COURSE STRUCTURE
(R19 Regulations)

INFORMATION TECHNOLOGY

FOR
B.Tech., FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2019-20)

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

NAMBUR, PEDA KAKANI MANDAL, GUNTUR-522508
An Autonomous Institution, Approved by AICTE,
All Courses Accredited by NBA & NAAC with 'A' Grade, Permanently Affiliated to JNTUK University

Applicable for the students of B. Tech. (Regular) from the Academic Year 2019-20 onwards

The B.Tech Degree of Jawaharlal Nehru Technological University Kakinada, Kakinada shall be conferred on candidates who are admitted to the programme and who fulfil all the requirements for the award of the Degree.

VISION

To impart quality education through exploration and experimentation and generate socially-conscious engineers, embedding ethics and values, for the advancement in science and technology.

MISSION

- To educate students with a practical approach to dovetail them to industry-needs.

- To govern the institution with a proactive and professional management with passionate teaching faculty.

- To provide holistic and integrated education and achieve over all development of students by imparting scientific and technical, social and cognitive, managerial and organizational skills.

- To compete with the best and be the most preferred institution of the studious and the scholarly.

- To forge strong relationships and linkage with the industry.

OBJECTIVES

- Equip the institute with state-of-the-art infrastructure comparable to the best in the industry.

- Tap the resources of the best minds in the field as faculty and visiting faculty.

- Groom students to become global entrepreneurs and responsible citizens.

- Provide financial assistance to meritorious students.

- Requisition the services of the best HR managers to place our students in reputed industries.

- Provide conducive atmosphere to the faculty for Research & Development and ensure active participation of the students.

Department Vision

To produce IT professionals who can develop globally competitive and socially useful information technology enabled solutions and products that offer cost effective solutions, for organizations, in particular and society in general, through their innovative ideas, and to create a knowledge pool through research in this field..

Department Mission

1. Producing information technology professionals for the Global IT industry

2. Developing student centric and qualitative teaching-learning practices.

3. Establishing infrastructure that endows cutting edge technology requirements of the industry.

4. To extend service to the public, the state and the nation at large by building quality engineers.

5. To carve disciplined and socially, technologically better responsible citizens.

6. To make the students pursuing information technology the technological ambassadors of VVIT in whatever part of the world they find themselves in their future careers.

1. Admission Criteria

The eligibility criteria for admission into UG Engineering programmes are as per the norms approved by Government of Andhra Pradesh from time to time.

The sanctioned seats in each programme in the college are classified into CATEGORY-A, and CATEGORY-B at 1st year level and only CATEGORY-A at Lateral Entry 2nd year level.

The percentages of Category–A, Category-B and Lateral Entry Seats are decided from time to time by the Government of Andhra Pradesh.

- CATEGORY – A (70%): These seats are filled through Convener, EAMCET as per the norms approved by the Government of Andhra Pradesh.

- CATEGORY – B (30%): These seats are filled by the College as per the norms approved by the Government of Andhra Pradesh.

- Lateral Entry: Lateral entry candidates shall be admitted into the Third semester directly as per the norms approved by the Convener, ECET, and Government of Andhra Pradesh.

2. Award of B. Tech. Degree

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

- A student after securing admission shall complete the B.Techprogramme in a minimum of four academic years (8 Semesters), and a maximum period of eight academic years starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech Course. Each student shall secure 160 credits (with CGPA>=4) required for the completion of the under graduate programme and award of B.Tech Degree.

3. Courses of Study

The following courses of study are offered at present as specializations for the B. Tech. Courses

S. No	Branch	Branch Code	Intake
1	Civil Engineering	01	120
2	Electrical and Electronics Engineering	02	180
3	Mechanical Engineering	03	180
4	Electronics and Communication Engineering	04	180
5	Computer Science and Engineering	05	240
6	Information Technology	12	180

4. Distribution and Weightage of Marks

i) The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory subject and 75 marks for practical subject. The Mini project work shall be evaluated for 50 marks and the Major Project work shall be evaluated for 150 Marks.

ii) For theory subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the Semester End Examinations.

iii) For theory subjects, during the semester there shall be two internal Mid Examinations. The weightage of internal marks for 40 consists of Descriptive Test – 15 Marks, Assignment Test- 10 Marks (Open book system with questions in accordance with BLOOMS taxonomy), and Objective Test -10 Marks and Subject Seminar 5 marks.

- The Descriptive Test is for 90 minutes duration conducted for 30 marks and will be scaled down to 15 Marks. Each Descriptive test question paper shall contain 3 questions, one question from each unit and all questions need to be answered. All the questions should be prepared in accordance with BLOOMS Taxonomy.

- The Assignment Test conducted for 20 Marks and will be scaled down to 10 Marks. The test is open book system and the duration of the exam is 60 minutes. The assignment question paper contains 3 questions given by the subject teacher concerned and all questions should be answered. Students can bring a maximum of three printed text books related to that subject. (Soft copies of the text books will not be allowed.) The assignments have to provide broadened exposure to the course. The questions shall include problem solving approach, problem analysis & design, implementation, case studies etc.

- The objective examination is for 20 minutes duration. (Conducted with 20 multiple choice question with a weightage of ½ Mark each)

- For the subject seminar, marks of each student shall be evaluated based on the presentation on any topic of his/her choice in the subject duly approved by the faculty member concerned.

- Internal Marks shall be calculated with 70% weightage for better of the two Mid Exams and 30% weightage for other.

iv) The Semester end examination shall be conducted for 3 hours duration. The question paper shall be given in the following pattern:

The question paper contains one question from each unit with internal choice. Each question carries 12 marks. Each course shall consist of five units of syllabus. The questions shall be framed in line with the Course Outcomes defined and cognitive levels.

v) For practical subjects there shall be continuous internal evaluation during the semester for 25 marks and 50 Marks for Semester end examination. The internal 25 marks shall be awarded as follows: day to day work - 05 marks, Record-05 marks and the remaining 15 marks are to be awarded by conducting an internal laboratory test of 3 hours duration.

The semester end examination for laboratory courses shall be conducted for three hour duration at the end of semester for 50 marks as follows:

Procedure - 10 marks, Experiment/Program execution – 15 Marks, Results-10 Marks and Viva-voice -15 Marks. For laboratory course in English 30 marks for written exam which includes listening comprehension and 20 marks for viva which includes JAM and Group Discussion.

vi) For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 40 marks for internal evaluation (20 marks for day –to– day work, and 20 marks for internal tests) and 60 marks for end examination. There shall be two internal tests in a Semester and the Marks for 20 can be calculated with 70% weightage for better of the two performances and 30% weightage for other and these are to be added to the marks obtained in day-to-day work.

vii) For Engineering Project on Community services / Mini Project, there shall be continuous evaluation during the semester for 20 marks and semester end evaluation for 30 marks. The distribution of continuous evaluation marks is as follows: Day to Day Assessment- 05 Marks and average of two reviews of 15 Marks each.

The distribution of semester end examination marks for Engineering Project on Community services/Mini Project is as follows: Report -10 Marks and Presentation and Viva Voce – 20 Marks.

vii) For Major Project, there shall be continuous evaluation during the semester for 50 marks and semester end evaluation for 100 marks

The distribution of continuous evaluation marks is as follows: Day-to-day Assessment- 30 Marks and average of at least two reviews of 20 Marks each. The Departmental review committee consists of HoD, two senior Faculty and supervisor concerned.

The semester end examination for Major Project work shall be conducted at the end of VIII Semester. It is evaluated by the Committee consisting of an external examiner, Head of the Department, Senior Faculty and Supervisor of the Project.

viii) Laboratory marks and the internal marks awarded by the faculty are final. However, any grievance regarding marks will be addressed by the result committee if necessary. The recommendations of the committee are final and binding.

ix) MOOCS Courses: All students are eligible to register and complete MOOCS courses relevant to their professional electives listed by the respective departments in the curriculum. However if the student is interested to do in conventional mode(descriptive mode), he is permitted to that course

However, if any student fails to complete a MOOCS course or the course is not offered by the agency concerned, that student is eligible to attend the examination following the same syllabus and pattern of examination in the VIII semester.

The MOOCS grades awarded to the student by the agency are converted to the course grades based on the percentage of marks obtained. The duration for course registered under MOOCS should range between 8 to 12 Weeks.

x) A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Industrial Oriented Mini Project/Summer Internship/practical training, if the student secures not less than 40% of marks (i.e., 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he/she (i) does not submit a report on Industrial Oriented Mini Project/Summer Internship, or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) does not present the seminar as required, or (iii) secures less than 40% of marks in Industrial Oriented Mini Project/Summer Internship and project seminar evaluations.

A student may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such 'one reappearance' evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

5. Attendance Requirements

- Students shall put in a minimum average attendance of 75% in the semester.

- Condonation of shortage in attendance may be recommended by the respective Head of the Department on genuine medical grounds, provided the student puts in at least 65% attendance and the Principal is satisfied with the genuineness of the reasons and the conduct of the student.

- Students, having more than 65% and less than 75% of attendance, shall have to pay requisite fee towards condonation.

- Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester. They may rejoin in that semester in which the student is detained by getting approval from the principal.

- If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible to readmit into the same class.

6. Minimum Academic Requirements

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item No.5

- A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical design/drawing subject/project and secures not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the internal marks and end semester examination marks.

- A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement.

- A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of the credits up to II B.Tech II semester from all the examinations, whether or not the candidate takes the examinations and secure prescribed minimum attendance in II Year II Semester.

- A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to III year II semester from all the examinations, whether or not the candidate takes the examinations and secure prescribed minimum attendance in III Year II Semester.

- A student shall register and put up minimum attendance in all 160 credits and earn all 160 credits.

- Break in Study: Student, who discontinues the studies for whatever may be the reason, can get readmission into appropriate semester of B. Tech programme after break in study, with the prior permission of the principal and following the transitory regulations applicable to each batch in which he/she joins. A student may utilize this break in study (Maximum of Two years for Regular Students and Maximum of One Year for Lateral Entry Students) only once in the entire period of B. Tech program.

7. Course Pattern

- The entire course of study is for four academic years, all the years are on semester pattern and the medium of instruction is English.

- A student who eligible to appear for the end semester examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject when conducted next.

- When a student is detained for lack of credits/shortage of attendance, he may be readmitted into the same semester in which he has been detained. However, the academic regulations under which he was first admitted shall continue to be applicable to him.

8. CGPA

The grade points and letter grade will be awarded to each course based on students' performance as per the grading system shown in the following Table.

Range of Marks (Theory)	Range of Marks (Lab)	Letter Grade	Level	Grade Points
≥ 90	≥ 67	**O**	Outstanding	10
≥ 80 to <90	≥ 60 to <67	**S**	Excellent	9
≥ 70 to <80	≥ 52 to <60	**A**	Very Good	8
≥ 60 to <70	≥ 45 to <52	**B**	Good	7
≥ 50 to <60	≥ 37 to <45	**C**	Fair	6
≥ 40 to <50	≥ 30 to <37	**D**	Satisfactory	5
<40	<30	**F**	Fail	0
ABSENT	ABSENT	**AB**	Absent	0

- **Computation of Semester Grade Point Average (SGPA)**

The performance of each student at the end of each semester is indicated in terms of Semester Grade Point Average (SGPA)calculated as shown in below equation (1).

$$\textbf{SGPA (Si)} = \sum \textbf{(Ci X Gi) / } \sum \textbf{Ci} \qquad \text{-----------------} (1)$$

Where C_i is the number of credits of the ith course and G_i is the grade point scored by the student in the ith course.

- **Computation of Cumulative Grade Point Average (CGPA)**

The Cumulative Performance of each student at the end of each semester is indicated in terms of CGPA and it is calculated as shown in equation (2).

$$\textbf{CGPA} = \sum \textbf{(C}_i \textbf{ X S}_i \textbf{) / } \sum \textbf{C}_i \qquad \text{------------------} (2)$$

Where S_i is the SGPA of the ith semester and C_i is the total number of credits in that semester.

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

- The approximate equivalence of marks to a given CGPA is calculated by using the formula:

$$\text{Percentage Equivalence of CGPA} = [\text{CGPA} - 0.5] \times 10$$

9. Award of Class

The criterion for the award of division, after successful completion of the program isas shown in the following table.

Class Awarded	CGPA to be secured	
First Class with distinction*	≥7.75	**From the CGPA secured from 160 credits**
First Class	≥6.5 - <7.75	
Second Class	≥5.5 - <6.5	
Pass Class	≥4 - <5.5	
Fail	<4	

* Awarded only if all the credit courses prescribed are cleared within four years for regular candidates and three years for lateral entry candidates

* The students who are approved for break in study for entrepreneurships/start-ups will also be considered for award of first class with distinction

* For the purpose of awarding First, Second and Pass Class, CGPA obtained in the examinations appeared within the maximum period allowed for the completion of the program shall be considered.

10. Minimum Days of Instructions

Each semester consists of a minimum of 90 instruction days excluding examination days.

11. Transfer of Branch

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

12. Withholding of results

If the student has not paid any dues to the college or if any case of indiscipline is pending against him/her, the result of the student will be withheld. His/her degree will be withheld in such cases.

13. Transitory Regulations

A candidate who is detained or discontinued a semester, on re-admission, he shall be required to pass all the courses in the curriculum prescribed for such batch of students in which the student joins subsequently. Also the academic regulations be applicable to him/her which are in force at the time of his/her admission. However, exemption will be given to those candidates who have already passed in such courses in the earlier semester(s) and additional courses are to be studied as approved by the Board of Studies and ratified by the Academic Council.

14. Amendments to Regulations
Revisions of Regulations, Curriculum and Syllabi

The college may from time-to-time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of examinations through the Board of Studies with the approval of Academic Council and Governing Body of the college.

15. Transferred Students

The students seeking transfer to VVIT from various Universities/ Institutions have to obtain the credits of any equivalent subjects as prescribed by the Academic Council. Only the internal marks obtained in the previous institution will be considered for the evaluation of failed subjects.

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ACADEMIC REGULATIONS (R19) FOR B. Tech.
(LATERAL ENTRY SCHEME)

Applicable for the students admitted into II year B. Tech. from the Academic Year 2020-21 onwards

1. Award of B. Tech. Degree

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

- A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than three academic years and not more than six academic years.

- The candidate shall register for 121 credits and secure all the 121 credits.

2. The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech Lateral Entry Students.

3. Promotion Rule

- A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.

- A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

4.Award of Class

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

Class Awarded	CGPA to be secured	
First Class with distinction	≥7.75	**From the CGPA secured from 121 credits from II Year to IV Year**
First Class	≥6.5 - <7.75	
Second Class	≥5.5 - <6.5	
Pass Class	≥4 - <5.5	
Fail	<4	

5. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech Lateral Entry Scheme.

MALPRACTICE RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S.No.	Nature of Malpractices/Improper conduct	Punishment
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and

		all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent /Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	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.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.

11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Controller o Examinations for further action to award suitable punishment.	

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

⟹ Ragging within or outside any educational institution is prohibited.

⟹ Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	10 Months	+	Rs. 50,000/-

In case any emergency call Toll Free No. 1800 425 1288

LET US MAKE VVIT A RAGGING FREE CAMPUS

Ragging

ABSOLUTELY
NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

In case any emergency call Toll Free No. 1800 425 1288

LET US MAKE VVIT A RAGGING FREE CAMPUS

COURSE STRUCTURE

<table>
<tr><th colspan="7">I Year I Semester</th></tr>
<tr><th>S.No.</th><th>Course Code</th><th>Course Title</th><th>L</th><th>T</th><th>P</th><th>C</th></tr>
<tr><td>1</td><td>19SHT101</td><td>Communicative English
(Common to ALL)</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>2</td><td>19SHT102</td><td>Mathematics – I
(Common to ALL)</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>3</td><td>19SHT106</td><td>Applied Chemistry</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>4</td><td>19CST101</td><td>Programming for Problem Solving Using C
(Common to ALL)</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>5</td><td>19MEL101</td><td>Engineering Workshop</td><td>0</td><td>0</td><td>3</td><td>1.5</td></tr>
<tr><td>6</td><td>19SHL101</td><td>Communicative English Lab-I
(Common to ALL)</td><td>0</td><td>0</td><td>3</td><td>1.5</td></tr>
<tr><td>7</td><td>19SHL105</td><td>Applied Chemistry Lab</td><td>0</td><td>0</td><td>3</td><td>1.5</td></tr>
<tr><td>8</td><td>19CSL101</td><td>Programming for Problem Solving Using CLab
(Common to ALL)</td><td>0</td><td>0</td><td>3</td><td>1.5</td></tr>
<tr><td>9</td><td>19SHN101</td><td>Environmental Studies
(Common to CE, CSE & IT)</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="6">Total Credits</td><td>18</td></tr>
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<table>
<tr><th colspan="7">I Year II Semester</th></tr>
<tr><th>S.No.</th><th>Course Code</th><th>Course Title</th><th>L</th><th>T</th><th>P</th><th>C</th></tr>
<tr><td>1</td><td>19SHT201</td><td>Mathematics - II
(Common to ALL)</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>2</td><td>19SHT202</td><td>Mathematics - III
(Common to ALL)</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>3</td><td>19SHT205</td><td>Applied Physics</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>4</td><td>19CST201</td><td>Python Programming</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>5</td><td>19EET202</td><td>Basics of Electrical & Electronics Engineering</td><td>2</td><td>1</td><td>0</td><td>3</td></tr>
<tr><td>6</td><td>19SHL201</td><td>Communicative English Lab - II
(Common to ALL)</td><td>0</td><td>0</td><td>3</td><td>1.5</td></tr>
<tr><td>7</td><td>19SHL203</td><td>Applied Physics Lab</td><td>0</td><td>0</td><td>3</td><td>1.5</td></tr>
<tr><td>8</td><td>19CSL201</td><td>Python Programming Lab</td><td>0</td><td>0</td><td>3</td><td>1.5</td></tr>
<tr><td>9</td><td>19MEL202</td><td>Engineering Graphics</td><td>1</td><td>0</td><td>3</td><td>2.5</td></tr>
<tr><td>10</td><td>19SHN291</td><td>Constitutionof India
(Common to CE, CSE & IT)</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="6">Total Credits</td><td>22</td></tr>
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II Year I Semester

