakinada
K. Kotturu, Tekkali, Srikakulam-532201, Andhra Pradesh, India

Academic Regulations 2020 (AR20) for B. Tech

(Effective for the students admitted into I year from the Academic Year 2020-21 onwards)

1. Award of B.Tech Degree:

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

Registered for **160** credits and he/she must secure total **160** credits.

Students, who fail to complete their four-year course of study within **8** years or fail to acquire the **160** Credits for the award of the degree within **8** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

2. Courses of study:

The following courses of study are offered at present with specialization in the B.Tech Course.

S. No.	Branch Code-Abbreviation	Branch
01	01-CE	Civil Engineering
02	02-EEE	Electrical and Electronics Engineering
03	03-ME	Mechanical Engineering
04	04-ECE	Electronics and Communication Engineering
05	05-CSE	Computer Science and Engineering
06	12-IT	Information Technology
07	42-CSM	CSE (Artificial Intelligence and Machine Learning)
08	44-CSD	CSE (Data Science)

And any other course as approved by the authorities of the University from time to time.

3. Credits (Semester system from I year onwards):

S. No	Course	Credits
1	Mandatory Course	0
2	Theory Course	3
3	Laboratory Course	1.5
4	Integrated Course	4.5
5	Interdisciplinary/Open Elective Course	3
6	Skill-Oriented/Skill-Advanced/Soft Skills Course	2
7	Internship	1.5/03
8	Project work	12

4. Interdisciplinary/Open Electives:

There are two interdisciplinary electives in II year II semester and III year I semester and one open elective in IV year I semester. The student can choose any one interdisciplinary elective/open elective courses offered in the respective semester. The pattern of Midterm examinations and End examinations of these courses is similar to regular theory courses and the valuation is purely internal.

5. MOOCs:

Explore all possibilities to run at least one subject in every semester from II year I semester onwards as a MOOCs.

6. NCC/NSS activities:

All undergraduate students shall register for NCC/NSS activities. A student will be required to participate in an activity for two hours in a week during II year I semester or II year II semester and evaluated during the II year II Semester. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

7. Evaluation Methodology:

The performance of a student in each semester shall be evaluated with a maximum of **100** marks for theory course, laboratory and other courses. The project work shall be evaluated for **200** marks.

7.1 Mandatory Courses:

Mandatory course is one among the compulsory courses and does not carry any Credits. The list of mandatory courses is shown below:

- Induction Program
- Constitution of India
- Environmental Science
- Human Values

No marks or letter grade shall be allotted for all mandatory non-credit courses.

7.2 Theory course (100 marks):

For theory course, the distribution shall be **40** marks for internal midterm evaluation and **60** marks for the External End Examinations. Out of **40** internal midterm marks, **25** marks are allotted for descriptive exam, **10** marks for two assignments (**5** marks for each assignment) or one case study (group-wise), and **5** marks for objective test.

7.2.1 Pattern for Internal Midterm Examinations (25 marks):

For theory courses of each semester, there shall be **2** Midterm exams. Each descriptive exam is to be held for **30** marks and will be scaled down to **25** marks, with the duration of **90** minutes.

For final calculation of internal marks, weightage of **70%** will be given to the student who performed well either in first Midterm or second Midterm and **30%** weightage will be given to other Midterm examination.

Midterm paper contains three descriptive type questions with internal choice. Each question carries **10** marks (3×10=30M). The first Midterm examination will be conducted usually after 8 weeks of instruction or after completion of 50% syllabus (i.e. first 3 Units), and the second Midterm examination will be conducted usually at the end of instruction after completion of remaining 50% syllabus (i.e. remaining 3 Units).

7.2.2 Objective test (5 marks):

For theory courses of each semester, there shall be **2** Objective tests to be conducted along with Midterm exam. Each Objective test is to be held for **10** marks with the duration of **10** minutes and will be scaled down to **5** marks.

For final calculation of objective test marks, weightage of **70%** will be given to the student who performed well either in first objective test or second objective test and **30%** weightage will be given to other objective test.

7.2.3 Pattern for External End Examinations (60 marks):

The question paper shall have descriptive type questions for **60** marks. There shall be one question from each unit with internal choice. Each question carries **10** marks. Each course shall consist of six units of syllabus. The student should answer total **6** questions. (6X10M=60M)

7.3 Laboratory Course (100 marks):

For laboratory course, there shall be continuous evaluation during the semester for **40** internal marks and **60** semester end examination marks. Out of the **40** marks for internal, **25** marks for day–to–day evaluation, **5** marks for record and **10** marks to be awarded for internal laboratory written test. The end examination shall be conducted by the teacher concerned and external examiner from outside the college.

For the course Engineering Graphics and Design, the distribution shall be **40** marks for internal evaluation (**20** marks for day–to–day evaluation, and **20** marks for internal tests) and **60** marks for end examination.

For the award of marks for internal tests, weightage of **70%** will be given to the student who performed well either in first test or second test and **30%** weightage will be given to other test.

7.4 Integrated Course (100 marks):

Integrated courses are exclusively designed to provide a unique learning experience of layered learning where students have a chance to practice while learning. These courses are designed by blending both theory and laboratory components one over the other.

Assessment for **100** marks as given below:

Category	Marks	Assessment
Internal	20	Internal assessment of Laboratory carried out for 40 marks will be scaled down to 20 marks.
	20	Internal assessment of Theory carried out for 40 marks will be scaled down to 20 marks.
End examination	40	End examination of Laboratory carried out for 60 marks will be scaled down to 40 marks.
	20	End examination of Theory carried out for 60 marks will be scaled down to 20 marks.

For Integrated courses, the evaluation of Theory and Laboratory are carried out separately as per evaluation method given in 7.2 and 7.3.

A candidate shall be declared to have passed in integrated course if he/she secures a minimum of **40%** aggregate marks i.e. **40** out of **100** (Internal & Semester-end examination marks put together), subject to a minimum of **35%** marks i.e. **21** marks out of **60** in semester-end examination; in addition to that he/she has to secure minimum of **14** marks (out of **40**) in Laboratory end examination and minimum of **7** marks (out of **20**) in Theory end examination.

7.5 Skill Oriented/Skill Advanced Course (100 marks):

Out of a total of **100** marks for the Skill-Oriented/Skill-Advanced Course, **40** marks shall be for the internal evaluation and **60** marks for semester-end examination.

The internal evaluation shall be made on the basis of seminar given by each student on the topic of his/her Skill-Oriented/Skill-Advanced Course, which was evaluated by internal committee constituted by HOD.

The semester-end examination (Viva-Voce) shall be conducted by the committee, consists of an External examiner, Head of the department and Internal supervisor of the Skill-Oriented/Skill-Advanced Course.

7.6 Soft Skills (100 marks):

One Soft Skills course is there in III year II semester and Soft skills shall be evaluated for **100** marks. Evaluation pattern of Soft Skills course is similar to the Theory course and evaluation is purely internal.

7.7 Internship (100 marks):

All the students shall undergo Community Internship as well as Industrial Internship. Community Internship is for a minimum period of **2** weeks after II year II Semester and Industrial Internship is for a minimum period of **4** weeks after III year II Semester.

Self study report for the Community Internship after the II year II Semester shall be submitted and evaluated during the III year I Semester and Self study report for the Industrial Internship after the III year II Semester shall be submitted and evaluated during the IV year I Semester.

The Self study report will be evaluated for a total of **100** marks consisting of **40** marks for internal assessment and **60** marks for semester-end examination.

Internal assessment for **40** marks shall be done by: internal supervisor in case of community internship and internship supervisor in industry in case of internship in an industry based on day to day observation.

The semester-end examination (Viva-Voce) shall be conducted by the committee, consisting of an External examiner, Head of the department and Internal supervisor of the Internship.

7.8 Project (200 marks):

Out of a total of 200 marks for the Project, **80** marks shall be for Project Internal Evaluation and **120** marks for the semester-end Examination.

The Internal Evaluation shall be made on the basis of two seminars given by each student on the topic of his project which was evaluated by an internal committee. Out of **80** internal marks: **20** marks allotted for literature survey, **30** marks for results and analysis, **15** marks for first seminar (usually after 8 weeks) and **15** marks for second seminar (at the end of the semester).

The semester-end examination (Viva – Voce) shall be conducted by the committee, consisting of an External examiner, Head of the Department and Supervisor of the Project. The evaluation of project shall be made at the end of IV year.

7.9 Honors/Minor Programme:

The curriculum provides flexibility to enable the competent students to register for B. Tech. degree with Honors/Minor by earning additional 20 credits which are over and above 160 credits for the award of B. Tech. (Regular) degree. The students registered for B. Tech (Honors) shall not be permitted to register for Minor or vice versa.

He/She shall register Honors/Minor during II B.Tech II semester provided he/she secures ≥ 8 CGPA and clearing all the courses in single attempt till II B.Tech I semester. In case of students admitted through lateral entry, the CGPA compliance will be considered from II B.Tech I semester onwards.

If a student is detained due to lack of attendance, he/she shall not be permitted to register the courses of Honors/Minor.

All the students who maintain ≥ 8 CGPA are eligible to enroll for B. Tech with Honors/Minor; however, registration for Honors/Minor degree will be limited to maximum of 35% of the total intake in a particular batch of students.

The students shall have the scope to earn these additional 20 credits from II year II semester to IV year I semester and at any point of time if he/she wishes to withdraw from B. Tech (Honors/Minor) program, the additional credits acquired till that time will get lapsed and cannot be used to compensate with those 160 credits needed for the award of B.Tech degree.

To acquire 20 additional credits, the students shall register for four 4-credit courses under the list of the courses offered by the respective departments and acquire the balance 4 credits by taking two MOOCs NPTEL courses with not less than 8 weeks duration. The student can complete these two MOOCs NPTEL courses during II year II semester to IV year I semester and evaluated and included in the IV year II Semester grade memo.

For the award of B. Tech. degree with Honors the additional 20 credits shall be earned by taking the courses offered by the respective department of study in one domain. A set of four courses are offered under each of the domains preferably from the new emerging areas as recommended by the BoS.

For the award of B. Tech degree with Minor the additional 20 credits shall be earned by taking the inter-disciplinary courses offered preferably from the new emerging areas by other departments.

These additional courses offered by the program may change from time to time based on the demand and resources availability. The courses may be offered in different modes i.e. guided learning/taught courses/Blended mode or combination.

Evaluation methodology of Honors/Minor courses will be similar to the regular B.Tech theory course/laboratory course/integrated course. No Supplementary examination for the courses offered in B.Tech Honors/Minor Program. If a student fails in a course (offered under B.Tech Honors/Minor Program), that course will not be reflected in Grade Memo. The courses passed under Honors/Minor program will not be counted for CGPA/SGPA calculation.

The student who acquires 20 additional credits and maintained ≥ 8 CGPA and acquiring 160 credits in regular B.Tech course and clearing all the courses in single attempt will be awarded the B.Tech degree with Honors/Minor. Any student who fails to fulfill these conditions will automatically get deregistered for B. Tech (Honors)/B.Tech (Minor) without any notification.

Honors/Minor shall not be awarded under any circumstances without completing the regular B. Tech programme in which a student got admitted.

The student is not permitted to repeat any course offered by any department to fulfil credit requirement for Honors/Minor program.

8. Attendance Requirements:

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

Condonation of shortage of attendance in aggregate up to **10%** (**65%** and above and below **75%**) in each semester with genuine reasons shall be approved by a committee duly appointed by the college. The condonation approved otherwise can be reviewed by the College Academic Committee. A fee stipulated by the college shall be payable towards condonation of shortage of attendance.

Shortage of Attendance below **65%** in aggregate shall in NO case be condoned.

A Student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. He/she may seek re-admission for that semester when offered next.

The overall attendance in each semester of regular B. Tech course and Honors/Minor course shall be computed separately.

A student shall maintain an attendance of 75% in each course of Honors/Minor to appear for semester end examination of Honors/Minor. Condonation of shortage of attendance up to **10%** (**65%** and above and below **75%**) in each course with genuine reasons shall be approved by a committee duly appointed by the college. A separate fee stipulated by the college shall be payable towards condonation of shortage of attendance in Honors/Minor.

A student detained due to lack of attendance in Honors/Minor course shall not be permitted to continue Honors/Minor programme, but he/she can continue regular B. Tech programme.

9. Minimum Academic Requirements:

9.1 Conditions for pass and award of credits for a course:

A candidate shall be declared to have passed in individual course if he/she secures a minimum of **40%** aggregate marks i.e. **40** out of **100** (internal & semester-end examination marks put together), subject to a minimum of **35%** marks i.e. **21** marks out of **60** in semester-end examination.

On passing a course of a programme, the student shall earn assigned credits in that Course.

9.2 Method of Awarding Letter Grades and Grade Points for a Course:

A letter grade and grade points will be awarded to a student in each course based on his/her performance as per the grading system given below.

Table: Grading System for B.Tech Programme

Marks Range	Level	Letter Grade	Grade Points
>= 90%	Outstanding	A+	10
80 – 89%	Excellent	A	9
70 – 79%	Very Good	B	8
60 – 69%	Good	C	7
50 – 59%	Fair	D	6
40 – 49%	Satisfactory	E	5
< 40%	Fail	F	0
-	Absent	AB	0

9.3 Calculation of Semester Grade Points Average (SGPA) for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA.

The SGPA is calculated as below:

$$\text{SGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}} \quad \text{(for all courses passed in a semester)}$$

Where CR = Credits of a Course
GP = Grade points awarded for a course

9.4 Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for entire programme:

The CGPA is calculated as below:

$$\text{CGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}} \quad \text{(for the entire programme)}$$

Where CR = Credits of a course
GP = Grade points awarded for a course

- Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- As per the AICTE regulations, conversion of CGPA into equivalent percentage as follows:
  Equivalent Percentage = (CGPA – 0.75) x 10

9.5 Award of Class:

Class Awarded	CGPA to be secured	Remarks
First Class with Distinction	≥ 7.75 (Without any supplementary appearance)	From the CGPA secured from 160 Credits
First Class	≥ 6.75	
Second Class	≥ 5.75 and < 6.75	
Pass Class	≥ 5.0 and < 5.75	

9.6 Supplementary Examinations:

Supplementary examinations will be conducted in every semester.

9.7 Conditions for Promotion:

(i) A student will be promoted to second year if he/she satisfies the minimum attendance requirement.

(ii) A student shall be promoted from II to III year only if he fulfills the academic requirement of total **50%** credits (if the number of credits is in fraction, it will be rounded off to a lower digit) from regular and supplementary examinations of I year and II year examinations, irrespective of whether the candidate takes the examination or not.

(iii) A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** credits (if number of credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I Year, II Year and III Year examinations, irrespective of whether the candidate takes the examinations or not.

10. Course pattern:

(i) The entire course of study is of four academic years and each year will have TWO Semesters (Total EIGHT Semesters).

(ii) A student is eligible to appear for the end examination in a subject, but when absent for it or failed in the end examinations he/she may appear for that subject's supplementary examinations, when offered.

(iii) When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted when the semester is offered after fulfillment of academic regulations. Whereas the academic regulations hold well with the regulations he/she first admitted.

11. Minimum Instruction Days:

The minimum instruction days for each semester shall be **90**.

12. There shall be no branch transfer after the completion of admission process.

13. **General:**

(i) Wherever the words “he,” “him,” “his,” occur in the regulations, they include “she,” “her,” “hers” as well.

(ii) The academic regulation should be read as a whole for the purpose of any interpretation.

(iii) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the principal is final.

(iv) The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

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Academic Regulations 2020 (AR20) for B. Tech (Lateral Entry Scheme)

(Effective for the students admitted into II year from the Academic Year 2021-22 onwards)

1. Award of B. Tech. Degree:

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

Registered for **121** credits and he/she must secure total **121** credits.

Students, who fail to complete their three-year course of study within **6** years or fail to acquire **121** Credits for the award of the degree within **6** academic years from the year of their admission shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

2. Promotion Rule:

A lateral entry student will be promoted from II year to III year if he satisfies the minimum required attendance in II year.

A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** of credits (if the number of credits is in fraction, it will be rounded off to lower digit) from the II Year and III Year examinations, irrespective of whether the candidate takes the examinations or not.

3. All other regulations as applicable for B. Tech. four- year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)

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DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
1	If the student possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
	If the student gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phone with any student or students in or outside the exam hall with respect to any matter	Expulsion from the examination hall and cancellation of the performance in that subject only. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the student has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year.
3	If the student impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all semester-end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of the seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	If the student smuggles the answer book or additional sheet or takes out or arranges to send out the question paper or answer book or additional sheet during or after the examination	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all semester-end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of the seat.
5	If the student uses objectionable, abusive or offensive language in the answer script or in letters to the examiners or writes to the examiner requesting him to award pass marks	Cancellation of the performance in that subject.
6	If the student refuses to obey the orders of the Chief Superintendent/Assistant -Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walkout or instigates others to walk out or threatens the officer-in charge or any person on duty in or outside the examination hall or causes any injury to any of his relatives either by words spoken or written or by signs or by visible representation, assaults the officer-in-charge or any person on duty in or outside the examination hall or any of his relatives, or indulges in any other act of misconduct or mischief which results in damage or destruction of property in the examination hall or any part of the	In case of students of the college, they shall be expelled from examination hall and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination	
7	If the student leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of the seat.
8	If the student possesses any lethal weapon or firearm in the examination hall	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clauses 6, 7, 8	In case of student of the college, expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and. a police case will be registered against them.
10	If the student comes in a drunken condition to the examination hall	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny	Cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work of that semester/year examinations.

I YEAR I SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
MC	20MCT101	Induction Program	3 weeks			0
HS	20HST101	English	3	0	0	3
BS	20BST101	Linear Algebra and Calculus	2	1	0	3
BS	20BST107	Chemistry	3	0	0	3
ES	**20ESI102**	Programming for problem solving	3	0	3	4.5
ES	20ESL103	Engineering Graphics & Design	1	0	4	3
HS	20HSL101	Language Proficiency Lab	0	0	3	1.5
BS	20BSL102	Chemistry Lab	0	0	3	1.5
Total			**12**	**1**	**13**	**19.5**

I YEAR II SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
MC	20MCT103	Constitution of India	2	0	0	0
BS	20BST102	Differential Equations	2	1	0	3
BS	20BST105	Applied Physics	3	0	0	3
PC	20CST101	Data Structures and Algorithms	3	0	0	3
ES	20EST101	Basic Electrical Engineering	3	0	0	3
ES	20ESL104	IT Workshop	1	0	4	3
BS	20BSL101	Physics Lab	0	0	3	1.5
ES	20ESL101	Basic Electrical Engineering Lab	0	0	3	1.5
PC	20CSL101	Data Structures and Algorithms Lab	0	0	3	1.5
Total			**14**	**1**	**13**	**19.5**

II YEAR I SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
MC	20MCT202	Environmental Science	2	0	0	0
ES	**20ESI204**	Python Programming	3	0	3	4.5
ES	20EST205	Digital Logic Design	3	0	0	3
PC	20CST202	Discrete Mathematics	2	1	0	3
PC	20CST203	Computer Organization & Architecture	3	0	0	3
PC	20CST204	Object Oriented Programming	3	0	0	3
ES	20ESL205	Digital Logic Design Lab	0	0	3	1.5
PC	20CSL202	Object Oriented Programming through Java Lab	0	0	3	1.5
SC	20CSS201	Skill Oriented Course – I	1	0	2	2
Total			**17**	**1**	**11**	**21.5**

II YEAR II SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
MC	20MCS204	NCC/NSS	2	0	0	0
MC	20MCT205	Human Values	2	0	0	0
BS	20BST204	Probability & Statistics with R	3	0	0	3
PC	20CST205	Design and Analysis of Algorithms	2	1	0	3
PC	20CST206	Database Management Systems	3	0	0	3
PC	20CST207	Operating Systems	3	0	0	3
OE	20IET21X	Interdisciplinary Elective – I	3	0	0	3
BS	20BSL203	Probability & Statistics with R Programming Lab	0	0	3	1.5
PC	20CSL203	Database Management Systems Lab	0	0	3	1.5
PC	20CSL204	Operating Systems Lab	0	0	3	1.5
SC	20CSS202	Skill Oriented Course – II	1	0	2	2
Total			**19**	**1**	**11**	**21.5**
Honors/Minor Courses: Artificial Intelligence & Machine Learning						
HM	20AIT201	Computational Statistics and Data Analysis	4	0	0	4
Community Internship (2 weeks) (Mandatory) during summer vacation						

Subject Code	Offered by Dept.	Interdisciplinary Elective – I	Offered for Dept.
20IET211	BS&H	Transform Theory	MECH/CIVIL
20IET212	BS&H	Numerical Methods	ECE/EEE
20IET213	BS&H	Introduction to Number Theory	CSE/IT
20IET214	CIVIL	Elements of building planning	MECH
20IET215	CIVIL	Remote Sensing	ECE/EEE/CSE/IT
20IET216	EEE	Mathematical Simulation and Modeling	ECE/MECH/CIVIL/CSE/IT
20IET217	MECH	Fundamentals of Material Science	ECE/EEE/CIVIL/CSE/IT
20IET218	ECE	Introduction to Electronic Measurements	EEE/MECH/CIVIL/CSE/IT
20IET219	**CSE**	UNIX Utilities	ECE/EEE/MECH/CIVIL
20IET21A	IT	Fundamentals Data Structures	ECE/EEE/MECH/CIVIL
20IET21B	TPC	Advanced Coding – I	CSE/IT
20IET21C	TPC	Competitive Programming – I	ECE/EEE/MECH/CIVIL

III YEAR I SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
PC	20CST308	Formal Language and Automata Theory	3	0	0	3
PC	20CST309	Software Engineering	3	0	0	3
PC	20CST310	Computer Networks	3	0	0	3
PE	20CSE31X	Professional Elective – I	3	0	0	3
OE	20IET32X	Interdisciplinary Elective – II	3	0	0	3
PC	20CSL305	Advanced Python Programming Lab	0	0	3	1.5
PC	20CSL306	Software Engineering and Case Tools Lab	0	0	3	1.5
SC	20CSS303	Skill Advanced Course – I	1	0	2	2
I/P	20CSP301	Community Internship	0	0	0	1.5
Total			**16**	**0**	**8**	**21.5**
Honors/Minor Course: Artificial Intelligence & Machine Learning						
HM	**20AIT302**	**Machine Learning Using Python**	**4**	**0**	**0**	**4**

Professional Elective – I		
S.No	**CODE**	**COURSE**
i)	**20CSE311**	Unix Internals
ii)	**20CSE312**	Advanced Computer Architecture
iii)	**20CSE313**	Distributed Systems
iv)	**20CSE314**	Computer Graphics

Subject Code	Offered by Dept.	Interdisciplinary Elective – II	Offered for Dept.
20IET321	BS&H	Fundamentals of Fuzzy Logic	All
20IET322	CIVIL	Geographical Information System	ECE/EEE/MECH/CSE/IT
20IET323	MECH	Renewable energy sources	ECE/MECH/CIVIL/CSE/IT
20IET324	EEE	Fundamentals of ROBOTICS	ECE/EEE/CIVIL/CSE/IT
20IET325	ECE	Principles of communications	EEE/MECH/CIVIL/CSE/IT
20IET326	CSE	JAVA Programming	ECE/EEE/MECH/CIVIL
20IET327	IT	Introduction to DBMS	ECE/EEE/MECH/CIVIL
20IET328	TPC	Advanced Coding – II	CSE/IT
20IET329	TPC	Competitive Programming – II	ECE/EEE/MECH/CIVIL

III YEAR II SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
PC	**20CSI311**	Web Technologies	3	0	3	4.5
PC	**20CST312**	Compiler Design	3	0	0	3
HS	**20HST303**	Managerial Economics and Management Science	3	0	0	3
PE	**20CSE32X**	Professional Elective – II	3	0	0	3
PE	**20CSE33X**	Professional Elective – III	3	0	0	3
HS	**20HSL302**	Professional Communication Skills Lab	0	0	3	1.5
PC	**20CSL307**	Mobile Application Development Lab	0	0	3	1.5
SC	**20SSS301**	Soft Skills	1	0	2	2
Total			**16**	**0**	**11**	**21.5**
Honors/Minor Course: Artificial Intelligence & Machine Learning						
HM	**20AIT303**	**Advance Machine Learning**	**4**	**0**	**0**	**4**
Industrial Internship (4 Weeks) (Mandatory) during summer vacation						

Professional Elective – II		
S.No	**CODE**	**COURSE**
i)	**20CSE321**	Advanced Operating Systems
ii)	**20CSE322**	Artificial Intelligence
iii)	**20CSE323**	Social Networks
iv)	**20CSE324**	Internet of Things

Professional Elective – III		
S.No	**CODE**	**COURSE**
i)	**20CSE331**	Quantum Computing
ii)	**20CSE332**	**Data Warehousing and Data Mining**
iii)	**20CSE333**	Natural Language Processing
iv)	**20CSE334**	Soft Computing

IV YEAR I SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
PC	**20CST413**	Cryptography and Network Security	3	0	0	3
PC	**20CST414**	Machine Learning	3	0	0	3
PE	**20CSE44X**	Professional Elective – IV	3	0	0	3
PE	**20CSE45X**	Professional Elective – V	3	0	0	3
OE	**20OET41X**	Open Elective	3	0	0	3
PC	**20CSL408**	UML & DP Lab	0	0	3	1.5
PC	**20CSL409**	Machine Learning Lab	0	0	3	1.5
SC	**20CSS404**	Skill Advanced Course – II	1	0	2	2
I/P	**20CSP402**	Industrial Internship	0	0	0	3
Total			**16**	**0**	**8**	**23**
Honors/Minor Course: Artificial Intelligence & Machine Learning						
HM	**20AIT404**	**Deep Learning**	**4**	**0**	**0**	**4**

Professional Elective – IV		
S.No	**CODE**	**COURSE**
i)	**20CSE441**	Software Testing Methodologies
ii)	**20CSE442**	Human Computer Interaction
iii)	**20CSE443**	Cyber Security
iv)	**20CSE444**	Data Analytics

Professional Elective – V		
S.No	**CODE**	**COURSE**
i)	**20CSE451**	Image Processing
ii)	**20CSE452**	Ad-hoc and Sensor Networks
iii)	**20CSE453**	Simulation & Modeling
iv)	**20CSE454**	Cloud Computing

CODE	***Offered By Dept.***	**Open Elective**	***Offered for Dept.***
20OET411	**MBA**	HRD & Organizational Behavior	**ALL**
20OET412	**MBA**	Project Management	**ALL**
20OET413	**MBA**	Entrepreneurial Development	**ALL**
20OET414	**MBA**	Digital Marketing	**ALL**
20OET415	**CIVIL**	Environmental Impact Assessment	**ALL**
20OET416	**EEE**	Energy Audit Conversation and Management	**ALL**
20OET417	**MECH**	Optimization Techniques	**ALL**
20OET418	**CSE**	Blockchain Technologies	**ALL**
20OET419	**IT**	IT Systems Management	**ALL**
20OET41A	**CSM**	API and Micro Services	**ALL**

IV YEAR II SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
I/P	**20CSP403**	Project work	0	0	0	12
Total						**12**
Honors/Minor Course: Artificial Intelligence & Machine Learning						
HM	20AIM405	MOOC Course – I				**2**
HM	20AIM406	MOOC Course – II				**2**

English
(Common to all Branches)

Subject Code: 20HST101

L	T	P	C
3	0	0	3

Course Objectives

- To enable students build vocabulary appropriate to their levels and to make students understand printed texts of different genres
- To enhance basic writing skills of the students in different forms of written communication
- To assist students implicitly synthesize the rules of grammar for the production of accurate sentences
- To help students learn rules of using punctuation marks and prepositions appropriately in writing
- To aid students acquire appropriate and adequate letter writing skills
- To get students develop reading skills and enhance their essay writing skills

Course Outcomes

1. Students will be able to comprehend printed texts of different genres more easily and they will be able to make appropriate word choice.
2. Students will be able to write short texts masterly.
3. Students will be able to construct grammatically correct sentences.
4. Students will be able to use punctuation marks and prepositions correctly in speech and writing.
5. Students will be able to communicate through letters and emails effectively.
6. Students will be able to comprehend unfamiliar passages, and will be able to write *essays.*

Unit – I *Father's Help* by R K Narayan
Synonyms and Antonyms — One-word substitutes

Unit – II *My Early Days* by A P J Abdul Kalam
Tense— Voice — *If* clauses

Unit – III *The Road Not Taken* by Robert Frost
Reported Speech—Degrees of Comparison — Simple, Compound, Complex Sentences

Unit – IV *Politics and the English Language* by George Orwell
Punctuation —Prepositions

Unit–V *Mother's Day* by J. B. Priestly
Letter Writing — E-mail Writing

Unit – VI *Chipko Movement*
Reading Comprehension—Essay Writing

Text Books

1. *On Writing Well.* William Zinsser. Harper Resource Book. 2001
2. *Practical English Usage*. Michael Swan. Oxford University Press. 1995.
3. *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
4. *Hugging the Trees: The Story of the Chipko Movement*. Thomas Weber. Viking Publishers, New Delhi, 1988.

Linear Algebra and Calculus
(Common to all Branches)

Subject Code : 20BST101

L	T	P	C
2	1	0	3

Course Objectives:

- Understand the process of calculation of rank, solution of System of Linear Homogeneous and Non Homogeneous equations by Gauss Elimination method.
- Learn the process of calculating the Eigen values, Eigenvectors and Quadratic Forms.
- Understand the concepts of multiple integrals and their usage.
- Learn the properties of Gamma and Beta Functions, their relation and evaluation of improper integrals.
- Understand the concepts of gradient, divergence, curl of scalar and vector point functions.
- Understand and calculate Line Integral, Surface Integral, Volume Integral, concepts of Green's, Stokes and Gauss Divergence theorems in converting one integral form to another

Course Outcomes:

The student will be able to:

1. Calculate the rank and solve linear homogeneous and non homogeneous equations by Gauss Elimination method.
2. Calculate eigen values, eigen vectors and estimate the nature of the matrix..
3. Evaluate multiple integral in both Cartesian and polar coordinates.
4. Apply Beta and Gamma functions to solve improper integrals.
5. Calculate gradient, divergence, curl of a scalar and vector point functions and derive vector identities.
6. Solve a Line Integral, Surface Integral, Volume Integral, apply Green's, Stokes and Gauss Divergence theorems in converting one integral form to another.

Unit – I

Linear System of Equations: *Matrices – Rank- echelon form – Normal form – System of Linear Homogeneous and Non Homogeneous equations – Gauss Elimination method- Applications- Matrix representation for a Graph- Current in an electrical circuit.* (8 hrs)

Unit – II

Eigen Values, Eigen Vectors, Quadratic Forms: *Eigen values – Eigenvectors – Properties (an over view)- Diagonalization- Quadratic Forms- Reduction of Quadratic Forms to Canonical Form- Rank-Nature-Index-Signature.* (8 hrs)

Unit – III

Multiple Integrals: *Double integral (Cartesian and polar form) -Change of order of integration - Change of variables (Cartesian to polar)- Triple integrals – Change of variables (Cartesian to spherical/cylindrical).* (8 hrs)

Unit – IV

Special functions: *Gamma and Beta Functions – Properties - Relation between Beta and Gamma functions-Evaluation of improper integrals.* (8 hrs)

Unit – V

Vector Differential Calculus: Scalar and Vector point functions- Vector differentiation - Directional derivatives – Gradient, Curl and Divergence- Vector identities. (8 hrs)

Unit – VI

Vector Integral Calculus: Vector Integration –Line Integral, Surface Integral, Volume Integral – Green Theorem, Stokes Theorem and Gauss Divergence theorem (without proofs with simple illustrations only). (8 hrs)

Text Books

1. B.V. Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi, 2014.
2. Dr.B.S.Grewal, Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. **G.B. Thomas and R.L. Finney**, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. **Veerarajan T**., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. **D. Poole**, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. **N.P. Bali and Manish Goyal**, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Chemistry
(Common to all Branches)

Subject Code : 20BST107

L	T	P	C
3	0	0	3

Course Objectives:

The students will become familiar and understand about:

- Rationalise the importance of water for society and industrial needs.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- To become familiar in moulding methods of preparation of different types of plastic materials
- Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions.
- Rationalise reference electrodes and science of corrosion.
- Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

Course Outcomes:

The course will enable the student to:

1. Rationalise the importance of water for society and industrial needs.
2. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
3. Differentiate different moulding techniques of plastic materials
4. Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions.
5. Rationalise the science of corrosion.
6. Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

Unit – I

Water Technology Hardness of Water – Temporary and Permanent Hardness - Units of Hardness - Estimation of Hardness by EDTA Method - Problems on Temporary and Permanent Hardness - Disadvantages of Hard Water – Softening Methods of Hard Water- Zeolite or Permutit Process - Ion Exchange Process - Methods of Treatment of Water for Domestic Purposes – Sedimentation, Coagulation, Filtration, Disinfection - Sterilization, Chlorination, Break Point chlorination, Ozonisation. ***(9 lectures)***

Unit – II

Spectroscopy Spectroscopy - Electronic Spectroscopy - Types of Electronic Transitions - Definition of Chromophore – Definition of Auxochrome – Absorption and Intensity Shifts - Introduction to I.R. Spectroscopy – Fingerprint Region – Introduction to NMR – Principle - Equivalent and Non-Equivalent Protons - Chemical Shift- Splitting – Coupling Constant. ***(8 lectures)***

Unit – III

Polymers and Plastics Definitions of Polymer, Polymerization – Functionality – Degree of polymerization - Types of Polymerization (Addition and Condensation Polymerizations) - Plastics – Definition, Thermoplastics, Thermosetting Plastics – Compounding of Plastics – Moulding of Plastics into Articles (Compression, Injection, Transfer and Extrusion Moulding Methods) - Preparation, Properties and Engineering Uses of PVC and Bakelite. ***(7 lectures)***

Unit – IV

Organic Reactions Types of Organic reactions: Addition - Electrophilic, Nucleophilic and Free radical - Substitution - Electrophilic, Nucleophilic (SN^1 and SN^2) and Free radical – Elimination (E_1 and E_2) – Rearrangement Reactions (Claisen, Pinacol Pinacolone Rearrangement). ***(7 lectures)***

Unit – V

Corrosion and Its Control Definition of Corrosion – Theories of Corrosion (Chemical & Electrochemical) – Mechanism of Electrochemical Corrosion (Oxygen Absorption Type and Hydrogen Evolution Type) - Galvanic Series - Factors Influencing Corrosion – Corrosion Control Methods - Proper Designing, Modifying the Environment, Cathodic Protections – Sacrificial Anodic Protection and Impressed Current Cathodic Protection. Metallic (Anodic and Cathodic) Coatings – Methods of application on metals (Galvanizing and Tinning). ***(9 lectures)***

Unit – VI

Green Chemistry & Energy Introduction to green chemistry – Definition and 12 principles of green chemistry. Types of energy sources – Renewable & Non-Renewable - Introduction to solar energy – harnessing of solar energy – photo voltaic cells – Concentrated Solar power plants.
Introduction of Energy storage devices: Principle& mechanism of Batteries & Supercapacitors, Types of Batteries (Alkaline & Lead-Acid) - Difference between Batteries and Supercapacitors. ***(8 lectures)***

Text Books

1. University chemistry, by B. H. Mahan
2. Elementary organic spectroscopy: principles and applications, by Y. R. Sharma
3. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
4. "Engineering Chemistry", P. C. Jain and Monica Jain, Dhanpat Rai Publications, Co., New Delhi, 2004, 16th Edition

Reference books:

1. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
2. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
3. Physical Chemistry, by P. W. Atkins
4. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition.
5. Concise Inorganic Chemistry: Fifth Edition by J.D. Lee

Programming for Problem Solving
(Common to all Branches)

Subject Code : 20ESI102

L	T	P	C
3	0	3	4.5

Course Objective

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Course Outcomes

1. Understand the fundamentals of C programming
2. Choose the loops and decision making statements to solve the problem
3. Make use of pointers to access arrays, strings and implements different operations on arrays, and work with textual information, characters and strings.
4. Apply programming to write modular programs, user defined functions to solve real time problems and allocate memory using dynamic memory management functions.
5. Create user defined data types including structures and unions to solve problems.
6. Implement files operations in C programming for a given application and able to handle errors during program execution.

Unit – I

Introduction to Programming: Introduction to components of Computer system, Algorithm, Flow chart, Program development steps, C Tokens, Operator precedence, Structure of C program, Basic I/O statements.