S.No.	Course Code	Course Title	L	T	P	C
1	19SHT302	Probability & Statistics	3	0	0	3
2	19ITT305	Mathematical Foundation of Computer Science	3	0	0	3
3	19ECT303	Digital Circuits and Logic Design	3	0	0	3
4	19ITT301	Data Structures	3	0	0	3
5	19ITT302	Java Programming	3	0	0	3
6	19ITL301	Data Structures Lab	0	0	0	1.5
7	19ITL302	Java programming Lab	0	0	3	1.5
8	19SHN302	Employability Skills-I	3	0	0	0
9	19SHN301	Essence of Indian Traditional Knowledge (Common to ALL)	2	0	0	0
Total Credits						**18**

II Year II Semester

S.No.	Course Code	Course Title	L	T	P	C
1	19ITT401	Advanced Data Structures	3	0	0	3
2	19ITT401	Software Engineering	3	0	0	3
3	19ITT403	Operating Systems	3	1	0	3
4	19ITT404	DataBase Management Systems	3	0	0	3
5	19ITT405	Computer Organization	3	0	0	3
6	19ITL401	DBMS Lab	0	0	3	1.5
7	19ITL402	Advanced Data Structures Lab	0	0	3	1.5
8	19ITR401	Socially Relevant Project	0	0	2	1
9	19SHN401	Professional Ethics and Human Values (Common to CE, CSE & IT)	2	0	0	0
Total Credits						**19**

		III Year I Semester				
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	19ITT501	Unix andShell Programming	3	0	0	3
2	19SHT501	Managerial Economics and Financial Analysis (Common to CE, CSE & IT)	3	0	0	3
3	19IIT502	Advanced Java Programming	3	0	0	3
4	19ITT503	Artificial Intelligence	3	0	0	3
5	19ITT504	Design and Analysis of Algorithms	3	0	0	3
6	19ITL501	Unix and Shell Programming Lab	0	0	3	1.5
7	19ITL502	Advanced Java Programming Lab	0	0	3	1.5
8	19ITL503	Artificial Intelligence Lab	0	0	3	1.5
9	19SHN501	Employability Skills –II	3	0	0	0
Total Credits						**19.5**

		III Year II Semester				
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	19ITT601	Data Warehousing and Data Mining	3	0	0	3
2	19ITT602	Computer Networks	3	0	0	3
3	19ITT603	Theory of Computation	3	0	0	3
4	19ITT604	Web Technologies	3	0	0	3

5	19ITT605	Professional Elective-I
		    A. NoSQL Databases
		    B. Software Testing Methodologies
		    C. Computer Graphics
		    D. Full Stack -I
		    E. Distributed Systems
			3	0	0	3

6	19ITT606	Professional Elective-II** MOOCS/NPTEL/SWAYAM- 12weeks duration/Conventional Mode	3	0	0	3
7	19ITL601	Web Technologies Lab	0	0	3	1.5
8	19ITL602	Data Mining Lab	0	0	3	1.5
9	19ITR601	Industrial Training/Internship	0	0	0	2.5
Total Credits						**23.5**

IV Year I Semester

S.No.	Course Code	Course Title	L	T	P	C
1	19ITT701	Cryptography and Network Security	3	0	0	3
2	19ITT702	Machine Learning	3	0	0	3
3	19ITT703	Mobile Computing	3	0	0	3
4	19ITT704	Open Elective-I A: Number Theory and Cryptanalysis B: Supply Chain Management C: MATLAB for Engineering Applications D: Operations Management E: Green Buildings	3	0	0	3
5	19ITT705	Professional Elective –III A: Software Project Management B: Big Data Analytics C: Internet of Things D: Network Programming	3	0	0	3
6	19ITL701	Mobile Application Development Lab	0	0	3	1.5
7	19ITL702	UML Lab	0	0	3	1.5
8	19ITR701	Project- I	0	0	0	3
9	19SHN701	Intellectual Property Rights and Patents (Common to CE, CSE & IT)	3	0	0	0
Total Credits						**21**

IV Year II Semester						
S.No.	Course Code	Course Title	L	T	P	C
1	19ITT801	Management and Organizational Behaviour	3	0	0	3
2	19ITT802	Open Elective –II A: Statistics with R Programming B: Fuzzy sets, Logic and Systems C: Optimization Techniques D: Environmental Pollution and Control	3	0	0	3
3	19ITT803	Professional Elective IV A; Object Oriented Analysis and Design B: Data Science C: Multimedia and Animation D: Full Stack II E: Blockchain Technologies	3	0	0	3
4	19ITT804	Professional Elective- V A: Devops B: Deep Learning C: Biometrics D: Image Processing E: Cyber Security and Forensics	3	0	0	3
5	19ITR801	Project – II	0	0	14	7
Total Credits						**19**

I- Year I- Semester	Name of the Course	L	T	P	C
HS1101	Communicative English	3	0	0	3

Course Objectives

1. Adopt activity-based teaching-learning methods to ensure that learners would be engaged in use of language both in the classroom and laboratory sessions.
2. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
3. Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
4. Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
5. Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
6. Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes

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

CO1. identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English (L3)

CO2. formulate sentences using proper grammatical structures and correct word forms (L3)

CO3. speak clearly on a specific topic using suitable discourse markers in informal discussions (L3)

CO4. write summaries based on global comprehension of reading/listening texts (L3)

CO5. produce a coherent paragraph interpreting a figure/graph/chart/table (L4)

CO6. take notes while listening to a talk/lecture to answer questions (L3)

Syllabus Blueprint

Contents	Learning Outcomes	Bloom's Level	No of Hrs
Unit-1 **Listening:** Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. **Reading:** Skimming to get the main idea of a text; scanning to look for	1. Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English 2. ask &answer general questions on familiar topics 3. employ suitable strategies for skimming &scanning to get the general idea of a text and specific information	L3 L2 L3	10

specific pieces of information.	4. recognize paragraph structure with beginnings/endings		
Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.	5. form sentences using proper grammatical structures and correct word forms	L3	
Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.		L3	
Unit-2	1. comprehend short talks on general topics	L2	
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.	2. speak clearly on a specific topic using suitable discourse markers in informal discussions	L3	
Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks.	3. understand the use of cohesive devices for better reading comprehension	L2	
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.	4. write well-structured paragraphs on specific topics		10
Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.	5. make necessary grammatical corrections in short texts	L3	
Grammar and Vocabulary: Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.		L3	
Unit-3	1. summarize the content with clarity &precision from short talks	L3	10
Listening: Listening for global comprehension and summarizing what is listened to.	2. report what is discussed in informal discussions	L3	
Speaking: Discussing specific topics in pairs or small groups and	3. infer meanings of unfamiliar		

reporting what is discussed	words using contextual clues	L3	
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.	4. write summaries based on global comprehension of reading/ listening texts		
	5. use correct tense forms, appropriate structures and a range of reporting verbs in speech and writing	L3	
Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. **Grammar and Vocabulary:** Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.		L3	
Unit-4	1. infer &predict about content of spoken discourse	L4	10
Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.	2. engage in formal/informal conversationsunderstanding verbal &non-verbal features of communication	L3	
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.	3. interpret graphic elements used in academic texts		
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.	4. produce a coherent paragraph interpreting a figure / graph / chart / table	L2	
Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.	5. use language appropriate for description and interpretation of graphical elements	L4	
Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms		L4	
Unit-5	1. take notes while listening to a talk/lecture to answer questions	L3	
Listening: Identifying key terms, understanding concepts and			

answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides. **Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences **Grammar and Vocabulary:** Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)	2. make formal oral presentations using effective strategies 3. produce a well-organized essay with adequate details 4. edit short texts by correcting common errors	L3 L3 L4	10

Detailed Syllabus

Unit 1 A Proposal to Girdle the Earth (Excerpt) by Nellie Bly
Theme: Exploration
1. **"How to Fashion Your Own Brand of Success" by Howard Whitman**
2. **"How to Recognize Your Failure Symptoms" by Dorothea Brande**
Listening
- identifying thetopic, the context and specific pieces of information
Speaking
- introducing oneself and others
Reading
- skimming for main ideas
- scanning for specific pieces of information
Writing/ Reading for Writing
- paragraphs, beginnings, introducing the topic, key words, main idea
Grammar and Vocabulary
- content words and function words
- word forms: verbs, nouns, adjectives and adverbs
- nouns: countable and uncountable; singular and plural forms
- basic sentence structures; simple question form: why-questions; word order in sentences
Learning Outcomes
- understand social or transactional dialogues spoken by native and non-native speakers of English and identify the context, topic, and pieces of specific information.
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match headings/main ideas with paragraphs
- form sentences using proper grammatical structures and correct word forms

Unit 2 An excerpt from The District School As It Was by One Who Went to It by Warren Burton
Theme: On Campus
    3. **"How to Conquer the Ten Most Common Causes of Failure" by Lois Binstock**
    4. **"How to Develop Your Strength to Seize Opportunities" by Maxwell Maltz**

Listening
- answering a series of questions about main idea and supporting ideas after listening to audio texts

Speaking
- discussion in pairs/ small groups on specific topics; preparing and delivering short structured talks using suitable cohesive devices

Reading
- identifying sequence of ideas
- recognizing verbal techniques that help link the ideas in a paragraph

Writing/ Reading for Writing
- paragraph writing (specific topics) using suitable cohesive devices; using key words/phrases and organizing points in a coherent manner
- mechanics of writing: punctuation, capital letters

Grammar and Vocabulary
- cohesive devices-linkers, sign posts and transition signals
- use of articles and zero articles
- prepositions

Learning Outcomes
- comprehend short talks on general topics
- participate in informal discussions and speak clearly on a specific topic using suitable discourse markers
- understand the use of cohesive devices for better reading comprehension
- write well-structured paragraphs on specific topics using suitable cohesive devices
- identify basic errors of grammar/usage and make necessary corrections in short texts

Unit 3 The Future of Work?
Theme: Working Together
    5. **"How to Make the Most of Your Abilities" by Kenneth Hildebrand**
    6. **"How to Raise Your Self-Esteem and Develop Self-Confidence" by James W. Newman**

Listening
- listening for global comprehension
- summarizing what is listened to

Speaking
- discussing specific topics in pairs/ small groups
- reporting what is discussed

Reading
- reading a text in detail by making basic inferences
- recognizing and interpreting specific context clues
- strategies to use text clues for comprehension

Writing/ Reading for Writing
- summarizing-identifying main idea/s
- rephrasing what is read
- avoiding redundancies and repetitions

Grammar and Vocabulary
- Verbs-tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes

Learning Outcomes
- comprehend short talks and summarize the content with clarity and precision
- participate in informal discussions and report what discussed
- infer meanings of unfamiliar words using contextual clues
- write summaries based on global comprehension of reading/listening texts
- use correct tense forms, appropriate structure and a range of reporting verbs in speech and writing.

Unit 4 H.G Wells and the Uncertainties of Progress by Peter J. Bowler
Theme: Fabric of Change
7. **"How to Win Your War Against Negative Feelings" by Dr Maxwell Maltz**
8. **"How to Find the Courage to Take Risks" by Drs Tom Rust and Randy Reed**

Listening
- making predictions while listening to conversations/transactional dialogues without video
- listening with video

Speaking
- role plays for practice of conversational English in social and academic contexts (formal & informal)
- asking for and giving information/directions/instructions/suggestions

Reading
- understand and interpret graphic elements used in texts (convey information, reveal trends/patterns/relationships, communicate processes or display data)

Writing/ Reading for Writing
- information transfer
- describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables

Grammar and Vocabulary
- quantifying expressions-adjectives and adverbs
- comparing and contrasting
- degrees of comparison
- use of antonyms

Learning Outcomes
- make inferences and predictions while listening to spoken discourse
- understand verbal and non-verbal features of communication and hold formal / informal conversations
- interpret graphic elements used in academic texts
- produce a coherent paragraph interpreting a figure/graph/chart/table
- use language appropriate for description and interpretation of graphical elements

Unit 5 Leaves from the Mental Portfolio of a Eurasian by Sui Sin Far
Theme: Tools for Life
9."How to Become a Self-Motivator" by Charles T Jones
10. "How to Eliminate Your Bad Habits"byOgMandino

Listening
- identifying the key terms
- understanding concepts
- answering a series of relevant questions that test comprehension

Speaking
- formal oral presentations on topics from academic contexts-without the use of PPT slides

Reading
- reading for comprehension

Writing/ Reading for Writing
- writing structured essays on specific topics using suitable claims and evidences

Grammar and Vocabulary
- reinforcing learning: articles, prepositions, tenses, subject-verb agreement

Learning Outcomes
- take notes while listening to a talk/lecture and make use of them to answer questions
- make formal oral presentations using effective strategies
- comprehend, discuss and respond to academic texts oral and in writing
- produce a well-organized essay with adequate support and detail
- edit short texts by correcting common errors

Text Books

1. *English All Round: Communication Skills for Undergraduate Learners-Volume 1*, Orient Black Swan, 2019 (to be released)
2. *University of Success* by OgMandino, Jaico, 2015.

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

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I- Year I- Semester	Name of the Course	L	T	P	C
BS1101	Mathematics-I	3	0	0	3

Course Objectives:
1. This course will illuminate the students in the concepts of calculus.
2. To enlighten the learners in the concept of differential equations and multivariable calculus.
3. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

Unit-1: Differential equations of first order and first degree:

Linear differential equations-Bernoulli's equations - Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

Unit-2: Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type $e^{ax}, \sin ax, \cos ax$, polynomials in x^n , $e^{ax} V(x)$ and $x^n V(x)$ - Method of Variation of Parameters.

Applications: LCR circuit – Simple harmonic motion

Unit-3: Mean value theorems:

Mean value theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

Unit-4: Partial differentiation:

Introduction – Homogeneous function – Euler's theorem **-** Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

Unit-5: Multiple integrals:

Double integrals (Cartesian and Polar) – Change of order of integration – Change of variables (Cartesian to Polar) –Triple integrals.

Applications: Areas by double integrals and Volumes by triple integrals.

TEXT BOOKS:
1. **B.S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **B.V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

REFERENCE BOOKS:
1. **H. K. Das,** Advanced Engineering Mathematics, 22nd Edition, S. Chand & Company Ltd.
2. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Course Outcomes: At the end of the course, the student will be able to
- solve the differential equations related to various engineering fields.
- utilize mean value theorems to real life problems.
- familiarize with functions of several variables which is useful in optimization.
- apply double integration techniques in evaluating areas bounded by region.
- learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional and 3 – dimensional coordinate systems.

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I- Year I- Semester	Name of the Course	L	T	P	C
BS1102	Applied Chemistry	3	0	0	3

Course Objectives:
- Significance and use of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells.
- Understand the mechanism of corrosion and how it can be prevented.
- Importance of advanced materials and their engineering applications.
- Differentiate and discuss the materials used in major industries like steel industry, metallurgical industries, construction industries, electrical equipments and manufacturing industries. Lubrication is also summarized.
- Essentiality of fuel technology.
- Need of water purification and importance of various water purification methods.

Course Outcomes:

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

1. explain the preparation, properties and applications of thermoplastics, thermosettings, elastomers and conducting polymers.
2. know the importance of various materials and their uses in the construction of batteries and fuel cells.
3. know the applications of advanced materials in various industries.
4. apply the principles of supramolecular chemistry in the applications of molecular machines, need of green chemistry.
5. explain the principles of spectrometry such as UV, IR, and NMR.

UNIT-I
Polymer Technology   (14 hrs)
Polymerisation: Introduction-Methods of polymerisation-(emulsion and suspension)-Physical and mechanical properties.
Plastics: Compounding-Fabrication (compression, injection, blown film, extrusion)-Preparation, properties and applications of PVC, ploycarbonates and Bakelite-Mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.
Elastomers: Natural rubber-Drawbacks-Vulcanization-Preparation-Properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes)
Composite Materials: Fiber reinforced plastics-CFRP and GFRP.
Conducting polymers: Polyacetylene, doped conducting polymers- p-type and n-type doping.
Bio degradable polymers: Biopolymers and biomedical polymers.

UNIT-II
Electrochemical Cells and Corrosion   (12 hrs)
Single electrode potential-Electrochemical series and uses of series-Standard hydrogen electrode,calomel electrode, concentration cell, construction of glass electrode, Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li-ion battery, Zinc air cells, Fuel cells-H_2 –O_2, CH_3OH-O_2, phosphoric acid, molten carbonate.
Corrosion: Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, water-line corrosion- passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control: (proper

designing, cathodic protection)-protective coatings: cathodic and anodic coatings, electroplating, electroless plating (nickel), paints (constituents and its functions).

UNIT-III
Chemistry of Materials   (12 hrs)
Nano materials: Introduction, sol-gel method, characterization by BET, SEM and TEM methods, applications of graphene- carbon nanotubes and fullerenes: Types, preparation of carbon nanomaterials by carbon-arc, laser ablation method, and applications.
Refractories: Definition , classification, properties (refractoriness, refractoriness under load, porosity and thermal spalling), failure of refractories.
Lubricants: Definition, mechanism of lubricants and properties (definition and importance).
Cement: Constituents, manufacturing, parameters to characterize the Clinker formation: lime saturation factor (LSF), silica ratio (SR), and alumina ratio (AR). Chemistry of setting and hardening, deterioration of cement.

UNIT-IV
Fuels   (12 hrs)
Introduction-calorific value - HCV and LCV – problems using Dulong's formula – proximate and ultimate analysis of coal sample – significance of these analysis – problems – petroleum (refining – cracking) – synthetic petrol (Fischer-Tropsch & Bergius) – petrol knocking, diesel knocking – octane and cetane rating – anti-knocking agents – introduction to alternative fuels (bio-diesel, ethanol, methanol, natural gas, LPG, CNG) – Flue gas analysis by Orsat apparatus – rocket fuels.

UNIT-V
Water Technology   (12 hrs)
Hardness of water – determination of hardness by complexometric method – boiler troubles (priming and foaming, scale formation, boiler corrosion, caustic embrittlement) – internal treatments – softening of hard water (zeolite process and ion exchange process) – treatment of industrial waste water – potable water and its specifications – steps involved in purification of water – chlorination, break point chlorination – reverse osmosis and electro dialysis.

Text Books
1.*Engineering Chemistry* by Jain & Jain; Dhanpat Rai Publicating Co., Latest Edition
2.*Engineering Chemistry* by Shikha Agarwal; Cambridge University Press, 2019 Edition.
Engineering Chemistry by Prasanth Rath, B. Ramadevi, Ch. Venkata Ramana Reddy, Subendu Chakravarthy; Cengage Publications, 2019 Edition.

Reference Books
1.*A text book of Engineering Chemistry* by S.S. Dara, S. S. Umare; S. Chand & Co., Ltd., Latest Edition.
2.*Engineering Chemistry* by Shashi Chawla; Dhanpat Rai Publicating Co., Latest Edition.

I Year I- Semester	Name of the Course	L	T	P	C
ES1101	Programming for Problem Solving Using C	3	0	0	3

Course Objectives:

1. To familiarize to notion of an algorithm, editing and executing programs in Linux.
2. To Understanding branching, iteration.
3. To represent Data using arrays.
4. To use Modular programming and recursive solution formulation.
5. To familiarize pointers and dynamic memory allocation.
6. To handle data through files

UNIT-I: Introduction to C

Introduction to Computers: hardware, Memory hierarchy, Types of Computers, Types of Software – Operating Systems, Translators, Device drivers and packages. Algorithms and its characteristics, Program development steps. Structure of a C program, Features of C, The main () Function, Standard I/O functions.

Programming Style – Indentation, Comments, Identifiers, Data Types**,** Operators, Precedence and Associativity. Variables and Declarations, Format Modifiers, Escape Sequences, Types of Statements

Casting –Implicit Type Conversions, Explicit Type Conversions, Mathematical Library Functions

UNIT-II: Control Flow & Modules

Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples. **Repetition**: Basic Loop Structures, Pre-test and Post-test Loops, Counter-Controlled andCondition-Controlled Loops, for, while and do while.

Branching: break & continue.

Modular Programming: Function and Parameter Declarations, Returning a Value, Types of parameters. Parameter – scalar data as argument.

Recursion: Definition, Base condition for recursion, Mathematical Recursion, Recursion versus Iteration.

UNIT-III Arrays & Strings

Arrays: Introduction to Arrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, Larger Dimensional Arrays- Matrices, 1D & 2D arrays as arguments.

Strings: String Fundamentals, String Input and Output, String Processing, Library Functions, Strings as arguments.

Unit – IV Pointers & Structures

Pointers: Concept of a Pointer, Initialization of Pointer variables, Pointers as function arguments, Passing by address, Dangling memory, Pointer Arithmetic, Character pointers, Pointers to Pointers, Array of pointers & Pointer to array, Dynamic memory management functions, Command line Arguments.

Structures: Derived types, Structure's declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, enum, bit-fields.

UNIT-V: Files

Storage classes – auto, static, extern, register. Pre-processor statements

Data Files: Declaring, Opening, and Closing File Streams, File handling functions, Reading from and Writing to Text Files, File copy, merge, Writing and reading records, Random File Access.

Text Books:

1. ANSI C Programming, E Balaguruswamy, Mc-GrawHill, 5th Edition
2. ANSI C Programming, Gary J. Bronson, Cengage Learning.
3. Programming in C, ReemaThareja, OXFORD Publications

Reference Books:

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Let us C, YashwantKanetkar, BPB Publications
3. Mastering in C, KR Venu Gopal, TMH

Course Outcomes: After completing this course, Students will be able to-

CO 1: Understand algorithms and basic terminology of C

CO 2: Solve problems using control structures and modular approach

CO 3: Make use of 1D and 2D arrays along with strings for linear data handling

CO 4: Determine the use of pointers and structures

CO 5: Implement various operations on data files.

I- Year I- Semester	**Name of the Course**	**L**	**T**	**P**	**C**
ES1101L	Engineering Workshop	0	0	3	1.5

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

Wood Working: Familiarity with different types of woods and tools used in wood working and make following joints
- a) Half – Lap joint
- b) Dovetail joint
- c) Bridle joint

Sheet Metal Working: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets
- a) Tapered tray   b) Conical funnel   c) Elbow pipe d) Brazing

Fitting: Familiarity with different types of tools used in fitting and do the following fitting exercises
a) V-fit   b) Dovetail fit c) square fit   d) Semi-circular e) Two Wheeler tyre puncture and change of two wheeler tyre

Electrical Wiring: Familiarities with different types of basic electrical circuits and make the following connections
a) Parallel and series   b) Two-way switch   c) Godown lighting   d) Tube light

e) Three phase motor   f) Soldering of wires

Course Outcomes: After completion of this lab the student will be able to
1. Apply wood working skills in real world applications. (L3)
2. Build different parts with metal sheets in real world applications. (L3)
3. Apply fitting operations in various applications. (L3)
4. Apply different types of basic electric circuit connections. (L3)
5. Demonstrate soldering and brazing. (L2)

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I- Year I- Semester	Name of the Course	L	T	P	C
HS1101L	Communicative English Lab I	0	0	3	1.5

Course Objectives

The main objective of the course is to adopt activity-based teaching-learning methods to ensure that learners would be engaged in use of language both in the classroom and laboratory sessions and appear confidently for competitive examinations for career development.

The specific objectives of the course are to

1. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native and non-native speakers
2. Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials like newspapers, magazines, periodicals, journals, etc.
3. Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
4. Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
5. Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes

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

CO1. identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English and speak clearly on a specific topic using suitable discourse markers in informal discussions (L3)
CO2. take notes while listening to a talk/lecture; to answer questions in English; formulate sentences using proper grammatical structures and correct word forms; and use language effectively in competitive examinations (L3)
CO3. write summaries based on global comprehension of reading/listening texts; produce a coherent write-up interpreting a figure/graph/chart/table; and use English as a successful medium of communication. (L3)

Detailed Syllabus
CALL based activity. English course books selected for classroom teaching will be used for practice in the computer-based language labs. However, a brief introduction to the English Phonetics will be given to the students. Activities that encourage individual learning of the students based on the suggested texts and web resources will be used in the practical sessions.

Introduction to Sound System of English
Articulation - Airstream mechanism, Manners of Articulation, Places of Articulation, English phonetic symbols.
Accent - Syllabification, word stress and accent, stress rules and stress shift, exceptions to rules.
Intonation - Stress and accent in connected speech. Types and functions of Intonation in English.
Pair work, Role play, conversational practice and Individual speaking activities based on following essays from *University of Success.*
1. "How to Fashion Your Own Brand of Success" by Howard Whitman
2. "How to Recognize Your Failure Symptoms" by Dorthea Brand
3. "How to Conquer the Ten Most Common Causes of Failure" by Lois Binstock

4. **"**How to Develop Your Strength to Seize Opportunities" by Maxwell Maltz
5. "How to Make the Most of Your Abilities" by Kenneth Hildebrand
6. "How to Raise Your Self-Esteem and Develop Self-Confidence" by James W. Newman
7. "How to Win Your War Against Negative Feelings" by Dr Maxwell Maltz
8. "How to Find the Courage to Take Risks" by Tom Rust and Randy Reed
9. "How to Become a Self-Motivator" by Charles T Jones
10. "How to Eliminate Your Bad Habits" by OgMandino

Text Books

1. English All Round: Communication Skills for Undergraduate Learners-Volume 1, Orient Black Swan, 2019 (to be released)
2. University of Success by OgMandino, Jaico, 2015.

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

AICTE Recommended Books

1. Meenakshi Raman and Sangeeta Sharma. Technical Communication. Oxford University Press, 2018.
2. Pushplata and Sanjay Kumar. Communication Skills, Oxford University Press, 2018.
3. Kulbushan Kumar. Effective Communication Skills. Khanna Publishing House, Delhi

Sample Web Resources

Grammar / Listening / Writing 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/ Grammar/Vocabulary English Language Learning Online http://www.bbc.co.uk/learningenglish/ http://www.better-english.com/ http://www.nonstopenglish.com/ https://www.vocabulary.com/ BBC Vocabulary Games Free Rice Vocabulary Game	Reading: https://www.usingenglish.com/comprehension/ https://www.englishclub.com/reading/shortstories.htm https://www.english-online.at/Listening https://learningenglish.voanews.com/z/3613 http://www.englishmedialab.com/listening.html Speaking https://www.talkenglish.com/ BBC Learning English – Pronunciation tips Merriam-Webster – Perfect pronunciation Exercises
All Skills https://www.englishclub.com/ http://www.world-english.org/ http://learnenglish.britishcouncil.org/	

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I- Year I- Semester	Name of the Course	L	T	P	C
BS1101L	Applied Chemistry Lab	0	0	3	1.5

Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations quantitative analysis .

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn (II) using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Copper (II) using standard EDTA solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Iron (III) by colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metric method).
9. Determination of concentration of strong acid vs strong base (by conductometric method).
10. Determination of strong acid vs strong base (by potentiometric method).
11. Determination of Mg^{+2} present in an antacid.
12. Determination of $CaCO_3$ presence in an egg shell.
13. Estimation of vitamin- C.
14. Determination of phosphoric content in soft drinks.
15. Adsorption of acetic acid by charcoal.
16. Prepatation of nylon-6, 6 and Bakelite (demonstration only)
Note: Choice of any 10 experiments from the above.

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

- To estimate the amount of metal ions present in different solutions (L4 & L3)
- To analyze the quality parameters of water (L4)
- To determine the strength of different solutions by using different instrumentation techniques (L3)

Reference Books:
A Text Book of Quantitative Analysis, Arthur J. Vogel.

Learning Objectives:
1. To furnish the students with a solid foundation in Chemistry Laboratory required to solve the Engineering problems.
2. To expose the students in practical aspects of the theoritical concepts like pH, hardness of water etc.
3. To guide the students on how to handle the instruments like UV-visible spectrophotometer, potentiometer and conductometer.

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I- Year I- Semester	Name of the Course	L	T	P	C
ES1101L	Programming for Problem Solving Using C Lab	0	0	3	1.5

Course Objectives:

1. Apply the principles of C language in problem solving.
2. To design flowcharts, algorithms and knowing how to debug programs.
3. To design & develop of C programs using arrays, strings pointers & functions.
4. To review the file operations, pre-processor commands.

Exercise - 1 Control Flow - I

a) Write a C Program to Find Whether the Given Year is a Leap Year or not.

b) Write a C Program to find second biggest of three numbers (Assume that all the numbers are unique).

Exercise – 2 Control Flow - II

b) Write a C Program to Find Whether the Given Number is

i) Prime Number

ii) Armstrong Number

Exercise – 3 Control Flow - III

a) Write a C program to print Floyd Triangle

b) Write a C Program to print Pascal Triangle

c) Write a C program to display a Pyramid

Exercise – 4 Arrays - Demonstration of arrays

a) Search-Linear.

b) Sorting-Bubble

c) Operations on Matrix. - Add, Subtract, Multiply

Exercise – 5 Strings

a) Implementation of string manipulation operations **with** library function: Copy, length, compare

b) Implementation of string manipulation operations **without** library function: copy, length, compare

Exercise – 6 Functions

a) Write a C Program demonstrating of parameter passing in Functions and returning values.

b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 7 Functions - Continued

Write a C Program to compute the values of sin x and cos x and ex values using Series expansion. (Use factorial function)

Exercise - 8 Arrays, Strings and Pointers

a) Write a C Program to find min and max of an array of elements using pointers

b) Write a C Program to concatenate one string to another using pointer.

Exercise – 9 Dynamic Memory Allocations

Write a C program to represent 1D and 2D arrays using malloc () function.

Exercises - 10 Structures

a) Write a C Program to Store Information of a Movie Using Structure

b) Write a C Program to sort a set of student records in ascending order.

c) Write a C Program to Add, subtract & multiply Two Complex Numbers.

Exercise -11 Files

a) Write a C programming code to open a file and to print it contents on screen.

b) Write a C program to copy the content of one file to another.

C) Write a C program merges two files and stores their contents in another file

Course Outcomes: By the end of the Lab, the student able to

1. **Comprehend** the various concepts of a C language
2. **Develop** algorithms and flowcharts
3. **Design** and development of C problem solving skills.
4. **Acquire** modular programming skills.

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I- Year I- Semester	Name of the Course	L	T	P	C
MC1101	Environmental Science	2	0	0	0

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

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

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

UNIT – II: Ecosystems, Biodiversity, and its Conservation
ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:
    a.   Forest ecosystem.
    b.   Grassland ecosystem
    c.   Desert ecosystem
    d.   Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
BIODIVERSITY AND ITS CONSERVATION : Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

LEARNING OUTCOMES
Students will be able to
1. get a clear picture of structure and functions of ecosystems.
2. explain why renewable and non-renewable energy resources are important.

3. get awareness about land degradation, soil erosion & desertification.
4. gain a rigorous foundation in various scientific disciplines as they apply to environmental science, such as ecology, evolutionary biology, hydrology, and human behaviour.

UNIT – III: Environmental Pollution and Solid Waste Management
ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :
    a.   Air Pollution.
    b.   Water pollution
    c.   Soil pollution
    d.   Marine pollution
    e.   Noise pollution
    f.   Thermal pollution
    g.   Nuclear hazards

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

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

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

LEARNING OUTCOMES:
Students will be able to
1. understand Cause, effects and control measures of air pollution.
2. understand soil, noise & water pollution.
3. explain the enforcement of Environmental legislation
4. understand solid waste management.

UNIT – V: Human Population and the Environment
HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.
FIELD WORK: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

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

TEXT BOOKS:
1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

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

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I- Year II- Semester	Name of the Course	L	T	P	C
BS1201	Mathematics-II	3	0	0	3

Course Objectives:

➢ To elucidate the different numerical methods to solve nonlinear algebraic equations

➢ To disseminate the use of different numerical techniques for carrying out numerical integration

➢ To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications

UNIT-1: Iterative methods: (10 hrs)

Introduction–Bisection method–Method of false position–Iteration method–Newton-Raphson method (one variable)–Jacobi and Gauss-Seidel methods for solving system of equations.

UNIT-2: Interpolation: (12 hrs)

Introduction–Errors in polynomial interpolation–Finite differences–Forward differences–Backward differences–Central differences –Relations between operators–Newton's forward and backward formulae for interpolation–Gauss's forward and backward formulae for

Interpolation – Interpolation with unequal intervals–Lagrange's interpolation formula–Newton's divide difference formula.

UNIT-3: Numerical integration and solution of ordinary difference equations: (10 hrs)

Trapezoidal rule–Simpson's $1/3^{rd}$ and $3/8^{th}$ rule–Solution of ordinary differential equations by Taylor's series–Picard's method of successive approximations–Euler's method–Modified Euler's method–Runge-Kutta method (second and fourth order).

UNIT–4: Laplace Transforms: (14 hrs)

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function –Periodic function - Inverse Laplace transforms – Convolution theorem (without proof)

Applications: Evaluation of integrals using Laplace transforms - Solving ordinary differential equations (Initial value problems) using Laplace transforms.

UNIT 5: Fourier series and Fourier Transforms: (14 hrs)

Fourier series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) - Fourier sine and cosine integrals – Sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

Text Books:

1. **B.S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.

Reference Books:

1. **B.V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
2. **H.K.Das,** Advanced Engineering Mathematics, 22nd Edition, S. Chand & Company Ltd.
3. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

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

- Evaluate approximate in the roots of polynomial and transcendental equations by different algorithms (EVALUATE)
- Solve system of linear algebraic equations using Gauss Jacobi, Gauss Seidel and apply Newton's forward and backward interpolation and Lagrange's formulae for equal and unequal intervals (SOLVE , APPLY,FIND)
- Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations and also by Laplace the transforms for solving differential equations (SOLVE , APPLY,FIND)
- Find or compute the Fourier series of periodic signals (SOLVE ,APPLY, FIND, ANALYSE)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to range of non-periodic waveforms (SOLVE , APPLY, FIND)

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I- Year II- Semester	Name of the Course	L	T	P	C
BS1202	Mathematics-III	3	0	0	3

Course Objectives:
1. To instruct the concept of Matrices in solving linear algebraic equations
2. To familiarize the techniques in partial differential equations
3. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications

UNIT-I:Solving system of linear equations, Eigen values and Eigen Vectors   (12 hrs)

Rank of a matrix by Echelon form and normal form–solving system of homogeneous and non-homogeneous linear equations–Gauss elimination, Gauss Jordan for solving system of equations- Eigen values and Eigen vectors and their properties

UNIT-II: Cayley-Hamilton theorem and quadratic forms: (12 hrs)

Cayley-Hamilton theorem (without proof)–Finding inverse and power of a matrix by Cayley-Hamilton theorem–Reduction to Diagonal form–Quadratic forms and nature of the quadratic forms–Reduction of quadratic form to canonical forms by orthogonal transformation.

Application: Free vibration of two mass systems.

UNIT – III: Vector Differentiation: (10 hrs)

Scalar and Vector point functions-Vector Differential operator- Gradient – Directional derivatives– Divergence – Curl – Laplacian second order operator- Vector identities- Scalar Potential.

UNIT– IV: Vector Integration: (12 hrs)

Line integral – Work done – Circulation- Surface integral- Volume integral Vector integral theorems (without proof): Greens theorem in a plane- Stokes theorem- Gauss Divergence theorem.

UNIT– V: Solutions of Partial differential Equations   (14 hrs)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

Second order PDE: Solutions of linear partial differential equations with constant coefficients RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.

Text Books:

2. **B.S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.

Reference Books:

4. **B.V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
5. **H.K.Das,** Advanced Engineering Mathematics, 22nd Edition, S. Chand & Company Ltd.
6. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

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

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)

- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan (L3)
- to interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- estimate the work done against a field, circulation and flux using vector calculus (L5)
- identify the solution methods for partial differential equation that model physical processes (L3)

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Course Objectives:

Applied Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by Vasireddy Venkatadri Institute of Technology, which serves as a transit to understand the branch specific advanced topics. The course is designed to:

➢ Impart Knowledge ofPhysical Opticsphenomena like Interference and Diffraction required to design instruments with higher resolution.

➢ Understand the physics of Semiconductors and their working mechanism for their utility in electronic devices.

Impart the knowledge of materials with characteristic utility in appliances.

Unit-I: Wave Optics:

Interference: PrincipleofSuperposition-Interferenceoflight – ConditionsforsustainedInterference-Interferencein thin films (reflected geometry) - Newton's Rings (reflected geometry)

Diffraction: Fraunhofer Diffraction:- Diffraction due to single slit (quantitative), double slit(qualitative), N –slits(qualitative) and circular aperture (qualitative) – Intensity distribution curves - Diffraction grating – Grating spectrum – missing order– resolving power – Rayleigh's criterion – Resolving powers of Microscope(qualitative), Telescope(qualitative) and grating (qualitative).