Exercise Questions: 1

Ex 1: Write the C programs to calculate the following

a) Area of triangle when sides are given.
b) Program for Type Casting.
c) Interchanging values of two variables.

Ex 2: Write the C programs to perform the following

a) Read lower case character and convert into upper case.
b) Find maximum of 3 values using conditional operator.
c) Calculate area and perimeter of circle.

Unit – II

Control Structures: Decision statements: if, if-else, nested if and switch, **Iterative statements:** for, while, do while and nested loops **Branching:** Break, continue, goto.

Exercise Questions: 2

Ex 3: Write C programs for the following using decision making statements

a) Program to find roots of quadratic equation.
b) Find the Largest among 3 values.
c) Calculate the grades of a student.

Ex 4: Write C programs for the following using Iterative Statements

a) Arithmetical operations using switch-case.
b) Read a number and display in reverse.
c) Check for Armstrong number property

Ex 5:

a) Generate Fibonacci series.
b) Generate Prime numbers between two numbers.
c) Write a program in C to display the pattern like right angle triangle using an asterisk

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Unit – III

Arrays: Definition, Types: 1D, Multi Dimensional arrays, declaration, initialization, accessing elements, Matrix operations and String Handling.

Pointers: Definition, Declaration, Initialization, Pointer arithmetic, Pointer to pointer, arrays and pointers, Dynamic memory allocation

Exercise Questions: 3

Ex 6: Implement the following using arrays

a) Largest and smallest from a list of elements.
b) Program for Linear Search.
c) Program for Bubble Sort.

Ex 7: Implement the following using arrays

a) Matrix addition.
b) Matrix Multiplication.
c) Program using string handling functions

Ex 8: Implement the following using DMA Functions

a) Find the sum and average of list of elements using DMA Functions
b) Implementation of call by reference and call by valve.

Ex 9:

a) Implement C Program using any numerical methods

Unit – IV

Functions: Definitions, Declaration, Types of Functions, Parameter passing, Passing Arrays to functions, Recursion, library functions, functions and pointers, and Storage classes,

Exercise Questions: 4

Ex 10:

a) Factorial using recursion and non recursion.
b) GCD using recursion and non recursion.
c) To count the digits of a given number using recursion

Unit – V

Structures: Definition, Declaration, Accessing the structure elements, Array of structures, Arrays with in structures, pointer to structure, passing structure to function, nested structures, and unions.

Exercise Questions: 5

Ex: 11

a) Implementation of array of structure
b) Demonstration of Union

Unit – VI

Files: Definition, Types of files, Opening modes, File IO Functions, Random access functions, Preprocessor directives.

Exercise Questions: 6

Ex 12:

a) Copy the contents of one file into another.
b) Count the number of characters, words and lines in a file.

Text Books

1. B. W Kernighan, Dennis M. Ritchie. The C – Programming Language. 2nd Edition, PHI.
2. Behrouz A. Forouzan, "A Structured Approach Using C" Richard F. Gilberg 3rd Edition
3.G.S.N Murty, S Vishnu Murty, "Problem solving Through 'C'- User Friendly Approach", First Edition, MANTECH Publication Pvt.Ltd., 2021

References

1. Yashwant Kantikar. 2012. Let Us C, 8th Ed. PBP Publications.
2. E. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.

Web Links:

1. https://www.tutorialspoint.com › Cprogramming › C – Home
2. https://www.programiz.com/c-programming

Engineering Graphics & Design
(Common to all Branches)

Subject Code : 20ESL103

L	T	P	C
1	0	4	3

Course Objectives:

- Able to develop drawing skills.
- To draw orthographic views from the given isometric view and vice verse
- To understand the fundamentals of computer aided design and drafting

Course Outcomes:

1. Draw projection of points and straight lines in first angle projection.
2. Project plane surfaces and simple solids inclined to one reference plane.
3. Convert orthographic views into isometric projections and vice-versa.
4. Draw basic lines and profiles with commonly used operations in drafting software.
5. Generate 2D drawings along with dimensioning in drafting software.

List Of Exercises

PART-A: Conventional Engineering drawing

1 Projections of points
2 Projections of straight lines inclined to one reference plane only.
3 Projections of planes inclined to one reference plane only.
4 Projections of simple solids inclined to one reference plane only.
5 Conversion of isometric views into orthographic views
6 Conversion of orthographic views into isometric views.

PART-B: Basic Computer aided engineering drawing (2-D drawings)

1. Commands – Axes, Coordinate points, Creation of lines, Polylines, Square, Rectangle, Polygons, Spines, Circles, Ellipse, Text.
2. Move, Copy, Offset, Mirror, Rotate, Trim, Extend, Break, Chamfer, Fillet, Curves.

Note: Six Exercises are to be completed by using AutoCAD software

Text Books:

1. Engineering Drawing, N. D. Bhatt, V. M. Panchal, Charotar Pub.
2. Engineering Drawing, K. L .Narayana, P.Kanniah, Scitech Pub.

Reference Books:

1. Engineering Drawing and Graphics, 2nd ed., K. Venugopal, New Age International Pub.
2. Fundamentals of Engineering Drawing, 11th ed., Luzadder, J. Warren, D.M. Jon, Prentice Hall India Pub.

Language Proficiency Lab
(Common to all Branches)

Subject Code : 20HSL101

L	T	P	C
0	0	3	1.5

Course Objectives

- To enable students develop neutralized accent
- To assist students utter words intelligibly
- To enhance the ability of students to speak spontaneously
- To help students converse aptly as the context demands
- To get students acquire perceptive abilities in professional conversations
- To aid students grasp and interpret information provided in graphs and tables

Course Outcomes

1. Students will be able to recognize differences among various accents and speak with neutralized accent.
2. Students will be able to pronounce words accurately with the knowledge of speech sounds and use appropriate rhythm and intonation patterns in speech.
3. Students will be able to speak extemporaneously about anything in general.
4. Students will be able to generate dialogues for various situations.
5. Students will be able to present posters perceptively and concisely.
6. Students will be able to comprehend and interpret data provided in graphs and tables.

Course Syllabus

Unit – I

Listening Comprehension of Audio and Video clips of different accents

Unit – II

Pronunciation—Intonation—Stress—Rhythm

Unit – III

JAM — Narration of an Event

Unit – IV

Situational Dialogues

Unit – V

Poster Presentation

Unit – VI

Interpretation of Data in Graphs and Tables

Text Books

1. *Communication Skills*. Sanjay Kumar and Pushpa Lata. OUP. 2011.
2. *Practical English Usage.* Michael Swan. OUP. 1995.
3. *Speak Well*. K. Nirupa Rani. Orient Blackswan, Hyderabad. 2012.
4. *Strengthen Your Communication Skills*. M. Hari Prasad. Maruthi Publications, Hyd. 2014.
5. *Strengthen Your Steps*. M. Hari Prasad. Maruthi Publications, Hyderabad. 2012.
6. *Technical Communication*. Meenakshi and Sangeetha. OUP. New Delhi. 2013.

Chemistry Lab
(Common to all Branches)

Subject Code : 20BSL102

L	T	P	C
0	0	3	1.5

Course Objectives

The students will become familiar and understand about:

- Measure molecular/system properties such as kinematic viscosity, acid number of lubricating oil, etc
- Measure molecular/system properties such as surface tension and viscosity.
- Measure molecular/system properties such as pH, conductance of solutions, redox potentials, etc
- Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, etc.
- Synthesize a small polymer molecule and analyze a salt sample.
- Estimate iron (by colurimeter), partition coefficient, and adsorption of acetic acid by Charcoal etc.

Course Outcomes:

The students will learn to:

1. Measure molecular/system properties such as kinematic viscosity, acid number of lubricating oil, etc.
2. Measure molecular/system properties such as surface tension and viscosity.
3. Measure molecular/system properties such as pH, conductance of solutions, redox potentials, etc
4. Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, etc.
5. Synthesize a small polymer molecule and analyze a salt sample.
6. Estimate iron (by colurimeter), partition coefficient, and adsorption of acetic acid by charcoal, etc.

List of Experiments
(Choice of 10-12 experiments from the following)

1. Determination of surface tension and viscosity
2. Determination of Hardness of water sample by EDTA Method.
3. Conductometric estimation of Acid by Base.
4. Conductometric estimation of mixture of acids by base.
5. Potentiometric Titrations.
6. Synthesis of a polymer/drug.
7. Determination of acid value of an oil
8. Chemical analysis of a salt
9. Determination of Dissolved Oxygen present in the given water sample by Modern Winkler's Method
10. Colurimetric estimation of iron
11. pH metric titrations
12. Determination of the partition coefficient of a substance between two immiscible liquids
13. Adsorption of acetic acid by charcoal 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
14. Potentiometric Titration of a Chloride-Iodide Mixture.
15. Determination of Chloride content present in given water sample.
16. Determination of kinematic viscosity of given lubricating oil.

Text Books

1. "Practical Engineering Chemistry" by K.Mukkanti, etal. B.S.Publications, Hyderabad (2011).
2. "Lab Manual on Engineering Chemistry" by Sudharani, Dhanpat Rai Publications, Co., New Delhi., (2009).

Reference Books

1. "Engineering Chemistry Lab Manual" by Shuchi Tiwari (2010), SCITECH Publications.
2. "Vogel's Text Book of Quantitative Chemical Analysis", 6th Edition by G. J. Jeffery, J. Bassett, J. Mendham, R.C. Denney, Longman Scientific & Technical Publications, New York.
3. "A Text Book of Engineering Chemistry" by R. N. Goyal and H. Goel, Ane Books (P) Ltd.(2009).
4. "A Text Book on experiments and calculations Engineering" by S.S. Dara, S.Chand & Company Ltd. (2003).
5. "Instrumental methods of Chemical Analysis", Gurudeep R, Chatwal Sham, K. Anand, Latest Edition (2015), Himalaya Publications.

Constitution of India
(Common to all Branches)

Subject Code: 20MCT103

L	T	P	C
2	0	0	0

Course Objectives

1. To help Students regulate their behavior in a social environment as Engineering Professionals.
2. To make students aware of the impact of taking social, legal and Administrative decisions about their profession.
3. To understand the political and constitutional parameters in work environment.
4. To understand the need and strengths of our nation and adopt their knowledge for future career.

Course Outcomes

By the end of this course the student will be able to

1. Realize the rigidness of our Indian Politics and Administrative aspects.
2. A Student can understand our nation federalism.
3. Can assess different types of risks involved in misadministration.
4. Can create competitive advantage.
5. Summarizes the legal and administrative establishments
6. A student can infer financial aspects for betterment of the National building.

Unit – I

Introduction Historical perspective of the constitution of India - Salient features of The Indian Constitution - Amendment Procedure of The Indian Constitution.42nd amendment (Mini Constitution) - 44th amendment (1978 – Janatha Govt.)

Unit – II

Important Features Of Constitution Fundamental Rights(Article 12 to 35), Duties (51 A – 1976 emergency) and Directive principles (Article 36 to 51) of State Policy - Articles 14 to 18 - Articles 19 - Article 21

Unit – III

Parliamentary form of Govt. In India President of India - Emergency provisions -National Emergency – Article 352 - President Rules – Article 356 - Financial Emergency – Article 360 Prime Minister and Cabinet - Supreme Court of India (Indian Judiciary)

Unit – IV

Indian Federalism Union – State relations; - Legislative , Administrative and Financial relations. Local self Govt. – Constitutional Schemes in India (73 & 74 Constitutional amendments)

Unit – V

Parliamentary Committees: Public Accounts Committee - Estimates Committee - Committee on Public Undertakings. - Election commission of India (Article -324) - Comptrollar and Auditor General (CAG) of India (Article – 148 to 150)

Unit-VI

Finance Commission (Article – 280) - Neethi Aayog (Planning Commission) and - Political Parties.

Text Books:

1) Introduction to Indian Constitution by D.D Basu,Lexis Nexis Butterworth wadhwa Nagapur, 2008.
2) Poicits in India by Rajini Kothari, Orient LongMan, 2005.
3) The Indian Constitution by Madhav Khosla by Oxford University Press India, 2012.

Differential Equations
(Common to all Branches)

Subject Code : 20BST102

L	T	P	C
2	1	0	3

Course Objectives:

- To solve the first order Ordinary Differential equations and apply to Orthogonal trajectories, Newton's Law of Cooling and Law of Growth (Decay).
- To solve second and higher order ordinary differential equations.
- Derive the Fourier series expansion of one variable functions.
- Understand Taylor's, Maclaurin's series expansion and rules of calculating extreme value of two or more variable functions.
- Learn the methods of solving first order quasi-linear (Lagrange) partial differential equations and first order non-linear partial differential equations.
- Understand the method of solving a linear Partial differential equation with constant coefficients by method of Separation of Variables, solve a one dimensional Wave and a one dimensional Heat equation.

Course Outcomes

The student will be able to:

1. Apply the mathematical tool for the solution of Ordinary Differential equations, Orthogonal trajectories, Newton's Law of Cooling and Law of Growth (Decay).
2. Evaluate higher order homogenous and non-homogenous linear differential equations with constant coefficients.
3. Estimate the Fourier series expansion of one variable functions.
4. Estimate the Taylor's, Maclaurin's series expansion of two variable functions and extreme values of two or more variable functions.
5. Evaluate a first order quasi-linear (Lagrange) partial differential equations and first order non-linear partial differential equations.
6. Evaluate a one dimensional Wave and Heat equation.

Unit – I

Ordinary differential equations of first order: *Linear type - Bernoulli type–Exact type - Equations reducible to exact type- Orthogonal Trajectories-Newton's law of cooling - Law of Growth and Decay.* (8 hrs)

Unit – II

Ordinary differential equations of higher order: *Higher order homogenous and non-homogenous linear differential equations with constant coefficients- Complimentary Functions-Particular integrals for the functions of type sin(ax+b)/cos(ax+b), x^m, e^{ax} , $e^{ax}V(x)$ - Method of variation of parameters, Applications-LCR circuits.* (8 hrs)

Unit – III

Fourier series: Fourier Series -Even and odd functions– Fourier series of functions defined in the interval (0, 2π), (-π, π), (0, 2c),(-c,c) - Half range Fourier sine and cosine series**(8 hrs)**

Unit – IV

Partial Differentiation: *Functions of two or more variables-Partial differentiation-Total Derivative- Taylor's and Maclaurin's Series (without proof) - Maxima, minima of functions without constraints and functions with constraints (Lagrange method of undetermined multipliers).* (8 hrs)

Unit- V

Partial Differential Equations of first order: Partial differential Equations - Formation of partial differential equations– solutions of first order quasi-linear (Lagrange) partial differential equations and first order non-linear (standard type) partial differential equations. (8 hrs)

Unit – VI

Applications of Partial Differential Equations *Solution of linear Partial differential equations with constant coefficients – Method of Separation of Variables- One dimensional Wave and Heat equations.* (8 hrs)

Text Books

1. B.V.Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi,2014.
2. Dr.B.S.Grewal, Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.
Reference Books
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

Applied Physics
(Common to all Branches)

Subject Code : 20BST105

L	T	P	C
3	0	0	3

Course Description

This course encompass Fundamental Concepts of Physics that include

- Wave Optics
- Lasers
- Fiber Optics
- Modern Physics
- Electro Magnetic Theory
- Semiconductor Physics

that are inevitable for any Engineering student so that these prerequisites aid the student to readily understand Day to Day Engineering Problems with Pragmatic Approach.

Course Objectives

- To realize the principles of optics in designing optical devices
- To comprehend the Principles of Lasers
- To Infer the Principles of Fiber Optics
- To Recognize the shortcoming of classical physics and describe the need for modifications to classical theory
- To Identify the interaction of electromagnetic fields
- To Summarize the characteristics of semiconductor materials.

Course Outcome

Students will be able to

1. Apply the principles of optics in designing optical devices
2. Illustrate the Principles of Lasers
3. Outline the Principles of Fiber Optics
4. Resolve the discrepancies in classical estimates through quantum principles
5. Analyze the interaction of electromagnetic fields.
6. Interpret the characteristics of semiconductor materials.

Unit – I

Wave Optics – Interference - Introduction, Principle of Superposition of Waves, Interference in Plane Parallel Film due to Reflected Light, Newton's Rings under Reflected Light - Determination of Wavelength of Monochromatic Source of Light.

Diffraction - Introduction, Differences between Interference and Diffraction, Fraunhofer Diffraction due to Single Slit – Intensity Distribution.

Unit – II

Lasers - Introduction, Characteristics of Lasers- Coherence, Directionality, Monochromacity and High Intensity, Principle of Laser – Absorption, Spontaneous and Stimulated Emission, Einstein Coefficients (Qualitative), Population Inversion, Optical Resonator and Lasing Action, Ruby Laser [Three Level System], Helium-Neon Laser [Four Level System], Applications of Lasers in Industry, Scientific and Medical Fields.

Unit – III

Fiber Optics - Introduction, Optical Fiber Construction, Principle of Optical Fiber – Total Internal Reflection, Conditions for Light to Propagate - Numerical Aperture and Acceptance Angle, Differences between Step Index Fibers and Graded Index Fibers, Differences between Single Mode Fibers and Multimode Fibers, Applications of Optical Fibers in Communication

Unit – IV (Modern Physics)

Quantum Mechanics - Wave Particle Duality, de-Broglie's Hypothesis of Matter Waves, Heisenberg's Uncertainty Principle, Physical Significance of Wave Function. Time independent wave equation and Particle in One Dimensional Potential Box.

Unit – V

Electromagnetic Theory Concept of Electric Field, Point Charge in Electric Field, Gauss Law and it's Applications, Magnetic Field - Magnetic Force on Current Carrying Coil. Ampere's Law, Biot-Savart Law, Faraday's Law of Induction, Lenz's Law, Maxwell's Equations and Applications

Unit – VI

Semiconductors Physics: Introduction- Intrinsic and Extrinsic Semiconductors, Dependence of Fermi Level on Carrier Concentration and Temperature, Diffusion and Drift Currents. Hall Effect – Mobility, Sign of Charge Carriers, Conductivity, Resistivity.

Text Books

1. A Textbook of Engineering Physics, M N Avadhanulu & P G Kshirsagar, S.Chand Publishers
2. Fundamentals of Physics by Resnick, Halliday and Walker
3. Modern Physics by Arthur Beiser

Reference books

1. University Physics by Young and Freedman
2. Solid State Physics by S. O. Pillai, New Age International Pubishers
3. Engineering Physics, Volume-I&II, P.K.PalaniSwamy, Scitech Publications Hyderabad
4. Engineering Physics Volume I&II Dr.K.Vijaykumar, S.Chand Publishing Company, New Delhi
5. Engineering Physics Dr. S. Mani Naidu, Pearson Publications Chennai

Data Structures and Algorithms

Subject Code: 20CST101

L	T	P	C
3	0	0	3

Course Outcomes:

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

1. Compute the time and space complexities and calibrate the performance of a given algorithm.
2. Compare the performances of various Searching and Sorting techniques.
3. Demonstrate the advantages of dynamic memory allocation via linked lists.
4. Illustrate the applications of Stacks and Queues.
5. Implement the basic operations and Traversals on binary Trees.
6. Understand traversals and shortest path algorithms on a Graph.

Unit – I

Introduction: Basic Concepts of Data Structures; Notations of Time & Space Complexity: Performance Analysis of algorithms: Iterative & Recursive Algorithms; Asymptotic Notations (O, Ω, θ, o, ω)

Unit – II

Searching: Linear Search, Binary Search: Algorithm & Analysis; **Hashing:** Hash functions, Collision Resolution techniques; **Sorting:** Methodology & Performance Analysis of Sorting Algorithms: Selection, Bubble, Insertion, Quick, Merge, Heap Sort.

Unit – III

Linked Lists: Comparison with Arrays; Operations on Singly linked list: Creation, Insertion, Deletion, Traversing, Searching; Operations on Doubly linked list; Operations on Circular Linked Lists;

Unit – IV

Stacks: Definition & Efficient operations: Push & Pop; Applications of Stacks: Conversion & Evaluation of expressions;

Queues: Types of Queues: Simple Queue; Circular Queue: Efficient Operations on Queues; Implementation of Stack and Queue using Linked Lists.

Unit – V

Trees: Basic Terminology of Trees; Binary Tree: Traversals; Binary Search Tree Operations: Insert, Delete; Introduction to Balanced Trees: AVL, B-Tree

Unit – VI

Graph: Basic Terminologies and Representations of Graphs; Graph traversal algorithms: Breadth-FS & Depth-FS; Single-Source Shortest Path Algorithm: Dijkstra's Algorithm.

Text Books:

1. Mark Allen Weiss , **"Data Structures and Algorithm Analysis",** Fourth Edition , Pearson.
2. Ellis Horowitz, Sartaj Sahni, "**Fundamentals of Data Structures**", Illustrated Edition,Computer- Science Press.

Reference Books

1. Michel T. Goodrich, Roberto Tamassia, David Mount, **"Data Structures and Algorithm Analysis",** 2nd Edition, John Wiley & Sons, Inc.
2. Adam. Drozdek , **"Data Structure And Algorithms In C++",** 4th edition, Cengage.

Basic Electrical Engineering
(Common to all Branches)

Subject Code: 20EST101

L	T	P	C
3	0	0	3

Course objectives

- To introduce the basic knowledge of electric circuits
- To illustrate knowledge with network reduction techniques.
- To analyze AC circuits.
- To provide knowledge on Magnetic circuits.
- To become familiar with DC Generator.
- To understand the concept of DC Motor.

Course outcomes

1. Able to summarize different electrical circuits.
2. Able to construct network reduction techniques
3. Able to outline the basics of AC circuits.
4. Able to state magnetic circuits.
5. Able to examine DC Generator.
6. Able to explain DC Motor.

Unit – I

Introduction to Electric Circuits: Basic definitions, Electrical circuit elements (R, L and C), Voltage and current sources Independent and dependent sources, Ohm's Law, Series & Parallel circuits, Source transformation, Kirchhoff's Laws, , simple problems.

Unit – II

Network Reduction Techniques: Star-Delta transformation, Nodal Analysis, Super node, Mesh analysis, super mesh-Problems.

Unit – III

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series only), real power, reactive power, apparent power, power factor, simple problems.

Unit – IV

Magnetic circuits: Basic definitions of magnetic flux, flux density, Reluctance, Magneto motive force (m.m.f), magnetic field intensity, magnetic permeability and susceptibility. Comparison between magnetic and electrical circuits, inductively coupled circuits, coefficient of coupling, dot convention, simple problems on magnetic circuits.

Unit – V

DC Generator: Generator-Principle of Operation, Construction, EMF equation, Classification, O.C.C, internal and external characteristics of shunt generator, Applications.

Unit – VI

DC Motor: Motor-principle of operation, Torque equation, Classification Speed Control Methods, Operation of 3 point starter, Applications.

Text Books

1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.
2. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.

Reference Books .

1. Basic Electrical Engineering Dr.K.B.MadhuSahu scitech publications (india) pvt.ltd.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,2010.

IT Workshop
(Common to all Branches)

Subject Code : 20ESL104

L	T	P	C
1	0	4	3

Course Objectives:

- PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers.
- All the DOS commands would be covered for maintains of the Operating system.
- Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered.
- Productivity tools module would enable the students in crafting professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools.

Course Outcomes:

1. Students gain knowledge on computer system such as system Unit, input devices, and output devices connected to the computer.
2. Students gain knowledge to understand the booting process that includes switching on the system, and familiar with all the commands of an operating system.
3. Students gain knowledge to understand the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers and search engines etc.
4. Students get familiarize with parts of Word window, To create and save a document, To set page settings, create headers and footers, To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.
5. Students get familiarize with parts of Excel window, to create and save a workbook with single and/or multiple worksheets, to apply operations on range of cells using built-in formulae, etc.
6. Students get familiarize with parts of PowerPoint win, to create and save a new presentation, apply design templates to a presentation, to insert, edit and delete a slide , etc.

PC Hardware

Task 1: Identification of the peripherals of a computer.
To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions.

Task 2: (Optional) : A practice on disassemble the components of a PC and assembling them to working condition.

Task 3 : Installation of WINDOW XP operating system in PC.

Task 4: Introduction to all internal and external DOS commands

Task 5 : Installation of LINUX operating system in PC.

Internet & World Wide Web

Task 6: S**urfing the Web using Web Browsers and Search engine:** How to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and pop up blockers. And Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google.

MS – Word

Word Orientation : Describe Importance of MS- Word

Task 7 :Using word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

Task 8: Creating project abstract for using MS-WORD: Abstract Features to be covered:- Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

Task 9 : Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs

Task 10 : Creating a Feedback form - Features to be covered- Forms, Text Fields, Inserting objects, Mail Merge in Word.

MS-Excel

Excel Orientation : The mentor needs to tell the importance of MS/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel –Accessing, overview of toolbars, saving excel files, Using help and resources

Task 11 : Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 12 : Creating Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

Task 13: Calculating GPA - Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

Task 14: Creating Cricket Score Card - Features to be covered:-Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation

MS-Power Point

Task 15 : Students will be working on basic power point utilities and tools which help them create basic power point presentation.
Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in Powerpoint.

Task 16 : Concentrating on the in and out of Microsoft power point, Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

Text Books:

1. Vikas Gupta ,"Comdex Information Technology course tool kit" , WILEY Dreamtech
2. Cheryl A Schmidt ,"The Complete Computer upgrade and repair book", 3rd edition, WILEY Dreamtech
3."Introduction to Information Technology", ITL Education Solutions limited, Pearson Education.
4. Kate J. Chase ,"PC Hardware and A+ Handbook" –PHI (Microsoft)

Reference Books:

1 Scott. Mueller, 2008, Upgrading and Repairing PCs, 22/e, QUE,
2 Cheryl A Schmidt ,The Complete Computer upgrade and repair book,3/e , Dreamtech

Physics Lab
(Common to all Branches)

Subject Code: 20BSL101

L	T	P	C
0	0	3	1.5

Course Description

This Laboratory course is intended to apply the scientific method to expedite experiments that include

- Error analysis
- Waves Fundamentals
- Mechanics
- Physical Optics
- Lasers and Fiber Optics
- Semiconductor devices

So that student can verify theoretical ideas and concepts covered in lecture through host of analytical techniques, statistical analysis and graphical analysis.

Course Objectives

- To Operate Sensitive Instruments for precision measurements
- To Identify Error for targeted accuracy
- To Interpret the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
- To Determine relevant parameters associated with Interference and Diffraction phenomena using Travelling Microscope and Spectrometer.
- To Exhibit Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
- To Characterize semiconducting material devices.

Course Outcomes: Will be able to

1. Demonstrate the ability for precision measurements to design instrumentation
2. Estimate the Error for targeted accuracy
3. Infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
4. Apply the knowledge of Optics to calculate geometrical parameters of thickness of thin object and radius of curvature of a lens
5. Illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
6. Evaluate characteristics of semiconducting material devices

List of Experiments

1. Precision Measurements and Instruments
2. Error Analysis and Graph Drawing
3. Determination of Rigidity Modulus of the Material of Wire using Tensional Pendulum
4. Determination of Acceleration due to Gravity (g) using Compound Pendulum

5. Newton's Rings – Determination of the Radius of Curvature of a given Plano Convex Lens
6. Determination of Thickness of Thin Object using Wedge Method
7. Verify the characteristic curve of NTC Thermistor.
8. Determination of width of a single slit using LASER
9. Determination of Numerical Aperture and Bending Loss of an Optical Fiber
10. Determination of Energy Band Gap using the given Semiconductor

Manual / Record Book

1. Manual cum Record for Engineering Physics Lab, by Prof. M. Rama Rao, Acme Learning.
2. Lab Manual of Engineering Physics by Dr.Y. Aparnaand Dr. K. VenkateswaraRao (VGS books links, Vijayawada)

Basic Electrical Engineering Lab
(Common to all Branches)

Subject Code: 20ESL101

L	T	P	C
0	0	3	1.5

Course Objective

To introduce the student to study different electrical components and to verify the basic laws related to electrical engineering, Speed control of D.C. motor, testing of transformer, electrical wiring system through study, practice, and experiments.

Course Outcomes

Students will be able to

1. Label various types of electrical components.
2. Demonstrate various basic electrical laws.
3. Demonstrate speed control DC motor & Characteristics of generator.
4. Experiment with lamps.
5. Examine electrical wiring system

List of Experiments:

1. Study of electrical components.
2. To verify Ohm's law.
3. To verify (a) Kirchhoff's current law (b) Kirchhoff's voltage law.
4. To verify the total resistance of the series and parallel connected circuits.
5. Find armature resistance, field resistance and filament Lamp Resistance using V-I method.
6. Magnetization characteristics of DC shunt generator.
7. Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method
8. Fluorescent tube connection.
9. (a) One way control of lamp
   (b) Two way control of lamp
10. Fan wiring.

Additional Experiments:

11. Soldering and bread board precautions.
12. To find voltage current relationship for series RL circuit and determine power factor

Data Structures and Algorithms Lab

Subject Code : 20CSL101

L	T	P	C
0	0	3	1.5

Course Outcomes:

1. Develop Programs as recursive solutions for problems.
2. Demonstrate different strategies to solve the common searching and sorting algorithms.
3. Illustrate the use of dynamic memory allocation through linked list operations.
4. Design programs for linear data structures such as Stacks, and Queues.
5. Develop Programs for implementing various operations on Binary Trees and Binary Search Trees.
6. Apply the fundamental graph algorithms to solve problems using Depth-First and Breadth- First Search.

List of Experiments:

1] a) Write a C program to generate a Fibonacci series using recursive function.
b) Write a C program to find the GCD of given numbers using recursive function.
c) Write a C program to solve the Towers of Hanoi problem using recursive function.

2] a) Design, Develop and Implement a C program to perform linear search for a key value in a given list.
b) Design, Develop and Implement a C program to perform Binary search for a key value in a given list.

3] Given a File of **N** employee records with a set **K** of Keys(4-digit) which uniquely determine the records in file **F**. Assume that file **F** is maintained in memory by a Hash Table(HT) of **m** memory locations with **L** as the set of memory addresses (2-digit) of locations in HT. Let the keys in **K** and addresses in **L** are Integers. Design and develop a Program in C that uses Hash function **H: K→L** as H(**K**)=**K** mod **m (remainder** method), and implement hashing technique to map a given key **K** to the address space **L.** Resolve the collision (if any) using **linear probing**.

4] a) Design, Develop and Implement a C program that implement Selection Sort to sort a given list of integers.
b) Design, Develop and Implement a C program that implement Bubble Sort to sort a given list of integers.

5] a) Design, Develop and Implement C program that implement Quick Sort to sort a given list of integers.
b) Design, Develop and Implement C program that implement Merge Sort to sort a given list of integers.

6] Design, Develop and Implement a menu driven Program in C for the following operations on **Singly Linked List (SLL)** of Student Data with the fields: ***USN, Name, Branch, Sem, PhNo***
a. Create a SLL of N Students Data by using front insertion.
b. Display the status of SLL and count the number of nodes in it
c. Perform Insertion / Deletion at End of SLL
d. Perform Insertion / Deletion at Front of SLL (Demonstration of stack)
e. Exit

7] Design, Develop and Implement a menu driven Program in C for the following operations on **STACK** of Integers (Array Implementation of Stack with maximum size **MAX**)
a. ***Push*** an Element on to Stack
b. ***Pop*** an Element from Stack

c. Demonstrate how Stack can be used to check ***Palindrome***
d. Demonstrate ***Overflow*** and ***Underflow*** situations on Stack
e. Display the status of Stack
f. Exit
Support the program with appropriate functions for each of the above operations

8] Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: **+, -, *, /, %(Remainder), ^(Power)** and **alphanumeric** operands**.**

9] Design, Develop and Implement a menu driven Program in C for the following operations on **QUEUE** of Characters (Array Implementation of Queue with maximum size **MAX**)
a. Insert an Element into QUEUE
b. Delete an Element from QUEUE
c. Demonstrate ***Overflow*** and ***Underflow*** situations on QUEUE
d. Display the status of QUEUE
e. Exit
Support the program with appropriate functions for each of the above operations

10]a) Design, Develop and Implement a C program to implement Binary tree traversals using iterative functions.
b)Design, Develop and Implement a C program to implement Binary tree traversals using recursive functions.

11]Design, Develop and Implement a menu driven Program in C for the following operations on **Binary Search Tree (BST)** of Integers
a. Create a BST of **N** Integers: 6, 9, 15, 22, 8, 45, 24, 18, 71, 8, 5, 2
b. Traverse the BST in Inorder, Preorder and Post Order
c. Search the BST for a given element (**KEY**) and report the appropriate message
e. Exit

12]Design, Develop and Implement a Program in C for the following operations on **Graph(G)** of Cities
a. Create a Graph of **N** cities using Adjacency Matrix.
b. Print all the nodes **reachable** from a given starting node in a digraph using DFS/**BFS** method.

Text Books:

1. Mark Allen Weiss , **"Data Structures and Algorithm Analysis",** Fourth Edition , Pearson.
2. Ellis Horowitz, Sartaj Sahni, "**Fundamentals of Data Structures**", Computer Science Press.

References Books

1. Michel T. Goodrich, Roberto Tamassia, David Mount, "Data Structures and Algorithm Analysis", 2nd Edition, John Wiley & Sons, Inc.
2. Debasis Samanta, "Classic Data Structures", Second Edition, PHI, 2012, New Delhi, India.
3. B.A. Forouzan and R.F. Gilberg, ,"Computer science, A structured programming approach using C", Third edition, 2011, Thomson, New Delhi, India.

Reference Link

1. https://www.geeksforgeeks.org/data-structures/

Environmental Science
(Common to all Branches)

Subject Code: 20MCT202

L	T	P	C
2	0	0	0

Course Objectives

- Memorize the knowledge of environment and status of different resources on earth.
- Identify the significance, arrangement, causes of annihilation and conservation of ecosystems and biodiversity.
- Identify the significance, types and conservation of biodiversity
- Discriminate causes, effects of a variety of pollutions and suitable control methods.
- Identify the hurdles of sustainable development; evaluate the different environmental management and legal issues.
- Describe the population growths, health problems and evaluate the environmental assets.

Course Outcomes

By Studying this Course Student will

1. Recognize and speaks well again on the general issues of environment and know how to conserve resources for better usage.
2. Explain and demonstrate the ecosystems setup, assess
3. Recognize and conserving of diversity to upkeep.
4. Examine a range of pollution problems along with control and their eco-friendly disposal methods.
5. Translate the sustainable development practice through clean development mechanisms.
6. Evaluate the changing trends of world population and compile the information in order to document the environmental assets.

Unit – I

Importance of Environmental Studies and Natural Resources: Definition of Environment – Importance - Need for Public Awareness

Forest Resources - Use and over exploitation - deforestation – consequences – case study

Water Resources - Use and over utilization - dams - benefits and problems on Tribes and Environment

Food Resources – Food security concept - changes caused by agriculture and overgrazing -effects of modern agriculture – fertilizer - pesticide problems - water logging - salinity – concept of sustainable agricultural methods - case study

Energy Resources - Non-renewable energy resources – coal – crude oil - natural gas - use of renewable and alternate energy sources.

Unit – II

Ecosystems: Definition – Structure of ecosystem: producers - consumers – decomposers.

Functions of ecosystem: Food chains - food webs - ecological pyramids - Energy flow – Nutrient cycles (Carbon cycle and Nitrogen cycle). Ecological succession.

Unit – III

Biodiversity and its conservation: Definition of Biodiversity - Values of biodiversity – Biogeographical classification of India - Hot Spots of India - Endangered and endemic species of India –Threats to biodiversity - Conservation of biodiversity.

Unit – IV

Environmental Pollution: Definition – causes - effects - control measures of Air pollution - Water pollution - Noise pollution – Marine Pollution - Nuclear hazards.

Solid waste Management: Causes - effects - disposal methods of urban waste – biomedical wastes - case studies

Disaster management: floods – earthquakes – cyclones

Unit – V

Social Issues and the Environment: Concept of Unsustainable and Sustainable development – Water conservation: Rain water harvesting- Watershed management – Global environmental challenges: climate change - global warming – acid rains - ozone layer depletion -World summits on environment: Stockholm conference – Rio-earth summit – Kyoto protocol – Environment (Protection) Act - Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act - Wildlife (Protection) Act -Forest (Conservation) Act

Unit-VI

Human Population and the Environment: Population growth patterns - variation among nations - Population problems - control -Environment and human health - Role of information Technology in Environment and human health.

Text Books:

1. Shashi Chawla. 2015, *A Text book of Environmental Studies*, Revised edition, TMH, New Delhi
2. Bharucha, E. 2005, *Text book of Environmental Studies*, First edition, Universities Press (India) Pvt. Ltd., Hyderabad
3. Suresh K. Dhameja. 2006-07, *Environmental Studies*, Third revised edition, S.K. Kataria & Sons (P) Ltd., New Delhi
4. Benny Joseph. 2015, *Environmental Studies*, Revised edition, TMH, New Delhi

Reference Books:

1. Odum, E.P, *Fundamentals of Ecology*, Third edition, W.B. Saunders & Co (P) Ltd., Philadelphia.
2. P. D. Sharma, *Ecology and Environment*, Revised edition, Rastogi Publications (P) Ltd.
3. Cunningham, W.P., Cunningham, M.A., *Principles of Environmental Science*, TMH, New Delhi.
4. Peavy, Rowe and Tchobanoglous, *Environmental Engineering*, Mc Graw – Hill Internationaledition.
5. Graedel, T.E., Allenby, B.R., *Industrial Ecology and Sustainable Engineering*, Pearson Publications.

Python programming
(Common to all Branches)

L	T	P	C
3	0	3	4.5

Subject Code: 20ESI204

Course Objectives

This course will enable students to

- Learn Syntax and Semantics and create Functions in Python
- Handle Strings and Files in Python
- Understand Lists, Dictionaries and Regular expressions in Python
- Understand use of functions and file handling in python
- Implement Object Oriented Programming concepts in Python
- Introduction to Regular Expressions and matching in Python

Course Outcomes

By the end of this course the student will be able to

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions
2. Demonstrate proficiency in handling Strings and File Systems
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions
4. Implement file handling functions and user defined functions in python
5. Interpret the concepts of Object-Oriented Programming as used in Python
6. Implement Regular Expressions and matching in Python

Unit – I

Introduction to Python: History, Features, Installing Python, Running Python, Operators, Statements and Expressions.

Control Structures: Conditional Statements, Loops

Exercise Questions: 1

Ex 1: Write the python programs to calculate the following

a) Find the factorial of given number
b) To print all the prime numbers below n. n value should be taken from the user at the time of execution

Ex 2: Write the python programs to perform the following

a) To check given number Armstrong or not.
b) To check Strong number.
c) To print Fibonacci series.

Unit – II

Data Types: Mutable vs immutable data type, Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules

Sequences - Strings, Lists, and Tuples, Dictionaries and Set Types

Exercise Questions: 2

Ex 3: Write the python programs to calculate the following

a) Write a Python program to get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself.

b) Write a Python program to remove the characters which have odd index values of a given string.

c) To remove punctuations from the string

d) Write a Python program to count repeated characters in a string

e) Write a Python program to count Uppercase, Lowercase, special character and numeric values in a given string

Ex 4: Write the python programs to perform the following

a) Implement a STACK program by using PYTHON.
b) Implement a QUEUE program by using PYTHON.
c) Implement a Python Program for creating a dictionary and display its keys alphabetically.
d) Write a Python program to convert a list into a nested dictionary of keys.
e) Write a python program to remove duplicates from the list

Unit – III

Functions: Definitions, Declaration, Parameter passing, calling functions

File Handling: creating a file, opening a file, I/O with file (read, write, append), closing a file

Exercise Questions: 3

Ex 5: Write the python programs to calculate the following

a) To find HCF or GCD of two numbers

b) To find sum of natural numbers using recursive function

Ex 6: Write the python programs to perform the following

a) Read a file line by line into a list
b) Get filename, line count, file extension, file creation and modification date .
c) Reads and displays the content of the file
d) Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.

Unit – IV

Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules.

Exercise Questions: 4

Ex 7: Write the python programs to calculate the following

a) Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
b) Write a python program to define a module and import a specific function in that module to another program.

Unit – V

Classes in Python : Principles of Object Orientation , Creating Classes , Instance Methods , Special Methods ,class Variables and Inheritance, Data base connectivity .

Exercise Questions: 5

Ex 8: Write the python programs to calculate the following

a) Define a class, which have a class parameter and have a same instance parameter.
b) Define a class named 'Shape' and its subclass 'Square'. The Square class has an 'init' function which takes a given length as an argument. Both classes have an area function which can print the area of the shape, where Shape's area is 0 by default..

Unit-VI

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

Exercise Questions: 6

Ex 9: Write the python programs to calculate the following

a) implement Re.findall, re.split, re.sub, re.subn, re.search and Match.group.

b) Write a Python program to check the validity of a password (input from users).
Validation :

- At least 1 letter between [a-z] and 1 letter between [A-Z].
- At least 1 number between [0-9].
- At least 1 character from [$#@].
- Minimum length 6 characters.
- Maximum length 12 characters.

Text Books

1. Wesley J .C hun "Core Python Applications Programming", 3rd Edition, 2012, Prentice Hall.
2. Brian jones, David Beazley “Python Cookbook ”, 3rd Edition.

References Books

1. Mark Lutz "Programming Python, 4th Edition" O'Reilly Media.
2. Think Python, Allen Downey, Green Tea Press

Web Links

https://docs.python.org/3/tutorial/index.html
https://pythonprogramminglanguage.com

Digital Logic Design
(Common to all Branches)

L	T	P	C
3	0	0	3

Subject Code: 20EST205

Course Objectives
The course is designed with the objective to:

- To solve a typical number base conversions
- To optimize logic gates for digital circuits using various techniques
- To apply knowledge of adders for higher order digital circuits
- To develop advanced combinational circuits
- To design various circuits using PLDs
- To identify new areas for applying the knowledge of flip-flops

Course Outcomes
After the successful completion of this course, students will be able to

1. Distinguish different number systems and digital codes
2. Design different arithmetic logic gates
3. Design various types of adder circuits using combinational circuits
4. Distinguish different combinational logic circuits and design logic circuits using Combinational circuits
5. Design logic circuits using PLDs
6. Distinguish different sequential logic circuits and design logic circuits using sequential circuits

Unit – I
Number Systems: Binary, Octal, Decimal, Hexadecimal Number Systems. Conversion Of Numbers from One Radix to another Radix, r's Complement and (r-1)'s Complement Subtraction, Weighted and Non- weighted codes.

Unit – II
Logic Gates and Boolean Algebra: Basic Gates: NOT, AND, OR, Boolean Theorems, Universal Gates, Ex-OR and Ex-NOR Gates, Compliment and dual of logic functions. Minimizations of Logic Functions, Multilevel Realization Of Logic Functions.

Gate-Level Minimization: Karnaugh Map Method (K-Map): Minimization Of Boolean Functions upto four variables, POS and SOP Simplifications with don't care conditions using K map, Quine mccluskey Method

Unit – III
Combinational logic circuits-I: Design of half adder, full adder, half subtractor, full subtractor, applications of full adders, 4-bit binary adder, 4-bit binary subtractor, BCD adder, excess – 3 adder, carry look ahead adder

Unit – IV
Combinational logic circuits-II: Design of decoder, encoder, multiplexer, de-multiplexer, and comparators and LED seven segment display

Unit – V
Programmable Logic Devices: PLA, PAL, PROM. Realization of Switching Functions Using PROM, PAL and PLA. Comparison of PLA, PAL and PROM. Programming Tables of PLA, PAL and PROM

Unit-VI

Itnroduction to Sequential Logic Circuits: Classification, Basic Sequential Logic Circuits:. RS, JK, T and D Flip flops, truth tables & excitation tables. Conversion of Flip Flops,Flip Flops with Asynchronous Inputs (Preset and Clear).

Registers and Counters: Design of Registers, Buffer Register, Control Buffer Registers, Bidirectional Shift Registers, Universal Shift Register, Design of Ripple Counters, Synchronous Counters and Variable Modulus Counters, Ring Counter, Johnson Counter

Text Books:

1. M.Morris Mano, Michael D Ciletti, Digital Design ,4/e, PEA
2. Roth, Cengage Fundamentals of Logic Design, 5/e.

Reference Books:

1. Kohavi, Jha, Switching and Finite Automata Theory,3/e, Cambridge.
2. Leach, Malvino, Saha,Digital Logic Design, TMH 3. Jaya Bhaskar, Verilog HDL primer, PEA

Reference Links

1. https://nptel.ac.in/courses/108/105/108105132/

Discrete Mathematics
(Common to all Branches)

Subject Code: 20CST202

L	T	P	C
2	1	0	3

Course Objectives

Students are expected to learn:

- Understand the theory and techniques of logic, graphs and trees, and algebraic systems
- Apply the knowledge and skills obtained to investigate and solve a variety of discrete mathematical problems
- Communicate mathematical ideas

Course Outcomes

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

1. Apply equivalence formulas, tautological implications in finding normal forms, and theory of inference in Statement Calculus and predicates, and explain Mathematical Induction principle and apply the same
2. Apply equivalences and inference theory in Predicate Calculus
3. Explain the basic properties of relations, POSETS, LATTICES, functions and apply the same in solving the problems
4. Identify the basic properties of graphs and related structures and solve the related problems
5. Identify the basic properties of Trees and solve minimum cost spanning tree problems
6. Solve and formulate, generating functions and recurrence relations

Unit – I

Logic & Mathematical Reasoning Propositional calculus: statements and notations, connectives, Truth tables, Tautologies, Equivalence of formulas, Tautological implications, Normal forms, Theory of inference for statement calculus.

Unit – II

Predicate Calculus Predicate logic, statement functions, variables and quantifiers, free and bound variables. Inference Theory of the Predicate Calculus: Logical implication involving quantifiers, Statements with more than one variable.

Unit – III

Relations Properties of Relations, Equivalence relations, partial orders, Lattices, properties of Lattices, Special types of Lattices (Proofs not required).

Unit – IV

Graph Theory Basic Concepts of Graphs, Matrix representation of graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerain & Hamiltonian graphs, Planar Graphs, Graph coloring.

Unit – V

Trees: Introduction and applications of trees, Tree traversals, Spanning Trees, Minimum cost spanning trees (Prim's & Kruskal's)

Unit-VI

Combinatorics: Generating Function of Sequences, calculating coefficient of Generating function, Partial Fractions. **Recurrence relations**: First order and second order Linear Homogeneous and Non-Homogeneous recurrence relations, method of generating functions.

Text Books:

1. J.P.Tremblay & R. Manohar, "Discrete Mathematical Structure with Applications to Computer Science" Mc.Graw Hill, 2004.
2. Kolman, Busby Ross , "Discrete Mathematical Structures", PHI,5th Edition,2003.
3. D.S.Chandrasekharaiah, "Mathematical Foundation of Computer Science" Prism Publications 2009.

Reference Books:

1. Trembly J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 30th Re-print (2007).
2. Discrete Mathematics for Computer Scientists & Mathematicians, 2/e Mott, Kandel, Baker, PHI
3. Kenneth H.Rosen, "Discrete Mathematics and its Applications", 6th Edition, Special Indian edition , Tata McGraw – Hill Pub. Co. Ltd., New Delhi, (2007).
4. V. Krishnamurthy, "Combinatories:Theory and Applications", East-West Press.
5. Seymour Lipschutz, M.Lipson, "Discrete Mathemataics" Tata Mc Graw Hill, 2005.

Computer Organization & Architecture

Subject Code: 20CST203

L	T	P	C
3	0	0	3

Course Objectives

Students are expected to learn

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

Course Outcomes

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

1. Draw the functional block diagram of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set
2. Describe hardware algorithms for fixed-point and floating-point arithmetic
3. Understand different types of storage element used in a computer
4. Understand input output device and their interconnection to CPU along mode of data transfer from I/O device to memory
5. Enhance the performance of a system by applying pipelining technique
6. Understand multiprocessor concepts

Unit – I

Functional blocks of a computer CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.

Unit – II

Data representation Signed number representation, fixed and floating-point representations, Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder. Multiplication – shift-and add, Booth multiplier, array multiplier. Division restoring and non-restoring techniques, floating point arithmetic.

Unit – III

Memory organization Memory Hierarchy, Main Memory-RAM, ROM Chips, Associative Memory-Hardware Organization and Match Logic, Cache Memory-Associative Mapping, Direct Mapping and Set Associative Mapping, Virtual Memory.

Unit – IV

Peripheral devices and their characteristics: Peripheral device, Input-output interface I/O Bus and Interface Modules, I/O versus memory bus, Isolated versus memory-mapped I/O, Asynchronous data transfer, modes of transfer, priority interrupt and direct memory access.

Unit – V

Pipelining: Introduction to parallel processing, Basic concepts of pipelining, Arithmetic pipeline, Instruction pipeline throughput and speedup, pipeline hazards. Vector processing and Array Processor.

Unit-VI

Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

Text Books:

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. "Computer System Architecture", Revised 3rd Edition by M. Morris Mano and Rajiv Mall, Pearson Education.

Reference Books:

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
3. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.
4. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Object Oriented Programming
(Common to all Branches)

Subject Code: 20CST204

L	T	P	C
3	0	0	3

Course Objectives

- The objective of the course is to teach the basic concepts and techniques which form the object oriented programming paradigm
- Well equipped with Java SDK environment to create, debug and run simple Java programs

Course Outcomes

By the end of this course the student will be able to

1. Knowledge of the structure and model of the Java programming language
2. Explain the concept of class and objects with access control to represent real world entities
3. Demonstrate the implementation of inheritance by using extends and implements keywords
4. Illustrate different techniques on creating and accessing packages (fully qualified name and import statements)
5. Understand the impact of exception handling to avoid abnormal termination of program using checked and unchecked exceptions
6. Use multithreading concepts to develop inter process communication and also design applet Programs.

Unit – I

Introduction To Java: Evolution of Java, Java Buzzwords, The Java Virtual Machine, An overview of Java- Simple Java Program, Naming Conventions in Java, Data types, Variables, Expressions, Automatic type Conversion, Operators, Control Statements , Arrays, Strings

Unit – II

Classes & Objects: Class fundamentals, Declaring Objects, Initializing the instance variables, Access Control, Constructors, Methods in Java, Overloading Methods and constructors, Static Methods, Recursion, final keyword, this keyword, garbage collection, finalize() method

Unit – III

Inheritance: Inheritance Basics, Types of Inheritance, The Keyword 'super', Final with inheritance.
Polymorphism: Method Overriding, Dynamic Method Dispatch, Abstract Classes. INTERFACES: Interface, Multiple Inheritance using Interface, Abstract Classes vs. Interfaces

Unit – IV

Packages: Packages, Different Types of Packages, Access Protection, Importing Packages.
Exception Handling: Exception-handling fundamentals, throw Clause, throws Clause. Types of Exceptions: Built-in Exception, User Defined Exception.

Unit – V

Threads: Java Thread Model, Main Thread, Creating a Thread and Running it, terminating the Thread, Creating Multiple Threads, Thread Synchronization, and Thread Priorities.

Unit-VI

Applets: Applet Basics, Applet Life Cycle, A Simple Applet, HTML applet tag, Applet Parameters.

Text Books:

1. Herbert Schildt, “Java The complete reference”, 9thEdition, McGrawHill, 2017.
2. Timothy budd, “An introduction to object-oriented programming”, 3rdEdition, Pearson Education, 2009.

Reference Books

1 E.Balaguruswamy, “Programming with Java A Primer”, 5th Edition, TataMcGraw-Hill, 2017.
2. Y. Daniel Liang, “Introduction to Java programming”, 9thEdition, Pearson education, 2012

Reference Link

1. http://en.wikibooks.org/wiki/Java_Programming - Java Learning WikiBook
2. http://www.javabeginner.com - Java Beginner Tutorial

Digital Logic Design Lab
(Common to all Branches)

Subject Code: 20ESL205

L	T	P	C
0	0	3	1.5

Course Objectives

- Verify the truth tables of logic gates
- Design and verify the operation of combinational circuits.
- Design and verify the operation of code converters.
- Design and verify the operation of sequential circuits
- Verify the operation of Johnson/ring counter
- Verify the operation of memory element

Course Outcomes

By the end of this course the student will be able to

1. Distinguish logic gates for design of digital circuits
2. Design different types of Combinational logic circuits
3. Design different types of Code converters
4. Analyze the operation of flip-flops
5. Apply knowledge of flip-flops in designing of Registers and Counters
6. Analyze the Read/write operations of memory element

List of Experiments (At least ten experiments are to be done) :

1. Verification of logic Gates
2. Half/Full Adder
3. Half/Full/Subtractor
4. Binary-Gray & Gray-Binary Converter using Ex-or gates
5. BCD –Excess3 & Excess 3 –BCD converter using Full adder
6. MUX/DEMUX
7. Comparators
8. Encoder/Decoder
9. Flip-Flops
10. 4 Bit - Counter
11. Shift Registers
12. RAM

Object Oriented Programming through Java Lab
(Common to all Branches)

Subject Code: 20CSL202

L	T	P	C
0	0	3	1.5

Course Objectives

- To develop skills to design and analyze the applications with respect to java programming
- To strengthen the ability to identify and apply the suitable object oriented concept for the given Real world problem

Course Outcomes

By the end of this course the student will be able to

1. Able to write, compile and execute simple java programs
2. Explain the concept of class and objects with access control to represent real world entities
3. Use overloading methodology on methods and constructors to develop application programs
4. Describe the concept of interface and abstract classes to define generic classes
5. Able to create user defined packages and handle exceptions at run time
6. Apply Threading concept based on application requirement and design Applet programming

List of Experiments

1. A) Write a java program that displays welcome to follow by user name. Accept user name from the user.
   B) Write a java program that prompts the user for an integer and then prints out all the prime numbers up to that integer.

2. A) Write a java program to create a class Rectangle. The class has attributes Length and Width. It should have methods that calculate Area and Perimeter of the Rectangle. It should have read Attributes () method to read Length and Width from the user.
   B) The Fibonacci sequence is defined by the following rule: The first two values in the sequence are1 and 1. Every subsequent value is the sum of the two values preceding it.

3. A) Write a java program that uses both Recursive and Non-Recursive functions to find the factorial of a given number.
   B) Write a java program that checks whether the given string is Palindrome or not. Ex: MALAYALAM is a Palindrome.

4. A) Write a java program to illustrate method overloading and method overriding.
   B) Writ a java program that illustrates how java achieved Run Time Polymorphism.
5. A) Write a java program to demonstrate the use of subclass.
   B) Write a java program for abstract class to find areas of different shapes.

6. Write a Java program to implement the concept of importing classes from user defined package and creating packages.

7. Write a java program to implement the concept of Exception Handling by using predefined and user defined exceptions.

8. Write a java program to implement the concept of Threading by Extending Thread class and by Implementing Runnable Interface.

9. Write a program using Applet to display a message in the Applet and for configuring Applets by passing parameters.

10 Write a java program to implement thread priorities

Text Books

1. Herbert Schildt: "Java The complete reference", 9th Edition, Tata McGraw Hill, 2017.
2. E.Balaguruswamy: "Programming with Java A Primer", 5th Edition, Tata McGraw Hill, 2017.

Reference Books

1. Timothy budd, "An introduction to object-oriented programming", 3rdEdition, Pearson Education, 2009.
2. Y. Daniel Liang, "Introduction to Java programming", 9thEdition, Pearson education, 2012

Human Values
(Common to all Branches)

L	T	P	C
2	0	0	0

Subject Code: 20MCT205

Course Objectives

- To educate the students how to governance the professional behavior in their carrier as employee.
- To make aware of culture when they are working in different organizations.
- Understand value of education and self- development.
- Imbibe good values in students.
- Let the student know about the importance of character.
- Let the student to discriminate the personality and behaviour development.

Course Outcomes

By the end of this course the student will be able to

1. Upon completion of this course students can aware of ethical behavior in the work place
2. To shapes the students by the end of this curriculum with appropriate behavior in the society
3. To understand the challenging environment in work place
4. To understand the Global culture in engineering problems
5. Learn the importance of Human values
6. Knowledge of self-development, Developing the overall personality

Unit – I

Introduction to Values and Morals: Theory of Evolution – Ethics as a necessity for spiritual evolution-- Description of Human Values & Morals ---- Values --- Integrity, Honesty, Courage, Empathy, Personality, Character, Self-Confidence, Respect for Others, 7 Ways of Misusing Truth – Work Culture, Social Responsibility, Responsibilities as a Citizen, Cooperation and Commitment, Caring and Sharing--- Religion vs. Spirituality, Philosophy, Customs and Practices --- Impediments to Responsibility – Self-Interest, Fear, Self-Deception, Ignorance, Ego, Narrow Vision, Uncritical Acceptance of Authority, Group Thinking

Unit – II

Mind and Its Mysteries: What is Mind? Mind and Body, Mind and Food--- Mental faculties, Theory of perception, Memory, Tendencies, Thought Creates the World -- Power of Thought, Thought Culture, Desires, Pleasure and Pain -- Cultivation of Virtues, Control of Senses and Mind -- Discrimination, Dispassion, Sacrifice – Concentration, Meditation and Enlightenment

Unit – III

Risk, Safety and Environment: Difficulties in Estimating Risk -- Approach to Acceptable Risk, Regulator's Approach to Risk – Engineer's Liability, Changing Legal Rights of the Employees -- Organizational Disobedience by Contrary Action, by Non-Participation, by Protest – Environmental Laws and Judicial Intervention in Related Matters -- Environmental Movements

Unit – IV

Non-Ethical Practices in Vogue: Engineer's Responsibility for Rights - Respect for Authority – Conflict of Interests - Occupational crime -- Global Issues – How Multinational Corporations Influence Government Decisions, Risk and Public Policy- Engineers as Managers, Advisors and Experts, Engineers as Moral Leaders Problem of Bribery, Extortion, Grease Payments, Nepotism ----

Nexus between Politicians and Industrialists. Case Study – Chinese Minister Sentenced to Death for Corruption

Unit – V

Values and Self-Development: Social values and individual attitudes. Work ethics, Indian vision of humanism Moral and non- moral valuation Standards and principles Value judgments

Unit – VI

Personality and Behavior Development: Soul and Scientific attitude Positive Thinking. Integrity and discipline Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance true friendship, happiness Vs suffering, love for truth. Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature

Text Books:

1. Charles E Harris, Micheal J Rabins, "Engineering Ethics, Cengage Learning
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering" McGraw Hill
3. Mind, Its Mysteries and Control, Swami Sivananda, Divine Life Society Pub.
4. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

Probability & Statistics with R

Subject Code: 20BST204

L	T	P	C
3	0	0	3

Course Objectives

- To introduce the concept of discrete random variable and describe Binomial, Poisson distributions.
- To introduce the concept of a continuous random variable and describe Normal distribution.
- To analyze sampling distribution of means and estimation.
- To perform large sample tests – test of means and proportion.
- To perform the small sample tests - t-test, F-test and Chi-square test and ANOVA for the give data.
- To determine correlation and regression coefficients for given data**.**

Course Outcomes

By the end of this course the student will be able to

1. Calculate the probability of a random variable following Binomial, Poisson distributions.
2. Obtain the probability of a random variable Normal distribution.
3. Determine the sampling distribution of means for the given data and estimate the parameters using point estimation and interval estimation.
4. Perform the large sample tests – test of means and proportion.
5. Perform the small sample tests - t- test, F-test, Chi-Square and analyze ANOVA for the given data.
6. Determine correlation and regression coefficients for given data.

Unit – I

Discrete Random variables and Distributions: Introduction- Random variables- Discrete Random variable-Distribution function-Expectation- Discrete distributions: Binomial, Poisson distributions.

Unit – II

Continuous Random variable and distributions: Introduction-Continuous Random variable-Distribution function- Expectation- Continuous distribution: Normal distributions.

Unit – III

Sampling Theory: Introduction - Population and sample- Sampling distribution of means (with σ known and σ unknown) - Central limit theorem- sampling distribution of sums and differences - Point estimation- Maximum error of estimate - Interval estimation.

Unit – IV

Tests of Hypothesis (Large samples): Introduction –Hypothesis-Null and Alternative Hypothesis-Type I and Type II errors –Level of significance - One tail and two tail tests- Tests concerning single mean and single proportion- Tests concerning difference of means and difference of proportions.

Unit – V

Test of Hypothesis (Small Samples): Introduction - student's - t -test, F-test, Chi-square Test (Test of independence of attributes and goodness of fit) -ANOVA for one-way and two-way classified data.

Unit-VI

Correlation and Regression: Introduction - Concept of correlation–types of correlation-Karl-Pearson correlation coefficient method and its properties-Rank Correlation Coefficient. Regression-Linear regression and its properties.

Text Books:

1. Probability and Statistics for Engineering, Richards A Johnson, Irvin Miller and Johnson E Freund, 9th Edition, PHI.
2. Introduction to Probability and Statistics Using R, G. Jay Kerns, First Edition, ISBN: 978-0-557-24979-4. (Free e-book from R software website)
3. Probability and Statistics, Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham and Dr.M.V.S.S.N.Prasad, S.Chand Publications.

Reference Books:

1. Probability and Statistics Engineers and the Scientists, Shron L. Myers, Keying Ye, Ronald E Walpole, 8th Edition, Pearson 2007.
2. Introduction to probability and statistics, William Menden Hall, Robert J. Bever and Barbara Bever, Cengage learning, 2009.
3. Introduction to probability and statistics Engineers and the Scientists, Sheldon, M. Rosss, Academic Foundation,2011.
4. Applied statistics for Engineers and Physical Scientists, Johannes Ledolter and Robert V.Hogg, 3rd Edition, Pearson,2010.
5. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley-India, 10th Edition.

Design & Analysis of Algorithms

Subject Code: 20CST205

L	T	P	C
2	1	0	3

Course Objectives

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

Course Outcomes

By the end of this course the student will be able to

1. Measure the performance and calculate the Time & Space complexities of algorithms
2. Design effective algorithms based on Divide and Conquer
3. Develop strategic plans to optimize solutions using Greedy method
4. Discuss various problems suitable to Dynamic programming
5. Construct a state space tree to solve different problems using Backtracking technique
6. Find an optimal solution by applying different Branch and Bound techniques and illustrate Non- deterministic algorithms

Unit – I

Introduction Areas of Study of Algorithms; Pseudo-code Conventions; Performance Analysis, Asymptotic notations, Amortized analysis.

Unit – II

Divide and conquer: General method, Applications: Binary search, Quick sort, Merge sort, Strassen's Matrix multiplication.

Unit – III

Greedy method: General method, Applications: Job sequencing within deadlines, Knapsack problem, Minimum cost spanning trees, Single source shortest path problem

Unit – IV

Dynamic Programming: Principle of Optimality, Applications: Matrix chain multiplication, Optimal Binary Search Trees (OBST), 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem.

Unit – V

Graph traversals: DFS & BFS, Connected components, Articulation point & Bi-Connected components.

Backtracking: General method, Applications: n-Queens problem, Sum of subsets problem, Graph Colouring, Hamiltonian cycles.

Unit – VI

Branch and Bound: Least Cost (LC) Search, FIFO Branch and Bound & LC Branch and Bound, Applications: 0/1 knapsack problem, Travelling sales person problem.

NP-Hard and NP-Complete problems: Basic concepts, Non-deterministic algorithms, Cook's theorem.

Text Books:

1) Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, India, 2010.
2) Aho, Ullman and Hopcroft, "Design and Analysis of algorithms", Pearson Education, Fourth Edition, India, 2009

Reference Books:

1) Anany Levitin, "Introduction to Design & Analysis of Algorithms", Second Edition, Pearson Education, India, 2008.
2) Jon Kleinberg & Eva Tardos, "Algorithm Design", Second Edition, Pearson Education, India, 2008.

Web reference:

1) http://nptel.ac.in/courses/106101060/

Data Base Management Systems

Subject Code: 20CST206

L	T	P	C
3	0	0	3

Course Objectives

- To introduce basic RDBMS concepts, SQL, Database Design and Query processing. And also to introduce transaction processing, issues and techniques relating to concurrency and recovery in multi-user database environments, and various Data structures for External Data storage and efficient retrieval.

Course Outcomes

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

1. Differentiate Database Systems from File Systems and Define the Terminology, Features, Classifications, Characteristics embodied in Database Systems
2. Interpret, Design and Implement an E-R Model
3. Create/Modify the structure and write optimized SQL queries to extract and modify Information from Tables or Views
4. Apply proper Techniques such as Normalization and analyze the applicability of a specific Normal Form in designing a Database
5. Explain broad range of Database Management issues including Data integrity, Concurrency and Recovery
6. Compare various Indexing, Hashing and File Organization Techniques.

Unit – I

Database System Applications: Database Systems versus file Systems; View of Data: Data Abstraction, Instances and Schemas; Data Models: The ER Model, Relational Model, Other Data Models; Database Languages: DDL, DML, Database Access from Application Programs; Database Users and Administrators; Transaction Management; Database System Structure: Storage Manager, the Query Processor.
(**Text Book 2**)

Unit – II

Database Design and ER Diagrams: Beyond ER Design; Entities, Attributes and Entity sets; Relationships and Relationship sets; Additional features of ER Model; Conceptual Design with the ER Model; Introduction to the Relational Model; Integrity Constraints over relations; Enforcing Integrity constraints; Querying relational data; Logical database Design: ER to Relational; Introduction to Views: Destroying/Altering tables and Views; Relational Algebra: Selection and projection, set operations, renaming , Joins, Division. (**Text Book 1**)

Unit – III

SQL: Queries, Constraints, Triggers: Overview; The Form of a Basic SQL Query; Nested Queries: Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators; Aggregative Operators ; NULL values : Comparison using Null values; Logical connectives AND, OR, and NOT, Impact on SQL Constructs, Outer Joins, Disallowing NULL values; Triggers and Active Data bases. (**Text Book 1**)

Unit – IV

Schema Refinement and Normal Forms: Problems Caused by Redundancy, Problems related to Decomposition; Functional Dependencies; Normal Forms: FIRST, SECOND, THIRD Normal Forms, BCNF; Properties of Decompositions: Lossless-Join Decomposition, Dependency-Preserving Decomposition. (**Text Book 1**)

Unit – V

Transaction Concept: Transaction State; Implementation of Atomicity and Durability; Concurrent Executions; Serializability; Recoverability; Lock–Based Protocols: Locks, Granting of locks, The Two-Phase Locking Protocol (2PL), Implementation of locking ; Timestamp-Based Protocols.

Recovery System: Failure classification; Log–Based Recovery; Shadow Paging; Buffer Management; Failure with loss of Nonvolatile storage.(**Text Book 2**)

Unit-VI

File Organization and Indexes: Comparison of File Organizations; Properties of Indexes: Clustered versus Unclustered Indexes, Dense versus Sparse Indexes, Primary and Secondary Indexes; Index Data Structures: Hash Based Indexing, Tree based Indexing: ISAM; B+ Trees: A Dynamic Index Structure.

(**Text Book 1**)

Text Books:

1. Raghu Ramakrishnan, Johannes Gehrke: Database Management Systems, TATA McGraw Hill, Fourth Edition, 2010.
2. Abraham Silberschatz, Henry F. Korth : Database System Concepts, McGraw Hill, Sixth Edition, 2011.

Reference Books

1. Peter Rob, Carlos Coronel: Database Systems: Design, Implementation, and Management, Cengage Learning, Seventh Edition, 2006.
2. Elmasri, Navathe: Fundamentals of Database Systems. Pearson Education, Sixth Edition, 2010.
3. C.J. Date: Introduction to Database Systems, Pearson Education, Fourth Edition, 2005.
4. https://www.coursera.org/course/db

Operating Systems

Subject Code: 20CST207

L	T	P	C
3	0	0	3

Course Objectives

- Understand structures and functions of operating systems
- Learn about Processes, Threads and Scheduling algorithms
- Understand the principles of concurrency
- Understand Deadlock Management
- Learn various memory management schemes
- Study File systems and Mass-storage devices

Course Outcomes

By the end of this course the student will be able to

1. Explain different types of operating systems and implement various process management concepts for maximization of CPU throughput
2. Analyze the mechanisms used for process synchronization
3. Implement deadlock handling methods
4. Compare and contrast various memory management schemes
5. Design and Implement file systems
6. Familiarize with disk organization and device drivers

Unit – I

Operating System structures: Overview of Operating System, Operating systems services, types of operating systems, system calls, types of system calls

Process Management: Process concept, process scheduling, operations on processes, scheduling criteria, scheduling algorithms, and their evaluation.

Unit – II

Concurrency: Process synchronization, the critical-section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors

Unit – III

Principles of deadlock: System model, deadlock characterization, deadlock prevention, deadlock detection, deadlock avoidance, recovery form deadlock

Unit – IV

Main Memory Management: Swapping, Contiguous memory allocation, paging, structure of the page table, segmentation, segmentation with paging

Virtual Memory Management: Virtual memory, demand paging, page replacement algorithms: FIFO, optimal page replacement and LRU, Allocation of frames, Thrashing.

Unit – V

File System Interface: The concept of a file, file attributes, file types, access methods: sequential access, direct access and indexed access, directory structure, files sharing, protection.

File System Implementation: File system structure, file system implementation, directory implementation, allocation methods: contiguous allocation, linked allocation and indexed allocation, free-space management.

Unit-VI

Mass-storage structure: Overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, block and character devices.

Text Books:

1. Abraham Silberchatz, Peter B. Galvin and Greg Gagne, Operating System Concepts, 9th Edition, John Wiley & Sons(Asia) Pvt Ltd.
2. William Stallings, Operating Systems-Internal and Design Principles,7th Edition, Pearson

Reference Books:

1. D.M. Dhamdhere, Operating systems-A concept based approach, 3rd Edition, TMH
2. Crowley, Operating Systems-A Design-Oriented Approach,7th Edition, Pearson
3. Andrew S Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson

Referencelinnks

1. http://www.cs.kent.edu/~farrell/osf03/oldnotes/index.html : Lecture Notes
2. http://www.computerhope.com/os.htm : Different Types of Operating Systems
3. http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-BANG/
4. http://www.personal.kent.edu/~rmuhamma/OpSystems/os.html : OS Lecture Notes

Probability & Statistics with R Lab

Subject Code: 20BSL203

L	T	P	C
0	0	3	1.5

Course Objectives

- To introduce basic R operations and determine the probabilities of a random variable using Binomial, Poisson's, Normal distribution.
- To determine the probabilities of sample mean using central limit theorem and to estimate confidence interval using R programming.
- To perform z-test for sampling distribution using R - programming.
- To analyze t-test and F-test for sampling distribution using R - programming.
- To perform χ^2-test and Analysis of variance (ANOVA) using R - programming.
- To calculate correlation and regression for given data using R programming.

Course Outcomes

On completion of this course, students will be able to

1. Obtain probabilities of random variable of a Binomial, Poisson's, Normal distribution using R programming.
2. Calculate probabilities of sample mean and confidence interval using R - programming.
3. Perform z – test for sampling distributions using R programming.
4. Perform t – test and F-test for sampling distributions using R programming.
5. Analyze tests of significance using χ^2-test and ANOVA using R programming.
6. Determine the coefficient of correlation and regression equations for given data using R programming.

List of Experiments

1. Calculate the probability of random variable for Binomial distribution using R.
2. Calculate the probability of random variable for Poisson distribution using R.
3. Calculate the probability of random variable for Normal distribution using R.
4. Calculate probability of mean of random variable using central limit theorem using R.
5. Calculate the confidence interval for mean and proportions C.
6. Perform z-test for testing single mean and difference of means at α level of significance using R.
7. Perform z-test for testing single proportion and difference of proportions at α level of significance using R.
8. Perform t-test for testing the single mean and difference of means at α level of significance using R.
9. Perform F-test for testing the equality of population variances at α level of significance using R.
10. Perform χ^2-test for testing the goodness of fit and independence of attributes using R.
11. Perform ANOVA of one way and two way classifications to test on the basis of sample observations whether the means of 3 or more populations are equal or not, using R.
12. Perform Correlation and regression for given data, using R.