Unit– II: LASERs and Holography

LASERs: Interaction of radiation with matter – Spontaneous and Stimulated emission of radiation – population inversion – Einstein's coefficients & Relation between them and their significance - Pumping Mechanisms - Ruby laser – Helium-Neon laser – Applications.

Holography: Introduction – principle – differences between photography and holography – construction and reconstruction of hologram – applications of holograms

Unit-III: Magnetism and Dielectrics

Magnetism: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment - Bohr magneton-Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

Dielectrics: Introduction-Dielectricpolarization

Dielectricpolarizability,SusceptibilityandDielectricconstant- Types of polarizations: Electronic and Ionic (Quantitative), Orientation Polarizations (Qualitative) - Lorentz Internal field-Claussius –Mossotti's equation- Frequency dependence of polarization - Applications of dielectrics.

Unit– IV: Quantum Mechanics

Introduction– matter waves – de Broglie's hypothesis – Davisson-Germer experiment – G.P.Thomson experiment – Heisenberg's Uncertainty Principle–Schrödinger time independent and time dependent wave equations – physical significance of Schrödinger wave function – Particle in a potential box (determination of energy).

Unit– V: Semiconductor Physics

Originofenergybands(qualitative)   –Classificationofsolidsbasedonenergybands

Intrinsicsemiconductors-densityof charge carriers –Electricalconductivity-Fermi level – extrinsicsemiconductors-P-type&N-type-Densityof chargecarriers-DependenceofFermienergyoncarrierconcentrationandtemperature-Halleffect-Hallcoefficient-ApplicationsofHalleffect- Drift and Diffusion currents - Einstein's equation.

TEXT BOOKS:
1. "Engineering Physics" by B. K. Pandey, S. Chaturvedi - Cengage Publications, 2012
2. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand, 2017.
3. "Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
4. "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

REFERENCE BOOKS:
1. "Engineering Physics" by M.R.Srinivasan, New Age international publishers (2009).
2. "Optics" by Ajoy Ghatak, 6th Edition McGraw Hill Education, 2017.
3. "Solid State Physics" by A.J.Dekker, Mc Millan Publishers (2011).

Course Outcomes:

The students will be able to

1. **Understand** the principles such as interference and diffraction to design and enhance the resolving power of various optical instruments.
2. **Learn** the basic concepts of LASER light Sources and Apply them to holography
3. **Study** the magnetic and dielectric materials to enhance the utility aspects of materials.
4. **Analyze** acoustic properties of typically used materials in buildings
5. **Understand** the concepts of shearing force and moment of inertia

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I- Year II- Semester	Name of the Course	L	T	P	C
ES1201	Python Programming	3	0	0	3

Course Objectives:
- Introduction to Scripting Language
- Use various data handling mechanisms
- Exposure to various problems solving approaches of computer science

UNIT – I
Introduction   **(8 hrs)**
History of Python, Need of Python Programming, differences between C and Python, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.
Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators-Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions.

UNIT – II
Flow Control & Data Structures   **(14 hrs)**
Control Flow - order of evaluations Control Flow- if, if-elseif, for, while, break, continue, pass
Data Structures- Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

UNIT – III
Modules & Packages   **(10 hrs)**
Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.
Modules: Creating modules, import statement, from. Import statement, name spacing.
Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages

UNIT – IV
OOPs   **(12 hrs)**
Object Oriented Programming in Python: Definition, advantages of OOPs, OOPs principles, Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, and Data hiding.
Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

UNIT – V
STL   **(8 hrs)**
Brief Tour of the Standard Library - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics
Testing: Why testing is required ?, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.

Text Books
1. *Python Programming: A Modern Approach*, Vamsi Kurama, Pearson
2. *Learning Python*, Mark Lutz, Orielly

Reference Books
1. *Think Python*, Allen Downey, Green Tea Press
2. *Core Python Programming*, W.Chun, Pearson.
3. *Introduction to Python*, Kenneth A. Lambert, Cengage.

Course Outcomes:
By the end the of the course, the student will be able to
- Understand the need and the Jargon of Python language
- Experiment with various Data structures in interpreted Language.
- Build modules and packages for real software needs.
- Implement object oriented principles in Python
- Identify solutions using GUI and testing mechanisms.

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I- Year II- Semester	Name of the Course	L	T	P	C
ES1202	Basics of Electrical and Electronics Engineering	2	1	0	3

Course Objectives:

- To introduce basics of electric circuits and to teach DC and AC electrical circuit analysis.
- To explain the working principles DC machines and speed control of various DC motors.
- To explain the working principles of transformers and AC machines and its applications.
- To introduce the basics of semiconductor physics and operation and applications of Diodes.
- To introduce the basics of transistors and explain the transistor configurations

Unit 1 DC & AC Circuits:

DC Circuits:

Electrical circuit elements (R - L and C) – Kirchhoff's laws -Voltage and Current division rules- series, parallel circuits and star-delta and delta-star transformations- [Elementary treatment only]

AC Circuits:

Representation of sinusoidal waveforms - Peak and RMS values - phasor representation - real power - reactive power - apparent power - power factor.[Elementary treatment only]

Unit 2 DC Machines:

DC Generator:

Construction-Principle and operation of DC Generator - EMF equation -Types– Applications[Elementary treatment only]

DC Motor:

Principle and operation of DC Motor – types-Torque equation - Speed control of DC Motor- Brake test- Swinburne's test-Applications. [Elementary treatment only]

Unit 3 AC Machines:

Single Phase Transformer:

Construction, Principle and operation of Single Phase Transformer –EMF Equation-Losses- Efficiency. [Elementary treatment only]

Three Phase Induction Motor: Construction- Principle and operation of three phase Induction Motor-Types- Applications. [Elementary treatment only].

Unit 4 Semiconductor Devices

Semiconductor Physics, PN Junction Diode & Zener Diode-characteristics- Applications: Rectifiers (Half Wave Rectifier & Full Wave Rectifier) [Elementary treatment only], Clippers and Clampers.

Unit 5 Bipolar Junction Transistors

Construction and working of bipolar junction transistor, CB, CE and CC Configurations and characteristics. [Elementary treatment only], Transistors as amplifiers, op-amp basics.

Text Books:

1. D. P. Kothari and I. J. Nagrath- "Basic Electrical Engineering" - Tata McGraw Hill - 2010.

2. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

References:
1. L. S. Bobrow- "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
2. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.

Course Outcomes: At the end of the course, the student will be able to
- Apply concepts of KVL/KCL in solving DC circuits.(Apply, Find, Solve)
- Choose correct machine for a specific application. (Understand, Apply)
- Illustrate working principles of DC and AC Machines. (Understand, Apply)
- Describe working principles of diodes and transistors. (Understand, Apply)
- Understand the applications of diodes and transistors. (Understand, Analyze)

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I- Year II- Semester	Name of the Course	L	T	P	C
HS1201L	Communicative English Lab II	3	0	0	3

The main objective of the course is to adopt activity-based teaching-learning methods to ensure that learners would be engaged in use of language both in the classroom and laboratory sessions and appear confidently for competitive examinations for career development.

The specific objectives of the course are to

1. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native and non-native speakers

2. Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials like newspapers, magazines, periodicals, journals, etc.

3. Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations

4. Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information

5. Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Detailed Syllabus

CALL based activity. English course books selected for classroom teaching will be used for practice in thecomputer-based language labs. Watching and listening to Video clips.
Listening Activity: Selected speeches of eminent personalities, audio texts, dialogues and discussions
Speaking: JAM, Oral Presentations, Group Discussions
Writing: Different types of reports
Project: Power point presentation of 5 min on a specific topic
Pair work, Role play, conversational practice and Individual speaking activities based on following essays from *University of Success*.
1. "How to Get Yourself Organized" by Michael LeBeouf
2. "How to Turn Your Desires into Gold" by Napoleon Hill
3. "How to Look Like a Winner How to Increase Your Value" by OgMandino
4. "How to Swap a Losing Strategy" by Auren Uris and Jack Tarrant
5. "How to Bounce Back from Failure" by OgMandino
6. "How to Prevent Your Success from Turning into Ashes" by Allan Fromme
7. "How to Have a Happy Life" by Louis Binstock
8. "How to Keep the Flame of Success Shining Brightly" by Howard Whitman

Any ten Supplementary Language Activities from *UN Global Goals*document

1. "Developing children's understanding of the Global Goals" by Carol Read

2. "End poverty in all its forms everywhere" by SylwiaZabor-Zakowska

3. "End hunger, achieve food security and improved nutrition and promote sustainable agriculture" by Linda Ruas
   4. 'Ensure healthy lives and promote well-being for all at all ages" by Carmen Flores

5. "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" by Daniel Xerri

6. "Achieve gender equality and empower all women and girls" by Jemma Prior and Tessa Woodward

7. "Ensure availability and sustainable management of water and sanitation for all" by Wei KeongToo

8. "Ensure access to affordable, reliable, sustainable and modern energy for all" by Phil Wade

9. "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all" by Nik Peachey

10. "Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation" by MaluSciamarelli

11. "Reduce inequality within and among countries" by Alan Maley

12. "Make cities and human settlements inclusive, safe, resilient and sustainable" by David Brennan

13. "Ensure sustainable consumption and production patterns" by Laszlo Katona and Nora Tartsay

14. "Take urgent action to combat climate change and its impacts" by Maria Theologidou

15. "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" by Jill Hadfield and Charlie Hadfield

16. "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss" by ChrysaPapalazarou

17. "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels" by Rebeca Duriga

18. "Strengthen the means of implementation and revitalise the global partnership for sustainable development" by Jennifer Verschoor and Anna Maria Menezes

19. "Content and the Sustainable Development Goals: going beyond language learning" by AdrianTennant

20. "Using extensive reading creatively to raise awareness of issues of equality and justice" by SueLeather

21. "Storytelling for a better world" by David Heathfield

22. "Using the Sustainable Development Goals in the EAP classroom" by Averil Bolster and PeterLevrai

Text Books

1. Alan Maley and Nik Peachy. *Integrating global issues in the creative English Classroom: Withreference to the United Nations Sustainable Development Goals.* British Council Teaching English, 2018 (Public Domain UN Document)

2. *University of Success* by OgMandino, Jaico, 2015 (Reprint).

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.

2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.

3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.

4. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

5. Chaturvedi, P. D. and ChaturvediMukesh. *The Art and Science of Business Communication:Skills, Concepts, Cases and Applications.* 4Ed. Pearson, 2017.

AICTE Recommended Books

1. Meenakshi Raman and Sangeeta Sharma. *Technical Communication.* Oxford University Press,2018.
2. Pushplata and Sanjay Kumar. *Communication Skills*, Oxford University Press, 2018.
3. Kulbushan Kumar. *Effective Communication Skills.* Khanna Publishing House, Delhi

Sample Web Resources

Grammar / Listening / Writing 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/ Grammar/Vocabulary English Language Learning Online http://www.bbc.co.uk/learningenglish/ http://www.better-english.com/ http://www.nonstopenglish.com/ https://www.vocabulary.com/ BBC Vocabulary Games Free Rice Vocabulary Game	Reading https://www.usingenglish.com/comprehension/ https://www.englishclub.com/reading/short stories.htm https://www.english-online.at/ Listening https://learningenglish.voanews.com/z/3613 http://www.englishmedialab.com/listening.html Speaking https://www.talkenglish.com/ BBC Learning English – Pronunciation tips Merriam-Webster – Perfect pronunciation Exercises
All Skills https://www.englishclub.com/ http://www.world-english.org/ http://l	

Course Outcomes

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

CO1. Prioritize information from reading texts after selecting relevant and useful points and paraphrase short academic texts using suitable strategies and conventions (L3)
CO2. Make formal structured presentations on academic topics using PPT slides with relevant graphical elements (L3)
CO3. Participate in group discussions using appropriate conventions and language strategies (L3)
CO4. Prepare a CV with a cover letter to seek internship/ job (L2)
CO5. Collaborate with a partner to make presentations and Project Reports (L2)

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I- Year II- Semester	Name of the Course	L	T	P	C
BS1201L	Applied Physics Lab	0	0	3	1.5

Course Objectives:

The Applied Physics Lab is designed to:
- ➢ Understand the concepts of interference and diffraction and their applications.
- ➢ Apply the concept of LASER in the determination of wavelength.
- ➢ Recognize the importance of energy gap in the study of conductivity and Hall Effect.
- ➢ Illustrate the magnetic and dielectric materials applications.
- ➢ Apply the principles of semiconductors in various electronic devices.

LIST OF EXPERIMENTS
(Any 10 of the following listed 15 experiments)
1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings – Radius of Curvature of Plano – Convex Lens.
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
5. Energy Band gap of a Semiconductor p – n junction.
6. Characteristics of Thermistor   – Temperature Coefficients
7. Determination of dielectric constant by charging and discharging method
8. Variation of dielectric constant with temperature
9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10. LASER – Determination of wavelength by plane diffraction grating
11. Verification of laws of vibrations in stretched strings – Sonometer.
12. Determine the radius of gyration using compound pendulum
13. Rigidity modulus of material by wire-dynamic method (torsional pendulum)
14. Dispersive power of diffraction grating.
15. Determination of Hall voltage and Hall coefficients of a given semiconductor using Hall Effect.

Course Outcomes:

The students will be able to:
1. Operate optical instruments like microscope and spectrometer
2. Determine thickness of a paper with the concept of interference
3. Estimate the wavelength of differentcolours using diffraction grating and resolving power
4. Plot the intensity of the magnetic field of circular coil carrying current with distance
5. Calculate the band gap of a given semiconductor

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I- Year II- Semester	Name of the Course	L	T	P	C
MC1201	Constitution Of INDIA	3	0	0	0

Course Objectives:

➢ To Enable the student to understand the importance of constitution

➢ To understand the structure of executive, legislature and judiciary

➢ To understand philosophy of fundamental rights and duties

➢ To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.

➢ To understand the central and state relation financial and administrative.

UNIT-I

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

LEARNING OUTCOMES:

After completion of this unit student will

● Understand the concept of Indian constitution

● Apply the knowledge on directive principle of state policy

● Analyze the History, features of Indian constitution

● Evaluate Preamble Fundamental Rights and Duties

UNIT-II

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

LEARNING OUTCOMES: - After completion of this unit student will

● Understand the structure of Indian government

● Differentiate between the state and central government

● Explain the role of President and Prime Minister

● Know the Structure of supreme court and High court

UNIT-III

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

LEARNING OUTCOMES: - After completion of this unit student will

● Understand the structure of state government

● Analyze the role Governor and Chief Minister

● Explain the role of state Secretariat

● Differentiate between structure and functions of state secretariate

UNIT-IV

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

LEARNING OUTCOMES: -After completion of this unit student will

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

UNIT-V

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

LEARNING OUTCOMES: -After completion of this unit student will

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

REFERENCES:

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

E-RESOURCES:

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

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

➢ Understand historical background of the constitution making and its importance for building a democratic India.

➢ Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

➢ Understand the value of the fundamental rights and duties for becoming good citizen of India.

➢ Analyze the decentralization of power between central, state and local self-government.

> Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

I- Year II- Semester	Name of the Course	L	T	P	C
ES1201L	Python Programming Lab	0	0	3	1.5

Course Objectives:
- Experiment with scripting language
- Evaluate expression evaluation, control statements
- Use Data structures
- Model Functions, Modules and packages
- Outline OOP through Python and Exception Handling
- Select required Python Standard Library and Testing

Exercise 1 – Basics
  a) Running instructions in Interactive interpreter and a Python Script
  b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 – Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
  b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise – 3 Control Flow

  a) Write a Program for checking whether the given number is an even number or not.
  b) Using a for loop, write a program that prints out the decimal equivalents of ½, 1/3, ¼, . . . , 1/10
  c) Write a program using for loop that loops over a sequence. What is sequence?
  d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 – Control Flow – Continued

       b) Find the sum of all the primes below two million.

Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:1, 2, 3, 5, 8, 13, 21, 34, 55, 89, …

b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise – 5 – DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure
b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise – 6 DS – Continued

a) Write a program combine_lists that combines these lists into a dictionary.
b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise – 7 Files

    a) Write a program to print each line of a file in reverse order.
    b) Write a program to compute the number of characters, words and lines in a file.

Exercise – 8 Functions

a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.
Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

Exercise – 9 Functions – Continued

a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to find all the unique elements of a list.

Exercise – 10 – Functions – Problem Solving

a) Write a function cumulative_product to compute cumulative product of a list of numbers.
b) Write a function reverse to reverse a list. Without using the reverse function.
c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 11 – Multi-D Lists

    a) Write a program that defines a matrix and prints
    b) Write a program to perform addition of two square matrices
    c) Write a program to perform multiplication of two square matrices

Exercise – 12 – Modules

    a) Install packages requests, flask and explore them. Using (pip)
    b) Write a script that imports requests and fetch content from the page. Eg. (Wiki)
    c) Write a simple script that serves a simple HTTPResponse and a simple HTML Page

Exercise – 13 OOP

a) Class variables and instance variable and illustration of the self variable
    i) Robot
    ii) ATM Machine

Exercise – 14 GUI, Graphics

    1. Write a GUI for an Expression Calculator using tk
    2. Write a program to implement the following figures using turtle
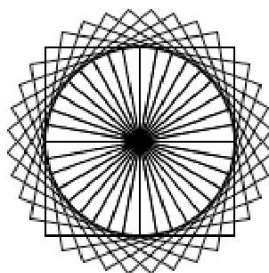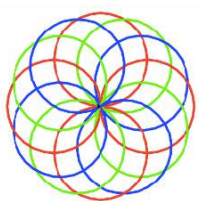
Exercise – 15 – Testing

a)Write a test-case to check the function even_numbers which return True on passing a list of all even numbers

b)Write a test-case to check the function reverse_string which returns the reversed string

Exercise – 16 – Advanced

a) Build any one classical data structure.
b) Write a program to solve knapsack problem.

Course Outcomes: After completing this course, Students will be able to-

CO1: Comprehend how software easily to build right out of the box.

CO2: Demonstrates the use of an interpreted language for problem solving through control statements including loops and conditionals.