Data Base Management Systems Lab

Subject Code: 20CSL203

L	T	P	C
0	0	3	1.5

Course Objectives

- To teach defining Logical Database schema, Query writing to retrieve required information from single/multiple tables, Creation and manipulation of views. Implementing Operations on relations (Tables) using PL/SQL, Writing Triggers for implementing automatic operations and constraints, Writing Cursors, Functions and Procedures for various tasks on tables, Exception handling and Packages

Course Outcomes

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

1. Create relational database
2. Manipulate data using SQL
3. Compose Queries to retrieve required information from Database
4. Use Aggregate functions
5. Develop programs using Triggers and Cursors
6. Design Procedures, Functions and Packages for required Database tasks

List of Experiments

1. Execute DDL and DML commands
   Execute single line and group functions on a table.
2. Create tables for various relations in SQL with necessary integrity constraints, keys, data types.
   Verify messages by violating the constraints.
   Perform various join operations like Equi and non-equi, outer join, self join on two tables and show the results.
3. Execute DCL and TCL Commands.
   Write a PL/SQL program for accepting a number and indicate whether it is odd or even.
4. Write a PL/SQL program to find the largest of three integers.
   Write a PL/SQL program to find the factorial of a given integer and store the integer with it's factorial in a table.
5. Write a PL/SQL program to display the sum of digits of given number.
   Write a PL/SQL program to display the reverse of given number.
6. Write a PL/SQL program to accept two numbers N1 and N2 and perform division operation.
   And also handle the exception "Divide by zero "when N2 is zero.
   Write a PL/SQL program to accept the customer id from the user and display the corresponding customer name and address from customer table. Raise user defined exception "invalid- id" when customer id is <=0 and catch built in exceptions "no data found " and display suitable messages for each exception.
7. Write a PL/SQL program using Cursors to update the salaries of Employees as follows.
   And also count and display the no. of records have been updated.*/
   if sal<1000 then update the salary to 1500.
   if sal>=1000 and <2000 then update the salary to 2500.
   if sal>=2000 and <=3000 then update the salary to 4000.
8. Write a PL/SQL program using triggers to automatically store all the deleted records from

employee table in a separate table called "employees history " along with date of deletion,user-id of the person who deleted.

9. Write a PL/SQL program to which computes and returns the maximum of two values using a function.

   Write a PL/SQL procedure to display all the records of employee table in a neat format.

10. Write a PL/SQL program to create a Package to group logically related variables, types and sub programs and use the package elements later.

Text Books:

1. SQL, PL/SQL the Programming Language of Oracle by Ivan Bayross, BPB Publications, 4th Edition

Operating Systems Lab

Subject Code: 20CSL204

L	T	P	C
0	0	3	1.5

Course Objectives

- To understand the design aspects of operating system.
- To study the process management concepts & Techniques.

Course Outcomes

1. Choose the best CPU scheduling algorithm for a given problem
2. Describe and analyze the memory management and its allocation policies.
3. Identify the performance of various page replacement algorithms
4. Develop algorithm for deadlock avoidance, detection.
5. Design and implement file allocation techniques

List of Experiments

1) Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF
2) Simulate the following CPU scheduling algorithms
   a) Round Robin b) Priority
3) Simulate Bankers Algorithm for Dead Lock Avoidance
4) Simulate Bankers Algorithm for Dead Lock Detection
5) Simulate MVT and MFT
6) Simulate all page replacement algorithms
   a) FIFO b) LRU c) Optimal
7) Simulate Paging Technique of memory management.
8) Simulate all file allocation strategies
   a) Sequential b) Indexed c) Linked

Text Books:

1 Abraham Silberchatz, Peter B. Galvin, Greg Gagne Operating System Principles- 7th Edition, John Wiley.
2 Stallings, 2005, Operating Systems – Internal and Design Principles Sixth Edition, Pearson education.

Reference Books:

1. http://nptel.iitm.ac.in/courses/Webcourse-contents-IISc-BANG/Operating%20Systems New_index1.html
2. D.M. Dhamdhere Operating systems-A concept based approach-, 2nd Edition, TMH
3. Crowley Operating System A Design Approach-, TMH.
4. Andrew S Tanenbaum Modern Operating Systems, 2nd edition Pearson/PHI

Transform Theory

(Interdisciplinary Elective – I)

(Common to Mechanical, Civil)

L	T	P	C
3	0	0	3

Subject Code: 20IET211

Course Objectives

- To study the Laplace transform of different basic functions and its properties.
- To study Inverse Laplace Transforms and apply Laplace transforms to solve differential equations.
- To Study the mathematical tool of Fourier transforms their properties and applications.
- To study Inverse Fourier transforms their properties.
- To study the mathematical tool of Z- transform, their properties and implementation.
- To study Inverse Z Transforms and apply Z- transform to solve Difference Equations..

Course Outcomes

The student will be able to:

1. Evaluate Laplace Transform of different functions utilizing its properties.
2. Evaluate Inverse Laplace Transform of different functions and solve Differential Equations.
3. Estimate Fourier transform/ Fourier sine(cosine) Transform of functions.
4. Estimate inverse Fourier transform/ inverse Fourier sine(cosine) transform of different functions.
5. Evaluate Z-transform of different functions utilizing different properties.
6. Evaluate inverse Z- transform of different functions and solve Difference Equations utilizing different properties.

Unit – I

Laplace Transforms: Laplace Transform for elementary functions – Properties- 1st shift and 2nd shifting theorems - Laplace transform of derivative, integrals, multiplication by t^n and division by t- unit step and unit impulse function.

Unit – II

Inverse Laplace Transforms: Inverse Laplace Transform –Evaluation by partial fractions, convolution theorem(without proof), application of Laplace transforms to solve ordinary differential equations.

Unit – III

Fourier Transforms: Fourier Integral Theorem (without proof)- Fourier sine and cosine integrals – complex form of Fourier Integral - Fourier transform – Fourier sine and cosine transforms – properties.

Unit – IV

Inverse Fourier Transforms: Inverse Fourier Transforms, Inverse sine and cosine transforms - properties – Convolution Theorem.

Unit – V

Z - Transforms: Z-transform – Linear property – Damping rule – Shifting rule – Initial and final value theorems- Z transforms of functions multiplied and divided by n.

Unit – VI

Inverse Z- Transforms: Inverse Z-Transforms of basic functions, Partial fractions, Convolution theorem. Application of Z transforms to solve Difference Equations.

Text books:

1) B.V.Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi,2014.
2) Dr.B.S.Grewal, Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.

References

1. Advanced Engineering Mathematics , Erwin Kreyszig, 9th Edition, John Wiley & Sons.
2. Engineering Mathematics for first year, Veerarajan T., Tata McGraw-Hill, New Delhi.
3. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications.

Numerical Methods

(Interdisciplinary Elective – I)

(Common to ECE, EEE)

Subject Code: 20IET212

L	T	P	C
3	0	0	3

Course Objectives

- To Solve the algebraic and transcendental equations, using different numerical method.
- Calculate the value of dependent variable for a particular x by deducing the unknown function y=f(x) for an evenly or unevenly spaced points.
- To estimate the value of derivatives using different numerical methods.
- To evaluate the definite integrals using different numerical methods.
- To calculate the numerical solution of an ordinary differential equation i.e IVP .
- Estimate an equation of curve which fits a given data.

Course Outcomes

On completion of this course, students should be able to

1. Solve the algebraic and transcendental equations by identifying suitable numerical methods.
2. Estimate a linear and non-linear curve to the given data by the method of least squares.
3. Calculate the value of dependent variable for a particular x by deducing the unknown function y = f(x) for an evenly or unevenly spaced points.
4. Estimate the value of derivatives and evaluate the definite integrals using different numerical methods and evaluate an IVP.
5. Calculate the numerical solution of an ordinary differential equation i.e IVP .
6. Enables to fit a equation of curve to the given data.

Unit – I

Algebraic and Transcendental Equations: Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

Unit – II

Interpolation: Interpolation**:** Introduction – Finite differences- Forward Differences – Backward differences – Central differences-Relation between different operators- Newton's Interpolation formulae –Gauss Interpolation Formulae- Interpolation with unevenly spaced points – Lagrange's Interpolation formula.

Unit – III

Numerical Differentiation: Numerical Differentiation– Differentiation using finite differences-Newton's Forward – Backward- Lagranges- Stirling's formula-Lagrange's interpolation formula.

Unit – IV

Numerical Integration: Numerical Integration – Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule. Numerical double integration - Trapezoidal rule – Simpson's 1/3 Rule.

Unit – V

Numerical solution of Ordinary Differential equations: Solution by Taylor's series – Picard's Method of successive Approximations – Euler's Method – Runge – Kutta Method(4^{th} order).

Unit – VI

Curve Fitting: Curve fitting: Fitting a straight line-Second degree curve-Exponential curve-Power curve by method of least squares.

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, New Delhi, 42nd edition, 2012.
2. A Text Book on Mathematical Methods, Ravindranath, V. and Vijayalaxmi, A.,Himalaya Publishing House, Bombay, 2nd edition, 2012.

Reference Books:

1. Engineering Mathematics Vol.2.-Mathematical Methods(JNTU Kakinada), Dr.T. K.V.Iyengar, Dr.M.V.S.S.N.Prasad, S.Ranganatham, Dr.B.Krishna Gandhi, , S. Chand Publications.
2. Engineering Mathematics, B. V. Ramana, Tata McGraw Hill, New Delhi.

Introduction to Number Theory

(Interdisciplinary Elective – I)

(Common to CSE, IT)

L	T	P	C
3	0	0	3

Subject Code: 20IET213

Course Objectives

- Identify importance of divisibility, prime and composite numbers in engineering field.
- Understand the process of congruence and solve linear congruence using their properties.
- Gain knowledge and importance of Euler-Fermat Theorem, Wilson Theorem, Chinese Remainder Theorem.
- Know the application of Mobious function and Euler totient function in their relevant problems.
- Calculate Quadratic Residues and use Quadratic reciprocity law in engineering subjects.
- Encrypt and decrypt the messages using Cryptography.

Course Outcomes

By the end of this course the student will be able to

1. Solve the divisibility problems, GCD, LCM, Bracket function.
2. Solve congruence problems, solutions of linear congruence equations.
3. Apply Euler-Fermat Theorem, Wilson and Chinese Remainder Theorems in engineering problems
4. Apply Euler-totient function and solve engineering relevant problems.
5. Estimate the reciprocity of a number.
6. Applying the process of encryption and decryption in converting the messages using Cryptography.

Unit – I

Divisibility Divisibility, Statement of Division Algorithm, GCD, Prime, Composite numbers, Statement of Fundamental theorem of Arithmetic, LCM, Bracket function, The " O" and "o" Symbols, Properties.

Unit – II

Congruence's Introduction to Congruence's, Residue systems, Euler's $\emptyset$ function, linear congruence's, properties and their solutions

Unit – III

Euler-Fermat Theorem, Wilson Theorem, The Chinese Remainder Theorem Statement of Euler's Theorem, Fermat Theorem, Wilson Theorem, the Chinese Remainder Theorem, properties and problem.

Unit – IV

Multiplicative Number theoretic Functions Definitions and properties, Euler's totient function $\emptyset(n)$, the sum of divisors function, the number of divisors function, product formula, Mobius function $\mu(n)$ and Mobious Inverse formula, perfect, Mersenne and Fermat Number.

Unit – V

Primitive Roots and Quadratic Residues Order of Integers and Primitive roots, primitive roots for primes, the existence of primitive roots, Quadratic residues, Legendre's symbol and its properties, Evolution of (-1/p) and (2/p), Gauss' lemma, the Quadratic Reciprocity law, application of the reciprocity law, the Jacobi symbol.

Unit – VI

Cryptography Introduction to Cryptography, Ciphers, Block and Stream Ciphers, Exponential Ciphers, Public Key Cryptography, Cryptographic protocol and applications.

Text books:

1. Introduction to Analytic Number theory, Tom M, Apostol,(Springer International Student Edition). Naroda Publishing House, Springer Publisher -8th reprint. ISBN: 81-85015-12-0.
2. Elementary Number Theory and its Applications, Kenneth H. Rosen, Pearson Publications (Sixth edition-Online, ISBN 10:0-321-50031-8, ISBN 13: 978-0-321-50031-1.)
3. An Introduction to the theory of Numbers, Ivan Niven- Herbert S, Zuckermam-Hugh L. Montgomery –John Wiley & Sons Publisher (Online- Fifth Edition , ISBN 0-471-62546-9)

References

1. Theory of Numbers, Prakash Om, Laxmi Publications (p) LTD, New Delhi.

Elements of Building Planning

(Interdisciplinary Elective – I)

(Common to Civil)

L	T	P	C
3	0	0	3

Subject Code: 20IET214

Course Objectives

Students will have

- To interpret the conventional building materials.
- To summarize the objectives of building byelaws, principles and regulations
- To apply the minimum standards for various parts of buildings.
- To draw the line plan of a school and hospital for given site plan
- To describe the orientation of buildings based on earth's motion around the sun and significance of bond for brick walls
- To draw plan, elevation and sectional elevation of single room buildings from the given line diagram.

Course Outcomes

After completion of this course, students should be able to

1. Interpret the conventional building materials.
2. Summarize the objectives of building byelaws, principles and regulations
3. Apply the minimum standards for various parts of buildings.
4. Draw the line plan of a school and hospital for given site plan
5. Describe the orientation of buildings based on earth's motion around the sun and significance of bond for brick walls
6. Draw plan, elevation and sectional elevation of single room buildings from the given line diagram.

Unit – I

Building Materials: Conventional Building Materials such as Brick, Cement, Steel, Wood - Modern Building Materials – Plumbing Fixtures – Sanitary fittings – Materials for Building Electrification – Ready to use building materials currently available in the market.

Unit – II

Building Byelaws and Regulations: Introduction- terminology- objectives of building byelaws floor area ratio floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements.

Unit – III

Residential buildings: Minimum standards for various parts of buildings, requirements of different rooms and their grouping, characteristics of various types of residential buildings - Study of structural elements of Building – Minimum standards for Septic tank, balcony, corridor and staircase.

Unit – IV

Public Buildings: Planning of educational institutions, hospitals and dispensaries. Requirements and minimum standards for various public buildings. Draw the line plan of a school and hospital for given site plan

Unit – V

Principles of Planning and Orientation of the Residential Building: Orientation of Buildings based on Earths motion round the Sun – Significance of Bond for Brick walls – Study of specifications of doors, Windows, ventilators and roofs – Prefabricated Buildings and Toilets.

Unit – VI

Drawing practice: Single room building, given line diagram with specifications to draw, plan, elevation and sectional elevation.

Text Books:

1. Planning and Design of buildings by Y.S. Sane, 2015
2. Planning, designing and Scheduling by Gurucharan Singh and Jagadish Singh, 2012
3. Building planning and drawing by M. Chakravarthi, 2016

Reference Books:

1. Building drawing by Shah and Kale
2. 'A' Series & 'B' Series of JNTU College of Engineering, Anantapur,

Remote Sensing

(Interdisciplinary Elective – I)
(Common to CSE, IT, ECE, EEE)

L	T	P	C
3	0	0	3

Subject Code: 20IET215

Course Objectives
The objective of the course is to

- To demonstrate the working principle of remote sensing
- To differentiate the types platforms and orbits
- To describe the various types of sensors and resolutions
- To utilize different digital image processing and visual interpretation techniques to extract
- meaningful information from spatial data
- To illustrate the image classification procedure
- To explain the use of remote sensing in different applications.

Course Outcomes
On completion of the course, the students will be able to:

1. Demonstrate the working principle of remote sensing
2. Differentiate the types of platforms and orbits
3. Describe the types of sensors & resolutions
4. Utilize different digital image processing and visual interpretation techniques to extract meaningful information from spatial data
5. Illustrate the image classification procedure
6. Explain the use of remote sensing in different applications.

Unit – I
Introduction: Definition, Basic components of remote sensing, Electromagnetic radiation, Electromagnetic spectrum, EMR interaction with atmosphere - EMR interaction with Earth Surface Materials.

Unit – II
Platforms: Introduction, Platforms- Ground borne, Airborne remote sensing, Space borne remote sensing; Orbital Characteristics, Type of Orbits

Unit – III
Sensors & Resolution: Introduction, Sensors- Passive sensors, Active sensors; Spatial Resolution, Spectral Resolution, Temporal Resolution, Radiometric Resolution.

Unit – IV
Image Analysis: Introduction, Digital Image processing, elements of visual interpretations, image enhancement techniques.

Unit – V
Image classification: Introduction, Principles of Image classification, Process of image classification supervised classification, unsupervised classification.

Unit – VI
Applications: Land use/Land cover, Agriculture, Forest, Water Resources and Urban Planning

Text books

1. LRA Narayana, *"Remote Sensing and its Applications"* University Press, 1999.
2. M. Anji Reddy, *"Remote Sensing and Geographical Information System*s", BS Publications, 4th edition,2014.
3.Basudeb Batta, *"Remote Sensing and GIS",* Oxford University Press, New Delhi, 2nd Edition, 2011

Reference Books

1. S.Kumar, *"Basics of Remote Sensing and GIS"*, Laxmi Publications, 1st Edition, 2016.
2. Lillesand, Kiefer, Chipman, *"Remote Sensing and Image Interpretation"*, Willy Publishers, 7th Edition, 2015
3. James B. Cambell, Rondolph H. Wynne, *"Introduction to Remote Sensing"*, Guilford Press, London and Newyork, 5th Edition, 2011

Mathematical Simulation and Modeling

(Interdisciplinary Elective – I)

(Common to CSE, IT, ECE, Mechanical, Civil)

Subject Code: 20IET216

L	T	P	C
3	0	0	3

Course Objectives

- By the end of this course, students in this class will understand the basic principles of programming and implementing mathematical concepts in MATLAB. Specifically, they will be able to write numerical algorithms and evaluate the computational results using graphical representations. The ultimate goal is to motivate the students for their profession and for future courses in curriculum.

Course Outcomes

1. Translate mathematical methods to MATLAB code.
2. Generalize results and represent data visually.
3. Apply computer methods for solving a wide range of engineering problems.
4. Utilize computer skills to enhance learning and performance in other engineering and science courses.
5. Demonstrate professionalism in interactions with industry.
6. Understands about Scilab.

Unit – I

Introduction to Matlab Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window). Operations with Variables, Clearing Operations, Commands, Data types, Operators.

Unit – II

Data and Data Flow in Matlab Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Functions

Unit – III

Matlab Programming Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

Unit – IV

Matlab Advanced Plotting graphs, Creating Plot & Editing Plot, MATLAB-Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

Unit – V

Simulink-I Introduction, Importance, Model Based Design, Tools, Mathematical Modeling,

Unit – VI

Simulink-II Converting Mathematical Model into Simulink Model, Running Simulink Models, Introduction to scilab.

Text books

1. Getting Started With Matlab: A Quick Introduction for Scientists and Engineers (English) by RudraPratap, OXFORD University Press.
2. Matlab Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication

Reference Books

1. MATLAB® Programming For Engineers Fourth edition by Stephen J. Chapman
2. Applied Numerical Methods Using MATLAB 1st Edition by Won Y. Yang ,WenwuCao,Tae-SangChung,JohnMorris.
3. https://in.mathworks.com/products/simulink.html

Fundamentals of Material Science

(Interdisciplinary Elective – I)

(Common to CSE, IT, ECE, EEE, Civil)

L	T	P	C
3	0	0	3

Subject Code: 20IET217

Course Objectives

- To understand different engineering materials and their structures.

Course Outcomes

1. On completion of this course, students should be able**:** To gain thorough knowledge in engineering materials and their structures.
2. To gain thorough knowledge in deformation in different engineering materials.
3. Understand necessity of hot and cold working methods.
4. Understand thoroughly mechanical properties.
5. To acquire knowledge on material testing methods and its process
6. Understand necessity of making components using powder metallurgy route

Unit – I

Introduction: Introduction, classification of materials, crystal defects.

Unit – II

Plastic deformation of single crystals: Plastic deformation of single crystals. Deformation by slip, Deformation of single crystal. Deformation by twinning.

Unit – III

hot working, cold working. Recovery, recrystallization and grain growth. Solidification mechanism.

Unit – IV

Mechanical properties: Mechanical properties. Tensile stress-strain diagrams, proof stress, yield stress diagrams, modules of elasticity. Hardness Testing: -Rockwell, Brinell and Vickers.

Unit – V

Impact toughness, Charpy V-Notch, fracture, ductile, brittle, creep, creep mechanisms, fatigue-mechanism-factors to improve fatigue resistance

Unit – VI

Powder Metallurgy: Definition, Methods of production of metal powders, Stages in powder metallurgical components preparation, Design considerations.

Text books

1. An introduction to material Science – V Raghavan
2. Mechanical Metallurgy – GE Dieter.
3. Material Science – Callister.

Reference Books

1. Material Science for Engineers – Vanvlack.
2. Material Science for Engineers – Schakleford.

Introduction to Electronic Measurements

(Interdisciplinary Elective – I)
(Common to CSE, IT, Mechanical, EEE, Civil)

L	T	P	C
3	0	0	3

Subject Code: 20IET218

Course Objectives

- To provide knowledge of performance characteristics and classify static errors of different measuring instruments.
- To construct DC Ammeter, DC Voltmeter, Ohmmeters for measurement of unknown current, voltage and resistance.
- To introduce various Signal generators and Harmonic Distortion analyzers.
- To become familiar with the working of CRO and special Oscilloscopes for measurement of electronic parameters.
- To construct AC and DC bridges for measurement of unknown Resistance, Inductance and Capacitance.
- To understand working principles of transducers for the measurement of non-electrical quantities.

Course Outcomes

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

1. Define various performance characteristics and classify static errors of Instruments.
2. Calculate the resistance values for construction of DC voltmeter, Ammeter and Ohmmeters.
3. Explain the working of various signal generators and analyzers for distortion measurements.
4. Describe the working and use of CRO and special oscilloscopes.
5. Determine the value of unknown resistance, inductance, capacitance and frequency of excitation.
6. Classify transducers and identify suitable transducer for measuring various non-electrical quantities.

Unit – I

Performance characteristics of instruments: Static characteristics - accuracy, resolution, precision, expected value, error and sensitivity, Error in measurement, Types of Static error, Dynamic characteristics - speed of response, fidelity, lag and dynamic error.

Unit – II

DC Meters: DC Ammeter Construction, Multirange ammeter, Universal Shunt and Extending Range. RF ammeter. DC Voltmeter **–** Construction, Multirange voltmeter, Extending Range. Ohmmeters - Series type and shunt type.

Unit – III

Signal Generators and Harmonic Distortion Analyzers:

Signal Generators - Standard signal generator, AF sine and square wave generator, Function Generator.

Harmonic Distortion Analyzers: Fundamental Suppression Type – Resonance Bridge, Wien's Bidge, Bridged T-Network.

Unit – IV

CRO and Special Oscilloscopes: CRT features, Block Diagram of oscilloscope, Dual Beam CRO, Dual trace oscilloscope, Storage oscilloscope.

Unit – V

DC and AC Bridges: DC Bridge – Measurement of Resistance – Wheatstone's Bridge. AC Bridges - Measurement of inductance - Maxwell's Bridge, Anderson's bridge. Measurement of capacitance – Schering's Bridge and Wien's Bridge

Unit – VI

Transducers: Classification**,** Resistive Transducer – Potentiometer type – Pressure Transducer and Position Transducer, unbonded and bonded strain gauges, Thermistor, Inductive Transducer- LVDT, Capacitive Transducer – Pressure Transducer, Temperature Transducer-Thermocouple.

Text books

1. Electronic instrumentation – H.S.Kalsi, Tata McGraw Hill, 2004, 2/e.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 2002, 5/e.

Reference Books

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2003, 2/e.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2004, 2/e.

Reference Links

1. https://nptel.ac.in/courses/108/105/108105153/
2. http://nitttrc.edu.in/nptel/courses/video/108105153/108105153.html

UNIX Utilities

(Interdisciplinary Elective – I)
(Common to ECE, EEE, Mechanical, Civil)

L	T	P	C
3	0	0	3

Subject Code: 20IET219

Course Objectives

- Know about UNIX operating system
- Understand important commands which are used in UNIX
- Learn shell programming
- Study UNIX file system
- Understand the process mechanism

Course Outcomes

By the end of this course the student will be able to

1. Describe UNIX Architecture and Functions of OS
2. Demonstrate the basic set of commands and utilities in UNIX system
3. Design and Implement of UNIX file system
4. Familiar with various shell commands
5. Develop shell scripts to automate various tasks
6. Analyze the different types of processes in UNIX environment

Unit – I

Introduction to Unix-Brief History,What is Unix-Unix Components, Operating system services, Assumptions about hardware. Introduction to the Kernel: Architecture of the UNIX operating system, Introduction to system concepts – Kernel data structures – System administration.

Unit – II

Using Unix-Commands, Unix-Some Basic Commands-. Unix Command - man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip. Unix Utilities:- Introduction to unix file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, Text processing utilities and backup utilities , detailed commands to be covered are tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, comm, cmp, diff, tr.

Unit – III

The File system –The Basics of Files-What's in a File-Directories and File Names- Permissions-I Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

Unit – IV

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 – V

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command- Branching Control Structures-Loop Control Structures-The Continue and Break Statement- The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval
Command-The Exec Command.

Unit – VI

The Process-The 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. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Parson.
2. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition.

References

1. Unix and shell programmingby B.M. Harwani, OXFORD university press.
2. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
3. Beginning shell scripting, E. Foster – Johnson & other, Wile Y- India

Fundamentals of Data Structures
(Interdisciplinary Elective – I)
(Common to ECE, EEE, Mechanical, Civil)

L	T	P	C
3	0	0	3

Subject Code: 20IET21A

Course Outcomes:
On completion of this course, the student will be able to:
1. Compute the time and space complexities and calibrate the performance of a given algorithm.
2. Compare the performances of various Searching and Sorting techniques.
3. Illustrate the applications of Stacks and Queues.
4. Demonstrate the advantages of dynamic memory allocation via linked lists.
5. Implement the basic operations and Traversals on binary Trees.
6. Understand traversals and shortest path algorithms on a Graph.

Unit – I
Introduction: Basic Concepts of Data Structures and types of Data Structures; Performance Analysis of algorithms; Asymptotic Notations (O,Ω, θ)

Unit – II
Searching: Linear Search, Binary Search: Algorithm & Analysis; Sorting: Methodology & Performance Analysis of Sorting Algorithms: Selection, Bubble, Insertion, Quick, Merge sort.

Unit – III
Stacks: Definition, operations, Applications of Stacks: Conversion of infix to postfix expression
Queues: Definition, operations, Applications of Queues;

Unit – IV
Linked Lists: Comparison with Arrays; Operations on Singly linked list: Creation, Insertion, Deletion, Traversing; Operations on Doubly linked list; Operations on Implementation of Stack and Queue using Linked Lists.

Unit – V
Trees: Basic Terminology of Trees; Binary Tree: Traversals; Binary Search Tree Operations:Insert, Delete;

Unit – VI
Graph: Basic Terminologies and Representations of Graphs; Graph traversal algorithms: Breadth-FS & Depth-FS; Minimum spanning tree algorithms: Prim's and kruskal's algorithms

Text Books:
1. Mark Allen Weiss , “Data Structures and Algorithm Analysis”, Fourth Edition , Pearson.
2. Ellis Horowitz, Sartaj Sahni, “Fundamentals of Data Structures”, Illustrated Edition,Computer- Science Press.

Reference Books
1. Michel T. Goodrich, Roberto Tamassia, David Mount, “Data Structures and Algorithm Analysis”, 2nd Edition, John Wiley & Sons, Inc.
2. Adam. Drozdek , “Data Structure And Algorithms In C++”, 4th edition, Cengage.

Reference Links
1. https://nptel.ac.in/courses/106/102/106102064/
2. https://nptel.ac.in/courses/106/106/106106127/

Advanced Coding – I
(Interdisciplinary Elective – I)
(Common to CSE, IT)

Subject Code: 20IET21B

L	T	P	C
3	0	0	3

Course Objectives

- Understanding importance of Mathematics and Problem solving approaches for Programming
- Understanding importance of Optimized solution for problem solving

Course outcomes

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

1. Solve problems using programming
2. Design solution using OOP principles
3. Analyze time and space Complexity of Solution of a problem.
4. Select appropriate container to organize data for problem solving.
5. Develop solution for problems Using Recursion
6. Analyze the problem using Mathematics

Unit – I

CPP Essentials: Basics: Basic Syntax, Variables, Data types, Operators, Input and output, Conditional Statements and loops, pointers and Dynamic memory allocation, arrays ,vector , built in functions, user defined functions.

Problems to Practice: Missing Number ,Integer to English Words ,Integer to Roman, Roman to Integer, 2sum, 3sum,3sum closet,4sum,Remove duplicates in a list, Circular Array Loop, Fruit Into Baskets, K-diff Pairs in an Array, Move Zeroes, Rotate Array, Flipping an Image, Circular Array Loop

Unit – II

OOP Principles: Implementation of OOP principles (Encapsulation , Abstraction, Inheritance ,polymorphism) in cpp and Exception Handling.

Unit – III

Algorithm Analysis: Characteristics of algorithm, Algorithm Analysis-operation count , step counts,. asymptotic complexity, recurrence equations.

Unit – IV

Standard Template Library: Containers, Container Classes, Vectors, Lists, Iterators, Maps, Set structures, Bit set, Stack, Queue, De queue, Priority queue

Unit – V

Recursion: Recursion and its applications, Exhaustive search using Backtracking.

Problems to Practice: Permutations, Palindrome Partitioning, Beautiful Arrangement, N-Queens , Path with Maximum Gold

Unit – VI

Number Theory: Modular arithmetic, exponentiation ,Modular exponentiation, Greatest Common Divisor, Extended Euclidean algorithm, Modular multiplicative inverse, Prime Number, Sieve of Eratosthenes.

Problems to Practice: Factorial Trailing Zeroes, Happy Number, Ugly Number, Smallest Integer Divisible by K, Prime Arrangements, Poor Pigs, Check If It Is a Good Array, Rabbits in Forest

Text Books

1. The Complete Reference C++ by Herbert Schildt ,4th Edition
2. E. Horowitz. et.al., Fundamentals of computer Algorithms, Universities Press, 2008, 2nd Edition.

Reference Books

1. J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi, 2006.
2. G.Brassard & P. Bratley – Fundamentals of Algorithms, PHI, New Delhi, 2005.
3. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005.
4. S.Dasgupta et.al. – Algorithms, TMH, New Delhi – 2007.

Reference Links

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106145/
3. https://www.spoj.com/problems

Competitive Programming – I
(Interdisciplinary Elective – I)
(Common to ECE, EEE, Mechanical, Civil)

Subject Code: 20IET21C

L	T	P	C
3	0	0	3

Course Objectives

- Understanding importance of Mathematics and Problem solving approaches for Programming
- Understanding importance of optimized solution for problem solving

Course Outcomes

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

1. Solve problems using programming
2. Design solution using OOP principles
3. Analyze time and space Complexity of a Solution.
4. Select appropriate container to organize data for problem solving.
5. Design a Relational Database schema for a subject of interest
6. Identify Redundancy in the Database using Normal Forms

Unit – I

CPP Essentials:

Basics: Basic Syntax, Variables, Data types, Operators, Input and output, Conditional Statements and loops, pointers and Dynamic memory allocation, arrays , vector , built in functions, user defined functions.

Problems to Practice: Missing Number ,Integer to English Words ,Integer to Roman, Roman to Integer, 2sum, 3sum,3sum closet,4sum,Remove duplicates in a list, Circular Array Loop, Fruit Into Baskets,, K-diff Pairs in an Array, Move Zeroes, Rotate Array, Flipping an Image, circular Array Loop

Unit – II

OOP Principles: Implementation of OOP principles (Encapsulation, Abstraction, Inheritance, Polymorphism) in cpp and Exception Handling.

Unit – III

Algorithm Analysis: Characteristics of algorithm, Algorithm Analysis-operation count , step counts,. asymptotic complexity, recurrence equations

Unit – IV

Standard Template Library: Containers, Container Classes,Vectors, Lists, Iterators, Maps, Set structures, Bit set, Stack, Queue, Deque, Priority queue.

Recursion: Recursion and its applications, Exhaustive search using Backtracking.

Problems to Practice: Permutations, Palindrome Partitioning, Beautiful Arrangement, N-Queens , Path with Maximum Gold

Unit – V

Introduction to DBMS, ER Model, ER to Relation Model Conversion

SQL Part1: SQL Command, Data Types, Operators and Expressions, DDL statements, DML statements, Functions, Sorting Data, Grouping Data

Unit – VI

SQL Part2: Cartesian Product and Inner Join, Self Join, Outer Join, Subquery, Independent Subquery, Correlated Subquery

Normalization: Functional Dependency and Normal Forms (1NF,2NF,3NF,BCNF)

Text Books

1. The Complete Reference C++ by Herbert Schildt ,4th Edition
2. Raghurama Krishnan, Johannes Gehrke: Database Management System, TATA McGrawHill 3rd Edition

Reference Books

1. J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi, 2006.
2. G.Brassard & P. Bratley –Fundamentals of Algorithms, PHI, New Delhi, 2005.
3. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005.
4. S.Dasgupta et.al. – Algorithms, TMH, New Delhi – 2007.

Reference Links

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106131/
3. https://www.spoj.com/problems

Computational Statistics and Data Analysis
(Common to all Branches)

L	T	P	C
4	0	0	4

Honours / Minor Course: *Artificial Intelligence and Machine Learning*
Subject Code: 20AIT201

Course Objective
To introduce several statistical techniques found to be serving as tools even today in the development of machine learning and artificial intelligence based computer algorithms.

- To imbibe strong foundation of statistics in students for implementation in computation.
- To understand modern computational methods used in statistics.
- To get detailed approach of simulation, estimation and visualization of statistical data.
- To understand the role of computation as a tool of discovery in data analysis.
- To be able to appropriately apply computational methodologies to real world statistical problems.
- To learn the data processing techniques required to get applied on machine learning algorithms.

Course Outcome
On completion of the course, learner will be able to–

1. Identify the suitable method of statistics on the given data to solve the problem of any heuristic approach of prediction.
2. Apply appropriate statistical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.
3. Design and analyze real world engineering problems by applying various statistical modeling techniques.
4. Formulate suitable statistical method required as pre-processing technique for finding the solution of machine learning algorithm.
5. Model and solve computing problem using correlation, and resampling using appropriate statistics algorithms.
6. To introduce students to the basic concepts and techniques of Machine Learning for solving practical problems.

Unit – I
Introduction to Statistics : What is statistics, Statistical Data-Categorical, Numerical (Continuous), Univariate and Bivariate Analysis, Mean, Median, Mode, Standard Deviation, Harmonic Mean, Data Visualization-Line, Scatter, Box plots, Histogram, Descriptive statistics: qualitative and quantitative Variable, discrete variable, population, sample, random sample.

Unit – II
Probability and Distribution: Probability, Random Variable, Joint and Conditional Probability, Baye's Theorem, Monte Carlo Method, Probability Distributions, Characterizing a Distribution, Discrete Distributions, Normal Distributions, Continuous Distributions Derived from the Normal Distribution, Poisson Distribution, Other Continuous distributions: Lognormal, Weighbull, Exponential, Uniform.

Unit – III
Hypothesis and Statistical Tests: Null hypothesis, Alternative hypothesis, Typical Analysis procedures, Hypothesis Concept, Errors, p-Value, z-value, Crucial value, Test on Numerical Data-Distribution of a Sample Mean, Comparison of Two Groups, Comparison of Multiple Groups, degree of freedom, T-test, Z-test, ANOVA analysis.

Unit – IV

Data Pre-processing and Performance Analysis

Data Pre-processing steps: data cleaning-missing data, noisy data, binning method, regression, clustering, data transformation - attribute selection, data reduction-feature selection, dimensionality reduction. Normalization- Decimal Scaling, Min-Max scaling, Z-score

Performance metrics: Confusion matrix, sensitivity, specificity, F1 score, Recall, Precision, ROC-AUC Curve, Cross validation technique – K-fold

Model evaluation: Residual error, Bias, Variance, Mean square error, RMSE, Loss.

Unit – V

Statistical Methods: Dimensionality Reduction Techniques- Principal Component Analysis, Discriminant Analysis, Feature Selection- Chi2 square method, Variance Threshold, Recursive Feature Elimination, Outliers detection methods, Resampling-Random, under-sampling and over re-sampling.

Unit – VI

Machine Learning: Introduction to Machine Learning: Supervised and unsupervised ML, Regression (Linear regression, Logistic regression) Classification (Naïve-Bayes classifier), Clustering (K-means, K-mediod).

Text Books:

1. Thomas Haslwanter, "An Introduction to Statistics with Python with Applications in the Life Sciences", Springer International Publishing Switzerland 2016, ISBN 978-3-319-28315-9, ISBN 978-3-319-28316-6 (eBook)
2. Allen B. Downey, "Think Stats", Second Edition, O'Reilly Media, ISBN: 978-1-491-90733-7
3. Foundations of Machine Learning, Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar, MIT Press, Second Edition, 2018.

Reference books:

1. José Unpingco, "Python for Probability, Statistics, and Machine Learning", Springer International Publishing Switzerland, ISBN 978-3-319-30715-2, DOI 10.1007/978-3-319-30717-6, ISBN 978-3-319-30717-6 (eBook)
2. Claus Weihs, Olaf Mersmann, Uwe Ligges, "Foundations of Statistical Algorithms", CRC Press, ISBN-978-1-4398-7887-3 (eBook - PDF)

e-Books:

- http://file.allitebooks.com/20151204/Foundations%20of%20Statistical%20Algorithms.pdf
- http://onlinestatbook.com/Online_Statistics_Education.pdf
- https://upload.wikimedia.org/wikipedia/commons/8/82/Statistics.pdf
- http://cnx.org/content/col10522/1.38/pdf
- http://www.greenteapress.com/thinkstats/thinkstats.pdf

MOOC/ Video Lectures available at:

- https://www.udemy.com/course/introduction-to-bayesian-statistics/ (Free Course)
- https://www.youtube.com/watch?v=xxpc-HPKN28
- https://www.udacity.com/course/intro-to-statistics--st101# (Free Course)
- https://nptel.ac.in/courses/111/105/111105090/
- https://nptel.ac.in/courses/111/105/111105077/

Formal Languages and Automata Theory

Subject Code: 20CST308

L	T	P	C
3	0	0	3

Course Objectives

To introduce students the fundamental concepts in theoretical computer science, and the formal relationship among machines, languages, grammars and computational problems.

Course Outcomes

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

1. Design finite automata with & without output.
2. Convert finite automata into regular expression and vice versa.
3. Design grammars for regular and context free languages.
4. Minimize Context free Grammars
5. Explain the equivalence between CFG and PDA, acceptances by final state and empty stack of PDA
6. Design Turing Machines and determine the decidability of computational problem

.

Unit – I

Finite Automata: Strings, Alphabet, Language, Operations, Finite state machine, languages, deterministic finite automaton and non deterministic finite automaton, computational problems. NFA with Epsilon transitions - Significance, acceptance of languages. **Conversions and Equivalence:** Equivalence between NFA with and without Epsilon transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines.

Unit – II

Regular Languages: Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

Unit – III

Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, and sentential forms. Right most and leftmost derivation of strings, Ambiguity in context free grammars,

Unit – IV

Minimization of Context Free Grammars: Chomsky Normal Form, Greibach Normal Form, Enumeration properties of CFL (proofs omitted).

Unit – V

Pushdown Automata: Pushdown automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty stack and its equivalence. Equivalence of CFL and PDA, inter-conversion (Proofs not required).

Unit-VI

Turing Machine & Computability Theory: Turing Machine, definition, model, design of TM, types of Turing machines (proofs not required). Chomsky hierarchy of languages, linear bounded automata and context sensitive language, post correspondence problem.

Text Books:

1. Hopcroft, J. E., Motwani, R., and Ullman, J. D., "*Introduction to Automata Theory, Languages, and Computation"*, Pearson – 2008.
2. Daniel I.A. Cohen, John Wiley, "Introduction to Computer Theory" - 2nd edition.

Reference Books:

1. John C Martin, Introduction to languages and the Theory of Computation, TMH.
2. Lewis H.P. & Papadimition "Elements of Theory of Computation", C.H. Pearson /PHI.
3. Mishra and Chandrashekaran, "Theory of Computer Science – Automata languages and Computation" -2nd edition, PHI.
4. Sipser ,Introduction to Theory of Computation –2nd edition Thomson.

Reference Link

1. http://nptel.iitm.ac.in/courses/webcourse-contents/IIT-%20Guwahati/afl/index.html

Software Engineering

Subject Code: 20CST309

L	T	P	C
3	0	0	3

Course Objectives

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

Course Outcomes

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

1. Understand software requirements that form the background to develop complex software systems.
2. Apply an effective software engineering process, based on knowledge of widely used development models.
3. Translate requirements specification into an implementable design.
4. Identify a testing strategy for a software system, employing techniques such as black box and white box testing strategies.
5. Evaluate the quality and estimate the cost of the requirements, analysis and design work during the module.
6. Understanding the Software maintenance process models.

Unit – I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, software myths Software Requirements: Functional and non-functional requirements, User requirements, System requirements, the software requirements document. Requirements engineering process: Feasibility study, Requirement Elicitation and analysis, Requirements validation

Unit – II

Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process, Agile Process Model (Scrum), Extreme Programming (XP)

Unit – III

Design Engineering: Design process and Design quality, Design concepts, the design model. Creating an architectural design: Software architecture, Data design, Architectural styles and patterns, Architectural Design. Performing User interface design: Golden rules, User interface analysis and design.

Unit – IV

Testing Strategies: Verification and Validation, Unit Testing, Integration Testing, Validation testing, System testing, the art of Debugging, White-Box Testing: Basis Path Testing, Control Structure Testing, Black-Box Testing: Equivalence Class Partitioning ,Boundary Value Analysis.

Unit – V

Product metrics: Software Quality, Metrics for Analysis Model, Architectural Design Metrics Metrics for source code Empirical Estimation: COCOMO Model

Unit – VI

Software Maintenance And Re-Engineering: Software Maintenance, Categories Of Maintenance, Maintenance Process Models: Quick Fix Model, Osborne's Model, Iterative Enhancement Model,

Full Reverse Model, IEEE 1219 Model, Maintenance Cost, Why Is Re-Engineering, Re-Engineering Process.

Text Books

1. Roger S Pressman-Software Engineering, 8th Edition, Tata McGraw Hill Education 2017
2. Sommerville, Software Engineering, 7th Edition, Pearson Education, 2005

Reference Books

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering: Chandramouli Subramanian, Saikat Dutt, Chandramouli Seetharaman, B G Geetha- Pearson Education

Reference Link:

1. http://nptel.ac.in/courses/106101061/

Computer Networks

Subject Code: 20CST310

L	T	P	C
3	0	0	3

Course Objectives

- Explain Data Communications System and its components, different types of network topologies and protocols.
- Demonstrate different layers of ISO and TCP/IP models and illuminate its function.
- Apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.
- Analyze main protocols such as HTTP, FTP, SMTP, TCP, UDP and IP.

Course Outcomes

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

1. Identify and enumerate different types of network topologies, protocols and the layers of the OSI and TCP/IP models and explain the functions of each layer.
2. Recognize the data link design issues and various data link protocols used for data transmission.
3. MAC Sublayer and illustrate how a network can detect and correct transmission errors.
4. Classify and compare the major routing and congestion control algorithms and understand how a packet is routed over the internet.
5. Describe how TCP and UDP function, its uses and summarize the connection establishment and connection release.
6. Analyze the features and operations of various Application layer protocols such as http, DNS, and HTTP.

Unit – I

Introduction: Network Hardware, Network Software; Reference Models: OSI Reference Model, TCP/IP Reference Model, Comparison between OSI and TCP/IP Models; Example Networks: The ARPANET, Internet.

Unit – II

Data Link Layer: Data Link Layer Design Issues: Services Provided to Network Layer, Framing, Error Control and Flow Control; Error Detection and Correction: Error Correcting Codes, Error Detecting Codes; Elementary Data Link Protocols, Sliding Window Protocols: One-Bit Sliding Window Protocol, Protocol Using Go Back N and Selective Repeat.

Unit – III

The Medium Access Control Sublayer: Channel Allocation Problem: Static Channel Allocation, Dynamic Channel Allocation; Multiple Access Protocol: ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited Contention Protocol.

Unit – IV

The Network Layer: Network Layer Design Issues, Routing Algorithms: Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Congestion Control Algorithms: General Principles of Congestion Control, Congestion Prevention Policies.

Unit – V

The Transport Layer: Services Provided to Upper Layer; Elements of Transport Protocols: Addressing, Connection Establishment, Connection Release; The Internet Transport Protocols: UDP and TCP Protocol, TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

Unit-VI

The Application Layer: DNS- Domain Name System, Electronic Mail: Architecture and Services, The User Agent, Message Format, Message Transfer, The World Wide Web: Architectural Overview, Static Web Document, Dynamic Web Document; Hyper Text Transfer Protocol (HTTP).

Text Books:

1. Andrew S. Tanenbaum, Computer Networks, 5th Edition, Pearson Education, 2016.
2. Behrouz A Forouzan, Data Communications and Networking, 4th Edition, McGraw-Hill, 2006

Reference Books:

1. S Keshav, An Engineering approach to computer Networking, 2nd Edition, Pearson Education
2. J.F.Kurose, K.W.Ross, Computer Networking a Top-Down approach featuring the internet, 2nd Edition, Pearson Education

UNIX Internals
(Professional Elective – I)

L	T	P	C
3	0	0	3

Subject Code: 20CSE311

Course Objectives

- Interpret the features of UNIX and basic commands.
- Demonstrate different UNIX files and permissions
- Implement shell programs.
- Explain UNIX process, IPC and signals.

Course Outcomes

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

1. Understand the architecture and features of UNIX operating system and distinguish it from other operating system.
2. Demonstrate the basic set of commands and utilities in UNIX systems.
3. Analyze a given problem and apply requisite facets of Shell programming in order to devise a shell script to solve the problem
4. Categorize, compare and make use of Unix System Calls
5. Describe process control and handle a process by using signals..
6. Build an application/service over a UNIX system.

.

Unit – I

Introduction: Unix Components/Architecture. Features of Unix. The UNIX Environment and UNIX Structure, Posix and Single Unix specification. General features of Unix commands/ command structure. Command arguments and options. Basic Unix commands such as echo, printf, ls, who, date,passwd, cal, Combining commands. Meaning of Internal and external commands.

Unix files: Naming files. Basic file types/categories. Organization of files. Hidden files. Standard directories. Directory commands – pwd, cd, mkdir, rmdir commands. File related commands – cat, mv, rm, cp, wc and od commands.

Unit – II

File attributes and permissions: The ls command with options. Changing file permissions: the relative and absolute permissions changing methods. Recursively changing file permissions. Directory permissions. The shells interpretive cycle: Wild cards. Removing the special meanings of wild cards. Three standard files and redirection. Connecting commands: Pipe. Basic and Extended regular expressions. The grep, egrep. Typical examples involving different regular expressions.

Unit – III

Shell programming: Ordinary and environment variables. The .profile. Read and readonly commands. Command line arguments. exit and exit status of a command. Logical operators for conditional execution. The test command and its shortcut. The if, while, for and case control statements. The set and shift commands and handling positional parameters. The here (<<) document and trap command. Simple shell program examples.

Unit – IV

UNIX Processes and Process Control: The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, UNIX Kernel Support for Processes. Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions.

Unit – V

Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model.

Unit-VI

Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times, I/O Redirection. Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores. Shared Memory, Client-Server Properties, Stream Pipes, Passing File Descriptors, An Open Server-Version 1, Client-Server Connection Functions.

Text Books:

1. Sumitabha Das., Unix Concepts and Applications. 4th Edition., Tata McGraw Hill **(Chapter 1,2 ,3,4,5,6,8,13,14)**
2. W. Richard Stevens: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2005 **(Chapter 3,7,8,10,13,15)**
3. Unix System Programming Using C++ - Terrence Chan, PHI, 1999. **(Chapter 7,8,9,10)**

Reference Books:

1. M.G. Venkatesh Murthy: UNIX & Shell Programming, Pearson Education.
2. Richard Blum , Christine Bresnahan : Linux Command Line and Shell Scripting Bible, 2ndEdition, Wiley,2014.

Advanced Computer Architecture
(Professional Elective – I)

Subject Code: 20CSE312

L	T	P	C
3	0	0	3

Course Objectives

- Identify the importance of architectural development tracks.
- Know the advanced processor technology and memory hierarchy technology.
- Learn multiprocessor and multi vector computers.
- Understand the linear and nonlinear scheduling processes in pipelining, various routing techniques and message passing techniques for cache coherence problem.

Course Outcomes

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

1. Infer knowledge on Hardware and System Design concepts and gain knowledge in techniques to enhance performance of the system.
2. Understand the advanced processor technology and memory hierarchy technology.
3. Understand the linear pipeline processors and know the importance of nonlinear pipeline processors.
4. Understand the multiprocessor system interconnection, design of various network routings and the basic concepts behind vector processing.
5. Understand cache coherence problem and its solution by using protocols.
6. Identify the message passing system to avoiding the inconsistency in multiprocessors and learn various message routing schemes.

Unit – I

Parallel Computer: State of computing, Elements of modern computer, Flynn's classification of parallel processors, System attributes to performance, Multiprocessors and Multicomputer, Shared memory multiprocessors, Distributed memory multiprocessors.

Unit – II

Processors and Memory Hierarchy: Design space of processors, Instruction set architectures, CISC scalar processor, RISC scalar processor, Hierarchy memory technology, Inclusion Coherence and Locality.

Unit – III

Linear and Non-Linear Pipeline Processors: Asynchronous and synchronous models, Clocking and timing control, Speedup, Efficiency and Throughput, Non-Linear Pipeline Processors-Reservation and latency analysis problems, Collision free scheduling problems, Instruction execution phases.

Unit – IV

Multiprocessors and Multivector Computers: Inter connection structure-Crossbar switch and multiport memory, Multistage and combining network routing, Applications and drawbacks, Multivector Computers-Vector processing principles, Vector instruction types, Vector access memory schemes.

Unit – V

Cache coherence and Synchronization Mechanisms: Cache coherence problems-Two protocol approach, Snoopy Bus Protocols, Directory Based Protocols.,

Unit-VI

Cache coherence and Message Passing Mechanisms: Message routing schemes, Deadlock and Virtual channels, Flow control strategies and Multicast routing algorithm.

Text Books:

1. "Advanced Computer Architecture-Parallelism, Scalability, Programmability" Kai Hwang and Naresh Jotwani, McGraw-Hill Publications.

Reference Books:

1. "Computer Architecture A Quantitative Approach" 3rd edition John L. Hennessy & David A. Patterson Morgan Kaufmann.

Distributed Systems
(Professional Elective – I)

L	T	P	C
3	0	0	3

Subject Code: 20CSE313

Course Objectives

- Provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission, IPC mechanisms in distributed systems, Remote procedure calls.
- Expose students to current technology used to build architectures to enhance distributed computing infrastructures with various computing principles

Course Outcomes

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

1. Describe important characteristics of distributed systems and the salient architectural features of Distributed systems.
2. Develop practical experience of inter-process communication in a distributed environment.
3. Identify the features and applications of important standard protocols which are used in distributed systems
4. Develop a familiarity with distributed file systems.
5. Describe how multiple transactions to run concurrently.
6. Design a set of operations on data that is performed across two or more data repositories.

Unit – I

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Applications of Distributed Systems,Resource Sharing and the Web, Challenges.

System Models: Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model

Unit – II

Inter process Communication: Introduction, The API for the Internet Protocols- The Characteristics of Inter process communication, Sockets, UDP Datagram Communication, TCP Stream Communication; External Data Representation and Marshalling; Client Server Communication; Group Communication- IP Multicast- an implementation of group communication, Reliability and Ordering of Multicast.

Unit – III

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects, Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI

Unit – IV

Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays; Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections,Multicast Communication.

Unit – V

Transactions & Concurrency Control: Introduction, Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison of Methods for Concurrency

Control.

Unit-VI

Distributed Transactions: Introduction, Flat and Nested Distributed Transactions, Atomic Commit Protocols, Concurrency Control in Distributed Transactions, Distributed Deadlocks, Deadlocks in Message Communication, Transaction Recovery.

Text Books:

1. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems- Concepts andDesign", 5th Edition, Pearson Publication- 2011

2. Ajay D Kshemkalyani, Mukesh Sighal, "Distributed Computing, Principles,Algorithmsand Systems",Cambridge Reissue Edition 2011**.**

Reference Books:

1. Distributed Systems, Principles and Paradigms, Andrew S. Tanenbaum, Maarten Van Steen, 2nd Edition, PHI.
2. Distributed Systems, An Algorithm Approach, Sukumar Ghosh, Chapman&Hall/CRC,Taylor & Fransis Group, 2007.
3. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.
4. Distributed Operating Systems Concepts and Design, Pradeep K.Sinha, PHI.
5. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, Tata McGraw-Hill Edition.

Computer Graphics
(Professional Elective – I)

L	T	P	C
3	0	0	3

Subject Code: 20CSE314

Course Objectives

- To enlighten the working principles of display devices, and concepts of resolution.
- To understand the fundamental data-structures and algorithms used for output primitives.
- To design graphics programs using mathematical and theoretical foundations.
- To hypothesize 3D models of objects.
- To organize steps and plan for generation of animations.

Course Outcomes

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

1. Understand the principles of concepts of pixel, interpolation techniques.
2. Develop various output primitives like lines, circles, polygons.
3. Create 2D & 3D pictures by designing various transformations.
4. Generate 3D computer graphics using Projection Transformations.
5. Implement modelling techniques and generate Computer Animation.
6. Apply rendering techniques and visible surface routines for attaining surface shading.

.

Unit – I

Basic Concepts & Techniques Pixels: Replicating Pixels, Pixel Interpolation, Pixel Art Scaling. Bilinear Interpolation; Vector-Scaling, Magnitude, Normalization, Dot Product, Cartesian and Polar co-ordinate system.

Unit – II

Two Dimensional Graphics Primitives Bresenham's Line Algorithm, Mid-point circle Algorithm, Liang-Barsky line clipping Algorithm, Weiler and Atherton polygon clipping Algorithm,

Unit – III

Geometric Transformations Basic 2D Transforms, Basic 3D Transforms, Composite transformation matrices, Co-ordinate transform.

Unit – IV

Curved Surfaces and Projections Hermite Curves, Beziere Curves, B-Spline Curves and surfaces: Properties; Projections - Orthographic, Axonometric, 1 Point Perspective Projection.

Unit – V

Modeling Fractal models - Lindenmayer system Models, Deterministic self-similar fractals. Viewing - Drawing the Canonical View Volume, Computer Animation methods, Morphing techniques

Unit – VI

Rendering Techniques Anti-aliasing, Texture Mapping- MipMap, Visible surface determination – Back-face detection, Z-Buffer method, Shading Model - Gouraud and Phong Shading.

Text Books

1. Donald Hearn, Pauline Baker, "Computer Graphics with OPENGL - C Version", 4th Edition, Pearson Education, 2017
2. John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley, "Computer Graphics: Principles and Practice", 3rd Edition, AddisonWesley Professional, 2013.

Reference Books

1. F.S.Hill, “Computer Graphics using OPENGL”, Second edition, Pearson Education, 2009
2. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, "Computer Graphics Principles and practice", 2nd Edition, Pearson Education, 2007
3. John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley, “Computer Graphics: Principles and Practice”, 3rd Edition, AddisonWesley Professional, 2013.
4. J. Vince ,"Mathematics for Computer Graphics, Undergraduate Topics in Computer Science ", DOI 10.1007/**978-1-84996-023**-6 14, Springer-Verlag.

Advanced Python Programming Lab

Subject Code: 20CSL305

L	T	P	C
0	0	3	1.5

Course Objectives

This course will enable students to

- Learn Syntax and Semantics and using Numpy in Python.
- Handle Pandas in Python.
- Understand Data-frames and aggregating using pandas in Python.
- Understand use of Matplotlib in python.
- Implement different plots in matplotlib in Python.
- Introduction to Bokeh library in Python.

Course Outcomes

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

1. Examine Python syntax and semantics of Python Numpy library.
2. Manipulate data using Pandas.
3. Build a structured application using Python Pandas.
4. Join two or more Data frames using Pandas.
5. Create an enriched plot using Matplotlib
6. Visualization of the data using Bokeh library in python.

.

List of Experiments

Week – 1: NUMPY

i) Using Numpy, write a basic array of operations on single array to add x to each element of array and subtract y from each element of array.
ii) Using Numpy, write a program to add, subtract and multiply two matrices.

Week – 2: Write a Python program to do the following operations:
Library: NumPy

i) Create multi-dimensional arrays and find its shape and dimension
ii) Create a matrix full of zeros and ones

Week – 3:

iii) Reshape and flatten data in the array
iv) Append data vertically and horizontally

Week – 4:

v) Apply indexing and slicing on array
vi) Use statistical functions on array - Min, Max, Mean, Median and Standard Deviation

Week – 5:

i) Import a CSV file and perform various Statistical and Comparison operations on rows/columns.
ii) Load an image file and do crop and flip operation using NumPy Indexing.

Week – 6: PANDAS

i) Write a Pandas program to convert a NumPy array to a Pandas series. NumPy array: [10 20 30 40 50]

ii) Write a Pandas program to sort a given Series.
Original Data Series: 0 100
1 200
2 python
3 300.12
4 400

Week – 7:

i) Write a Pandas program to create the mean and standard deviation of the data of a given Series.
Original Data Series:
0 1
1 2
2 3
3 4
4 5
5 6
6 7
7 8
8 9
9 5
10 3

ii) Import any CSV file to Pandas Data Frame and perform the following:

Handle missing data by detecting and dropping/ filling missing values.
Transform data using apply () and map() method.

Week – 8:

Visualize data for the following:

i) Line Plots
ii) Bar Plots
iii) Histograms
iv) Density Plots

Week – 9:

i) Draw a scatter plot in matplotlib
ii) Generate a heatmap in matplotlib using pandas data

Week – 10: Bokeh

Plotting different types of plots using Bokeh library

i) Bar plot
ii) Scatter plot
iii) Patch plot
iv) Pie Plot

Week – 11:

i) Visualize the Iris dataset using python Bokeh. Plot a graph with length of petals as the x-axis and breadth of petals as y-axis

Week – 12:

i) Adding different widgets to the plot using Bokeh library

Reference Books:

1. Yashavant Kanetkar, Aditya Kanetkar, "Let us Python, BPB publication, 1 st Edition, 2019.
2. Ashok Kamthane, Amit Kamthane, "Programming and Problem solving with Python", McGraw Hill Education (India) Private Limited, 2018.
3. Taneja Sheetal, Kumar Naveen, "Python Programming – A Modular Approach", Pearson, 2017.
4. R Nageswara Rao, "Core Python Programming", Dreamtech Press, 2017 Edition.
5. Dainel Y.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019.

Web References:

1. https://realpython.com/python3-object-oriented-programming
2. https://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html
3. https://www.pythonprogramming.in/python-pandas/
4. https://www.geeksforgeeks.org/python-programming-language/
5. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

Software Engineering and Case Tools Lab

Subject Code: 20CSL306

L	T	P	C
0	0	3	1.5

Course Objectives

- Various test processes and continuous quality improvement
- Methods of test generation from requirements
- Combinatorial test generation
- Test adequacy assessment using: control flow, data flow, and program mutations
- The use of various test tools

Course Outcomes

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

1. Understand the procedure for Functional Testing
2. Generate and run Test Scripts repeatedly for Regression Testing.
3. Check the behavior of Test Scripts.
4. Know to test Web application for no. of links, no. of images, load time, web buttons etc.
5. Design own Test cases and perform Manual Testing
6. Create the procedure for JUnit and TestNG.

Lab Experiments

1. Using Selenium IDE, Write a test suite containing minimum 4 test cases.
2. Write and test a program to login on any web page.
3. Installation of Selenium and demonstrate it.
4. Develop a test suite for any two web sites.
5. a) Write testscript for launching a URL (http://www.google.com) maximize the size of window ,quitting the window after 6000 milliseconds.
   b) Write testscript for launching a URLs (https://www.facebook.com) and, maximize the size of window and navigate using forward() and back() commands.
6. Write a test scripts to demonstrate test suite using JUNIT using selenium.
7. Write a test script to use different annotations using JUNIT and open a website in new tab.
8. a) Write a test script to perform cross-browser testing using JUnit by selenium.
   b) Write test script for launching a URLs (https://www.facebook.com) and, maximize the size of window and navigate using forward() and back() commands.
9. a) Write the characteristics of SRS, mention components of SRS and structure of SRS(IEEE).
   b) Draw the CPM chart and find the critical path for the given project management table and find all remaining constants (ES,EF,LS,LF,TF,FF,IF)
10. Using COCOMO estimate effort for a given project.

Text Book:

1. Selenium Testing Tools Cookbook by Unmesh Gundecha Reference Books:
2. https://www.packtpub.com/sites/default/files/downloads/Integration_with_Other_Tools.pdf
3. https://www.packtpub.com/sites/default/files/downloads/Distributed_Testing_with_Selenium_Grid.pdf

References:

1. K. V. K. K. Prasad, “Software Testing Tools”, Dreamtech, 2004.

Reference Link

http://docs.selieniumhq.org

Fundamentals of Fuzzy Logic
(Interdisciplinary Elective – II)
(Common for all Branches)

L	T	P	C
3	0	0	3

Subject Code: 20IET321

Course Objectives

The student will be able to

- Understand the concepts of fuzzy sets, membership functions and their operations.
- Understand the concepts of fuzzy relations and their operations.
- Frame linguistic variables, analyze the fuzzy quantifiers and understand Fuzzy Inference.
- Understand the concept of constructing simple fuzzy sets.
- Understand the process of Fuzzification and Defuzzification by using different methods.
- Understand the concepts of Mamdani Approach **&** Takagi Sugeno's Approach with simple examples**.**

Course Outcomes

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

1. Perform different fuzzy operations on fuzzy sets.
2. Perform different fuzzy operations on fuzzy relations.
3. Construct linguistic variables, estimate the fuzzy quantifiers as per the Requirement, and perform Fuzzy Inference.
4. Construct the fuzzy set.
5. Perform the process of Fuzzification and Defuzzification by using different methods for simple Engineering problems.
6. Apply Mamdani Fuzzy Model & Takagi Sugeno Model for simple Engineering problems

Unit – I

Fuzzy set Theory : Crisp Sets- an overview, Fuzzy sets – membership functions -types of membership functions: Triangular, Trapezoidal, Gaussian-examples. Basic Fuzzy set operations-union, intersection, complement. Properties of Fuzzy Sets. ,

Unit – II

Fuzzy Relations: Cardinality, operations, properties, fuzzy Cartesian product and composition, fuzzy tolerance and equivalence relations, forms of composition operation.

Unit – III

Fuzzy Logic: Classic and fuzzy logic, approximate reasoning, Natural language, linguistic hedges, Fuzzy propositions, Fuzzy connectives, Fuzzy quantifiers, Fuzzy Inference -fuzzy rule based systems, graphical technique of inference.

Unit – IV

Construction of Fuzzy sets: Methods of construction –an overview, Direct methods with one expert, Direct methods with multiple experts, constructions from Sample data –examples.

Unit – V

Fuzzy Expert System –Fuzzification & De-fuzzification: Fuzzy Controllers, Fuzzy Logic Control-Fuzzification- Fuzzy membership values, linguistic Hedges, Fuzzy Logical operators, Fuzzy Inference rules. Defuzzification-Centre of gravity method, centre of sums method, Mean of Maximum method.

Unit – VI

Fuzzy Expert System: Mamdani Approach & Takagi Sugeno's Approach with simple examples.

Text books

1. Fuzzy Sets and Fuzzy Logic-Theory and Applications, George. J. klir / Bo Yuan, Prentice-Hall of India Pvt Limited.
2. Neural Networks, Fuzzy Logic, and Genetic Algorithms, S.Rajasekharan, G.A.Vijayalakshmi Pai, Prentice-Hall of India Pvt Limited.

References Books

1. Fuzzy Logic with Engineering Applications, Timothy J.Ross, 3rd edition, John wiley & sons Ltd.

Geographical Information System
(Interdisciplinary Elective – II)
(Offered for ECE/EEE/MECH/CSE/IT)

L	T	P	C
3	0	0	3

Subject Code: 20IET322

Course Objectives

- To interpret map projections
- To describe GIS components in GIS.
- To discuss data analysis operations in GIS
- To apply the concepts of DBMS in GIS
- To analyze spatial data and modeling in GIS
- To apply GIS in real time applications

Course Outcomes

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

1. Interpret map projections
2. Describe GIS components.
3. Discuss data analysis operations in GIS
4. Apply the concepts of DBMS in GIS
5. Analyze spatial data and modeling in GIS
6. Apply GIS in real time applications

Unit – I

Fundamental Concepts of Map: Introduction; Classification of Maps; Scale of maps; Spatial referencing System; Map Projections- Classification; commonly used map projections and their comparisons- Grid systems.

Unit – II

Basic Concepts of Geographical Information System: Introduction to GIS; components of a GIS; Geo spatial Data: Spatial Data- Attribute data-Joining Spatial and attribute data.

Unit – III

GIS Operations: Spatial Data Input – Attribute data Management -Data display Data Exploration – Data Analysis.

Unit – IV

Data Base Management Systems: Introduction - Functions of DBMS; Components of DBMSGIS Data file Management- Simple List, Ordered Sequential Files; Data Base Models Hierarchical Database Models, Network Systems.

Unit – V

Spatial Data Modeling: Introduction; stages of GIS data modeling; Graphical representation of Raster data, Graphical representation of Vector data; Raster GIS Model, Vector GIS Model.

Unit – VI

Applications of GIS: Land use and Land cover, agriculture, forestry, geology, urban applications, flood zone delineation and mapping.

Text Books

1. Peter A Burrough, Rachael A. Mc Donnell and Christopher D. Lloyd (2016), Principles of Geographical Information Systems, 3rd edition, Oxford University Press.
2. M.Anji Reddy(2012), Text Book of Remote Sensing and Geographical Information systems,4th edition, BS Publications/BSP Books

Reference Books

1. Chor Pang Lo and Albert K.W. Yeung (2016), Concepts & Techniques of GIS, Pearson Education
2. Kang – tsung Chang (2017), GIS, 4th edition, McGraw-Hill Education

Renewable energy sources
(Interdisciplinary Elective – II)
(Offered for ECE/MECH/CIVIL/CSE/IT)

L	T	P	C
3	0	0	3

Subject Code: 20IET323

Course Objectives

- To outline the concept regarding solar radiation.
- To outline the concept regarding the collection of solar energy and storage of solar energy
- To outline the concept regarding different types of wind mills.
- To outline the concept regarding different types of biomass digesters and geothermal energy conversion.
- To Outline the concept regarding ocean energy conversion
- To Outline the concept regarding direct energy conversion

Course Outcomes:

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

1. Define different kind of solar radiation.
2. Understand different methods of collection of solar energy and storage of solar energy.
3. Classify different types of wind mills.
4. Classify different types of biomass digesters and geothermal energy.
5. Classify different types of ocean energy extracting techniques.
6. Distinguish different kinds of direct energy conversion techniques.

Unit – I

Principles of solar radiation: Role and potential of new and renewable source, the solar energy option, the solar constant, extraterrestrial and terrestrial solar radiation, instruments for measuring solar radiation.

Unit – II

Solar energy collection, storage and applications: Flat plate and concentrating collectors, Different methods of storage -Sensible, latent heat. Solar Applications- solar heating/cooling technique, solar distillation and, photovoltaic energy conversion.

Unit – III

Wind energy: Sources and potentials, block diagram, **Types**: horizontal and vertical axis windmills. Types of generators and its parts.

Unit – IV

Biomass and Geothermal energy: Principles of Bio-Conversion, Anaerobic/aerobic digestion, gas yield. Resources, types of wells, Open loop and closed loop energy conversion.

Unit – V

Ocean energy: OTEC, Principles utilization, setting of OTEC plants, Tidal and wave energy: Potential and conversion techniques.

Unit – VI

Direct energy conversion (DEC): Need for DEC, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, MHD generators, principles, hall effect, magnetic flux, principle of MHD, power generation with closed loop MHD systems.

Text Books

1. Non-Conventional Energy Sources /G.D. Rai
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa

Reference Books

1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems / K Mittal /Wheeler
4. Solar Energy /Sukhame

Fundamentals of ROBOTICS
(Interdisciplinary Elective – II)

(Offered for ECE/EEE/CIVIL/CSE/IT)

L	T	P	C
3	0	0	3

Subject Code: 20IET324

Course Objectives:

- This subject gives the knowledge about the fundamentals of the robotics technology and its wide area of applications in various fields.
- This gives the knowledge about the kinematic and dynamic aspects of the robot construction and designing aspects of the robots.

Course Outcomes:

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

1. Discuss basic fundamentals and Describe commonly used robot configurations.
2. Discuss end effectors, drives along with robotics applications.
3. Describe working principles of various sensors commonly used in a robot.
4. Solve basic transformation problems and rotation matrices.
5. Discuss methods of programming and programming languages.
6. Discuss robot manufacturing & non-manufacturing applications of robots.

Unit – I

Fundamentals of Robotics: Introduction to Robotics & Overview –Robotics & Automation – Robotics – Classification of Robots based on Configuration & Control – Terminology - Components of Industrial Robots – DOF, Functions and Specifications of Robot System.

Unit – II

Robot Actuators: Robotic Actuators – Classification of actuators – Difference between Electric, Pneumatic and Hydraulic actuators, Servo & Stepper Motors, Servo Amplifiers, Control of Robotic Joints, Closed and Open Loop Control System.

Unit – III

Sensing Systems: Sensing systems – Overview of sensing – Functions of sensing – Types – Optical and Non – Optical Sensors, position sensors: potentiometer, resolvers, and encoders, velocity, proximity, accelerometers, tactile, range sensors, touch and slip sensors, force and torque sensors.

Unit – IV

Homogeneous transformations: Mapping, mapping between rotated, translated and combined rotated and translated frames, description of objects in space, fundamental rotation matrices, homogeneous transformations, representations & properties – problems and differential motions of a frame.

Unit – V

Programming: Introduction to robot programming – methods of programming – programming languages. generations of robot programming languages, robot control sequencing, AL, AML, RAIL, RPL, VAL Robot languages.

Unit – VI

Applications: Introduction – Manufacturing & Non-manufacturing applications – Selection and need of robot for a particular application (Case study), Future applications.

Text Books:

1. Industrial Robotics, M. P. Groover, Pearson Education Pub.
2. Robotics & Control, R. K. Mittal, I. J. Nagarath, Tata McGraw Hill Pub.

Reference Books:

1. Robotics, K. S. Fu, Lee, McGraw Hill Pub.
2. An Introduction to Robot Technology, P. Coiffet, M. Chaironze, Kogam Page Pub., London.
3. Robotic Engineering, Richard D. Klafter, Prentice Hall Pub.
4. Robot Analysis and Intelligence, Asada, Slow time, Wiley Inter-Science Pub.
5. Introduction to Robotics, John J Craig, Pearson Education Pub.
6. Robot Dynamics & Control, Mark W. Spong, M. Vidyasagar, John Wiley & Sons (ASIA) Pub.

Principles of communications
(Interdisciplinary Elective – II)
(Offered for EEE/MECH/CIVIL/CSE/IT)

L	T	P	C
3	0	0	3

Subject Code: 20IET325

Course Objectives:

- Explain the fundamental concepts of modulation and demodulation of Amplitude modulation and Angle modulation schemes.
- Understand various pulse modulation schemes.
- Compare the different types of Digital communication systems
- Understand various Digital modulation schemes.
- Understand the concept of channel capacity, information theory and Shannon's theorem.

Course Outcomes:

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

1. Determine Modulation Index, Bandwidth and power of AM,DSB- and SSB for the given specifications and also compare various Demodulation techniques of AM.
2. Compute Modulation parameters of FM and PM waves as per the given specifications and also compare FM and PM in terms of characteristics and applications.
3. Describe Sampling theorem and Compute Nyquist sampling rate for the given signal and also compute Modulation parameters of PAM,PWM and PPM for the given specifications.
4. Analyze the PCM,DM and ADM techniques with respect to baud rate bit error rate and also construct the above said signals as per given conditions.
5. Determine Modulation parameters of ASK,FSK,PSK, DPSK and QPSK for the given data and also construct the wave forms for the given specifications.
6. Differentiate noises in communications systems and compute noise figure as per given specifications.

Unit - I

Amplitude Modulation: Need for modulation, Types of Amplitude modulation, AM, DSB , SSB , Power and BW requirements, generation and Demodulation of AM.

Unit – II

Angle Modulation: Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

Unit – III

Pulse Modulations: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM

Unit – IV

Digital Communication: Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM.

Unit – V

Digital Modulation: ASK, FSK, PSK, DPSK, QPSK.

Unit – VI

Noise: External noise, Internal noise, noise calculations, noise figure and noise temperature.

Text books

1. Electronic Communication Systems – Kennedy & Davis, TMH, 4th edition.
2. Digital Communications – Dr. Sanjay Sharma, S.K.Kataria and sons, New delhi, 2015

Reference Books

1. Communication Systems Engineering – John. G. Proakis, Masoud and Salehi, 2nd Ed. PHI/Pearson, 2004.
2. Digital and Analog Communication Systems – Sam Shanmugam, John Wiley, 2005.