CO3: Practice with data structures for quick programming solutions.

CO4: Demonstrates software building for real needs by breaking out code into reusable functions and modules.

CO5: Comprehend the software reliability through exception handling.

CO6: Use of python standard library for problem solving and Identifies the necessity of testing software.

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I- Year II- Semester	Name of the Course	L	T	P	C
ES1202L	Engineering Graphics & Design	1	0	3	1.5

Course Objectives:

- ➢ Expose the students to use Drafting packages for generating Engineering curves and conventions followed in Preparation of engineering drawings.
- ➢ Make the students to understand the concepts of orthographic projections of Lines and Plane Surfaces.
- ➢ To understand the concepts of orthographic projections of Regular Solids.
- ➢ Develop the ability of understanding sectional views and Development of Solid Surfaces.
- ➢ Enable them to use computer aided drafting packages for Conversion of Isometric view to Orthographic Projection and vice versa.

UNIT-I: INTRODUCTION TO AUTOCAD:

Basic commands, Customization, ISO and ANSI standards for coordinate dimensioning, Annotations, layering, 2D drawings of various mechanical components, 2D drawings of various electrical and electronic circuits. Creation of engineering models- floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; (Experiments should be Planned According to respective Core Branch Applications)

UNIT-II: THEORY OF PROJECTION:

Principles of Orthographic Projections-Convention: Projections of Points, Projections of Lines inclined to both planes, Projections of planes inclined to one Plane & Projections of planes inclined to both Planes

UNIT III: PROJECTIONS OF REGULAR SOLIDS:

Projections of Solids –with the axis perpendicular to one of the principal planes, with the axis Inclined to one of the principal planes, Projections of Solids –with the axis Inclined to Both the principal planes

UNIT IV: DEVELOPMENT OF SURFACES & SECTIONAL ORTHOGRAPHIC VIEWS

Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and, Cone. Draw the sectional orthographic views of geometrical solids

UNIT V: ISOMETRIC PROJECTIONS

Conversion of isometric views to orthographic views, drawing of isometric views - simple Solids, Conversion of orthographic views to isometric views of simple Drawings

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications

2. Engineering Graphics with Autocad by Kulkarni D.M , PHI Publishers

3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

4. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers

2. Engineering Graphics for Degree by K.C. John, PHI Publishers

3. Engineering Graphics by PI Varghese, McGrawHill Publishers

4. AutoCAD 2018 Training Guide (English, Paperback, Sagar Linkan) ISBN: 9789386551870, 938655187X RUPAPUBLICATIONS

Websites

1 .https://www.autodesk.com.au/campaigns/autocad-tutorials

2. https://nptel.ac.in/courses/112104172

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

CO1: Prepare engineering drawings as per BIS conventions Understand level, KL2}

CO2: Produce computer generated of orthographic projections of Lines and Plane surfaces using CAD software {Apply level, KL3}

CO3: Use the knowledge of orthographic projections of Solids to represent engineering information/concepts and present the same in the form of drawings

{Apply level, KL3}

CO4: Use the knowledge of sectional views and Development of Solid Surfaces in Real time Applications {Apply level, KL3}

CO5: Develop isometric drawings of simple objects reading the orthographic projections of those objects {Analyze level, KL4}

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II- Year I- Semester	Name of the Course	L	T	P	C
BS1201	Probability and Statistics	3	0	0	3

Prerequisites: Basic Mathematics on Calculus and Set theory
Course objectives:
1. To **Classify** the concepts of data science and its importance (L4) or (L2)
2. To **Interpret** the association of characteristics and through correlation and regression tools (L4)
3. To **Understand** the concepts of probability and their applications, **apply** discrete and continuous probability distributions (L3)
4. To **Design** the components of a classical hypothesis test (L6)
5. To **Infer** the statistical inferential methods based on small and large sampling tests (L4)

UNIT-I
Descriptive statistics and methods for data science: 10 hrs

Data science-Statistics Introduction-Population vs Sample-Collection of data-primary and secondary data-Types of variable: dependent and independent Categorical and Continuous variables-Data visualization-Measures of Central tendency-Measures of Variability (spread or variance)-Skewness Kurtosis.

UNIT-II
Correlation and Curve fitting: 10 hrs

Correlation-correlation coefficient-Rank correlation-Regression coefficient and properties-regression lines-Multiple regression-Method of least squares-Straight line-parabola-Exponential-Power curves.

UNIT-III
Probability and Distributions: 12hrs

Probability-Conditional probability and Baye's theorem-Random variables-Discrete and Continuous random variables-Distribution function-Mathematical Expectation and Variance-Binomial, Poisson, Uniform and Normal distributions.

UNIT-IV
Sampling Theory: 10 hrs

Introduction–Population and samples-Sampling distribution of Means and Variance (definition only)-Central limit theorem (without proof)-Point and Interval estimations, Good estimator, Unbiased estimator, Efficiency estimator-Maximum error of estimate.

UNIT-V
Test of Hypothesis: 14 hrs

Introduction–Hypothesis-Null and Alternative Hypothesis-Type I and Type II errors-Level of significance-One tail and two-tail tests-Tests concerning one mean, two means, and proportions using Z test, Tests concerning one mean, two means using t test, also chi-square and F tests use for small samples.

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

CO1   **Classify** the concepts of data science and its importance (L4) or (L2)

(**Understand, Analyze**)

CO2   **Interpret** the association of characteristics and through correlation and regression tools (L4)**Analyze**

CO3   **Understand** the concepts of probability and their applications,
apply discrete and   continuous probability distributions (L3)
Understand, Apply

CO4   **Design** the components of a classical hypothesis test (L6)
Understand, Design, create

CO5   **Infer** the statistical inferential methods based on small and large sampling tests (L4)**Understand, Analyze**

Learning Resources
Text books:
1. **Miller and Freund's,** Probability and Statistics for Engineers, 7/e, Pearson, 2008. 2. **S. C. Gupta and V. K. Kapoor,** Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012
Reference books
1. **Shron L. Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007. 2. **Jay I. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage. 3. **Sheldon M. Ross,** Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011. 4. **Johannes Ledolter and Robert V. Hogg,** Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010. 5. **T. K. V. Iyenger**, Probability and Statistics, S. Chand & Company Ltd, 2015.
e- Resources & other digital material
1. https://www.youtube.com/watch?v=COI0BUmNHT8&list=PLyqSpQzTE6M_JcleDbrVyPnE0PixKs2JE (For Probability and Statistics)
2. https://www.youtube.com/watch?v=VVYLpmKRfQ8&list=PL6C92B335BD4238AB (For Probability and Statistics)
3. https://www.mathsisfun.com/data/standard-normal-distribution-table.html   (Information about Normal distribution)
4. https://www.statisticshowto.com/tables/t-distribution-table/ (Information about T- distribution)
Statistical Tables to be allowed in examinations:
1. Normal distribution table 2. T- distribution table

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II- Year I- Semester	Name of the Course	L	T	P	C
PC2101	Mathematical Foundations of Computer Science	2	1	0	3

Prerequisites: Familiarity of concepts of sets, relations ,functions, permutations and combinations

Course Objectives:

- To introduce concepts of mathematical logic.
- To introduce concepts and perform operations with sets,relations and functions.
- To solve counting problems by applying elementary counting techniques.
- To introduce algebraic structures ,generating functions and recurrence relations.
- To use graph theory for solving problems.

Unit – I: **12 hrs**

Mathematical Logic : Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof.

Predicate Calculus: Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

Unit – II: Set Theory & Relations: **12 hrs**

*Set Theory***:** Introduction, Operations on Binary Sets, Principle of Inclusion and Exclusion.

*Relations:*Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams, *Functions:* Bijective Functions, Composition of Functions, Inverse Functions, Permutation Functions, Recursive Functions, Lattice and its Properties.

UNIT- III:Algebraic Structures and Number Theory: **12hrs**

*Algebraic Structures:*Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism.

*Number Theory:*Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

Unit – IV: Combinatorics & Recurrence Relations   **12 hrs**

Combinatorics: Binomial and Multinomial Coefficients, Binomial and Multinomial Theorems, Pigeonhole Principle and its Application.

Recurrence Relations: Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving non homogeneous Recurrence Relations.

Unit – V: Graph Theory   **12 hrs**

Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Colouring , Chromatic Number, Spanning Trees, BFS and DFS algorithms for Spanning Trees (Problems Only and Theorems withou*t* Proofs).

Learning Resources
Text Books:
1.Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill. 2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P.Mohapatra, 3rdEdition, Tata McGraw Hill. 3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H.Rosen, 7th Edition, Tata McGraw Hill.
Reference Books
1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel,T.P. Baker, 2nd Edition, Prentice Hall of India. 2. Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon CutlerRoss, PHI. 3. Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011
e- Resources & other digital material
1. https://nptel.ac.in/courses/106/103/106103205/ 2. https://nptel.ac.in/courses/106/106/106106183/

Course Outcomes: After completing this course, Students will be able to-
CO1: Apply mathematical logic to solve problems **(Knowledge, Understand, and Apply)**
CO2: Understandsets,relations,functions and discrete structures. **(Understand, Apply and create)**
CO3: Understand algebraic structures and apply number theory to perform modulo arithmetic and computer arithmetic. (**(Understand, Apply, and create)**
CO4: Formulate problems andsolverecurrence relations **(Understand, Apply)**
CO5: Analyzeand solve real world problems using graphs and trees .(**(Understand and analyze)**

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II- Year I- Semester	Name of the Course	L	T	P	C
ES2101	Digital Circuits and Logic Design	3	0	0	3

Course Objectives:

1. To understand common forms of number representation in digital circuits and Boolean algebra.

2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems and simplify logic expressions using basic theorems, K-map and Tabular methods.

3. To understand the concept of Combinational logic design and realize logic expressions using MUX and Decoder

4. Illustrate the concept of sequential logic design; analyze the operation of flip-flop and conversion from one flip-flop to another, and application of flip-flop.

5. To impart to student the concepts of sequential machines of digital system.

Unit-1: Number Systems and Boolean Algebra   14 Hours

Number systems: Introduction to different number system and their conversions,Complement of number system and subtraction using complement method,Floating-Point Representation, Weighted and Non-weighted codes and its Properties, Error detection and correction codes,

Boolean Algebra: Boolean algebra and logic gates, Basic theorems and properties of Boolean Algebra, Boolean functions, canonical and standard forms, Universal Gates.

Unit-2: Minimization Methods of Boolean functions   11 Hours

Minimization of logic expressions by algebraic method, Sum of Products (SOP), Product of Sums (POS), K-Map Method, Don't Care Combinations, Multilevel NAND/NOR realizations, Prime and essential Prime Implicants, Tabular Method, Prime Implicants Chart, Simplification Rules.

Unit-3: Combinational Circuits   14 Hours

Design procedure,Half/full adders, Half / full substractors, Carry look ahead adder, BCD adder, Multiplexer/De-Multiplexer, Encoder/Decoder, Priority encoders, Implementation of Higher-Order Device Using Lower Order devices,Implementation of combinational logic using MUX/Decoder, Magnitude Comparator, Programmable logic devices.

Unit-4: Sequential Circuits   **12 Hours**

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

Registers and Counters: Shift Registers Left, Right and Bidirectional Shift Registers, Applications of Shift Registers, Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

Unit-5:Sequential Machines   **8 Hours**

Finite State Machines, Synthesis of Synchronous Sequential Circuits, Mealy and Moore models, Serial Binary Adder, Sequence Detector, Parity-bit Generator Synchronous Modulo N – Counters, Finite state machine capabilities and limitations.

Note: Case Studies / Small Projects of Digital Circuits and Logic Design

TEXT BOOKS

1. Digital Design by Mano, PHI

2. Modern Digital Electronics by RP Jain, TMH

3. Switching Theory and Logic Design by A. Anand Kumar, PHI.

REFERENCE BOOKS:

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition

2. Fundamentals ofLogic Design by Charles H. Roth Jr, Jaico Publishers

Course Outcomes: After completing this course, Students will be able to-

CO1: Distinguish the analog and digital systems, apply positional notations, number systems, computer codes in digital systems. **(Remember, Understand, and Apply)**

CO2: Uunderstand the Boolean Algebra theorems, simplify and design logic circuits. **(Understand, Apply, Analyze and valuate)**

CO3: Implement combinational logic circuit design and modular combinational circuits using encoders, decoders, multiplexers and demultiplexers. (**Apply, Analyze, valuate, and create)**

CO4: Understand the basic elements of sequential logic circuits. **(Understand, Apply, Analyze)**

CO5: Design and analyze sequential circuits. **(Apply, Analyze and create)**

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Pre Requisites: MFCS, Programming in C

Course Objectives:

- To make students learn the basic concepts of Data Structures and Algorithms.
- To solve problems using data structures such as linear lists, stacks, queues.
- To explore advanced data structures such as balanced search trees.
- To be familiar with Graphs and their applications.
- To analyze various sorting techniques.

UNIT-I: Linear Lists   12 hrs

Introduction to Data Structures, Definition, Need & Types of Data Structures
Algorithms: Introduction, Time complexity and Space complexity, Performance and Analysis
Linear lists (Arrays) – Introduction, Operations, Searching.
Sorting - Insertion Sort, Quick Sort, Merge Sort and Radix Sort.

UNIT-II: Stack & Queue   10 hrs

Stacks: Introduction, Operations, implementation, Applications.
Queues: Introduction, Operations, implementation, Applications, Circular Queue

Unit – III: Linked Lists   10 hrs

Single Linked List: Introduction, Representation, Operations, Applications.

Circular Lists: Introduction, Representation, Operations.

Double linked lists – Representation, operations.

UNIT-IV: TREES   8 hrs

Trees: Introduction, Terminology, Representation of Trees
Binary Trees: Properties, Representations, Traversals, Types of Trees
Binary Search Trees: Definition, Operations.

UNIT-V: GRAPHS   12 hrs

Graphs: Introduction, Definition, Representation, Degree of vertex, Types of graphs, Elementary Graph Operations, Graph Traversals – Depth First Search, Breadth First Search, Spanning trees-Prim's algorithm, Krushkal's algorithm.

Text Books:
1. Data structures, Algorithms and Applications in Java, S. Sahni, University Press (India) Pvt. Ltd, 2nd edition, Universities Press, Pvt. Ltd.
2. Data structures and Algorithm Analysis in Java, Mark Allen Weiss, Pearson Education. Ltd, Second Edition

Reference Books

1. Introduction to Algorithms, by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, MIT Press.
2. Classical Data Structures, Second Edition, Debasis Samanta, PHI

e- Resources & other digital material

Data Structures Visualizations :

https://www.cs.usfca.edu/~galles/visualization/Algorithms.html

Code Archery Youtube Channel:

https://www.youtube.com/playlist?list=PLrKBFf87Cy9CNZpzi3poq8BFWc0h4f0vL

Course Outcomes:

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

CO1: Implement various operations on linear lists.(L2)
CO2: Apply data structure strategies like stacks and queues for exploring complex data structures.(L3)
CO3: Identify performance and trade-offs of static and dynamic data structures.(L3)
CO4: Incorporate data structures into the applications such as binary trees, binary search trees.(L3)
CO5: Identify appropriate data structure algorithms for graphs.(L3)

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II- Year I- Semester	Name of the Course	L	T	P	C
PC2103	Java Programming	3	0	0	3

Course Objectives:

1. To understand object oriented programming concepts, and apply them in solving problems.
2. To make the students to learn the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes; to introduce the implementation of packages and interfaces.
3. To make the students to learn the concepts of exception handling and multithreading.
4. To impart the knowledge on collection framework.
5. To make the students to develop GUI applications network based applications.

Unit – I: Introduction to OOPS Concepts, Classes and Strings   12 Hours

IntroductiontoObjectOrientedProgramming, Java buzzwords, JavaProgrammingBasics, Sample programs, Data types and operators, Control statements.

Classes: Classes, Objects, Methods, Constructors, this and static keywords, Method and Constructor Overloading, Access modifiers, arrays-One Dimensional and multidimensionalarrays. **Strings**-Exploring the String class, String buffer class, String builder class, Command-line arguments.

Unit – II: Inheritance, Interfaces, Packages And Exception Handling   15 Hours

Inheritance: Single, Multi-level, hierarchical, Usage of Super, Method overriding, Final keyword Abstract class, Polymorphism. **Interfaces**: Creating, Implementing, Extending interfaces, Inner classes. **Packages:** creating packages and Importing packages, Member Access, CLASSPATH. **Exception Handling:** Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, creating user defined exceptions, Assertions.Unit – III: Multi-Threading And I/O Streams (14 hrs)

Unit – III: Multi-Threading And I/O Strea13 Hours

Multithreading : Concepts of Multithreading, differences between process and thread, thread life cycle, creating threads using Runnable interface andThread class, Synchronization, thread priorities, inter thread communication, daemon threads, thread groups.

Stream I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading data from files and writing data to files, Random access file operations, Object Serialization, exploring java.nio

Unit – IV: Collection Frame Work Classes   **12 Hours**

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hashtable, Properties, Stack, Vector.

Unit – V: GUI Programming and Networking   **12 Hours**

GUI Programming with Swing: Introduction, limitations of AWT, JFrame and Jcomponent, Icons and Labels, TextFields, Buttons – The Jbutton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees,and Tables. **Event Handling**- event delegation model, sources of event, Event Listeners, adapter classes, inner classes.

Introduction to Networking: Basics of Networking, Networking classes and Interfaces, Networking with URLs, Exploring java.net package.

TEXT BOOKS

1.Java The Complete Reference, Herbert Schildt, MC GRAW HILL Education, 9th Edition, 2016

REFERENCE BOOKS:

1. "Java – How to Program", Paul Deitel, Harvey Deitel,PHI.
2. "Core Java", NageswarRao, WileyPublishers.
3. "Thinking in Java", Bruce Eckel, PearsonEducation
4. "A Programmers Guide to Java SCJP", Third Edition, Mughal, Rasmussen,Pearson.

e- Resources & other digital material

1. Programming in Java:https://nptel.ac.in/courses/106/105/106105191/

Course Outcomes:

CO-1: Understandobject-oriented programming concepts for problem solving.{**Understand level**, **KL2**}
CO-2: Buildclass hierarchy and packages for real world problems. {**Apply level, KL3**}

CO-3: Developthread safe Java programs with appropriate Exception handling. {**Apply level, KL3**}

CO-4: Implement various data structures using java collections. { **Apply level, KL3**}
CO-5: Design GUI and network based applications using swings and multithreading. { **Apply level, KL3**}

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II- Year I- Semester	Name of the Course	L	T	P	C
PC2101L	Data Structures Lab	0	0	3	1.5

Learning Objectives:

The objective of this laboratory is to teach students various data structures and to explain them algorithms for performing various operations on these data structures. This lab complements the Algorithms and Data Structures course. Students will gain practical knowledge by writing and executing programs in C using various data structures such as arrays, linked lists, stacks, queues, trees, graphs, and search trees.