Reference Links

1. https://youtube.com/playlist?list=PLq-Gm0yRYwTgX2FkPVcY6io003-tZd8Ru
2. https://youtube.com/playlist?list=PLmA4L9UCzuEMcZv9QxlBoUJHcNFM2LIpf

Advanced Coding – II
(Interdisciplinary Elective – II)

(Offered for CSE, IT)

L	T	P	C
3	0	0	3

Subject Code: 20IET328

Course Objectives

- Understanding importance of Mathematics and Problem solving approaches for programming
- Understanding importance of optimized solution for problem solving

Course Outcomes

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

1. Develop solution using Dynamic linear Data structures
2. Select appropriate Sorting /Hashing technique to solve the Problem
3. Develop solutions using Non-Linear Data Structures
4. Develop Solution to problems using Greedy approach
5. Develop solution to pattern matching problems
6. Develop Solution to problems using Dynamic Programming

Unit – I

Linked List: Singly Linked List, Doubly Linked List and Circular Linked List and Josephus Circle problem

Problems to practice: Add Two Numbers, Swap Nodes in Pairs, Rotate List, Palindrome Linked List, Linked List Cycle, Remove Duplicates from Sorted List,

Stacks and Queues: Implementation in Array and Linked List and classic problem on Stacks and Queues.

Problems to practice : Min Stack, Valid Parentheses, Trapping Rain Water, Largest Rectangle in Histogram, Asteroid Collision, Simplify Path, Next Greater Element I, Online Stock Span, Implement Stack using Queues

Unit – II

Sorting and Searching: Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick sort , Count Sort. Linear Search , Binary Search and Ternary Search.

Practice Problems: Find Peak Element, Guess Number Higher or Lower, Peak Index in a Mountain Array, Koko Eating Bananas, Find Minimum in Rotated Sorted Array.

Hashing: Introduction to Hashing, Open addressing and Separate chaining.

Problems to Practice: Sort Colors, Largest Number, H-Index, Car Fleet, Relative Sort Array, Maximum Gap, Merge Intervals, Pancake Sorting, Insertion Sort List, Valid Anagram.

Unit – III

Trees : Terminology of Tree concept, Types of Trees ,Tree traversal, Binary Search Tree and Heap sort.

Graphs: Terminology, Representation of Graph, Graph Traversal DFS and BFS, Disjoint Set Union (Union Find).

Problems to Practice: Word Ladder, Shortest Path in Binary Matrix, Rate In Maze, Same Tree, Path Sum, Loud and Rich, Matchsticks to Square.

Unit – IV

Greedy Approach: General approach, Fractional Knapsack problem, Scheduling problem, Dijkstra's Algorithm

Problems to Practice: Jump Game, Gas Station, Candy, Assign Cookies, Lemonade Change, Walking Robot Simulation, Two City Scheduling, Car Pooling

Unit – V

String Matching algorithms: Naïve approach, KMP algorithm, Rabin-Karp Algorithm.

Problems to Practice: Repeated String Match, Count Binary Substrings, Most Common Word, Goat Latin, Minimum Time Difference, Longest Common Prefix, Number of Segments in a String, Validate IP Address.

Unit – VI

Dynamic Programming : Introduction, Bottom up DP, Top Down DP, Coin Change Problem, Road Cutting problem, Egg dropping problem, 0/1 Knapsack problem, Longest common Sub Sequence problem.

Text Books:

1. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005.

Reference Books:

1. J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi, 2006.
2. G.Brassard & P. Bratley – Fundamentals of Algorithms, PHI, New Delhi, 2005.
3. S.Dasgupta et.al. – Algorithms, TMH, New Delhi – 2007.
4. E. Horowitz. et.al., Fundamentals of computer Algorithms, Universities Press, 2008, 2nd Edition.

Reference Links:

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106131/
3. https://www.spoj.com/problems

Machine Learning using Python

(Honors/Minor Course: Artificial Intelligence & Machine Learning**)**

Subject Code: 20AIT302

L	T	P	C
4	0	0	4

Course Objectives

- Students understand issues and challenges of Machine Learning.
- Should be able to select data, model, model complexity etc.
- Understand the strengths and weaknesses of many popular machine learning approaches.

Course Outcomes

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

1. Understand the basic concepts of various types of machine learning and classification algorithms and their applicability in solving machine learning problems.
2. Assess the suitability of clustering algorithms in solving a particular problem.
3. Apply various dimensionality reduction techniques for the extraction of features from high dimensionality data
4. Develop scaling up machine learning techniques and associated computing techniques and technologies for various applications
5. Choose a suitable regression technique that is appropriate for a particular dataset by analyzing the trade-off of computational complexity versus convergence speed
6. Recognize the feasibility of applying neural network methodology for solving real time application problems

Unit – I

Brief Introduction to Machine Learning: Supervised Learning, Unsupervised Learning, Ensemble Learning, Reinforcement Learning, Supervised Learning: Decision Tree Induction, Naïve Bayes Classification, Rule based Classification, K-Nearest Neighbor, Performance evaluation metrics of Classifiers.

Unit – II

Unsupervised Learning: Clustering, Partitioned Clustering (K-Means), Hierarchical Clustering, BIRCH, CURE, Density based Clustering (DBSCAN). Performance evaluation metrics of Clustering

Unit – III

Feature Analysis: Dimensionality Reduction, Feature Selection, Feature Projection, Filter Method, Wrapper Method, Embedded Method, Feature Projection, Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA).

Unit – IV

Support Vector Machine (SVM): Introduction to SVM, Linear learning machines and Kernel space, Kernels for learning non-linear functions, SVM for classification and regression problems.

Unit – V

Regression: Linear and Logistic regression, Regularization - L1 & L2 regularization, drop out method, Lasso Regression, Ridge regression, Hypothesis testing of Regression Model, R-square and goodness of fit, Influential Observations. Multiple Linear Regression: Polynomial Regression, Regularization methods, Lasso, Ridge and Elastic nets.

Unit – VI

Models of ANNs: Feed-forward & feedback, Multi-layer Feed forward Networks, Delta learning rule for Multi-Perceptron layer, Generalized delta learning rule, Error back-propagation training networks, Recurrent NN.

Text Book

1. Shalev-Shwartz, S., Ben-David,S., (2014), Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press
2. R. O. Duda, P. E. Hart, D. G. Stork (2000), Pattern Classification, Wiley-Blackwell, 2nd Edition.

Reference Book

1. Mitchell Tom (1997). Machine Learning, Tata McGraw-Hill
2. C. M. BISHOP (2006), Pattern Recognition and Machine Learning, Springer-Verlag New York, 1st Edition.

Reference links

1. https://in.mathworks.com/content/dam/mathworks/ebook/gated/machine-learning-workflow-ebook.pdf
2. https://www.coursera.org/learn/machine-learning-with-python
3. https://nptel.ac.in/courses/106106139
4. https://www.geeksforgeeks.org/machine-learning/

Web Technologies

Subject Code: 20CSI311

L	T	P	C
3	0	3	4.5

Course Objectives

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

- To teach students the basics of server side scripting using PHP
- To explain web application development procedures
- To impart servlet technology for writing business logic
- To facilitate students to connect to databases using JDBC
- To familiarize various concepts of application development using JSP

Course Outcomes

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

1. Create web pages using HTML and Cascading Styles sheets, analyze a web page and identify it's elements and attributes.
2. Build dynamic web pages.
3. Define and retrieve the data from XML file.
4. Connect to a database using JDBC and perform a simple query and create dynamic web Pages.
5. Write server side programming with Java Servlets.
6. Create dynamic web pages using JSP.

Unit – I

Html: Basic Syntax, Standard HTML Document Structure, Images, Hypertext Links, Lists, Tables, Forms, Frames, HTML5

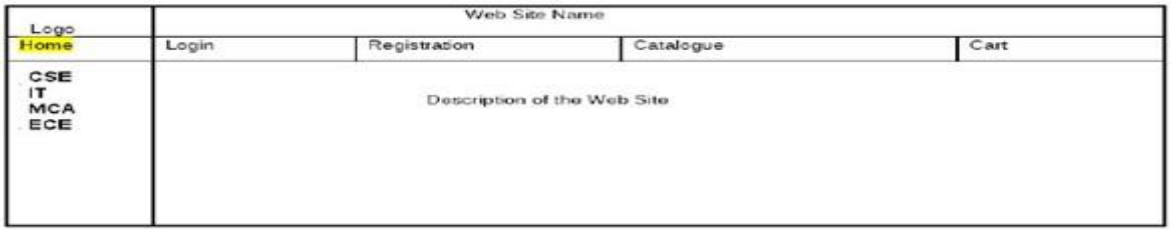
CSS: Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution.

Exercise Questions:

Ex1: Develop a Home Page:

The static home page must contain three pages, which includes **Top frame :** Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below). **Left frame :** At least four links for navigation, which will display the catalogue of respectivelinks. For e.g.: When you click the link "CSE" the catalogue for CSE Books should be displayed in the Right frame.

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



Ex 2: Design a web page using CSS (Cascading Style Sheets) which includes the following: Use different font, styles: In the style definition, define how each selector should work (font,color etc.). Then, in the body of web pages, activate the styles if you refer these selectors.

Unit – II

JavaScript: Introduction to JavaScript, Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions.

Angular JS: Introduction to Angular JS, Expressions, Arrays, Objects, Strings, Angular JS Form Validation & Form Submission.

Exercise Questions:

Ex 3: Develop a Registration Page with the following fields:

Create a registration page with the following fields

1) Name (Text field)
2) Password (password field)
3) E-mail id (text field)
4) Phone number (text field)
5) Sex (radio button)
6) Date of birth (3 select boxes)
7) Languages known (check boxes – English, Telugu, Hindi, Tamil)
8) Address (text area)

Write a JavaScript to validate the following fields of the above registration page.

1. Name (Name should contains alphabets and the length should not be less than 6 characters).
2. Password (Password should not be less than 6 characters length).
3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
4. Phone number (Phone number should contain 10 digits only).

Ex 4: Develop a simple Angular JS Form Validation application.

Unit – III

XML: Introduction, Document type Definition (DTD), XML schemas, Parsers - DOM and SAX.

Exercise Questions:

Ex 5: Write an XML file which will display the Book information which includes the following:

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

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

Ex 6: Develop a Simple AJAX application which can retrieve and display the Book information (Title of the book, Author Name, ISBN number, Publisher name, Edition, Price)

Unit – IV

JDBC: Introduction, JDBC Architecture, JDBC Drivers, JDBC API: JDBC Process with java.sql package.

Exercise Questions:

Ex 7: JDBC Programs using Statement

- A program to create a table
- A program to insert record in a table
- A program to fetch records from a table

Ex 8: JDBC Programs using Prepared Statement

- A program to insert a record and select records

Unit – V

Servlets: Introduction to Servlets, Servlet life cycle, Servlet API, Reading Parameters(ServletConfig, ServletContext

Exercise Questions

Ex 9: Write a servlet program using cookie management

Ex 10: write servlet program to illustrate Http Session

Unit-VI

JSP: Introduction, JSP life cycle, JSP Implicit Objects, JSP Directives, JSP Scripting Elements, JSP Actions, JSTL.

Exercise Questions:

Ex 11: Create a table (Book which contains Title of the book, Author Name, ISBN number, Publisher name, Edition, Price) in the database and Develop a JSP program to retrieve the book data from the database.

Ex 12 JSP program to demonstrate arithmetic operations

Text Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2009.
2. Robert W Sebesta, Uttam K Roy, "Programming the World Wide Web", 7th Edition, Pearson, 2013.
3. Web Technologies, 1st Edition 7th impression, Oxford, 2012.
4. David McFarland, "Java Script & JQuery the missing manual", 2nd Edition, O'Reilly, 2011.
5. Peter Pollock, "Web Hosting for Dummies", 1st Edition, John Wiley & Sons, 2013.

Reference Books:

1. Diane Zak, Don Gosselin, Michael Ekedahl "The Web Warrior Guide to Web Programming",. CourseTechnology Inc, 2003.
2. Paul S Wang, Sanda S Katila, "An Introduction to Web Design and Programming", Cengage Learning, 2003.

Reference Links

1. https://www.mooc-list.com/course/introduction-web-development-courseera
2. https://www.edx.org/course/introduction-html-javascript-microsoft-dev211-1x-0
3. http://infolab.stanford.edu/~ullman/fcdb/oracle/or-web.html

Compiler Design

Subject Code: 20CST312

L	T	P	C
3	0	0	3

Course Objectives

- To implement the concept learned in automata theory and languages to the field of Computer Science.
- Analyze the basic steps involved in converting a source language to target code.
- Understands the concepts of parsers and can write solutions for various grammars by using tools, and also analyzes different storage techniques, error recovery strategies
- Gain the knowledge to write a compiler program or can able to build a compiler.

Course Outcomes

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

1. Identify the basic concepts needed for the development of a compiler
2. Analyze the various phases and Tools of a Compiler
3. Describe the differences between Top-Down and Bottom-Up Parsers and apply parsing methods for various grammars.
4. Compare and Contrast Symbol table organization for Block Structured and Non-Block Structured languages.
5. Analyze the concepts involved in Intermediate, Code Generation and Code Optimization Process
6. Recognize the various types of errors and error recovery strategies in phases of Compilation

.

Unit – I

Introduction to Compilers Introduction to compilers, Phases of compiler, Lexical Analyzer, The role of the lexical analyzer, input buffering, specification of tokens, Recognition of tokens.

Unit – II

Syntax Analysis Role of the parser, writing grammars and context free grammars, Top-down parsing, Brute-force approach, Recursive descent parsing, Predictive parsing, FIRST and FOLLOW constructs

Unit – III

Bottom-up parsing, shift-reduce parsing, operator precedence parsing, LR parsers, SLR parser, canonical LR parser, LALR parser.

Unit – IV

Semantic Analysis Syntax directed translations, applications of syntax directed translations, Syntax directed definitions, construction of syntax tree, Bottom-up evaluation of S-attributed definitions, L-attributed definitions.

Unit – V

Intermediate Code Generation and Code Optimization Intermediate languages, Declarations, Assignment statements, Boolean Expressions, case statements, back patching, Procedure calls, Principal sources of optimization, optimization of basic blocks, DAG representation of basic blocks, flow graphs.

Unit-VI

Data flow analysis: Flow graph, Global optimization, Redundant sub expression elimination, Induction variable elements, live variable analysis, copy propagation.

Code generation: Issues in the design of code generator, the target machine, run time storage management, peephole optimization

Text Books:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, *"Compilers: Principles Techniques & Tools"*, Pearson Education,2nd Edition 2013.
2. Kenneth C. Louden. 1997. Compiler Construction: Principles and Practice</i>. PWS Publishing Co., USA.

Reference Books:

1. Kenneth C Louden, *"Compiler Construction: Principles and Practice*", Cengage Learning. Lex &Yacc, John R Levine, Oreilly Publishers.
2. Keith D Cooper & Linda Tarezon, *"Engineering a Compiler*", Morgan Kafman, Second edition. Lex &Yacc, John R Levine, Tony Mason, Doug Brown, Shroff Publishers.
3. Muchnik, "*Advanced Compiler Design and Implementation*", Kauffman(1998)

Managerial Economics and Management Science

Subject Code: 20HST303

L	T	P	C
3	0	0	3

Course Objectives

- To introduce the economic concepts
- To familiarize with the students the importance of economic approaches in managerial decision making To understand the applications of economic theories in business decisions

Course Outcomes

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

1. Recognize managerial Economics skills to the solution of engineering problems
2. Explain the cost and production theories in engineering problems
3. Explore and develop the management qualities
4. Enhance the problem solving skills in various business areas
5. Enhance the promotional skills in various Marketing situations
6. Evaluate the future threats and application theories.

Unit – I

Introduction to Managerial Economics: Definition, Nature and Scope of Managerial Economics, Demand Analysis: Demand Determinants, Law of Demand and its Exceptions, Elasticity of Demand, Demand Forecasting, Factors Governing Demand Forecasting ,Methods of Demand Forecasting viz. Survey methods, Statistical methods, Expert opinion method, Test marketing, Controlled experiments, Judgmental approach to Demand Forecasting.

Unit – II

Theory of Production and Cost Analysis: Production Function in Isoquants and Isocosts, MRTS, Least cost Combination of Inputs, Production Function Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost Concepts, Opportunity cost, Fixed &Variable costs explicit costs &Implicit costs, Out of pocket costs & Imputed costs, Break-Even Analysis (BEA), Determination of Break- Even Point (simple problems), Managerial Significance and Limitations of BEA. .

Unit – III

Introduction to Markets and Pricing Strategies: Market Structure, Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, Price-Output Determination in Case of Perfect Competition and Monopoly, Concept on different Pricing Strategies.

Unit – IV

Introduction to Management : Concept of Management and Organization : Nature, Importance and Functions of Management, Taylor‘s Scientific Management Theory, Fayal‘s Principles of Management, Mayo‘s Hawthorne Experiments , Maslow‘s Theory of Human Needs, Douglas McGregor‘s Theory X and Y, Hertzberg‘s Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

Unit – V

Introduction to Marketing: Function of Marketing, Marketing Mix, Marketing Strategies based on Product Lifecycle, Channels of Distribution, Digital Marketing.

Unit-VI

Human Resources Management (HRM): Concept of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs. PMIR, Basic Functions of HR Manager; Manpower Planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

Text Books:

1. Managerial Economics – Varshney and Maheswari, Sultan and Chand, New Delhi, 2003
2. Principles of Management – Ramaswamy,T, Himalaya Publishing House, Mumbai, 2008.
3. Marketing Management – Phillip Kotler and Kevin Lane Keller, PHI Learning Private Limited, 2006, 12/e.
4. Personnel and Human Resource Management: Text and Cases – P.Subba Rao, Himalaya Publishing Houses, Mumbai.

Reference Books:

1. Managerial Economics, Dwivedi, Vikas Publications, 2009, 6/e.
2. Principles of Management – Koonz, Weihrich and Aryasri, Tata McGraw Hill, 2004.
3. Marketing Management: Texts and Cases – Tapan K. Panda, Excel Books, 2008, 2/e.
4. Marketing Management – Rajan Saxena, Tata Mc Graw Hill, 2009, 4/e.
5. Human Resource Management – Aswathappa, Mc Graw Hill, 2009.
6. Personnel Management – Edwin B.Flippo, Mc Graw Hill, 2000

Advanced Operating Systems
(Professional Elective – II)

Subject Code: 20CSE321

L	T	P	C
3	0	0	3

Course Objectives

- To get a comprehensive knowledge of the architecture of distributed systems.
- To understand the deadlock and shared memory issues and their solutions in distributed environments.
- To know the security issues and protection mechanisms for distributed environments.
- To get a knowledge of multiprocessor operating system and database operating systems.

Course Outcomes

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

1. Understand lowest-level Operating System code and its interaction with hardware and design-issues.
2. Understand the design approaches of advanced operating systems
3. Analyze the design issues of distributed operating systems.
4. Evaluate design issues of multi processor operating systems.
5. Identify the requirements of Distributed File System and Distributed Shared Memory.
6. Formulate the solutions to schedule the real time applications.

Unit – I

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives.

Unit – II

Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms,

Non-Token – Based Algorithms: Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm,

Token-Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Singhal's Heurisric Algorithm, Raymond's Heuristic Algorithm.

Unit – III

Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

Unit – IV

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures

Multi Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling.

Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

Unit – V

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration

Unit-VI

Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols

Text Books:

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, Tata McGraw-Hill Edition 2001.

2. Pradeep K.Sinha, "Distributed operating system-Concepts and design", PHI, 2003.

Reference Books:

1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007

2. Andrew S.Tanenbaum, "Modern operating system", PHI, 2003

Artificial Intelligence
(Professional Elective – II)

L	T	P	C
3	0	0	3

Subject Code: 20CSE322

Course Objectives

- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems and machine learning.

Course Outcomes

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

1. Understand the characteristics of AI problems.
2. Study various heuristic algorithms.
3. Apply predicate logic to solve problems.
4. Represent the knowledge using various structured approaches.
5. Develop a reasoning mechanism using different statistical concepts.
6. Illustrate the architecture of an expert system.

.

Unit – I

Introduction: AI Problems, State Space Search: water-jug problem, Production systems: Control strategies: BFS, DFS; Problem characteristics; Production system characteristics

Unit – II

Heuristic Search Techniques– Generate & Test, Hill Climbing, Best first, A* algorithm, Constraints satisfaction

Unit – III

Representation of Knowledge: Issues in Knowledge representation, Approaches to Knowledge representation, Knowledge representation using Predicate logic, Unification Algorithm, Resolution, Procedural Vs Declarative knowledge

Unit – IV

Structured Knowledge Representation- Semantic Nets, Frames, Conceptual Dependencies, Forward Vs Backward chaining, matching

Unit – V

Statistical Reasoning: Bayesian Theorem, Bayesian Network, Dempster-Shafer theory.
Planning and Machine Learning: Basic plan generation systems - Strips – Advanced plan generation systems – K strips, Machine learning, adaptive Learning.

Unit – VI

Expert Systems: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition – Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XOON:
Expert systems shells.

Text Book

1. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc Graw Hill- 2013. (Unit s-I, II, IV & V)
2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2017.

Reference Books:

1. Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
2. Stuart Russel and Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007.
3. Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013. Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach, Fourth Edition, Pearson, 2020.

Reference Links:

1. https://swayam.gov.in/nd1_noc19_me71/previe
2. https://ai.google/

Social Networks
(Professional Elective – II)

L	T	P	C
3	0	0	3

Subject Code: 20CSE323

Course Objectives

The student should be made to:

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

Course Outcomes

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

1. Predict human behavior in social web and related communities.
2. Visualize social networks.
3. Able to discover the capabilities and limitations of Semantics for social networks
4. Understand how these Social technologies impact society and vice versa.
5. Develop skills, recognize, understand, and more effectively manage new social practices online.
6. Understand the Dynamic Social Networks.

Unit – I

Introduction to Social Networks and Semantic Web Introduction to Social Networks – Emergence of the Social Web, Limitations of the Current Web, Development of the Semantic Web, the Semantic Solution

Unit – II

Social Network Analysis Social Network analysis: What is Network analysis, Development of Social Network analysis, Key Concepts and Measures in Network analysis.

Unit – III

Web Intelligence Web data and Semantics in Social Network applications – Electronic Sources for Network analysis: Electronic Discussion Networks, Blogs and Online Communities, Web based Networks.

Unit – IV

Knowledge Representation: Knowledge Representation on the semantic web: Ontologies and their role in the Semantic web, Ontology languages for the semantic web.

Unit – V

Social Networks Analysis in The Sciences History of Social Networks – Context, Methodology-Data acquisition, Representation, Storage and Reasoning, Visualization and analysis.

Unit-VI

Dynamic Social Networks Applications and Research Trends, Dynamic social networks, Link prediction, Social learning on networks, Special issues in Information and Biological networks.

Text Books:

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

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

3.Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science, 2008.

Reference Books:

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

Internet of Things
(Professional Elective – II)

Subject Code: 20CSE324

L	T	P	C
3	0	0	3

Course Objectives

- To understand about the fundamentals of Internet of Things and its building blocks along with their characteristics
- To understand the recent application domains of IoT in everyday life
- To understand the protocols and standards designed for IoT and the current research on it.
- To understand the other associated technologies like cloud computing in the domain of IoT.

Course Outcomes

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

1. Understand Characteristics and Design of Internet of Things (IoT).
2. Compare various M2M and IoT architectures.
3. Study various Cloud Storage Models for IoT.
4. Design IoT System using Python.
5. Apply various Data Analytics tools for IoT.
6. Illustrate Internet of Things applications for various domains

Unit – I

Introduction: Internet of Things, Definition & Characteristics of IoT, Physical Design of IoT Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates. Domain Specific IoTs: Home, Cities, Environment, Energy systems, Logistics, Agriculture, Health & Lifestyle.

Unit – II

IoT & M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IoT Systems, Management with NETCONF-YANG, NETOPEER.

Unit – III

IoT Platforms Design Methodology IoT Design Methodology, Case Study on IoT System for Weather Monitoring , Motivation for Using Python , IoT Systems - Logical Design using Python, Installing Python , Python Data Types & Data Structures ,Control Flow , Functions, Modules, Packages , File Handling, Date/Time Operations , Classes ,Python Packages of Interest for IoT.

Unit – IV

IoT Physical Devices & Endpoints, Raspberry Pi , About the Board , Linux on Raspberry Pi ,Raspberry Pi Interfaces , Programming Raspberry Pi with Python, Other IoT Devices.

Physical Servers & Cloud Offerings , Introduction to Cloud Storage Models & Communication APIs ,WAMP - AutoBahn for IoT , Xively Cloud for IoT , Python Web Application Framework- Django, Amazon Web Services for IOT

Unit – V

Data Analytics for IoT , Introduction , Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis , Apache Oozie, Apache Spark , Apache Storm, Using Apache Storm for Realtime Data Analysis.

Unit-VI

Case Studies Illustrating IoT Design, Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.

Text Books:

1. A.Bahgya and V.Madisetti,"Internet of Things", Univesity Press, 2015.
2. Raj Kamal "Internet of Things", MGH,2015.

Reference Books:

1. K.A.Lambert and B.L.Juneja "Fundamentals of Python", , Cengage Learning, 2012.
2. Rajkumar Buyaa and Amir V Dastjerdi, Internet of things: Principles and Paradigms, Morgan Kaufmann.
3. Olivier Hersent, David Boswarthick and Omar Elloumi, The Internet of Things: Key applications and Protocols, Wiley

Quantum Computing
(Professional Elective – III)

Subject Code: 20CSE331

L	T	P	C
3	0	0	3

Course Objectives

This course teaches the fundamentals of quantum information processing, including quantum computation, quantum cryptography, and quantum information theory.

Course Outcomes

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

1. Analyze the behaviour of basic quantum algorithms
2. Implement simple quantum algorithms and information channels in the quantum circuit model
3. Simulate a simple quantum error-correcting code
4. Prove basic facts about quantum information channels
5. Understanding the concepts of pervasive computing & quantum computing.
6. Ability to set up cluster and run parallel applications

Unit – I

Fundamental Concepts - Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.

Unit – II

Quantum Computation- Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications

Unit – III

Algorithms: Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database

Unit – IV

Quantum Computers - Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance.

Unit – V

Quantum Informations - Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information.

Unit – VI

Quantum Error Correction- Introduction, Shor code, Theory of Quantum Error – Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource.

Text Books:

1. Michael A. Nielsen and Isaac L. Chuang, "Quantum computation and quantum information", Cambridge University Press 2010.
2. P. Kaye, R. Laflamme, and M. Mosca, "An introduction to Quantum Computing", Oxford University Press, 1999.
3. Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013.

Reference Books:

1. David McMahon, "Quantum computing explained", Wiley-interscience, John Wiley & Sons, Inc. Publication 2008
2. David J. Griffiths, "Introduction to Quantum Mechanics", 2nd Edition, Prentice Hall New Jersey 1995
3. Michael A. Nielsen and Issac L. Chuang, "Quantum Computation and Information",Cambridge (2002)

Reference Links

1) https://nptel.ac.in/courses/104104082/
2) https://swayam.gov.in/nd1_noc19_cy31/preview

Data Warehousing and Data Mining
(Professional Elective – III)

Subject Code: 20CSE332

L	T	P	C
3	0	0	3

Course Objectives:

- Introduce basic concepts, principles, major techniques and algorithms in Data Warehousing and Data Mining. These include concepts and techniques for data preprocessing, OLAP, association rule mining, data classification, and data clustering.
- Discuss applications, Emerging Areas in Data Mining.

Course Outcomes:

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

1. Recognize types of Data, Data Quality, need of preprocessing and different measures of similarity and dissimilarity.
2. Differentiate between methods for modeling multidimensional data, design and implement Data Warehouse.
3. Characterize and compare different conceptions of data.
4. Explain in detail major techniques and algorithms involved in data mining, including techniques and algorithms for association rule mining, data classification, and data clustering.
5. Evaluate and increase the performance of a classifier.
6. Compare and contrast Partitioning, Hierarchical and Density based Clustering Algorithms.

Unit – I

Introduction to Data Mining: What is data mining, Motivating challenges, Origins of data mining, Data Mining Tasks, Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity. **(Text Book 1)**

Unit – II

Data Warehouse and OLAP Technology: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining. **(Text Book 2)**

Unit – III

Concept Description: Characterization and Comparison: Data Generalization and Summarization-Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes. **(Text Book 2)**

Unit – IV

Mining Frequent Patterns, Associations: Basic Concepts, Market Basket Analysis, Frequent Itemsets, Closed Itemsets, and Association Rules, Frequent Itemset Mining methods: Apriori Algoriyhm, Generating Association Rules from Frequent Itemsets, Improving the efficiency of Apriori, FP–Growth algorithm. **(Text Book 2)**

Unit – V

Classification and Prediction: What is classification? What is prediction? Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Increasing the Accuracy, Model Selection. **(Text Book 2)**

Unit – VI

Cluster Analysis: What is Cluster Analysis, Different Types of Clusterings, Different Types of Clusters, The Basic K–means Algorithm, K-means: Additional Issues, Bisecting K-means, K-means and Different Types of Clusters, Strengths and Weaknesses, K-means as an Optimization Problem; Agglomerative Hierarchical Clustering: The Basic agglomerative Hierarchical Clustering Algorithm, DBSCAN Algorithm. **(Text Book 1)**

Text Books:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, Second Edition, 2009.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.

Reference Books:

1. G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006.
2. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.

Natural Language Processing
(Professional Elective – III)

L	T	P	C
3	0	0	3

Subject Code: 20CSE333

Course Objectives

This course will enable students to

- Learn introduction to classical and modern techniques in NLP.
- Understand Word level analysis.
- Learn how to employ literary-historical NLP-based analytic techniques named entity recognition.
- Understand sentiment analysis and topic modelling.
- Introduction to text visualisation techniques and clustering the documents.
- Understand the use of Cross Lingual Information Retrieval (CLIR).

Course Outcomes

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

1. Describe the fundamental concepts and techniques of natural language processing.
2. Demonstrate N-Grams, TF-IDF and POS.
3. Illustrate how to collect data from social media, web and other sources using APIs, web-scraping.
4. Describe sentiment analysis and topic modelling.
5. Classify the text and visualisation.
6. Differentiate Multilingual and Cross Lingual Information Retrieval (CLIR).

Unit – I

Introduction to NLP: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM, Tokenization, Morphology fundamentals, Morphology Paradigms.

Unit – II

Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff -Word Classes, TF-IDF, Features, Word Vectors, Part-of-Speech Tagging, Rule-based, stochastic and Transformation-based tagging.

Unit – III

Data Collection and Software tools: Data Collection using API, Social Media, Web scraping; Software tools such as NLTK; Named EntityRecognition.

Unit – IV

Fundamentals of sentimental analysis and topic modeling: Sentiment Analysis; Block diagram of sentiment analysis, Applications, Topic Modeling, Goals of topic modeling; Stylometry.

Unit – V

Introduction to text classification and visualisation: Text classification, Text Visualization; Dendograms, PCA, Plotting the Text; Document Clustering;

Unit – VI

Machine Translation: Robust and Scalable Machine Translation; Question Answering in Multilingual Setting; Cross Lingual Information Retrieval (CLIR).

Text Books

1. Dan Jurafsky and James H. Martin. Speech and Language Processing (3rd ed. draft)
2.Jacob Eisenstein. Natural Language Processing
3.Delip Rao and Brian McMahan. Natural Language Processing with PyTorch

Reference Books

1.Yoav Goldberg. A Primer on Neural Network Models for Natural Language Processing
2. Ian Goodfellow, Yoshua Bengio, and Aaron Courville. Deep Learning

Reference Links

1. https://nptel.ac.in/courses/106/105/106105158/ A course on Nautrual Language Processing, by Prof. Pawan Agrawal, IIT Kharagpur.
2. https://nptel.ac.in/courses/106/106/106106211/ A course on Applied Nautral Laguage Processing, Prof. Rameseshan Ramchandran, IIT Madras.

Soft Computing
(Professional Elective – III)

L	T	P	C
3	0	0	3

Subject Code: 20CSE334

Course Objectives

To provide an understanding of the soft computing field and familiarize with neural networks and learning methods for neural networks and also understand the underlying principles of Fuzzy set theory and Fuzzy Inference, introduce basics of genetic algorithms and their applications in optimization and Planning, develop skills through understanding of the theoretical and practical aspects of Soft Computing.

Course Outcomes

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

1. Identify and describe soft computing techniques and their roles in building intelligent machines.
2. Recognize the feasibility of applying neural network methodology for a particular problem.
3. Define fuzzy systems
4. Apply genetic algorithms to combinatorial optimization and real life problems.
5. Analyze SWARM algorithms for optimization of solutions.
6. Design various hybrid solutions for a given problem.

Unit – I

Basics of Soft Computing : Overview of Soft Computing, Difference between Soft and Hard computing, Characteristics of Soft computing, Requirement of Soft computing, Components of soft computing including Artificial intelligence systems Neural networks, fuzzy logic, genetic algorithms, swarm algorithms, applications of Soft computing techniques.

Unit – II

Neural Network : What is Neural Network, how brain works, Neuron as a simple computingelement, Basic building block of an artificial neuron, The perceptron, Learning rules and variousactivation functions, McCulloch & Pitts model, Single layer and Multilayer Perceptrons, TheHopfield network, RBF Neural Network, Back Propagation networks, Architecture of Backpropagation(BP) Networks, Backpropagation Learning, accelerated learning in multilayer perceptron,

Unit – III

Fuzzy Logic: Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, MembershipFunctions, Fuzzy Rules & Fuzzy Reasoning, Fuzzification, Minmax Composition,Defuzzification Method, Fuzzy Logic, uzzy Rule based systems, Predicate logic, FuzzyDecision Making, Fuzzy Control Systems, Fuzzy Classification.

Unit – IV

Genetic Algorithms: Fundamentals of genetic algorithms: Encoding, Fitness functions,Reproduction. Genetic Modeling: Encoding, Crossover, Selection, Mutation, Convergence of GA, Bit-wise operators, Bitwise operators used in GA. Convergence of Genetic algorithm.Applications to Real life Problems, Issues related to GA.

Unit – V

Swarm Algorithms: Fundamentals of swarm algorithms, Reflection of various animalbehavior in swarm algorithms, Particle swarm optimization, Applications of PSO.

Unit – VI

Hybrid Systems: Genetic Algorithm based Back propagation Networks, Fuzzy Back Propagation Networks, Support Vector Machines for classification, Bidirectional AssociativeMemory, Probabilistic Neural Network, Applications.

Text Books

1. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn.,
2. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India.
3. N.P. Padhy and S.P. Simon, ''Soft Computing: With Matlab Programming'', Oxford University Press, 2015.
4. S.N.Sivanandam & S. N. Deepa, 'PRINCIPLES OF SOFT COMPUTING', John Wiley & Sons, 2008.

Reference Books:

1. S.Rajasekaran, G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic, and Genetic Algorithm (synthesis and Application)", PHI.
2. S. Haykins, "Neural networks: a comprehensive foundation". Pearson Education, India.
3. David E. Goldberg, "Genetic Algorithm in Search Optimization and Machine Learning" Pearson Education India, 2013.
4. V. Keeman, "Learning and Soft computing", Pearson Education, India.
5. F. O. Karry and C. de Silva, "Soft Computing and Intelligent Systems Design – Theory, Tools and Applications". Pearson Education. (Printed in India).
6. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall of India.

Reference Links

1. http://nptel.ac.in/courses/117105084/
2. http://nptel.ac.in/courses/108104049

Professional Communication Skills Lab

L	T	P	C
0	0	3	1.5

Subject Code: 20HSL302

Course Objectives

- To provide students with a wide range of vocabulary to enable them to take language tests for higher education and employment
- To assist students acquire effective and adequate presentation skills
- To get students learn to collect comprehensive data for a project report
- To help students master techniques of being successful in group discussions
- To improve communication skills of students by making them participate in different language activities
- To prepare students for facing interviews self-assuredly

Course Outcomes

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

1. State meanings, synonyms, antonyms, analogies, idioms, phrases, one-word substitutes, word roots, prefixes and suffixes for words in general.
2. Present and interpret data on select topics using pre-existing slides.
3. Collect data extensively on a social issue and make it public for the sake of enlightening populace.
4. Contribute proactively and extrapolate in group discussions.
5. Make impromptu speeches.
6. Prepare Job Application and Résumé / CV of their own, and face interviews confidently.