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

- **Identify** appropriate list for solving general data structure problems .(L3)
- **Incorporate** data structures into the applications such as binary trees, binary search trees (L3)
- **Choose** appropriate algorithm for solving graph related problems (L3).

SEARCHING AND SORTING (2 Exercises)   **[CO – 1]**

1. Write a C program to Implement the following searching techniques using linear list(arrays)
    a. Binary Search
    b. Fibonacci Search
2. Write a C program to implement the following sorting techniques using arrays
    a. Selection sort
    b. Insertion sort
    c. Quick Sort
    d. Merge Sort
    e. Radix Sort

STACK & QUEUE (2 Exercises)   **[CO – 1]**

3. Write a C program to
    a. Implement stack using arrays.
    b. Convert infix expression to postfix expression
    c. Evaluation of postfix expression.

4. Write a C program to implement
    a. Queue using arrays
    b. Round Robin Algorithm.
    c. Simulation : Hot Potato

LINKED LISTS (3 Exercises)   **[CO – 1]**

5. Write a C program to implement Singly Linked List.
6. Write a C program to implement Circular Linked List.
7. Write a C program to implement Doubly Linked List.

8. Implement C code for polynomial representation, addition, subtraction & multiplication.

TREES (5 Exercises) [CO – 2]

9. Write a C program to implement Binary trees.
10. Write a C program to implement tree traversal techniques (Both Recursive and Non Recursive).
11. Write a C program to implement Binary Search trees.
12. Write a C program to implement Complete Binary Search tree.
13. Write a C program to implement Huffman Coding.

GRAPHS (2 Exercises) [CO–3]

14. Write a C program to implement graphs.
15. Write a C program to implement graphs traversal techniques (both recursive and non-recursive)
    a. Breadth First Search
    b. Depth First Search

ADDITIONAL EXERCISES:

The below list of problem statements can be solved in either www.hackerrank.com or www.hackerearth.com, and must submit the solution

SEARCHING AND SORTING (Any 2 additional problems from below list of 6 problems)

1. Sherlock and Numbers / Ice cream Parlour (Binary Search)
2. The Exam / The Missing Numbers (Fibonacci Search)
3. Monk and Nice Strings / Insertion Sort (Insertion Sort)
4. K- Palindrome / Quick Sort (Quick Sort)
5. Pebbles Game (Merge Sort)
6. Monk and Sorting Algorithm (Radix Sort)

STACK & QUEUE (Any 2 additional problems from below list of 4 problems)

1. Stack Operations / Maximum Elements (Stack Operations)
2. Balanced Brackets / Balanced Brackets (Stack)
3. Robin Robin, Round Robin (Queue)
4. Double Ended Queue (Queue)

LINKED LIST (Any 2 additional problems from below list of 4 problems)

1. Insert At Begin, Insert At End, Insert At Position, Delete a Node (Linked List Operations)
2. Remove Friends (Single Linked List)
3. Cycle Detection (Circular Linked List)
4. Reversing a Double Linked List (Double Linked List)

TREES (Any 2 additional problems from below list of 3 problems)

1. Mirror Image, Nodes in a Tree (Binary Tree)
2. Level Order traversal. (Binary Tree Traversal)
3. Monk Watching Fight, Distinct Count (Binary Search Tree)

GRAPHS (Any 2 additional problems from below list of 3 problems)

1. Build a graph, Monk at Graph Factory (Graph representation)
2. Monk and the islands, Zeta and Thanos (Breadth First Search Tree Traversal)
3. Words and Trees, Water Supply (Depth First Search Tree Traversal)

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Course Objectives:

1. To write programs using OOP concepts.
2. To write programs using exception handling
3. To introduce multithreaded programs.
4. To implement data structures using collection framework
5. To design GUI applications and client-server applications.

Note:

1. Mandatory to follow test driven development with Eclipse IDE empowered JUnit testing framework and code coverage plugin.
2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

List of experiments:

1. Create a class called Invoice that a hardware store might use to represent an invoice for an item sold at the store. An Invoice should include four pieces of information as instance variables-a part number(type String),a part description(type String),a quantity of the item being purchased (type int) and a price per item (double). Your class should have a constructor that initializes the four instance variables. Provide a set and a get method for each instance variable. In addition, provide a method named getInvoiceAmount that calculates the invoice amount (i.e., multiplies the quantity by the price per item), then returns the amount as a double value. If the quantity is not positive, it should be set to 0. If the price per item is not positive, it should be set to 0.0. Write a test application named InvoiceTest that demonstrates class Invoice's capabilities. [CO1]

2. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, and type of EB connection (i.e. domestic or commercial). Compute the bill amount using the following tariff. [CO1]

If the type of the EB connection is domestic, calculate the amount to be paid as follows:

- First 100 units - Rs. 1 perunit
- 101-200units   - Rs. 2.50 perunit
- 201 -500 units - Rs. 4 perunit
- >501 units   - Rs. 6 perunit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:

- First 100 units - Rs. 2 perunit
- 101-200units   - Rs. 4.50 perunit
- 201 -500 units - Rs. 6 perunit
- >501 units   - Rs. 7 perunit

3. Create class SavingsAccount. Use a static variable annualInterestRate to store the annual interest rate for all account holders. Each object of the class contains a private instance variable savingsBalance indicating the amount the saver currently has ondeposit. Provide method calculateMonthlyInterest to calculate the monthly interest by multiplying the savingsBalance by annualInterestRate divided by 12 this interest should be added to savingsBalance. Provide a static method modifyInterestRate that sets the annualInterestRate to a new value.Write a program to test class SavingsAccount. Instantiate two savingsAccount objects, saver1 and saver2, with balances of $2000.00 and $3000.00, respectively. Set annualInterestRate to 4%, then calculate the monthly interest and print the new balances for both savers. Then set the annualInterestRate to 5%, calculate the next month's interest and print the new balances for both savers. [CO1]

4. Create a class called Book to represent a book. A Book should include four pieces of information as instance variables-a book name, an ISBN number, an author name and a publisher. Your class should have a constructor that initializes the four instance variables. Provide a mutator method and accessor method (query method) for each instance variable. In addition, provide a method named getBookInfo that returns the description of the book as a String (the description should include all the information about the book). You should use this keyword in member methods and constructor. Write a test application named BookTest to create an array of object for 30 elements for class Book to demonstrate the class Book's capabilities. [CO1]

5. Write a JAVA program to search for an element in a given list of elements using binary search mechanism.   [CO1]

6. Write a Java program that implements Merge sort algorithm for sorting and also shows the number of interchanges occurred for the given set of integers. [CO1]

7. Write a java program to make rolling a pair of dice 10,000 times and counts the number of times doubles of are rolled for each different pair of doubles. Hint: Math.random() [CO1]

8. Develop a java application to validate user information using regular expressions. [CO1]

9. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% ofBP for staff club fund. Generate pay slips for the employees with their gross and net salary. [CO1]

10. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the givenshape.[CO1]

11. Develop a java application to implement currency converter (Dollar to INR,EURO to INR,YentoINR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , timeconverter (hours to minutes, seconds and vice versa) using packages. [CO1]

12. Write a Java Program to Handle Arithmetic Exceptions and Input MisMatch Exceptions. [CO2]

13. Write a multi-threaded Java program to print all numbers below 100,000 that are both prime and Fibonacci number (some examples are 2, 3, 5, 13, etc.). Design a thread that generates prime numbers below 100,000 and writes them into a pipe. Design another thread that generates Fibonacci numbers and writes them to another pipe. The main thread should read both the pipes to identify numbers common to both. [CO3]

14. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of thenumber. [CO3]

15. Write a Java program that correctly implements the producer – consumer problem using the concept of inter-thread communication. [CO3]

16. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file inbytes. [CO1]

17. Develop Rational number class in Java. Use JavaDoc comments for documentation. Your implementation should use efficient representation for a rational number, i.e. (500 / 1000) should be represented as (½). [CO1]

18. You are given lines. In each line there are zero or more integers. You need to answer a few queries where you need to tell the number located in position of line. Take your input from System.in. **Input Format:** The first line has an integer . In each of the next lines there will be an integer denoting number of integers on that line and then there will be space-separated integers. In the next line there will be an integer denoting number of queries. Each query will consist of two integers and . **Constraints** Each number will fit in signed integer. Total number of integers in lines will not cross . **Output Format** In each line, output the number located in position of line. If there is no such position, just print "ERROR!".(ArrayList)[CO4]

19. A string containing only parentheses is balanced if the following is true: 1. if it is an empty string 2. if A and B are correct, AB is correct, 3. if A is correct, (A) and {A} and [A] are also correct. Examples of some correctly balanced strings are: "{}()", "[{()}]", "({()})" Examples of some unbalanced strings are: "{}(", "({)}", "[[", "}{" etc. Given a string, determine if it is balanced or not. **Input Format** There will be multiple lines in the input file, each having a single non-empty string. You should read input till end-of-file. The part of the code that handles

input operation is lready provided in the editor. **Output Format** For each case, print 'true' if the string is balanced, 'false' otherwise.[CO4]

20. Comparators are used to compare two objects. In this challenge, you'll create a comparator and use it to sort an array. The *Player* class is provided for you in your editor. It has 2 fields: name a String and a score integer. Given an array of *Player* objects, write a comparator that sorts them in order of decreasing score; if or more players have the same score, sort those players alphabetically by name. To do this, you must create a *Checker* class that implements the *Comparator* interface, then write an *int compare(Player a, Player b)* method implementing the Comparator.compare(T o1, T 2) method. **Input Format** Input from stdin is handled by the locked stub code in the *Solution* class. The first line contains an integer, , denoting the number of players. Each of the subsequent lines contains a player's and , respectively. **Constraints** 0<score<1000,rplayers can have the same name. Player names consist of lowercase English letters. **Output Format** You are not responsible for printing any output to stdout. The locked stub code in *Solution* will create Checker object, use it to sort the *Player* array, and print each sorted element.[CO4]

21. Write a Java program to build a Calculator in Swings/ [CO5]

22. Write a Java program to implement JMenu to draw all basic shapes using Graphics. [CO5]

23.Write a Java program to implement JTable and JTree. [CO5]

24. Write a Java program to implement JTabbedPane. [CO5]

25. Write a Java Program that implements a simple client/server application. The client sends data to a server. The server receives the data, uses it to produce a result and then sends the result back to the client. The client displays the result on the console. For ex: The data sent from the client is the radius of a circle and the result produced by the server is the area of the circle. [CO5]

Course Outcomes:

> CO1: Able to solving real world problems using OOP concepts.
> CO2: Able to handle exceptions.
> CO3: Able to develop multithreaded programs.
> CO4: Able to create various data structures using java collections.
> CO5: Able to develop GUI applications and client server applications.

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II- Year I- Semester	Name of the Course	L	T	P	C
MC2101	Essence of Indian Traditional Knowledge	2	0	0	0

Objectives:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

● The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledge system
● To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act 2003.
● The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection.
● To know the student traditional knowledge in different sector.

Unit-I: 10Hrs

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

Learning Outcomes:

At the end of the unit the student will able to:

● understand the traditional knowledge.
● contrast and compare characteristics importance kinds of traditional knowledge.
● analyze physical and social contexts of traditional knowledge.
● evaluate social change on traditional knowledge.

Unit-II: **10Hrs**

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Learning Outcomes:

At the end of the unit the student will able to:

● know the need of protecting traditional knowledge.
● apply significance of TK protection.
● analyze the value of TK in global economy.
● evaluate role of government

Unit-III: 10Hrs

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act);B:The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

Learning Outcomes:

At the end of the unit the student will able to:

● Understand legal framework of TK.
● Contrast and compare the ST and other traditional forest dwellers

- Analyze plant variant protections
- Evaluate farmers right act

Unit-IV: 7Hrs

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FOR A for increasing protection of Indian Traditional Knowledge.

Learning Outcomes:

At the end of the unit the student will able to:

- Understand TK and IPR
- Apply systems of TK protection.
- Analyze legal concepts for the protection of TK.
- Evaluate strategies to increase the protection of TK.

Unit-V: 9Hrs

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Learning Outcomes:

At the end of the unit the student will able to:

- know TK in different sectors.
- apply TK in engineering.
- analyze TK in various sectors.
- evaluate food security and protection of TK in the country.

Reference Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
4. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

E-Resources:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
   2.http://nptel.ac.in/courses/121106003/

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

1. understand the concept of Traditional knowledge and its importance
2. know the need and importance of protecting traditional knowledge
3. know the various enactments related to the protection of traditional knowledge.
4. understand the concepts of Intellectual property to protect the traditional knowledge

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II- Year I- Semester	Name of the Course	L	T	P	C
MC2102	Employability Skills-I	3	0	0	0

Components

1. Verbal Ability
2. Quantitative Ability
3. Reasoning Ability
4. Soft Skills

Unit-1: Basic Mathematics

Number System, LCM & HCF, Percentages, Profit and Loss & Discount, Simple Interest & Compound Interest, Ratios and Proportions, Partnership, Chain Rule, Time and Work & Pipes and Cisterns, Ratios and Proportions, Partnership, Chain Rule, Time and Work & Pipes and Cisterns, Time, Speed and Distance, Problems on Trains, Boats and Streams, Races and games

Unit-2: - Advanced Mathematics

Averages, Alligation and Mixtures, Logarithms, Indices & Surds, Progressions(AP,GP & HP), Linear Equations in one & two variables, Quadratic Equations, Problems on Numbers, Problems on Ages, Permutations &Combinations, Probability, Elementary Statistics, DI(Tabulation, Bar& Line Graph, Pi Chart/Circle Chart, Line Graph)

Unit-3 – Reasoning Ability

Part-1-Basic Reasoning
Number Series, Letter Series, Number Analogy, Letter Analogy, Word Analogy, Number Odd Man out, Letter Odd Man Out, Word Odd Man Out, Coding and Decoding, Directions.

Part-2-Non-Verbal Reasoning
Series, Analogy, Classification, Embedded figures, Paper Cutting, Paper Folding, Mirror

Image, Water Image, Dot situations, Formation of figure analysis, Quant and Reasoning.

Unit-4 – Verbal Ability

i)   Vocabulary: Synonyms & Antonyms, Spellings & Confusable words, Idioms

      & phrases, Phrasal Verbs, One Word Substitutes

ii)   Verbal Reasoning : Odd Man Out, Analogies

iii)   Comprehension : Reading Comprehension, Cloze Test, Text Completion

Unit-5 – Soft Skills

Speaking: Describing Self, Describing Places, People, Events and Things, Describing

Experience, Tech Talk, Group Discussions, Presentation skills, Just and Minute.

Reference Books

1. Quantitative Aptitude for Competitive Examination by Dr R S Agarwal

2. Fast Track Objective Arithmetic Paperback – 2018 by Rajesh Verma

3. Teach Yourself Quantitative Aptitude, by Arun Sharma

4. The Pearson Guide To Quantitative Aptitude For Competitive Examination by Dinesh Khattar

5. Quantitative Aptitude for all Competitive Exam by Abhijit Gupta

6. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma

7. Modern Approach to Verbal and Non-Verbal Reasoning by Dr R S Agarwal

8. How to Prepare for Data Interpretation by Arun Sharma

9. Analytical Reasoning by M K Pandey

10. Logical Reasoning Data Interpretation by Nishit K. Sinha

11. How to prepare for Verbal Ability and Reading Comprehension – Arun Sharma and Meenakshi Upadhyay

12. Word Power Made Easy by Norman Lewis

13. Random House Roget's Thesaurus ---- By Random House

14. Cambridge Complete PET Students Book ----Emma Heyderman and Peter May

15. The Verbal Reasoning Test Workbook----- By Mike Bryon

16. Master the GRE (Peterson's) ---- By Margaret Moran

17. How to Prepare for Verbal Ability and Reading Comprehension for CAT ----- By Arun Sharma

18. ABC of Common Grammatical Errors ----- By Nigel D. Turton

19. English Collocations in Use: Advanced ---- By Felicity O'Dell and Michael McCarthy

20. Writing Remedies ----By Edmond H Weiss

21. Objective English for Competitive Examination ---B y Edgar Thorpe, Showick Thorpe, Pearson Education India.

22. Contemporary English Grammar Structures and Composition ----- By David Green (2010), MacMillan Publishers, New Delhi.2010.

23. The study of Language ----   George Yule, Cambridge University Press UK.

24. Contemporary English Teaching ----   Dr. Ram Nath Sharma

II- Year II- Semester	Name of the Course	L	T	P	C
PC2201	Advanced Data Structures	3	0	0	3

Course Objectives:

1. To impart the knowledge on sets and various hashing techniques.
2. To help the students to learn Priority Queues and its applications.
3. To demonstrate the students about the operations of Efficient Binary Search Trees.
4. To make the student to understand various shortest path algorithms in graphs.
5. To make the students to learn the use of Digital Search Structures and pattern matching algorithms.

UNIT-I 12 Hours

Hashing: Introduction to Static Hashing, Hash Tables, Hash Functions, Different Hash Functions, Secure Hash Functions, Collision Resolution Techniques-Linear probing, Quadratic probing, Double hashing, Rehashing, Chaining, Dynamic Hashing-Motivation, Dynamic hashing using Directories, Directory less Dynamic hashing.

UNIT-II 12 Hours

Priority Queues (Heaps): Introduction, Binary Heaps-Model and Simple Implementation, Basic Heap Operations, Other Heap Operations, Applications of Priority Queues, Binomial Heaps/Queues, Binomial Heap Structure and Implementation, Binomial Queue Operations.

UNIT-III 14 Hours

Efficient Search Trees: Binary Search Trees, Optimal Binary Search Trees, Self-balancing Binary Search Trees, AVL Trees- Operations on AVL Trees, Red-Black Trees-Properties and Representation of Red-Black Trees, Operations on Red-Black Trees, Applications of Red-Black Trees. B-tree : Searching for an Element in a B-Tree, Inserting a New Element in a B-Tree, Deleting an Element from a B Tree, B+ Trees - Searching a B+ Tree, Inserting a New Element in a B+ Tree, Deleting an Element from a B+ Tree.

UNIT-4 10 Hours

Graph Algorithms- Elementary Graph Operations: Connected components, Bi-connected components. Minimum cost spanning tree: Sollin's algorithm. Shortest paths and Transitive Closure: single source shortest path, all pair's shortest path, transitive closure, Bellman Ford algorithm.

UNIT-V   **12 Hours**

Digital Search Structures- Introduction to Digital Search Tree, Operations on Digital Search Trees: Insertion, Searching, and Deletion, Binary Tries and Patricia: Binary Tries, Compressed Binary Trie, Patricia and Suffix Trees.

Pattern Matching- Pattern matching algorithms: Brute force Algorithm, the Boyer –Moore algorithm, the Knuth- Morris-Pratt algorithm.

Text Books:

1. Advanced Data Structures, Reema Thareja, S. Rama Sree, Oxford University Press, 2017.
2. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson-Freed, Second Edition, 2008.

Reference Books:

1. Advanced Data Structures, Peter Brass, Cambridge University Press, 2008.
2. Data Structures and Algorithms, A. V. Aho, J. E. Hopcroft, and J. D. Ullman, Pearson, 2002.
3. Data Structures and Algorithm Analysis in C,Mark Allen Weiss, Second Edition, Pearson.

Course Outcomes:

CO1: Able to implement sets functions and various hashing technique. techniques. **(Remember, Understand and Apply)**

CO2: Able to use priority queue principle in the context of solution for the given specific problem. **(Understand and Apply)**

CO3: Able to implement operations on efficient binary search trees. **(Remember, Understand and Apply)**

CO4: Able to implement various shortest path algorithms in graphs. **(Apply, Analyze and Evaluate)**

CO5: Able to understand various digital search trees and implement pattern matching algorithms. **(Apply, Analyze and Evaluate)**

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II- Year II- Semester	Name of the Course	L	T	P	C
PC2202	Software Engineering	3	0	0	3

Prerequisites: No Strong Technical Prerequisites needed, but
1. Basic Programming Skills

2. Zeal to learn about Real World Software Engineering Products and their development process

COURSE OBJECTIVES:

1. To understand the software life cycle models.
2. To understand the software requirements and SRS document.
3. To understand the importance of modelling and modelling languages.
4. To design and develop correct and robust software products.
5. To understand the quality control and how to ensure good quality software.

UNIT-1
Introduction to Software Engineering: (14Hrs)

Software, Software Classifications and Characteristics, Emergency of Software Engineering, what is Software Engineering? Software Engineering Challenges

Software Processes Process model, Elements and Characteristics of Process model, Process Classification, Phased Development Life Cycle, Software Development

Process Models: Prescriptive Process Models, Agile process models, and RUP process model
UNIT-2
Project Management & Planning: (12Hrs)

Project management essentials, Project success and failures,Project Life Cycle, Project team structure and organization, Software Configuration Management. Project planning activities, Metrics and Measurements, Project Size Estimation,Effort Estimation Techniques, Staffing and Personnel Planning, Project SchedulingandMiscellaneous Plans.

UNIT-3
Requirement Engineering: (10 Hrs)

Software Requirements, Requirement Engineering Process,Requirement Elicitation, Requirement Analysis (Structured Analysis, Object Oriented Analysis,Data Oriented Analysis and Prototyping Analysis), Requirements Specification, RequirementValidation, and Requirement Management.

UNIT-4
Software Design: (14 Hrs)

Software Design Process, Characteristics of a Good Design**,** Design Principles, Modular Design (Coupling and Cohesion), Software Architecture, Design Methodologies (Function Oriented Design and Object Oriented Design), Structured Design Methodology (SDM), Transaction Analysis and Logical Design;

Coding: Coding principles, Coding process, Code verification and documentations.

UNIT-5
Software Testing   **14Hrs**

Testing Fundamentals, Test Planning, Black Box Testing, White Box Testing, Levels of Testing, Debugging Approaches

Quality of Software: Quality Concept, Quality Factors, Verification and Validation, Quality Assurance Activities, Quality Standards: Capability Maturity Model (CMM), ISO 9000, Six Sigma.

Maintenance: Software Maintenance, Maintenance Process Models and Reengineering.

TEXT BOOKS:

1. Software Engineering: Concepts and Practices- UgrasenSuman, Cengage Learning Publications.
2. Fundamentals of Software Engineering-Rajib Mall, PHI, New Delhi.

REFERENCE BOOKS:

1. An Integrated Approach to S/w Engineering- PankajJalote, Narosa Publishing House.
2. Software Engineering- Ian Sommerville, Pearson Education, New Delhi.
   3. Software Engineering Concepts-Richard E. Fairly, Tata McGraw Hill Inc. New York.

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

CO1: Define and develop a s/w project from requirement gathering to implementation.

CO2: Obtain knowledge about principles and practices of software engineering.

CO3: Focus on the fundamentals of modelling a software project.

CO4: Obtain knowledge about estimation and maintenance of software systems.

CO5: Design test cases, schedules and perform testing for SQA.

II- Year II- Semester	Name of the Course	L	T	P	C
PC2203	Operating Systems	3	0	0	3

Course Objectives:

1.Study the basic concepts and functions of operating system

2.Learn about Processes, Threads and Scheduling algorithms

3.Understand the principles of concurrency and Deadlocks

4.Learn various memory management schemes

5.Study I/O management and File systems

UNIT–I:Introduction to Operating System Concepts   10Hours

What Operating Systems do, Computer System Organization, Functions of Operating systems, Types of Operating Systems, Operating Systems services, System calls, Types of System calls, Operating System Structures, Distributed Systems, Special purpose systems.

UNIT– II: Process Management   12Hours

Process concept, Process State Diagram, Process control block, Process Scheduling- Scheduling Queues, Schedulers, Scheduling Criteria, Scheduling algorithm's and their evaluation, Operations on Processes, Interprocess Communication.

Threads –Overview, User and Kernel threads, Multi-threading Models

UNIT – III: Concurrency   12Hours

Process Synchronization, The Critical- Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Monitors, Classic Problems of Synchronization.

Principles of deadlock– System Model, Deadlock Characterization, Methods for Handling Deadlocks: Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock

UNIT– IV: Memory Management   12Hours

Logical vs physical address space, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.

Virtual Memory Management: Virtual memory overview, Demand Paging, Page-Replacement & its algorithms, Allocation of Frames, Thrashing

UNIT – V: File system Interface   10Hours

The concept of a file, Access Methods, Directory structure, file sharing, protection.

File System implementation- File system structure, Allocation methods, Free-space management.

Mass-storage structure- Overview of Mass-storage structure, Disk scheduling, Swap space management

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012

Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, Tata Mc Graw-Hill Education

e- Resources & other digital material

https://en.wikipedia.org/wiki/Operating_system

https://www.tutorialspoint.com/operating_system/

Course Outcomes:

CO1: Understand the structure and functionalities of Operating System **(Understand)**

CO2:Demonstratethe concept of Process, Threads and CPU Scheduling Algorithms. **(Apply)**

CO3: Use the principles of Concurrency to solve Synchronization problems. **(Apply)**

CO4: Demonstratevarious methods for handling Deadlocks. **(Apply)**

CO5: Infervarious Memory Management Techniques.**(Understand)**

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Course Objectives:

1. Study the basic concepts and importance of Database Management Systems
2. Learn and understand the conceptual design of database and information retrieval
3. Learn various commands and writing of queries for information retrieval
4. Understand the concepts of Database design
5. Study of internal storage and its access

UNIT-I: Introduction (10hrs)

Introduction to Database, Applications of Database, Purpose of Database, View of Data, Data Independence, Data Models, Users of Database, DBA, Query Processor, Storage Manager, Database Architecture

UNIT-II: Conceptual Design & Relational Query Languages (14 hrs)

Conceptual Design of Database using ER Model, Notations, Types of attributes, Relation, Mapping Constraints, Features of ER Diagram, Weak Entity Set, Examples of Conceptual Design

Relational Algebra: Selection, Projection, Set Operations, Rename, Cartesian-Product, Join, Outer Join, Examples

Relational Calculus: Tuple Relational Calculus and Domain Relational Calculus

Safety Expressions

UNIT-III: SQL & PL/SQL (14 hrs)

SQL Commands: DDL, DML, TCL, DCL

Types of Constraints (Primary, Alternate, Not Null, Check, Foreign), Basic form of SQL query, joins, outer joins, set operations, group operations, various types of queries, PL/SQL (Cursor, Procedures, Functions, Packages, Triggers…)

UNIT-IV: Database Design (10 hrs)

Database Design: Normalization, Purpose of Normalization, Functional Dependency, Closure, 1NF, 2NF, 3NF, BCNF, MVFD, 4NF, Join Dependency, 5NF

Why NoSQL?, Importance of NoSQL

UNIT-V: Transaction, Data Recovery & Storage Management (12 hrs)

Transaction Management: ACID Properties of Transactions, Conflict & View serializability, Lock based protocols, Time Stamp based protocol, Thomas Write Rule, Validation Based Protocol, Deadlock detection, Deadlock avoidance, Deadlock prevention: wait-die and wound-wait

Recovery Management: Types of failures, ideal storage, Log, Log records, log based recovery techniques, Shadow Paging, ARIES

File Organization & Indexing: Types of File Organizations, Primary Indexing, Secondary Indexing, Multi-level Indexing, Hash Indexing, Tree Indexing

Learning Resources
Text Books:
1. Data base System Concepts,5/e, Silberschatz, Korth, TMH   2. Introduction to Database Systems, CJ Date, Pearson
Reference Books
4. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition   5. Fundamentals of Database Systems, ElmasriNavate Pearson Education

Course Outcomes:

CO1	U**nderstand** the basics of database systems and applications{ Understand level, KL2}
CO2	C**onstruct** logical design of database and information retrieval {Apply level, KL3}
CO3	D**emonstrate** relational model practically (Structured Query Language) {Apply level, KL3}
CO4	D**emonstrate** and relate normalization for database design {Apply level, KL3}
CO5	O**utline** the necessity of transaction management, recovery management, file organization & indexing { Understand level, KL2}

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Course Objectives:

- To understand basic structures of computers and to understand various machine instructions.
- To understand basic structures of computers and to understand various machine instructions.
- To analyse ALU & I/O organization of a computer.
- To understand various memory systems.
- To analyse functionalities done by processing unit and also learn micro programmed control.

Unit – I: Basic Structure of a Computer and Machine Instructions.

Introduction, History of Computer Generations, Functional unit, Basic Operational concepts, Bus structures, System Software, Performance. Number representation: Fixed Point and Floating Point representation. Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types

Unit – II: Addressing modes and types of Instructions

Addressing Modes, Basic Input/output Operations, and role of Stacks and Queues in computer programming equation.

Component of Instructions: Logical Instructions, shift and Rotate Instructions. Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

Unit – III: **Basic building blocks for the ALU:**

Adder, Subtracter, Shifter, Multiplication and division circuits. Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

Unit – IV: The Memory Systems

Basic memory circuits, Memory System Consideration, Read- Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Associative Memory, Cache Memories: Mapping Functions, INTERLEAVING, Secondary Storage: Magnetic Hard Disks, Optical Disks.

Unit – V: Processing unit

Fundamental Concepts: Register Transfers, Performing an Arithmetic or Logic Operation, Fetching A Word From Memory, Execution of Complete Instruction, Hardwired Control, MICRO PROGRAMMED CONTROL: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field.

Learning Resources
Text Books:
1.Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill.
2.Computer Architecture and Organization by William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003
Reference Books
6. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.
7. Computer System Architecture by M Morris Mano, Prentice Hall of India, 2001
e- Resources & other digital material

Course Outcomes

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

CO1 **Understand** basic structures of computers and to **understand** various machine instructions.
{Understand level, KL2}

CO2 **Learn and use** the addressing modes and types of instructions. **{Apply level, KL3}**

CO3 **Analyze** I/O organization of a computer. **{Apply level, KL3}**

CO4 **Understand** various memory systems. **{ Apply level, KL3}**

CO5 **Analyze** functionalities done by processing unit and also learn micro programmed control. **{Apply level, KL3}**

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II- Year II- Semester	Name of the Course	L	T	P	C
PC2201L	Advanced Data Structures Lab	0	0	3	1.5

Prerequisites: Prior knowledge of programming language(s) and basic Data Structures and

Algorithms

Course Objectives:

1. To impart knowledge on disjoint set algorithms and Dictionaries using various hashing techniques.
2. To help the students to implement Priority Queues and its applications.
3. To help students to implement various operations on Binary search tree and AVL tree.
4. To make students to implement variety of shortest path algorithms.
5. To make the student to develop algorithms for pattern matching problems.

List of experiments:

Week 1: Write a program to implement Functions of Dictionary using Hashing Techniques

    i.   Division method

    ii.   Digit folding

    iii.   Mid square method

Week 2: Write a program to implement Collision Resolution Techniques in Hash Table.

    i.   Linear Probing

    ii.   Quadratic Probing

    iii.   Double Hashing

Week 3: Write a program to implement separate chaining technique in hashing.

Week 4: Write a program to implement binary heap operations.

Week 5: Write a program to implement BST operations.

Week 6: Write a program to implement AVL tree operations.

Week 7: Write a program to find the shortest path from a single source.

Week 8: Write a program to find the shortest path between all pair of vertices.

Week 9: Write a program to implement Sollin's algorithm.

Week 10: Write a program to implement Brute force pattern matching algorithm.

Week 11: Write a program to implement Boyer-Moore pattern matching algorithm.

Week 12: Write a program to implement Knuth-Morris pattern matching algorithm.

Course Outcomes:

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

1. Implement disjoint set algorithms and Dictionaries using various hashing techniques.
2. Build code for various problems using priority queue principle.
3. Implement basic operations of BST tree and AVL tree.
4. Construct code for variety of shortest path algorithms
5. Develop algorithms for pattern matching problems

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II- Year II- Semester	Name of the Course	L	T	P	C
PC2202L	Data Base Management Systems Lab	0	0	3	1.5

Course Objectives:

1. To familiarize the participant with the distinctions of database environments towards an information-oriented framework
2. To give a good formal foundation on the relational model of data
3. To present SQL and procedural interfaces to SQL comprehensively

List of experiments:

SQL

1. Queries for Creating, Dropping, and Altering Tables, Views, and Constraints **[CO1]**
2. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions. **[CO1]**
3. Queries using operators in SQL **[CO2]**
4. Queries to Retrieve and Change Data: Select, Insert, Delete, and Update **[CO2]**
5. Queries using Group By, Order By, and Having Clauses **[CO2]**
6. Queries on Controlling Data: Commit, Rollback, and Save point **[CO2]**
7. Queries to Build Report in SQL *PLUS **[CO2]**
8. Queries on Joins and Correlated Sub-Queries **[CO2]**
9. Queries on Working with Index, Sequence, Synonym, Controlling Access, and Locking Rows for Update, Creating Password and Security features **CO2]**

PL/SQL

10. Write a PL/SQL Code using Basic Variable, Anchored Declarations, and Usage of Assignment Operation **[CO3]**
11. Write a PL/SQL Code Bind and Substitution Variables. Printing in PL/SQL **[CO3]**
12. Write a PL/SQL block using SQL and Control Structures in PL/SQL **[CO3]**
13. Write a PL/SQL Code using Cursors, Exceptions and Composite Data Types **[CO3]**
14. Write a PL/SQL Code using Procedures, Functions, and Packages FORMS **[CO4]**
15. Write a PL/SQL Code Creation of forms for any Information System such as Student Information System, Employee Information System etc. **[CO4]**
16. Demonstration of database connectivity **[CO4]**

Course Outcomes:

CO1:	Create database for user (Creation of Database)
CO2:	Solve various SQL queries for user defined schemas
CO3:	Generalize PL/ SQL blocks
CO4:	Illustrate the usage of user defined packages

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II- Year II- Semester	Name of the Course	L	T	P	C
PR2201	Socially Relevant Projects	0	0	0	1

PREAMBLE:

VVIT conforming to the standards, procedures initiated and steered by the AICTE, NBA, NAAC and other statutory bodies, gives utmost importance to the ***Promotion of social science research***. In this regard, students are encouraged to pursue projects in socially relevant domains by taking challenging problems that when solved will increase in the sophistry of the mankind in society. The to-be-engineers-of-society are urged to conduct cutting edge projects in various fields of social sciences that have theoretical, conceptual, methodological and policy implications which prop up the society at large. These socially relevant projects are made as mandatory practical course in the B.Tech Curriculum of every stream and a nice guidance will be given by the processors to inculcate the philanthropic culture in the engineering posterity.

DOMAIN OF SOCIAL SCIENCES:

Following are the domains in which VVIT encourages students to pursue data, requirements analysis through implantation of a model of the project.
- Environment
- Energy
- Materials
- Computing
- Telecommunications
- Defense
- Healthcare
- Agriculture and other interesting areas that are even tangentially connected to the society.

GUIDELINES:

Every student must do the socially relevant project either individually or team as per the guidelines in the **Anexure** given.

ASSESSMENT:

The Project review panel of individual departments and Institute will assess the quality of projects based on the
- ➜ Quality of Literature survey
- ➜ Novelty in the topic relevance to the society and specialization
- ➜ Understanding of the topic
- ➜ Quality of Report and Oral Presentation
- ➜ Efficiency in implementation
- ➜ Scalability, Portability and ability to fuse the project with other systems

A sum of 1.5 Credits will be awarded for those who successfully complete the project and even promoted to present the project in social projects expositions etc. competitions.

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II- Year II- Semester	Name of the Course	L	T	P	C
MC2201	Professional Ethics and Human Values	2	0	0	0

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others.
- To create awareness on assessment of safety and risk

Unit I: HUMAN VALUES:

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation–Commitment – Empathy –Self Confidence Character –Spirituality.

LEARNING OUTCOMES:

1. learn about morals, values & work ethics.
2. learn to respect others and develop civic virtue.
3. develop commitment
4. learn how to live peacefully

Unit II: ENGINEERING ETHICS:

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg's theory-Gilligan's theory-Consensus and controversy –Models of professional roles-Theories about right action-Self interest -Customs and religion –Uses of Ethical theories –Valuing time –Co operation –Commitment.