.

List of Experiments

Experiment – 1 Classified Vocabulary

Experiment – 2 Power Point Presentation

Experiment – 3 Project Reports on Social Issues

Experiment – 4 Group Discussion

Experiment – 5 Debate

Experiment – 6 Job Application and Résumé / CV Writing— Mock Interviews

References

1. Advanced Communication Skills Lab. Version 1.0 (Software). K-VAN Solutions Pvt. Ltd.
2. Communication Skills. Sanjay Kumar and Pushpa Lata. Oxford University Press. 2011.
3. Speak Well. K. Nirupa Rani. Orient Blackswan, Hyderabad. 2012.
4. Strengthen Your Communication Skills. M. Hari Prasad. Maruthi Publications, Hyd. 2014.
5. Strengthen Your Steps. M. Hari Prasad. Maruthi Publications, Hyderabad. 2012.
6. Technical Communication. Meenakshi and Sangeetha. OUP. New Delhi. 2013.

Mobile Application Development Lab

Subject Code: 20CSL307

L	T	P	C
0	0	3	1.5

Course Objectives

- Explain the differences between Android and other mobile development environments
- Understand how Android applications work, their life cycle, manifest, Intents, and using external resources.
- Design and develop useful Android applications with compelling user interfaces by using, extending, and creating your own layouts and Views and using Menus.
- Take advantage of Android's APIs for data storage, retrieval, user preferences, files, Databases, and content providers
- Use Android's communication APIs for SMS, telephony.

Course Outcomes

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

1. Design and develop user Interfaces for the Android platform
2. Develop application to perform basic mobile operations programmatically
3. Able to know how to acquire additional resources to develop android applications
4. Apply Java programming concepts to Android application development.
5. Familiar with SQLite database operations on data locally in android application

List of Experiments

1. Write an android application program that accepts input from the user and displays the hello to the user in response as output using eclipse
2. Write an android application program that demonstrates different layouts in android.
3. Write an Android application program to generate a simple notification message.
4. Write an Android application program to generate alert dialogue.
5. Write an android application program to display progress bar
6. Write an android application program to pick date.
7. Write an android application program to make phone call and SMS.
8. Write an android application that shows how to use intents in mobile application development
9. Write an Android application program to display List view.
10. Write an android application program that converts the temperature from Celsius to Fahrenheit
11. Write an android application program to develop a simple calculator.
12. Write an android application program to perform SQLlite operations

Text Books

1. J.F. DiMarzio,"Android: A Programming Guide"Tata McGraw-Hill Education Pvt. Ltd., 2010
2. Camilus Raynaldo,"Android Programming Painless " Kindle Edition,

Reference Books:

1. John Horton,"Android Programming for Beginners" PACKET PUBLISHING, 2015
2. Pradeep Kothari,"Android Application Development" , Black Book,DREAM TECH,2014

Reference Links

1. https://developer.android.com/training/index.html
2. https://www.tutorialspoint.com/android/
3. http://nptel.ac.in/syllabus/106106147/

Soft Skills
(Common to All)

Subject Code: 20SSS301

L	T	P	C
1	0	2	2

Course Objectives

- Develop communicative competence in students of engineering.
- Enrich students emotional intelligence and inter personal skills
- Enable students to understand the importance of employing appropriate body language when communicating
- Develop students competence in written communication.
- Train students in interview skills, group discussions and presentation skills to enhance their employability skills.
- Bridge the gap between the current skill sets of students and the skills required by a potential employer through practice.
- Make students industry ready by grooming for corporate life.

Course Outcomes

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

Apply communication theory to solve workplace communication issues

1. Demonstrate the communication required in the work place interpersonal and intrapersonal communication skills, listening skills along with barriers of communication
2. Interpret the role non verbal communication cultural difference business etiquettes in communication
3. Express and understand complex ideas accurately in written and spoken formats: resume writing email writing and report writing.
4. Express technical knowledge and expertise orally through presentations group discussions and interviews to enhance employability competence.
5. Preparing students for campus to corporate transition and help to improve their communication competence.
6. Enable students to learn the techniques to acc the tests through English competence and demonstrate second language competence to enhance employability skills among students.

Unit – I

Fundamentals of communication: Fundamentals and process of communication**:** Objectives of communication process of communication types of communication, noise listening skills types of listening essentials of good listening and tips.

Unit – II

Interpersonal communication and emotional intelligence: Managing interpersonal and intrapersonal communication – Role of emotion in interpersonal communication – Barriers to interpersonal communication – Exchange theory – Gateways for effective interpersonal communication.

Unit – III

Non verbal communication, Attire & Etiquettes : Non verbal Communication and body language kinesics, Polemics, Paralanguage, Hepatics, Handshakes ,appropriate body language and mannerisms for interviews business etiquettes- across different cultures.

Unit – IV

Technical communication and resume writing : written communication, mechanics of writing, report writing , business correspondence – business letter and Email format – meetings and managing meeting – Resume and cove letter writing – Formats.

Unit – V

Presentation and group discussion: Presentation skills prerequisites of effective presentation, format of presentation, Assertiveness strategies of assertive behavior, communication skills for group discussions and interviews, interview techniques.

Unit – VI

Campus to corporate training: Goal setting – Establishing Smart goals, Importance of mission statements, formulation of goals time management – Prioritization, dealing with difficult tasks, getting organized, conflict management – creating a win-win situation, negotiation and persuasion, dealing with Aggressive behavior, interpersonal and team building skills – Managing relationships, Understandings cultural Diversity, Teambuilding process and techniques, coordination in terms.

Text Books

1. Suresh, K. E. (2010). *Communication Skills and Soft Skills: An Integrated Approach (With Cd)*. Pearson Education India.
2. Meenakshi Rama,"Business Communication", Oxford University Press, New Delhi
3. Viswanathan, R. (2010). *Business communication*. Himalaya Publishing House.
4. Butterfields, Jeff Soft skills for Everyone,NewDelhi,Cengage Learning, 2010.

Reference Books

1. Quintanilla, K. M., & Wahl, S. T. (2018). *Business and professional communication: Keys for workplace excellence*. Sage Publications.
2. Rajput, A. S., & Sharma, S. (2022). Importance of communicating science to the general public: an empirical study of top Indian scientists. *Weather*.
3. Thorpe, E. (2011). *Winning at Interviews, 4/e*. Pearson Education India.
4. Rovida, E., & Zafferri, G. (2022). *The Importance of Soft Skills in Engineering and Engineering Education*. New York: Springer.
5. Sinha, R. P. (2003). Current English Grammar and Usage with Composition.
6. Agarwal, N. K. (2009). AN EVALUATION OF KIRAN DESAI'S THE INHERITANCE OF LOSS1. *The Grove: Working papers on English studies*, (16), 115-128.

Advance Machine Learning

(Honors/Minor Course: Artificial Intelligence & Machine Learning**)**

Subject Code: 20AIT303

L	T	P	C
4	0	0	4

Course Objectives

- Be familiar with a breadth of foundational machine learning concepts;
- Be able to implement standard machine learning methods without the use of pre-packaged machine learning software;
- Be able to make informed decisions about which machine learning methods are appropriate for different tasks;
- Have awareness of the mathematical and computer science concepts underlying machine learning;

Course Outcomes

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

1. Familiar with the statistical foundation of ensemble approaches and able to interpret the variance and bias trade-off in machine learning algorithms.
2. Able to analyse various boosting approaches and have the ability to adapt the existing boosting approaches to different purposes.
3. Familiar with the working of Restricted Boltzmann machine and their application in solving particular machine learning problem
4. Able to interpret the state-of-the-art methods in Bayesian state estimation, parameter estimation andapplications.
5. Able to demonstrate knowledge of the forecasting models and the relative strengths and weaknesses of each and their most appropriate uses.
6. Able to assess how these modular components can be combined to build state-of-the-art NLP systems.

Unit – I

Introduction to Ensemble Methods: Bagging, weak learner, bias-variance tradeoff, Bootstrapping, Random forests, Voting machine, Application to real world problems.

Unit – II

Boosting ensemble learning: Adaptive boosting, XGboost, Light boost, Catboost, Stacking.

Unit – III

Structured Models: Restricted Boltzmann machine, An overview of Restricted Boltzmann Machines and Contrastive Divergence, size of a mini-batch, Monitoring the progress of learning and overfitting, Markov Random fields, Hidden Markov model.

Unit – IV

Introduction to Regularization: Bias and Variance, Regularization Techniques, Early Stopping, L1 Regularization, L2 Regularization, Sparse Coding, Dropout layer.Dealing uncertainty in ML, Bayesian modelling and Gaussian processes, randomised methods, Bayesian neural networks.

Unit – V

Forecasting models: Trend analysis, Cyclical and Seasonal analysis, Smoothing, Moving averages, Box-Jenkins, Holt-winters, Auto-correlation; ARIMA, Examples: Applications of Time Series in financial markets.

Unit – VI

Natural Language Processing:NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation, Information retrieval, Text Simplification, Text Summarization, Supervised and unsupervised methods for NLP.

Text Book

1. Aurélien Géron (2019) Hands-On Machine Learning with Scikit-Learn and TensorFlow (Concepts, Tools, and Techniques to Build Intelligent Systems), 2nd Edition, ISBN-13: 978-1492032649, O'Reilly Media.
2. Giuseppe Bonaccorso(2020) Mastering Machine Learning Algorithms: Expert techniques for implementing popular machine learning algorithms, fine-tuning your models, and understanding how they work, 2nd Edition, Packt Publishing Limited; 2nd edition.

Reference Book

1. Mitchell Tom (1997). Machine Learning, Tata McGraw-Hill
2. C. M. BISHOP (2006), Pattern Recognition and Machine Learning, Springer-Verlag New York, 1st Edition.
3. Steven Bird, Ewan Klein, Edward Loper (2009) Natural Language Processing with Python: Analysing Text with the Natural, Language Toolkit, O'RELLY publications.

Cryptography and Network Security

Subject Code: 20CST413

L	T	P	C
3	0	0	3

Course Objectives

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

- To clearly recognize the different Security Attacks, Security Services and Security Mechanisms.
- To demonstrate the basic categories of Cryptographic Systems, different Conventional Encryption Algorithms and describe the important public-key cryptosystems.
- To analyze the authentication by studying different authentication applications.
- To describe the security approaches related to Electronic Mail and to express the overall structure of IPSec.

Course Outcomes

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

1. Recall different Security Attacks, Services and Mechanisms.
2. Classify and explain categories of different encryption and decryption techniques.
3. Identify the authentication applications such as Kerberos and x.509 directory services.
4. Analyze the usage of PGP and S/MIME
5. Familiar with the importance of IP Security.
6. Exposed to viruses and related threats and different types of firewalls.

Unit – I

Introduction: Security Attacks, Security Services and Security Mechanisms, Network security model. **Software Vulnerabilities:** Buffer Overflow, Format String Attacks and SQL Injection. **Basics of Cryptography:** Substitution Techniques, Transposition Techniques, Block and Stream Ciphers.

Unit – II Conventional Encryption and Message Confidentiality: Conventional Encryption Principles, Algorithms: DES, Triple DES, Blowfish, IDEA and AES, Cipher Block Modes of Operations.

Unit – III

Public-Key Cryptography and Message Authentication: Public Key Cryptography Principles, Algorithms: RSA, Diffie-Hellman Key Exchange, Digital Signatures, Approaches to Message Authentication, Secure Hash Functions (SHA-1).

Authentication Applications - Kerberos: Motivation, Requirements, Version 4, X.509 Authentication Certificate format.

Unit – IV

Electronic Mail Security - Pretty Good Privacy: Notation, Operational Description. **S/MIME:** RFC 822, Limitations of SMTP, MIME Overview, MIME Content Types, MIME Transfer Encodings, S/MIME Functionality.

Unit – V

IP Security: IP security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, key management.

Viruses and Warms, **Firewalls:** Design Principles, Characteristics, Types of Firewalls.

Unit – VI

Web Security: Considerations, **SSL:** Architecture, Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol, **SET:** Overview, Dual Signatures, Payment Processing.

Text Books:

1. Network Security Essentials: Applications and Standards, William Stallings, Pearson Education.
2. Cryptography and Network Security:Principles and Practice, William Stallings, Pearson education.

Reference Books:

1. Cryptography and Network Security, 3rd Edition, Behrouz A. Fourouzan and Debdeep Mukhopadhyay, McGraw-Hill, 2015.
2. Principles of Information Security, Whitman, Thomson.
3. Introduction to Cryptography, Buchmann, Springer.

Reference Links

1. https://nptel.ac.in/courses/106105031/
2. https://nptel.ac.in/courses/106105162/

Machine Learning

Subject Code: 20CST414

L	T	P	C
3	0	0	3

Course Objectives

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

- Students understand issues and challenges of Machine Learning.
- Should be able to select data, model, model complexity etc.
- Understand the strengths and weaknesses of many popular machine learning approaches.

Course Outcomes

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

1. Identify the suitable method of statistics on the given data to solve the problem of any heuristic approach of prediction.
2. Understand the basic concepts of various types of machine learning and classification algorithms and their applicability in solving machine learning problems.
3. Assess the suitability of clustering algorithms in solving a particular problem.
4. Apply various dimensionality reduction techniques for the extraction of features from highdimensionality data
5. Develop scaling up machine learning techniques and associated computing techniques and technologies for various applications
6. Recognize the feasibility of applying neural network methodology for solving real time application problems.

Unit – I

Introduction to Statistics: What is statistics, Categorical data, Numerical data, Univariate and Bivariate Analysis, Mean, Median, Mode, Standard Deviation, Harmonic Mean,Line plot, Bar Plot, Patch Plot, Pie Plot, Scatter plot, Box plots, Histogram, Density plot.

Normalization: Decimal Scaling, Min-Max scaling, Z-score

Unit – II

Data Pre-processing steps: Data cleaning- different ways of handling missing data

Noisy data: binning method, regression, clustering

Feature analysis: Dimensionality Reduction, Feature Selection, Feature Projection, Filter Method, Wrapper Method, Embedded Method, Feature Projection, Principal Component Analysis (PCA), and Linear Discriminant Analysis (LDA).

Unit – III

Machine Learning: Supervised Learning, Unsupervised Learning and Ensemble Learning: Bagging, stacking, and boosting. Reinforcement Learning.

Unit – IV

Classification: Simple Linear Regression, Decision Trees, Naïve Bayes Classification, Decision Tree and Rule based Classification, K-Nearest Neighbor.

Unit – V

Regression: Multiple Linear Regression, Polynomial Regression, Regularization, Support Vector regression, Random Forest regression, Lasso regression.

Performance metrics: Confusion matrix, sensitivity, specificity, F1 score, Recall, Precision, ROC-AUC Curve, Cross validation technique - K-fold

Unit – VI

Models of ANNs: Introduction to ANN, Structure and working of biological Neural Network, Perceptron, Feed-forward Neural Network, Feedback Neural Network, Multi-layer Feed forward Networks, Delta learning rule for Multi-Perceptron layer, Error back-propagation training networks.

Text Books:

1. Thomas Haslwanter, "An Introduction to Statistics with Python with Applications in the Life Sciences", Springer International Publishing Switzerland 2016, ISBN 978-3-319-28315-9, ISBN 978-3-319-28316-6 (eBook)
2. Allen B. Downey, "Think Stats", Second Edition, O'Reilly Media, ISBN: 978-1-491-90733-7
3. Foundations of Machine Learning, Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar, MIT Press, Second Edition, 2018.

Reference books:

1. José Unpingco, "Python for Probability, Statistics, and Machine Learning", Springer International Publishing Switzerland, ISBN 978-3-319-30715-2, DOI 10.1007/978-3-319-30717-6, ISBN 978-3-319-30717-6 (eBook)
2. Claus Weihs, Olaf Mersmann, Uwe Ligges, "Foundations of Statistical Algorithms", CRC Press, ISBN-978-1-4398-7887-3 (eBook - PDF)

Books:

- http://file.allitebooks.com/20151204/Foundations%20of%20Statistical%20Algorithms.pdf
- http://onlinestatbook.com/Online_Statistics_Education.pdf
- https://upload.wikimedia.org/wikipedia/commons/8/82/Statistics.pdf
- http://cnx.org/content/col10522/1.38/pdf
- http://www.greenteapress.com/thinkstats/thinkstats.pdf

MOOC/ Video Lectures available at:

- https://www.udemy.com/course/introduction-to-bayesian-statistics/ (Free Course)
- https://www.youtube.com/watch?v=xxpc-HPKN28
- https://www.udacity.com/course/intro-to-statistics--st101# (Free Course)
- https://nptel.ac.in/courses/111/105/111105090/
- https://nptel.ac.in/courses/111/105/111105077/

Software Testing Methodologies
(Professional Elective – IV)

Subject Code: 20CSE441

L	T	P	C
3	0	0	3

Course Objectives

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

- To provide knowledge of the concepts in software testing such as testing process, criteria, Strategies and methodologies.
- To develop skills in software test automation and management using latest tools.
- It also helps to learn the types of bugs, testing levels with which the student can very well identify a bug and correct as when it happens.
- It provides knowledge on transaction flow testing and data flow testing techniques so that the flow of the program is tested as well.
- To learn the domain testing, path testing and logic based testing to explore the testing process easier.

Course Outcomes

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

1. Understand the basic concepts of testing, path testing and sensitization
2. An Ability to learn about the transaction flow testing and data flow testing.
3. Understand the concepts of domain based testing and logic based testing.
4. To describe about the path product and data flow anomaly detection.
5. Understand the concepts of transitions testing.
6. Apply software testing techniques in commercial environments

Unit – I

Introduction Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing : Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

Unit – II

Transaction Flow, Testing Transaction flows, transaction flow testing techniques.

Dataflow testing:-Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

Unit – III

Domain Testing:-domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

Unit – IV

Paths, Path products and Regular expressions Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

Unit – V

Logic Based Testing Overview, decision tables, path expressions, kv charts, specifications. State, State Graphs and Transition testing : State graphs, good & bad state graphs, state testing, Testability tips.

Unit – VI

Graph Matrices and Application Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. Usage of JMeter and Winrunner tools for functional Regression testing.

Text Books:

1. Boris Beizer, "Software Testing techniques", 3re edition., Dreamtech, 2016.
2. Dr. K. V. K. K. Prasad, "Software Testing Tool", 2nd edition., Dream tech. 2018.

Reference Books:

1. Brian Marick, "The craft of software testing", 2nd ed., Pearson Education, 2007.
2. Edward Kit, "Software Testing in the Real World ", 2nd ed., Pearson Educaton, 2008.
3. The craft of software testing – Brian Marick, Pearson Education.
4. Software Testing Techniques – SPD(Oreille)
5. Software Testing in the Real World – Edward Kit, Pearson.
6. Effective methods of Software Testing, Perry, John Wiley.

Reference Links:

1. NOC: Software Testing, ST: (Video) https://nptel.ac.in/courses/106/101/106101163/

Human Computer Interaction
(Professional Elective – IV)

Subject Code: 20CSE442

L	T	P	C
3	0	0	3

Course Objectives

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

- To facilitate communication between students of psychology, design, and computer science on user interface development projects.
- To provide the future user interface designer with concepts and strategies for making Design decisions.
- To expose the future user interface designer to tools, techniques, and ideas for interface design.
- To introduce the student to the literature of human-computer interaction.
- To stress the importance of good user interface design

Course Outcomes

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

1. Apply rules for effective graphical and web design methodology.
2. Evaluate many characteristics and considerations that must be applied to the interface and screen design process.
3. Indentify the components of graphical and web interface and screens, including windows,
4. Understand the using of menus and controls
5. Organize graphical screens to encourage the fastest and most accurate comprehension and execution of screen components.
6. Choose screen colors and design screen icons.

Unit – I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. Characteristics of GUI, Popularity of Graphics, Web user – Interface popularity, characteristics- Principles of user interface.

Unit – II

Design Process: Human interaction with computers, importance of human characteristics in design, Human considerations in design. Understanding business functions-business definition and requirement Analysis, Determining Basic Business functions.

Unit – III

Develop System Menus and Navigation schemes: Structure, Function, Content, Formatting of Menus, Phrasing the Menu, Selecting Menu Choices, Navigating Menus, Kinds of graphical Menus.

Unit – IV

Select the Proper Kinds of Windows: Window Characteristics, Components of Windows, Window Presentation Styles, Types of Windows, Windows Management, Organizing Window Functions and Operations.

Unit – V

Write Clear Text and Messages. Web Systems, Select the Proper Device-Based Controls. Create Meaningful Graphics, Icons and Images.

Unit – VI

Multimedia Choose the Proper Colors: Color-What Is It? Color Uses, Possible Problems with Color, Color and human vision, Choosing Colors for Textual Graphics Screens, Statistical Graphics Screens and Web Pages. Uses of Color to Avoid. Modern Tool usage to Design UI.

Text Books:

1. Wilbert O Galitz ,"The essential guide to user interface design," Wiley DreamTech.
2. Ben Shneidermann , "Designing the user interface". 3rd Edition, Pearson Education Asia.

Reference Books:

1. Human – Computer Interaction. ALAN DIX, JANET FINCAY, GRE GORYD, ABOWD, RUSSELL BEALG, PEARSON.
2. Interaction Design PRECE, ROGERS, SHARPS. Wiley Dreamtech,
3. User Interface Design, Soren Lauesen , Pearson Education.
4. The Essentials of Interaction Design, 3rd edition, Wiley 2007.

Reference Links

1. http://learnlinky.com/2018/01/introduction-human-computer-interaction/
2. http://hci.liacs.nl/tutorials

Cyber Security
(Professional Elective – IV)

Subject Code: 20CSE443

L	T	P	C
3	0	0	3

Course Objectives

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

The objective of the course is to teach the basic concepts and techniques of Cyber Security, and understanding of the main issues related to security in modern networked computer systems. This covers underlying concepts and foundations of computer security, basic knowledge about security-relevant decisions in designing IT infrastructures.

Course Outcomes

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

1. Understand key terms and concepts in cyber security fundamentals.
2. Gain knowledge about attacker techniques and motivations.
3. Differentiate various governing bodies of cyber laws.
4. Understand principles of malicious code.
5. Obtain comprehensive knowledge on Defense and Analysis Techniques.
6. Know about Data Forensics and Incident Response

Unit – I

Cyber Security Fundamentals: Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System (DNS), Microsoft Windows Security Principles: Windows Tokens, Window Messaging, Windows Program Execution

Unit – II

Introduction to cyber-attacks, application security (design, development and testing), operations security, monitoring, identifying threats and remediating them, Principles of data security - Confidentiality, Integrity and Availability, Data Privacy, Data breaches, preventing attacks and breaches with security controls, Compliance standards, Computer Ethics.

Unit – III

Cyber Security Management Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing With Disaster – Legal Issues – Protecting programs and Data.

Introduction to Cyber Law: Cyber Law, Need for Cyber Law Jurisprudence of Indian Cyber, Law, Evolution of Cyber Crime

Unit – IV

Malicious Code: Self-Replicating Malicious Code, Evading Detection and Elevating Privileges, Stealing Information and Exploitation, Research ideas in Cyber Security.

Unit – V

Defense and Analysis Techniques: Memory Forensics, Honeypots, Malicious Code Naming, Automated Malicious Code Analysis Systems, Cyber Security current trends and standards.

Unit – VI

Data Forensics and Incident Response: Data Forensics, Incident Handling Process, Computer Forensics Investigation Process, Hard Disks and File Systems, Operating System Forensics, Anti-Forensics Techniques, Eradication and Recovery

Text Books:

1. James Graham, Richard Howard, Ryan Olson "CYBER SECURITY ESSENTIALS", CRC Press, Taylor & Francis Group, LLC, 2011.
2. Sammons, John, and Michael Cross. The basics of cyber safety: computer and mobile device safety made easy. Elsevier, 2016.

Reference Books:

1. Thomas A. Johnson "Cyber Security", CRC Press, Taylor & Francis Group, LLC, 2015.
2. Brooks, Charles J., Christopher Grow, Philip Craig, and Donald Short. Cybersecurity essentials. John Wiley & Sons, 2018.
3. Charles P. Pfleeger, Shari Lawrence, Pfleeger Jonathan Margulies; Security in Computing, Pearson Education Inc . 5th Edition, 2015

Refernce Link:

1. **https://onlinecourses.swayam2.ac.in/nou19_cs08/preview**

Data Analytics
(Professional Elective – IV)

Subject Code: 20CSE444

L	T	P	C
3	0	0	3

Course Objectives

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

- Make use of Data Analysis.
- Create descriptive statistics and tabulation.
- Apply Data Visualization to numerous plots.
- Illustrate the HDFS file system, Map Reduce frameworks.
- Develop sorting, Map and Reduce side joins.

Course Outcomes

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

1. Classify the creation of data objects.
2. Analyze the manipulation of data objects such as select, sort, rearrange, display and testfor different object types.
3. Analyze different distributions and graphs.
4. Outline the concepts of HDFS file systems and interfaces and able to keep HDFSCluster balanced
5. Compile map reduce classes, combiner functions and map reduce job.
6. Analyze different latest Hadoop applications.

Unit – I

Some Simple Math, Types of Data Items, The Structure of Data Items, Reading and Getting Datainto R, Viewing Named Objects, Examining Data Structure, Working with History Commands, Saving Your Work in R.

Unit – II

Manipulating Objects, Viewing Objects within Objects, Constructing Data Objects, Forms of Data Objects: Testing and Converting, Summary Commands, Summarizing Samples, Summary Tables.

Unit – III

Introduction to Data Analytics-Data Analytics Overview, Importance of Data Analytics, Types of Data Analytics, Data Visualization for Decision Making, Data Types, Measure Of central tendency, Measures of Dispersion, Graphical Techniques, Sampling Funnel, Sampling Variation, Central Limit Theorem, Confidence interval).

Unit – IV

Introduction to Big Data Platform – Challenges of conventional systems - Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting - Modern data analytic tools.

Unit – V

Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics - Rule induction.

Unit –VI

MapReduce-Hadoop, Hive,MapR, Sharding,NoSQLDatabases,S3,Hadoop Distributed file Systems,Visualizations,Visual data analysis techniques, interaction techniques; Systems and applications.

Text Books:

1. Mark Gardener, "Beginning R: The Statistical Programming Language" First Edition, Wrox Publisher.
2. Tom White ,"Hadoop: The Definitive Guide", 3rd Edition, O'reilly
3. Chuck Lam, "Hadoop in Action" MANNING Publ.

Reference Books:

1. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2011. Ron Bekkerman, Mikhail Bilenko and John Langford, Scaling up Machine Learning: Parallel and Distributed Approaches, Cambridge University Press, 2011.
2. Tom White, Hadoop: The Definitive Guide, O"Reilly Media, Third Edition, 2012.
3. Bill Franks, Taming The Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Wiley, 2012.
4. Michael Minelli, Michele Chambers, and Ambiga Dhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley, 2013.
5. Frank J. Ohlhorst, Big Data Analytics: Turning Big Data into Big Money, Wiley, 2012.
6. Arvind Sathi, Big Data Analytics: Disruptive Technologies for Changing the Game, MC Press, 2012.

Reference Link:

1. **https://nptel.ac.in/courses/106107220**
2. http://www.r-tutor.com/elementary-statistics
3. Hadoop in Practice by Alex Holmes, MANNING Publ.
4. Hadoop Map Reduce Cookbook, Srinath Perera, Thilina Gunarathne
5. Hadoop: http://hadoop.apache.org/

Image Processing
(Professional Elective – V)

Subject Code: 20CSE451

L	T	P	C
3	0	0	3

Course Objectives

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

- Cover the basic theory and algorithms that are widely used in digital image processing.
- Expose students to current technologies and issues that are specific to image processing systems.
- Give Hands-on experience in using computers to process images.
- Formulate solutions to general image processing problems
- Familiarize with image manipulations and analysis

Course Outcomes

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

1. Explain Fundamentals in Image Processing.
2. Apply Image Transforms and Spatial Domain Techniques for Image Enhancement.
3. Demonstrate various Morphological Algorithms.
4. Discuss basic concepts of color image processing
5. Compare and analyze Image Compression Techniques.
6. Classify Various Image Segmentation Techniques.

Unit – I

Digital Image Fundamentals: Examples of fields that Use Image Processing, Fundamental Steps & Components in Digital Image Processing; Image Sampling and Quantization- Spatial and Gray level Resolution - Zooming and Shrinking; Basic Relationship Between Pixels.

Unit – II

Image Transforms: 2D-DFT and properties, Discrete Cosine Transform

Image Enhancement: Basic Gray level Transformations, Histogram processing, Arithmetic/ Logical Operations- Image Subtraction and Image Averaging, Basics of Spatial Filtering.Smoothening Spatial Filters, Sharpening Spatial Filters.

Unit – III

Image Morphology : Preliminaries- Basic Concepts from Set theory, dilation and erosion, opening and closing, Hit or Miss Transformation, Basic Morphological algorithms- Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull,Skeletons.

Unit – IV

Image Segmentation: Basics; Detection of discontinuities- point, line, edge detection, edge linking and boundary detection-local processing, global processing via Graph-Theoretic techniques; Thresholding-Basic Global and Basic Adaptive Thresholding; Region- Based Segmentation-Basic Formulation, Region growing, Region Splitting and Merging.

Unit – V

Image Compression: Redundancy- Coding Redundancy, Inter pixel Redundancy, Psychovisual Redundancy; Fidelity Criteria- objective fidelity criteria, subjective fidelity criteria; Image Compression Models-The Source Encoder and Decoder, The Channel Encoder and Decoder; Error-

Free compression-Variable Length Coding, LZW Coding, Bit-Plane Coding, Image Compression Standard – JPEG

Unit – VI

Colour Image Processing: Fundamentals, Colour Models – RGB, CMY,CMYK, HSI, Pseudo Colour Image processing

Text Books

1. Digital Image Processing – R.C. Gonzalez & R.E. Woods, Addison Wesley / Pearson Education, 3rd Edition, 2018.
2. Digital Image Processing – S Jayaraman, S Esakkirajan, T Veerakumar, Tata McGraw Hill.

Reference Books

1. Digital Image Processing using MATLAB-Rafael C. Gonzalez, Richard E woods and Steven Eddins, Tata McGraw Hill, 2010.
2.Digital Image Processing and Computer Vision, Sonka, CENGAGE

Reference Links

1. http://www.imageprocessingplace.com/root_files_V3/tutorials.html

Ad-hoc and Sensor Networks
(Professional Elective – V)

Subject Code: 20CSE452

L	T	P	C
3	0	0	3

Course Objectives

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

- The comprehensive knowledge of various techniques in mobile networks/ Ad-hocnetworks and sensor based networks.
- Make observation of mobile Ad-hoc networks, design and implementation issues and available solutions.
- Discusses on routing mechanisms.
- Develop experience in designing and implementing sensor network functionality.

Course Outcomes

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

1. Summarize the concepts and applications of Ad-hoc networks.
2. Explain the goals and issues in designing a MAC protocols.
3. Distinguish various MAC protocols.
4. Discriminate various routing protocols for Ad-hoc Wireless Networks.
5. Explain Wireless Sensor Networks.
6. Demonstrate various MAC protocols for Sensor Networks.

Unit – I

Ad-hoc Wireless Networks: Introduction, Cellular and Ad-hoc Wireless Networks, Applications of Ad-hoc Wireless Networks, Issues in Ad-hoc Wireless Networks, Ad-hoc Wireless Internet.

Unit – II

MAC Protocols for Ad-hoc Wireless Networks: Introduction, Issues in designing a MAC Protocols for Ad-hoc Wireless Networks, Design goals of a MAC Protocol for Ad-hoc Wireless Network.

Unit – III

Classification of MAC Protocols: Contention-Based Protocols (MACAW, FAMA), Contention-Based Protocols with Reservation Mechanisms (D-PRMA, CATA), Contention- Based MAC Protocols with Scheduling Mechanisms (DPS, DWOP)

Unit – IV

Routing Protocols for Ad-hoc Wireless Networks: Introduction, Issues in designing a Routing Protocol for Ad-hoc Wireless Networks, Table-Driven Routing protocols (DSDV, WRP), On-Demand Routing Protocols (DSR, AODV), Hybrid Routing Protocols (CEDAR, ZRP).

Unit – V

Wireless Sensor Networks: Introduction, Comparison with Ad-hoc Wireless Networks, Issues and Challenges in designing a Sensor Network, Sensor Network Architecture: Layered architecture, Clustered architecture, Applications of Sensor Networks.

Unit – VI

MAC Protocols for Sensor Networks: Self-Organizing MAC for Sensor Networks and Eavesdrop and Register, Hybrid TDMA/FDMA, CSMA based MAC Protocols, Location Discovery: Indoor Localization, Sensor Network Localization, Quality of Sensor Network:Coverage, Exposure.

Issues: Energy efficient design, Synchronization, Security, Real-Time communication.

Text Books:

1. C.Siva Ram Murthy and B.S.Manoj,"Ad-hoc Wireless Networks: Architectures and Protocols", Pearson Education, 2004.
2. Feng Zhao, Leonidas Guibas, "Wireless Sensor networks: An information Processing Approach," Elsevier Science Import Morgan Kauffman Publishers, 2015.

Reference Books:

1. Carlos dc Morais Cordeiro and Dharma Prakash Agrawal, "Ad-hoc and Sensor Networks: Theory and Applications", World Scientific Publications / Cambridge University Press, 2006.

Reference Link:

1. http://nptel.ac.in/courses/106105160/

Simulation and Modeling
(Professional Elective – V)

Subject Code: 20CSE453

L	T	P	C
3	0	0	3

Course Outcomes

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

1. Differentiate between continuous and discrete system models.
2. Describe continuous system simulation and methods.
3. Analyze stochastic variables and probability functions.
4. Outline the methods for discrete simulation.
5. Articulate queuing disciplines with mathematical solutions
6. Assess problems and propose solutions through SIMSCRIPT and GPSS algorithms.

Unit – I

Introduction to Modelling and Simulation: Nature of Simulation: Systems, Models and Simulation, Continuous and Discrete Systems, Components of a simulation study, Static and Dynamic physical models, Static and Dynamic Mathematical models; Advantages, Disadvantages and pitfalls of Simulation.

Unit – II

System Simulation and Continuous System Simulation: Types of System Simulations; Monte Carlo Method, Comparison of analytical and Simulation methods; Distributed Lag Models, Cobweb Model; Continuous System models, Analog and Hybrid computers, Digital-Analog Simulators.

Unit – III

System Dynamics & Probability concepts in Simulation: Exponential growth and decay models; logistic curves; Generalization of growth models; System dynamics diagrams;

Unit – IV

Probability concepts in Simulation: Discrete and Continuous probability functions, Continuous Uniformly Distributed Random Numbers, Generation of a Random numbers, Generating Discrete distributions.

Unit – V Simulation of Queuing Systems and Discrete System Simulation: Poisson arrival patterns; Exponential distribution Service times; Normal Distribution Queuing Disciplines, Simulation of single and two server queue. Application of queuing theory in computer system. Discrete Events, Generation of arrival patterns.

Unit – VI

Simulation languages: GPSS: Action times, Succession of events, Choice of paths; Conditional transfers, program control statements. **SIMSCRIPT**: Organization of SIMSCRIPT Program, Names & Labels, SIMSCRIPT statements. Estimation methods.

Text Books:

1. Geoffrey Gordon, “System simulation”, 2nd edition Prentice Hall.
2. Andrew F. Seila, “Applied Simulation Modelling”, 1st edition, Cengage Learning

Reference Books:

1. Averill M. Law. “Simulation Modelling and Analysis”, 5th edition, McGraw Hill.
2. Deo Narsingh, Millican Charles E, “System Simulation with Digital Computer”, PHI.

Reference Links:

1. **https://nptel.ac.in/courses/112107214**

Cloud Computing
(Professional Elective – V)

Subject Code: 20CSE454

L	T	P	C
3	0	0	3

Course Objectives

Cloud Computing is a large-scale distributed computing paradigm that has become a driving force for information technology over the past several years. This course introduces cloud computing technology to undergraduate engineering students, so they can learn, apply, and use it in their future careers.

Course Outcomes

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

1. Understand and analyze different computing paradigms.
2. Understand the basics of cloud computing and different cloud deployment models.
3. Explain the cloud architecture and management strategies.
4. Assessing the financial and technological and organizational capacity of employers for actively initiating and installing cloud-based applications
5. Understand and evaluate different cloud service models.
6. Understand various virtualization concepts and evaluate various storage classifications and technologies.

Unit – I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio Computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

Unit – II

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud Computing, and Cloud Computing is a Service, Cloud Computing is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models. *(add following topics: Virtualization)*

Unit – III

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure, Managing the Cloud Application, Migrating Applications to Cloud, Phases of Cloud Migration Approaches for Cloud Migration. *(add following topics: load balance and disaster management)*

Unit – IV

Using Cloud Services: Collaborating on Calendars, Schedules, Task Management, Event Management, Contact Management, and Project Management.

Unit – V

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros, and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

Unit – VI

Virtualization and Storage Management: Introduction, Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization. Evolution of Storage Technology, Storage Models, File Systems and Databases, Distributed File Systems, Google File System, Apache Hadoop, and NoSQL Databases.

Text Books:

1. Chandrasekaran, K. Essentials of cloud computing. CrC Press, 2014. Taylor & Francis Group.
2. Miller, Michael. Cloud computing: Web-based applications that change the way you work and collaborate online. Que publishing, 2008. 1st edition.

Reference Books

1. Velte, Anthony T., et al. "Cloud computing: a practical approach." (2010).
2. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering cloud computing: foundations and applications programming. Newnes, 2013.

Reference Links

1. https://nptel.ac.in/courses/106/105/106105167/

UML & DP Lab

Subject Code: 20CSL408

L	T	P	C
0	0	3	1.5

Course Objectives

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

Know the practical issues of the different Object oriented analysis and design concepts and Carry out the analysis and design of a system in an object oriented way. Create an object-oriented design using design patterns and Compare design patterns with object-oriented designs

Course Outcomes

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

1. Construct different UML diagrams to model structural aspects of software system.
2. Model behavioral aspects of a system.
3. Explain different views of an object oriented system.
5. Understand the structure and logic of design patterns.
5. Distinguish different design patterns
6. Apply design patterns to solve design problems.

List of Experiments

1. To create a UML diagrams of Library Management System.
2. To create a UML diagrams of ATM Application.
3. To create a UML diagrams of Hospital Management System.
4. To create a UML diagrams of Airline Reservation Systems.
5. To create a UML diagram of ONLINE BOOK SHOP
6. Using UML design Factory Design pattern
7. Using UML design Composite Design pattern
8. Using UML design Abstract Factory Design Pattern.
9. Using UML design Bridge Design Pattern
10. Using UML design Chain of Responsibility
11. Using UML, design Builder design pattern
12. Using UML, design Decorator design pattern

Text Books

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Mark Priestley: Practical Object-Oriented Design with UML,TATAMcGrawHill .

Reference Books:

1. Design Patterns Explained By Alan Shalloway,Pearson Education
2. Head First Design Patterns By Eric Freeman-Oreilly-spd

Reference Link

1. https://nptel.ac.in/courses/106105224

Machine Learning Lab

Subject Code: 20CSL409

L	T	P	C
0	0	3	1.5

Course Objectives

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

This course introduces the fundamental concepts and methods of machine learning, including the description and analysis of several modern algorithms, their theoretical basis, and the illustration of their applications

Course Outcomes

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

1. Apply appropriate statistical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
2. Formulate suitable method required as pre-processing technique for finding the solution of machine learning algorithm
3. The underlying mathematical principles from probability, linear algebra and optimization.
4. The knowledge of using machine learning to make predictions in a scientific computing environment.
5. The underlying mathematical relationships within and across machine learning algorithms and the paradigmsof supervised and un-supervised learning.
6. The advanced topics such as robotics, machine learning, deep learning, pattern recognition, computer vision,cognitive computing, human-computer interaction etc.

List of Experiments

1. Write a python program to compute
   (i).Central Tendency Measures: Mean, Median, Mode
   (ii.)Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Libraries for ML application such as Pandas and Matplotlib
3. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
   Implementation of PCA algorithm
4. Implement and demonstrate the different plots: Line plot, Bar Plot, Patch Plot, Pie Plot, Scatter plot, Box plots, Histogram, Density plot.
5. Implementing the Back propagation algorithm
6. Write a Python program to implement Simple Linear Regression
7. Implementation of Multiple Linear Regression for House Price Prediction using Sklearn
8. Implementation of Decision tree using sklearn and its parameter tuning
9. Implementation of KNN using sklearn
10. Implementation of Logistic Regression using sklearn
11. Implementation of K-Means Clustering
12. Performance analysis of Classification Algorithms on a specific dataset

Text Books:

1. Thomas Haslwanter, "An Introduction to Statistics with Python with Applications in the Life Sciences", Springer International Publishing Switzerland 2016, ISBN 978-3-319-28315-9, ISBN 978-3-319-28316-6 (eBook)
2. Allen B. Downey, "Think Stats", Second Edition, O'Reilly Media, ISBN: 978-1-491-90733-7

3. Foundations of Machine Learning, Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar, MIT Press, Second Edition, 2018.

Reference Books:

1. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", MIT Press, 2nd Edition, 2018.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning: Data Mining, Inference, and Prediction", Springer, 2nd Edition, 2009.
3. Avrim Blum, John Hopcroft, Ravindran Kannan, "Foundations of Data Science", Cambridge University Press, 2020.
4. Tom M. Mitchell, "Machine Learning", Mc Graw Hill, Indian Edition, 2017.
5. Gareth James, Daniela Witten, Trevor Hastie and Rob Tibshirani, "An Introduction to Statistical Learning: with applications in R", Springer Texts in Statistics, 2017.

Reference Links

1. https://onlinecourses.nptel.ac.in/noc19_cs52/preview
2. https://ece.iisc.ac.in/~parimal/2019/ml.html
3. https://www.springer.com/gp/book/9780387848570
4. https://www.cse.iitb.ac.in/~sunita/cs725/calendar.html
5. https://www.analyticsvidhya.com/blog/2018/12/guide-convolutional-neural-network-cnn/
6. https://cs.nyu.edu/~mohri/mlu11

HRD & Organizational Behavior
(Open Elective)

Subject Code: 20OET411

L	T	P	C
3	0	0	3

Course Objectives

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

- To co-create a comprehensive view of Human Resource Development (HRD) through assessment of theories and practices of HRD
- To familiarize the students with the components of individual and group behavior in organizational setting
- To help them learn behavioral skills in managing people at work.
- To provide basic insight into select contemporary management practices and Strategic Management.
- To learn theories of motivation and also deals with individual behavior, their personality and perception of individuals.
- To understand about organizations groups that affect the climate of an entire organizationthis helps employees in stress management.

Course Outcomes

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

1. To build an understanding and perspective of Human Resource Development as discipline appreciating learning.
2. To learn the skills of developing a detailed plan for need and implementation of HRD . program in the organization.
3. To learn role of learning in action as an individual, group and an organization in order to develop creative strategies to organizational problems.
4. To develop a perspective of HRD beyond organizational realities including national HRD
5. To develop positive attitude through personality development and can equip with motivational theories.
6. To attain the group performance and grievance handling in managing the organizational culture.

Unit – I

HRD-Macro Perspective: HRD Concept, Origin and Need, HRD as a Total System; Approaches to HRD; Human Development and HRD; HRD at Macro and Micro Climate.

Unit – II

HRD–Micro Perspective: Areas of HRD; HRD Interventions Performance Appraisal, Potential Appraisal, Feedback and Performance Coaching, Training, Career Planning, OD or Systems Development, Rewards

Unit – III

Employee Welfare and Quality of Work Life and Human Resource Information; Staffing for HRD: Roles of HR Developer; Physical and Financial Resources for HRD; HR Accounting; HRD Audit, Strategic HRD

Unit- IV

Human Resource Training and Development: Concept and Importance; Assessing Training Needs; Designing and Evaluating T&D Programmes; Role, Responsibilities and challenges to Training Managers

Unit- V

Individual Behavior: Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of Motivation: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation,

Unit-VI

Group Dynamics: Types of Groups, Stages of Group Development, Group Behavior and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.

Text Books:

1. Nadler, Leonard :Corporat Human Resource Development, Van NostrandReinhold, ASTD, New York .
2. Rao, T.V and Pareek, Udai: Designing and Managing Human Resource Systems,Oxford IBH Pub. Pvt.Ltd., New Delhi , 2005.
3. Rao, T.V: Readings in HRD, Oxford IBH Pub. Pvt. Ltd., New Delhi , 2004.
4. Subba Rao P., Organizational Behaviour, Himalaya Publishing House.Mumbai.
5. Fred Luthans Organizational Behaviour, TMH, NewDelhi.
6. Robins, Stephen P., Fundamentals of Management, Pearson,India.

Reference Books

1. Viramani, B.R and Seth, Parmila: Evaluating Management Development, VisionBooks, New Delhi.
2. Werner &DeSimone (2006). Human Resource Development. Thomson Press, Network.
3. Mankin, David (2009). Human Resource Development. Delhi: Oxford University Press.

Hersey, Paul, Dewey E. Johnson & Kenneth H. Blanchard (2013). Management of Organizational Behaviour. PHI.

Project Management
(Open Elective)

Subject Code: 20OET412

L	T	P	C
3	0	0	3

Course Objectives

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

- To develop an understanding of Project Planning and formation.
- To make students gaining the knowledge and skills related to Project Analysis.
- To make student better understand on Selection Criteria and select the best Project.
- To develop understanding the concepts of Project Financing and Contracts.
- To familiarize the students with implementation and execution of the project.
- To make students understandingcomplete and close the project.

Course Outcomes

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

1. To understand the concept of Project Planning and formation.
2. To understandthe keyissues in Project Analysis.
3. To understand Selection Criteria and select the best Project.
4. To understand the concepts of Project Financing and Contracts.
5. To understand how to implement and execute the project.
6. To understand how to complete and close the project.

Unit – I

Project Planning and Formation: Project meaning and concepts **–** Overview of total Project Management Cycle – Classification of Projects and Project Formation –Strategic Planning and Capital budgeting – Generation and Screening of Project Ideas – Generation of Ideas – Monitoring the Environment – Corporate Appraisal – Tools for Identify Investment opportunities – Scouting for Project Ideas – Preliminary Screening – Project Rating Index.

Unit - II

Project analysis: Issues in Project Analysis - Market and Demand Analysis–conduct of Market Survey,Demand forecasting.Technical analysis – Manufacturing Process Technology, Material Inputs and Utilities, Plant Capacity, Location and Site –Machineries and Equipment, Structures and Civil Works, Environment Aspects.Financial Estimations and projections – Cost of Projects, Means of Finance – Estimates of sales and Productions, Working capital Requirement and its financing, Profitability Projections, Projected Cash flow Statement, Projected Balance Sheet –Time Value of Money

Unit-III

Project Selection: Selection Criteria– Net Present Value, Benefit Cost Ratio, Internal Rate of return, Urgency, Payback Period, Accounting Rate of Return, Assessment of Various Methods, Investment Evaluation in Practice. Project Selection Under Risk – Risk Analysis in Practice, How Financial Institutions Analyse Risk. Social Cost Benefit Analysis,Rationale for SCBA – UNIDO Approach.

Unit – IV

Project FinancingandContracts: Financing of Projects **–** Capital Structure, Working Capital**,** Financing Infrastructure Projects, Public Private Partnership, Venture Capital **-** Private Equity, Credit

Risk Management.Contracts - Definitions of contract and Contractor.Elements of contracts, offer acceptance and consideration, Valid Contracts, Department execution of work – Master Roll Form 21 – Piece work Agreement form – Work order. Types of Contracts – Lump sum Contract, Lump sum and Schedule contract, Item rate Contract, Sub Contracts, Joint ventures, Arbitration Disputes and claim Settlement.Tender -Contract system with tenders, Quotation, Earnest Money, Security Money – Tender Notice, Tender Form, Bidding – Procedure – Irregularities in Bidding – award

Unit – V

Project Implementation: Forms of Project organisation – Human Aspects – of project Management – Pre requisites for successful project implementation –Project Monitoring and Controlling – Parameters for monitoring and Control – Process of Monitoring –Network Techniques for Project Management– Developmentof Project Network -Time Estimation –Determination of Critical path– Scheduling when Resources are Limited - PERT Model – CPM Model – Network Cost System.

Unit – VI

Project Completion: Completion of project and Managing Transition Period – Closure of Contracts – Completion of Assets of Projects – Post Project Evaluation and CompletionAudit Report.Management – Scope of the Construction Management, Significance of Construction management, Concept of Scientific Management, Qualities of Manager, Organisation – Authority, Policy, Recruitment process and Training Development of Personal Department, Labour problems, Labour legislation in India, Workmen compensation Act 1923, and subsequent amendments, Minimum Wages Act 1948.

Text Books:

1. Narendra Singh, Project management and Control, Himalaya Publishing House, Mumbai 5th Edition
2. Prasanna Chandra: Projects, TMH, New Delhi,2014, 8th Edition.
3. K.Nagarajan: Project Management, New Age International, New Delhi,2010
4. PERT and CPM – L.S Srikanth
5. PERT and CPM – Punmia
6. Construction Management and Planning – Guna and Sen Gupta, B.

Reference Books

1. Gray, Larson: Project Management-Tata McGraw Hill-2015
2. Jeffery K.Pinto: Project Management-Pearson Education-2015
3. Enzo Frigenti: Project Management-Kogan, 2015
4. R. Panneerselvam, P. Senthilkumar: Project Management, PHI, 2015

Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute,USA

Entrepreneurial Development
(Open Elective)

Subject Code: 20OET413

L	T	P	C
3	0	0	3

Course Objectives

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

- To co-create a comprehensive view of Human Resource Development (HRD) through assessment of theories and practices of HRD
- To familiarize the students with the components of individual and group behavior in organizational setting
- To help them learn behavioral skills in managing people at work.
- To provide basic insight into select contemporary management practices and Strategic Management.
- To learn theories of motivation and also deals with individual behavior, their personality and perception of individuals.
- To understand about organizations groups that affect the climate of an entire organization this helps employees in stress management.

Course Outcomes

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

1. Understand the concept of Entrepreneurship and demonstrate the ability to provide a self analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.
2. Understanding Entrepreneurship Development programmes in India and contents for training for Entrepreneurial competencies.
3. Create appropriate business model and develop well presented business plan that is feasible for the student.
4. Understanding how to manage effectively the selected business.
5. Understanding how to create e-Entrepreneurship.
6. Explain how various disciplines of the venture can be managed.

Unit-I

Entrepreneur and Entrepreneurship: Nature and Scope of Business. Concept of Entrepreneur & Entrepreneurship,, characteristics of an Entrepreneur, types of Entrepreneurs, Entrepreneur. Role of Entrepreneurship in Economic development. Ethics and social responsibility of an entrepreneur. Future of Entrepreneurship in India.

Unit-II

Entrepreneurship Development in India: Emergence of entrepreneurial class in India, Environmental factors effecting entrepreneurship, local mobility of Entrepreneurs, Concept of women entrepreneurship and rural entrepreneurship. Development of women Entrepreneurship, problems and remedies of women Entrepreneurship. Entrepreneurship Development programme (EDP) - need and objectives of EDPs, Designing an appropriate training programme for existing and new entrepreneurs. Institutions supporting for EDP .

Unit –III

Creating and starting the venture : Steps to start an MSME. Meaning of a project. Project Identification- Sources of new Ideas, methods of generating ideas, creative problem solving, and opportunity recognition. Project selection - meaning of project report (Business Plan) & Formulation of a project report, Preparation of sample project report of any one product and service.

Unit –IV

Government and Institutional support to Entrepreneurs: MSME Development Act-2006. Technology Incubation Centre, Business Incubation Centre, National Skill Development Corporation, Institutional finance – sources of short term and long term capital including Venture capital. Role of SIDBI, NSIC, EXIM Bank and commercial Banks, APSFC, AP Industrial policy (2020-23) - incentives and subsides, industrial estates, AP Skill Development Corporation.

Unit - V

e-Entrepreneurship: Concept of e-Entrepreneurship, Difference between Entrepreneurship and e-Entrepreneurship, Purpose of Creating e-Entrepreneur, Essence of e-Entrepreneurship, e-Business Ventures in different sectors, Role of information technology in MSME, Problems and prospectus of e-Entrepreneurs in INDIA.

Unit –VI

Managing the venture: Types of Ownership. Concepts of working capital management, Marketing management, Human Resource management and TQM. Problems and prospects of MSME in India. Profile of Entrepreneurs.

Text Books:

1. H.Nandan: Fundamentals of Entrepreneurship, PHI Learning, New Delhi, 2009
2. S.S.Khanka: Entrepreneurial Development, S.Chand & Company Ltd New Delhi 2009
3. Dr.C.B.Gupta and Dr.S.S.Khanka Entrepreneurship and Small Business Management: Sultan Chand & Sons:,2010
4. Narayana Reddy: Entrepreneurship, Cengage learning, New Delhi, 2010
5. Rajeev Roy: Entrepreneurship, Oxford university press, New delhi,2010
6. Vasat Desai: The Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, 2011

Reference Books

1. Robert D Hisrich, Michel P Peters, Dean A Sheperd: Entrepreneurship, Tata Mc Graw Hill Education Private ltd, 2009
2. Hisrich: Entrepreneurship, TMH, New Delhi,2009
3. Prasanna Chandra: Projects, TMH, New Delhi,2012
4. K.Nagarajan: Project Management, New Age International, New Delhi,2010

Digital Marketing
(Open Elective)

Subject Code: 20OET414

L	T	P	C
3	0	0	3

Course Objectives

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

- To develop an understanding on the digital marketing.
- To make students gaining the knowledge and skills related to the area of search engine optimization (SEO).
- To make student better understand on Social Media Optimization (SMO).
- To develop understanding on SME (Search Engine Marketing) through AdWords.
- To familiarize the students with the Lead Management & Digital Marketing.
- To understand the contemporary concepts on digital innovation and trends.

Course Outcomes

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

1. Understand the concept on digital marketing.
2. Define the concept on search engine optimization (SEO).
3. Describe the concept on Social Media Optimization (SMO).
4. Explain the idea on SME (Search Engine Marketing) through AdWords.
5. Justify the concepts and developments on lead management & digital marketing.
6. Comprehend the contemporary concepts on digital innovation and trends.

Unit – I

Introduction to Digital Marketing: Digital Marketing- Importance -Digital Marketing Platforms- Difference between Traditional Marketing and digital Marketing- Advantages of Digital Marketing. Role and functions of a Digital Marketing Manager

Unit - II

Search Engine Optimisation: Definition, scope of SEO, on-page optimisation and Off Page Optimisation, Report Preparation- Keywords, Titles, Meta Tags

Unit –III

Social Media Optimization (SMO): Meaning and scope of SMO. Social Media Optimization of Facebook- Twitter- LinkedIn- Pinterest: Social media services optimization.

Unit – IV

Search Engine Marketing (SME): SME through AdWords, Keyword Selection, Create Text Ads- CPC Bidding- Navigate Ad Words- SEM Metrics & Optimization.

UNIT – V

Lead Management & Digital Marketing: Web to lead forms- Web to case forms- Lead generation techniques- Social media and lead gen Inbuilt tools for Digital Marketing

Unit – VI

Digital Innovation and Trends: The contemporary digital revolution- Digital Transformation framework- Security and Privatization Issues with Digital Marketing- Trends in Digital Marketing

Text Books:

1. Chaffey, D. (2019). Digital marketing. Pearson UK.
2. Chaffey, D., & Smith, P. R. (2017). Digital marketing excellence: planning, optimizing and integrating online marketing. Taylor & Francis.
3. Dodson, I. (2016). The art of digital marketing: the definitive guide to creating strategic, targeted, and measurable online campaigns. John Wiley & Sons.

Reference Books

1. Kaufman, I., & Horton, C. (2014). Digital marketing: Integrating strategy and tactics with values, a guidebook for executives, managers, and students. Routledge.
2. Stokes, R. (2011). E-Marketing: The essential guide to digital marketing. Quirk eMarketing.
3. Kamalesh K.Bajaj: Debjani Nag: E-commerce - The cutting edge of business, Tata Mc-Graw Hill.

Environmental Impact Assessment
(Open Elective)

Subject Code: 20OET415

L	T	P	C
3	0	0	3

Course Objectives

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

- To understand basic concepts of EIA
- To study different methodologies of EIA
- To appreciate the significance of ecosystem and environmental protection
- To prepare environmental audit reports
- To understand the legal and regulatory compliance
- To prepare EIA reports for different developmental and industrial establishments

Course Outcomes

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

1. Determine and demonstrate the environment and developmental issues to the public effectively.
2. Assess and evaluate the key EIA methodologies and generate the data.
3. Assess and diagnose the impact of developmental activities on ecosystems.
4. Demonstrate environmental audit protocols to conduct on-site audit for the generation of reports.
5. Demonstrate the environmental and legal compliance suitable for the developmental activities.
6. Examine and generate comprehensive EIA reports to different developmental activities.

Unit-I

Basic Concepts of EIA: History and guiding principles of EIA-EIA Process-types of EIA-Initial Environmental Evaluation (IEE)-elements of EIA-factors affecting EIA during impact evaluation and analysis-preparation of environmental base maps and importance-classification of environmental parameters.

Unit-II

EIA Methodologies: Introduction-criteria for the selection of EIA methodology-EIA Methods: Ad-hoc method-matrix method-networks Method-Environmental Media Quality Index method (EMQIM)-overlay method-cost/benefit analysis.

Unit-III

Ecosystems Assessment: Assessment of Ecosystems-Assessment of impact of development activities on vegetation and wildlife, mitigation-causes and effects of deforestation-environmental impacts of deforestation.

Unit-IV

Environmental Auditing: Environmental audit definition-objectives of environmental audit-types of environmental audit-audit protocol-stages of environmental audit-onsite audit activities-post audit activities-evaluation of audit data and preparation of audit report.

UNIT-V

Environmental Legislations: Environmental Legislations introduction-The Environmental (Protection) Act-1986-The Water (Prevention and Control of Pollution) Act-1974-The Air (Prevention and Control of Pollution) Act-1981-The Motor Vehicles Act-1988-The Wildlife (Protection) Act-1972.

Unit-VI

EIA Report Writing: Introduction - Case studies and preparation of Environmental Impact Assessment (EIA) statement report for coal mining activities – chemical industries – Thermal power plants.

Text Books:

1. Environmental Science and Engineering by Suresh K. Dhameja, S. K. Kataria& Sons Publications (Recent addition), New Delhi.
2. Environmental Impact Assessment Methodologies by Y. Anjaneyulu, B. S. Publications (Recent addition), Sultan Bazar, Kakinada.

Reference Books:

1. Environmental Pollution and Control by Dr. H. S. Bhatia, Galgotia Publications (P) Ltd., New Delhi (Recent addition).
2. Environmental Science and Engineering by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers (Recent addition).

Energy Audit Conversation and Management
(Open Elective)

Subject Code: 20OET416

L	T	P	C
3	0	0	3

Course Objectives

To introduce basic principles of energy auditing and to know something about energy management. Also it provides immense knowledge about energy efficient motors, power factor improvement, lighting and energy instruments. Finally economic aspects are analyzed.

Course Outcomes

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

1. Apply principles of energy auditing and propose energy conservation schemes.
2. Demonstrate principle and organizing energy management program.
3. Demonstrate the operating principle of energy efficient motors.
4. Analyze power factor improvement methods,
5. Illumination methods and demonstrate the operation of various energy instruments.
6. Analyze and compute the economic aspects of energy consumption.

Unit-I

Basic principles of energy audit Energy audit- definitions, concept, types of audit, energy index, cost index,pie charts, Sankey diagrams, load profiles, Energy conservation schemes.

Unit-II

Energy management Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting.

Unit-III

Energy efficient motors Energy efficient motors , factors affecting efficiency, loss distribution, constructional details, characteristics – variable speed , variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit.

Unit-IV

Power factor improvement Power factor – Need of power factor -methods of improvement of power factor, location of capacitors.

Unit-V

Lighting and energy instruments Good lighting system design and practice, lighting control, lighting energy audit. Energy Instruments wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers.

Unit-VI

Economic aspects and analysis Economics Analysis-Depreciation Methods, time value of money, rate of return, present worthmethod, replacement analysis, life cycle costing analysis.

Text Books:

1. Energy Management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Energy Efficient Electric Motors by John. C. Andres, Marcel Dekker Inc. Ltd – 2nd Edition, 1995
3. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill Publishing CompanyLtd, New Delhi.

Reference Books:

1. Energy management by Paulo' Callaghan, Mc – Graw Hill Book company – 1st edition, 1998
2. Energy management hand book by W.C. Turner, John wiley and son, 2001.
3. Energy management and good lighting practice: fuel efficiency booklet12 – EEO

Optimization Techniques
(Open Elective)

Subject Code: 20OET417

L	T	P	C
3	0	0	3

Course Objectives

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

- Enumerate the fundamental knowledge of Linear Programming and Dynamic Programming problems.
- Learn classical optimization techniques and numerical methods of optimization.
- Explain Integer programming techniques and apply different optimization techniques to solve various models arising from engineering areas

Course Outcomes

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

1. Solve linear programming problems using simplex method and to use duality principle
2. Analyze the simplex solutions for the changes in cost coefficients constraint coefficients
3. Identify the queuing model and to solve them
4. Enumerate fundamentals of non-linear programming
5. Solve different dynamic programming problems
6. Solve problems of decision making under certainity, uncertainity and risk

Unit – I

Introduction to optimization techniques: Linear programming problem, simplex method, duality principle , Big-M method, Two phase simplex method.

U Unit – II

Sensivity analysis: Change in the constraints, cost coefficients, coefficients of the constraints, addition and deletion of variable, constraints.

Unit – III

Queuing Theory: Characteristics of Queuing models, Classification, (M/M/1:FCFS/∞/∞), (M/M/1:FCFS/N/∞), (M/M/C:FCFS/∞/∞) models.

Unit – IV

Introduction to Non linear programming: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi-variable optimization with constraints, method of Lagrange multipliers, Kuhn-Tucker condition.

Unit – V

Dynamic Programming: Introduction, Terminology, Bellman‟s Principle of optimality, Applications of dynamic programming, shortest path problem, linear programming problem, Product allocation problem, Cargo load problem.

Unit – VI

Decision Theory: Introduction, Classification of decisions, decision making under certainty, decision making under risk, decision making under uncertainty.

Text Books:

1. Operations Research by P. Rama Murthy, New Age Pub
2. Operations Research, S.D.Sharma, Kedarnath Ramanadh Publications.
3. Operations Research by D.S. Hira and Prem Kumar gupta, S.Chand.

References Books:

1. Operations Research, J.K. Sharma, MacMilan Pub.
2. Introduction to Operations Research by V. K. Kapoor, S. Chand Publishers
3. Optimization theory & Applications / S.S .Rao / New Age International

Blockchain Technologies
(Open Elective)

Subject Code: 20OET418

L	T	P	C
3	0	0	3

Course Objectives

To give students the understanding of emerging abstract models for Blockchain Technology and to familiarize with the functional/operational aspects of crypto currency eco-system, this course covers the technological underpinning of block Chain operations in both theoretical and practical implementation of solutions using Ethereum.

Course Outcomes

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

1. Understand block chain technology.
2. Understand Crypto currency
3. Understand Smart contract
4. Use Remix IDE
5. Develop block chain based solutions and write smart contract using Ethereum Framework.
6. Deploy Open source Hyper ledger Architecture

Unit – I

Introduction: Overview of Block chain, History of Blockchain, Peer to Peer Network, Smart Contract, Wallet, Digital Currency, Ledgers, Types of Block chain Platform, Consensus algorithms and their scalability problems, digital cash etc.

Unit – II

Consensus Mechanism &Crypto primitives: Atomic Broad cast, Consensus, Permission Block chain, Permission less Block chain, Hash functions, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems.

Unit – III

Bitcoin basics: Bit coin block chain, Challenges and solutions, Different Consensus Mechanism- Proof of Work, Proof of Stake, Proof of Activity, Proof of Burn, Proof of Elapsed Time, Proof of Authority, Proof of Importance, alternatives to Bitcoin consensus, Bitcoin scripting language and their use.

Unit – IV

Crypto currency and Wallet: Types of Wallet, Desktop Wallet, App based Wallet, Browser based wallet, Metamask, Creating a account in Metamask, Use of faucet to fund wallet, transfer of crypto currency in metamask.

Unit – V

Contract and Ethereum: Overview of Ethereum, Writing Smart Contract in Solidity, Remix IDE, Different networks of ethereum, understanding blocks practically at blockhcain.com, how to compile and deploy smart contract in remix.

Unit – VI

Understanding Hyperledger Fabric: Overview of Open source Hyperledger project, Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric.

Text Books:

1. Blockchain: Blueprint for a New Economy by Melanie Swan Narayanan, Bonneau, Felten, Millerand Goldfeder, "Bitcoin and Cryptocurrency Technologies -A Comprehensive Introduction", Princeton University Press.

Reference Books:

1. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Imran Bashier.
2. Mastering Ethereum: Building Smart Contracts and DApps by Andrews Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, "*Blockchain Architecture Design And Use Cases*"[MOOC], NPTEL: https://nptel.ac.in/courses/106/105/106105184/

Reference Links:

1. Dr.Mayank Agarwal, "*BlockChain*"[MOOC], NPTEL: https://onlinecourses.swayam2.ac.in/aic21_ge01/preview

IT Systems Management
(Open Elective)

Subject Code: 20OET419

L	T	P	C
3	0	0	3

Course Objectives

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

- Provides extensive theoretical knowledge of IT infrastructure.
- Enhances the student's computing environment knowledge.
- Provides broad based knowledge of IT System management.
- Develops management skills required for a business environment.
- Builds upon the essential core Network Security and storage management with greater emphasis.

Course Outcomes

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

1. Describe the business value and processes of ICT services in an organization and apply that knowledge and skill with initiative to a workplace scenario.
2. Analyze and evaluate the impact of new and current ICT services to an organization.
3. Describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organization.
4. Characteristics of the network Security that affect user operations.
5. Define, track, and maintain data and data resources and recent trends in IT.
6. Describe E-Commerce and Global System for Mobile Communication.

Unit – I

IT Infrastructure: Overview: Definitions, Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-New age systems) and their Management, growth of internet, current business demands and IT systems issues, complexity of today's computing environment.

Unit – II

Software Management: SDLC, The Waterfall Model, Advantages, Disadvantages, Conventional Software Management performance, Software Economics.

Unit – III

Current computing environment: Complexity of current computing, multiple technologies.

IT system Management: Common tasks in IT system management, approaches for organization IT management systems context diagram, patterns for IT system Management, Service level management, Financial Management, Capacity Management, availability management.

Unit – IV

Security Management: Computer Security, Internet Security, Physical Security, Identity Management, Access control System, Intrusion Detection.

Unit – V

Storage Management : Types of Storage management, Benefits of storage management, backups, Archive, Recovery, Disaster recovery. Space management, Hierarchical storage management.

Unit – VI

Emerging Trends in IT : Introduction, E-Commerce, Electronic Data Interchange , Global System for Mobile Communication.

Text Books:

1. IT Infrastructure & Its Management, By Phalguni Gupta, Tata McGraw-Hill Education.**b**(Unit 1,3,4,5).2009
2. Software Project Management , Walker Royce: pearson Education,2021.(Unit 2).

Reference Books:

1. Ivanka Menken, ITIL V3 Foundation Certification Exam Preparation Course in a Book for Passing the ITIL V3 Foundation Exam, Second Edition (The Art of Service), 2009. Van Haren, Passing the ITIL Foundation, Van Haren Publishing, 2011.

API and Micro Services
(Open Elective)

Subject Code: 20OET41A

L	T	P	C
3	0	0	3

Course Outcomes

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

1. Understand the Spring framework concepts.
2. Develop the Spring boot application
3. Develop a Spring Data JPA application with Spring Boot
4. Implement query methods for querying the database using Spring Data JPA
5. Write RESTful services using Spring REST that consumes and produces data indifferent formats
6. Handle exceptions and errors in Spring REST endpoints

Unit – I

Spring 5 Basics : Why Spring, What is Spring Framework, Spring Framework - Modules, Configuring IoC container using Java-based configuration, Introduction To Dependency Injection, Constructor Injection, Setter Injection, What is AutoScanning.

Unit – II

Spring Boot: Creating a Spring Boot Application, Spring Boot Application Annotation, What is Autowiring, Scope of a bean, Logger, Introduction to Spring AOP, Implementing AOP advices, Best Practices : Spring Boot Application

Unit – III

Spring Data JPA with Boot: Limitations of JDBC API, Why Spring Data JPA, Spring Data JPA with Spring Boot, Spring Data JPA Configuration, Pagination and Sorting,

Unit – IV

Query Approaches, Named Queries and Query, Why Spring Transaction, Spring Declarative Transaction, Update Operation in Spring Data JPA, Custom Repository Implementation, Best Practices - Spring Data JPA

Unit – V

Web Services: Why Web services, SOA - Service Oriented Architecture, What are Web Services, Types of Web Services, SOAP based Web Services, RESTful Web Services, How to create RESTful Services

Unit – VI

Spring REST: Spring REST - An Introduction, Creating a Spring REST Controller, @RequestBody and ResponseEntity, Parameter Injection, Usage of @PathVariable, @RequestParam and @MatrixVariable, Exception Handling, Data Validation, Creating a REST Client, Versioning a Spring REST endpoint, Enabling CORS in Spring REST, Securing Spring REST endpoints.

Hardware and software configuration

- 4 or 8 GB RAM/126 GB ROM
- Swagger tool suite(opensource)
- OpenJDK 17 or Java 11,Maven 3.2 or above and MySQL 8.0 or above,Spring Tool suite, Postman

Text Books:

1. Spring in action, 5th Edition, Author: Craig Walls, Ryan Breidenbach, Manning books

Reference Links [Courses mapped to Infosys Springboard platform]:

Infosys Springboard courses:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01296689056211763272_shared/overview [Spring 5 Basics with Spring Boot]
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_4313461831752789500_shared/overview [Spring Data JPA with Boot]
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012731900963905536190_shared/overview [Spring REST]

Deep Learning

(Honors/Minor Course: Artificial Intelligence & Machine Learning**)**

Subject Code: 20AIT404

L	T	P	C
4	0	0	4

Course Objectives

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

Deep learning is a sub-field of machine learning that focuses on learning complex, hierarchical feature representations from raw data. Upon completion of this course, the students will be able to recognize the characteristics of deep learning models that are useful to solve real-world problems, Understand different methodologies to create application using deep nets, Identify and apply appropriate deep learning algorithms for analyzing the data for variety of problems.

Course Outcomes

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

1. Understand key terms and concepts in Neural Network.
2. Gain fundamental knowledge about Deep Learning
3. Obtain comprehensive knowledge on CNNs.
4. Understand the Advanced Deep architectures.
5. Obtain comprehensive knowledge on Modern Convolution Neural Networks
6. Know about Deep Learning applications.

Unit – I

The Neural Network: Introduction, Building Intelligent Machines, The Neuron, Expressing Linear Perceptions as Neurons, Linear Neurons and Their Limitations, Sigmoid.
Feed-Forward Neural Networks, Training Feed-Forward Neural Networks..

Unit – II

Deep Learning: Introduction, History, Compare artificial intelligence, machine learning with deep learning, Kinds of Machine Learning problems, deep learning applications**.**

Unit – III

Convolution Neural Networks: Introduction to CNNs, Convolution, Correlation, FIltering,Convolution Layer, CNN architectures, Detection and Segmentation, Convolutions for image.

Unit – IV

Deep Learning Architectures: Recurrent Neural networks (RNNs), Advanced RNN: LSTM, GRU, Generative Adversarial Networks (GANs), Advanced GANs.

Unit – V

Modern Convolutional Neural Networks: Deep Convolutional Neural Networks (AlexNet), AlexNet Architecture, Transfer learning Techniques, Variants of CNN: DenseNet, PixelNet

Unit - VI

Applications of Deep Learning: Images segmentation,Object Detection ,Automatic Image Captioning ,Image generation with Generative adversarial networks – Video to Text with LSTM models ,Computer Vision Basics.

Text Books:

1. Ian Goodfellow, YoshuaBengio and Aaron Courville, " Deep Learning", MIT Press, 2017.
2. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.
3. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018

Reference Books:

1. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009): 1127.

Reference Links:

1. https://cs229.stanford.edu/notes2020spring/cs229-notes-deep_learning.pdf
2. http://perso.ens-lyon.fr/jacques.jayez/Cours/Implicite/Fundamentals_of_Deep_Learning.pdf