LEARNING OUTCOMES:

1. learn about the ethical responsibilities of the engineers.
2. create awareness about the customs and religions.
3. learn time management
4. learn about the different professional roles.

Unit III: ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering As Social Experimentation –Framing the problem –Determining the facts –Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles – Utilitarian thinking respect for persons

LEARNING OUTCOMES:

1. demonstrate knowledge to become a social experimenter.
2. provide depth knowledge on framing of the problem and determining the facts.
3. provide depth knowledge on codes of ethics.
4. develop utilitarian thinking

UNIT IV: ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK:

Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety-Intellectual Property rights(IPR).

LEARNING OUTCOMES:

1. create awareness about safety, risk & risk benefit analysis.
2. engineer's design practices for providing safety.
3. provide knowledge on Intellectual Property Rights.

UINIT V: GLOBAL ISSUES

Globalization –Cross culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts –Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research.

LEARNING OUTCOMES:

1. develop knowledge about global issues.
2. create awareness on computer and environmental ethics
3. analyze ethical problems in research.
4. give a picture on weapons development.

COURSE OUTCOMES

Students will be able to:

CO1.   identify and analyze an ethical issue in the subject matter under investigation or in a relevant field in a real-world situation or practice

CO2.   articulate what makes a particular course of action ethically defensible and assess their own ethical values and the social context of problems

CO3.   identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects

CO4.   demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work

CO5.   integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

Text Books:

1. "Engineering Ethics includes Human Values" byM.Govindarajan, S.Natarajan anad, V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009
2. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGraw-Hill–2003.
4. "Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications.
5. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran-LaxmiPublications.
6. "Professional Ethics and Human Values" by Prof.D.R.Kiran-
7. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication

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III- Year I- Semester	Name of the Course	L	T	P	C
PC3101	Unix and Shell Programming	3	0	0	3

Prerequisites: Working knowledge of any OS and basic Programming skills

Course Objectives:

1. Introduce Unix Operating System and its features while exploring file system and security
2. Learn UNIX Filters related to text processing, communication and search utilities
3. Learn programming filters and interactive shell scripting
4. Learn shell programming constructs writing advanced scripts
5. Learn kernel programming on file operations and managing processes

UNIT - I   **10 Hours**

IntroductionUnix OS, File Systems, Security and File Permissions, Introduction to Shells.

UNIT - II   **10 Hours**

Filters, Communications, Regular Expressions, global regular expression and print(grep)

UNIT - III   **10 Hours**

Stream editor(sed), Programming filter (awk), Interactive shell programming

UNIT - IV   **10 Hours**

Shell Programming concepts, Advanced Shell Programming

UNIT - V   **08 Hours**

Introduction System calls and Signals, File I/O, Files & Directories, Process control

Learning Resources
Text Books
1.Unix and Shell Programming, Behrouz A, Forouzan and Richard F.Gilberg, Cengage Learning, 2003. 2.Advanced Programming in Unix Environment, W.Richard Stevens, Stephen A Rago, 3rd Edition, Addison-Wesley Professional, 2013.
Reference Books
1. UNIX and shell programming by B.M. Harwani, OXFORD university press. 2. Unix essentials by Sumitabha Das 3. Unix Shell Programming, Stephen G.Kochan, Patrick Wood, 3/e, Pearson
e- Resources & other digital material
1.Coursera Online Learning Material
2.Lecture Notes and Teaching Material supplied Via MS Teams STM Course Channel
3.Open Access e-Resources like **SWAYAM by nptel** etc
e-books
1. Directory of Open Access Books (DOAB) **2.** AICTE Open Library

Online links for Unix
www.unix.org www.linuxfoundation.org www.itsfoss.com

Course Outcomes:

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

CO1:Infer the importance of Unix operating system by learning salient features and using basic utilities **(Understand)**

CO2:implement programming and non-programming filters aptly **(Apply)**

CO3:create shell scripts using the syntactic constructs of shell for producing the desired effects. **(Create)**

CO4:create advanced shell scripts for string and array processing. **(Create)**

CO5:develop functions using system calls for file and process control. **(Create)**

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III- Year I- Semester	Name of the Course	L	T	P	C
HS3101	Managerial Economics and Financial Analysis	3	0	0	3

Course Objective: The objective of this course is to inculcate basic knowledge to students relating to concepts of Managerial Economics and Accounting to make them effective business decision makers.

Other course educational objectives of this course:

1. To equip the students with the basic inputs of managerial economics and demand concepts.
2. To understand the concepts of production and cost for various business decision.
3. To understand the different types of market, market structures & pricing strategies and their applications in business decision making and to know the different forms of Business organization and the concept of Business Cycles.
4. To understand the fundamental of accounting and analysis of accounting statements for managerial decision making.
5. To understand the concept of Capital, Capital Budgeting and the techniquesused to evaluate Capital Budgeting proposals.

UNIT – I Introduction to Managerial Economics and demand Analysis: 10 Hrs

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demandcurve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting.

UNIT - II Theory of Production and Cost Analysis: 13 Hrs

Production Function – Isoquant and Isocost, MRTS, Least Cost Combination of Inputs - Laws of Returns to scale - Internal and External Economies of Scale, Cost Analysis: Cost concepts, Cost & output relationship in short run & long run - Break-even Analysis (BEA)-Determination of Break-Even Point - Significance and limitations.

UNIT – III Introduction to Markets, Pricing Policies & Types of Business Organization and Business Cycles: 12 Hrs

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, and Internet Pricing: Flat Rate Pricing, Usage sensitive pricing and Priority Pricing. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – Business Cycles: Phases of Business Cycles.

UNIT – IV Introduction to Financial Accounting & Analysis: 13 Hrs

Financial Accounting and analysis: Accounting –significance -- Book Keeping-Double entry system –Journal- Ledger- Trial Balance- Final Accounts with simple adjustments.

Financial Statement Analysis through ratios: Ratio-analysis of financial statement using different ratios (Liquidity -Profitability- Solvency -Activity ratios).

UNIT - V Capital and Capital Budgeting: **12 Hrs**

Capital Budgeting: Meaning of Capital-Capitalization-Meaning ofCapital Budgeting-Time value of money- Methods of appraising Project profitability: TraditionalMethods (payback period, accounting rate of return) and modern methods (Discounted cash flow method,Net Present Value method, Internal Rate of Return Method and Profitability Index).

Text Books:

1. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011.

2. Dr. N. Appa Rao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi – 2011.

3. Prof. J.V. Prabhakara rao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.

Reference Books:

1. V. Maheswari : Managerial Economics, Sultan Chand.

2. Suma Damodaran : Managerial Economics, Oxford 2011.

3. Dr. B. Kuberudu and Dr. T. V. Ramana : Managerial Economics & Financial Analysis, Himalaya Publishing House 2011.

4. Vanitha Agarwal : Managerial Economics, Pearson Publications 2011.

5. Sanjay Dhameja : Financial Accounting for Managers, Pearson.

6. Maheswari: Financial Accounting, Vikas Publications.

7. S. A. Siddiqui & A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012.

Course Outcomes: After completion of the course, students will be able to
CO1: Equipped with the knowledge of estimating the Demand and demand elasticities for a product.

CO2: Understandthe Input-Output-Cost relationships and estimation of the least cost combination of inputs.

CO3: Understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.

CO4: Prepare Financial Statements and the usage of various Accounting tools for analysis.

CO5: Evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

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III- Year I- Semester	Name of the Course	L	T	P	C
PC3102	Advanced Java Programming	3	0	0	3

Course Objectives:

• Implementation of JDBC

• Understanding Java Beans

• Develop web application using Servlets and JSP

• Understands MVC in web development

UNIT-I: 10 hrs
JDBC: JDBC Connectivity, Types of JDBC drivers, connecting to the database, JDBC Statements, JDBC Exceptions, Manipulations on the database.
Introduction to Web: DNS, Role of DNS, DNS root servers, Internet and Intranet, Evolution: web 1.0, 2.0, 3.0, HTTP Request and HTTP Response, Website design principles, planning
Introduction to HTML

UNIT-II: 10 hrs
Applet Context– signed applet – object serialization- shallow and deep copying
Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizers, Java Beans API

Unit – III: 12 hrs
Servlets: Web servers, Tomcat web server installation steps, introduction to servlets, Lifecycle of a Servlet, Simple servlet, the Servlet API, Reading Servlet parameters, the javax.servlet.http package, Handling Http Request & Responses, Using Cookies-Session Tracking.
Java Server Pages: Introduction to JSP, The Problem with Servlet, the Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC architecture.

UNIT-IV: 10 hrs
JSP Application Development: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Conditional Processing, Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing data between JSP pages, Requests and Users, Passing Control and Date between Pages, Sharing Session and Application Data.

UNIT-V: 8 hrs
Introduction to Spring Framework: Introduction to Spring framework, Dependency Injection and Inversion of Control, Spring modules, Spring with MVC.
Introduction to struts framework.

OUTCOMES:
• ImplementJDBC

• Understand the concept of Java Beans

• Develop web application using Servlets and JSP

• UnderstandMVC in web development

Text Books:

1. Internet and World wide web- How to program, Dietel and Nieto, Pearson.

2. The Complete Reference, Java 2, 3ed, Patrik Naughton, Herbert Schildt, TMH.

3. Java Server Pages, Hans Bergstan, Oreilly

Reference Books

1. Jakarta Struts cook book, Bill Siggelkow, SPD, Oreilly

2. Murach's, Beginning Java JDK5, Murach, SPD.

3. An introduction to Web Design and Programming, Wang Thomson

e- Resources & other digital material

1.AbhayRedkar, JSF Developer, ―Struts2 Framework for beginners'', Udemy.https://www.udemy.com/struts-2-framework-for-beginners/

2. Prof. I. Sengupta. (14th, May, 2017), Department of Computer Science & Engineering, I.I.T.,Kharagpur, ―Internet Technologies'', NPTEL videos.

Course Outcomes:

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

CO1: Implement JDBC Connectivity (L3)
CO2: Understands benefit of Java Beans (L2)
CO3: Implements Web Application using Servlets & JSP (L3)
CO4: Understands MVC in web development using spring and Struts (L2)

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III- Year I- Semester	Name of the Course	L	T	P	C
PC3103	Artificial Intelligence	3	0	0	3

Course Objectives:

- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language

- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs

- To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

UNIT-I: 12 hrs

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.
Introduction to Prolog : Introduction To Prolog: Syntax and Numeric Function, Basic List Manipulation Functions In Prolog, Functions, Predicates and Conditional, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics, LISP and Other AI Programming Languages

UNIT-II: Problem Solving   12 hrs

Problem Solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction. Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

Unit –III: Logic concepts   8hrs

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT-IV: Knowledge Representation   12 hrs

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames. Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web

UNIT-V: Expert system and applications   8 hrs

Expert system and applications: Introduction phases in building expert systems, expert system vs traditional systems
Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory,Fuzzy Logic.

Text Books:

1) Artificial Intelligence- Saroj Kaushik, CENGAGE Learning

2) Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

3) Introduction to Prolog Programming By Carl Townsend.

Reference Books

1)Artificial Intelligence- Deepak Khemani, TMH, 2013

2) Introduction to Artificial Intelligence, Patterson, PHI

3) Atificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA

4)"PROLOG Programming For Artificial Intelligence" -By Ivan Bratko(Addison-Wesley)

5) "Programming with PROLOG" –By Klocksin and Mellish.

e- Resources & other digital material

1) https://nptel.ac.in/courses/106/105/106105077/

 2) http://aima.cs.berkeley.edu/

Course Outcomes:

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

CO1: Develop a basic understanding of AI building blocks presented in intelligentagents.

CO2: Choose an appropriate problem solving method and knowledge representation technique.

CO3: Analyze the strength and weaknesses of AI approaches to knowledge– intensive problem solving.

CO4: Design and develop the AI applications in real world scenario.

CO5: Evaluate different algorithms of a problem formalisation and state the conclusions that the evaluation supports.

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III- Year I- Semester	Name of the Course	L	T	P	C
PC3104	Design and Analysis of Algorithms	3	0	0	3

Course Objectives:

1. To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms
2. To introduce the different algorithmic approaches for problem solving through numerous example problems
3. To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

UNIT - I   **14 Hours**

Introduction: Algorithm Definition, Algorithm Specification, Performance Analysis, Performance Measurement, Asymptotic notations.

Divide and Conquer: General Method, Binary Search, Finding the Maximum and Minimum, Quick Sort.

UNIT - II   **10 Hours**

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing With DeadlinesProblem, Single Source Shortest Path Problem, Optimal Merge PatternsProblem.

UNIT - III   **12 Hours**

Dynamic Programming: The General Method, 0/1 KnapsackProblem, Single Source Shortest Path – General Weights, All Pairs-Shortest Paths Problem, Traveling Salesperson Problem, String Editing Problem.

UNIT - IV   **10 Hours**

Backtracking: The General Method, The N-Queens Problem, Sum of SubsetsProblem, Graph ColoringProblem, Hamiltonian CyclesProblem.

UNIT - V   **14 Hours**

Branch and Bound: The General Method, FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack Problem, Traveling Salesperson Problem.
NP-Hard and NP-Complete problems: Basic concepts, Cook's Theorem.

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, " Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.

Reference Books:

1. Harsh Bhasin, " Algorithms Design & Analysis", Oxford University Press.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

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

CO1: Infer the divide-and-conquer paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
CO2: Infer the greedy paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.

CO3: Infer the dynamic-programming paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.

CO4: Infer the backtracking paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.

CO5: Infer the branch and bound paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.

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III- Year I- Semester	Name of the Course	L	T	P	C
PC3101L	Unix and Shell Programming Lab	0	0	3	1.5

Course Objectives:

1. Learn UNIX Filters related to text processing, communication and search utilities
2. Learn programming filters and interactive shell scripting
3. Learn shell programming constructs writing advanced scripts
4. Learn kernel programming on file operations and managing processes

List of Shell Scripts:

1. Create a script that, given a user name, finds the home directory of the user using the /etc/passwd file.

   Preparation:
   - None

   Script:
   - **Script Name: findHomeDirectory.scr**
   - **Arguments:** One, The user name.
   - **Validation:** The minimum validation requirements are :
       i. Ensure that there is only one argument.
   - **Body Section:** Create a script that, given the name of a user (as the only argument), prints the absolute pathname of the user's home directory

   Testing the Script:
   - Test the script with two or more arguments.
   - Test the script with no arguments.
   - Test the script with one argument.

   Testing the Effect of the Script:
   - Verify the script by using your user name.

2. Write a script that creates a file out of the /etc/passwd file.

   Preparation:
   - None

   Script:
   - **Script Name: newEtcPasswd.scr**
   - **Arguments:** One, The name of the file.
   - **Validation:** The minimum validation requirements are :
       i. Ensure that there is only one argument.
   - **Body Section:** Create a script that makes a file out of the information in the /etc/passwd file using the following format.

User Name	User Id	Group ID	Home Directory
- - - - - - - -	- - - - - -	- - - - - - -	- - - - - - - - - - - -
ram	234	23	/etc/usr/student/ram
-	-	-	-

   Testing the Script:
   - Test the script with two or more arguments.
   - Test the script with no arguments.
   - Test the script with one argument that is not the name of a file.

- Test the script with one argument that is the name of a file.

Testing the Effect of the Script:
- Verify the file was created and contains the correct information and format.

3. In a C Program, there is only one comment format. All comments must start with an open comment token, /*, and end with a close comment token, */. C++ programs use the C tokens for comments that span several lines. Single-line comments start with two slashes (//). In either case, the start token can be anywhere on the line.

    Write a script to change every single-line comment in a C++ source file that uses C program start and end comment tokens to a single-line comment starting with a C++ single-line token. The comment itself is to be unchanged.

Preparation:
- Create at least five C++ source files in your home directory. The files do not have to be real C++ source files; they can contain only a few lines of comments, some with C program tokens and some with C++ single-line tokens. Each program should have at least one multiple comment and at least one single-line comment that uses the C program tokens. Use one or more blank lines between comments. The name of the files should have C++ extension (.c++), such as file1.c++.

Script:
- **Script Name: `commentType.scr`**
- **Arguments:** None
- **Validation:** The minimum validation requirements are :
    i. Ensure that there is no argument.
- **Body Section:** Create a script that finds all files with extension (.c++) under your directory and change only the lines with comments. The name of the files should be preserved. If a file has the name file1.c++, the name still should be file1.c++ after the change.

Testing the Script:
- Test the script with one or two arguments.
- Test the script with no arguments.

Testing the Effect of the Script:
- Check to see if the comments are changed in the files.

4. Write a script to backup and archive a list of files.
Preparation:
- Create a file and type in it the list of files (in your home directory) that you want to back and archive
- Create a directory in which you will store the backed-up files and archive file.

Script
- **Script Name:** backup.scr
- **Arguments:** A filename and a directory. The filename holds the list of the files that should be backed-up. The directory is where the backed-up files should be stored.

- **Validation:** The minimum validation requirements are :
    - **i.** Ensure that exactly two arguments are entered.
    - **ii.** Check that the first argument is the name of a file exists
    - **iii.** Check that the second argument is the name of the directory that exists
- **Body Section:** Create backup files for files listed in the first argument. The backup files should have the same name as the original file with the extension `bak`. They should be copied to the directory given as the second argument.

Testing the Script:
- Test the script with no arguments
- Test the script with one argument
- Test the script with three arguments
- Test the script with two arguments in which the first one is not the name of the file
- Test the script with two arguments in which the second one is the name of a file rather than a directory.
- Test the script with name of the file and the name of the directory you created in the preparation section.

Testing the Effect of the Script:
- Check the contents of the directory to be sure that the files are copied

5. Write a script that finds all soft links to a specific file.
   Preparation:
   - Create a file and type some junk in it.
   - Make at least five soft links to this file using completely arbitrary names..
   Script:
   - **Script Name: `softLinkFinder.scr`**
   - **Arguments:** A filename. The file for which we want to find the soft links.
   - **Validation:** The minimum validation requirements are :
       - **i.** Ensure that exactly one argument is entered.
       - **ii.** Check that only argument is the name of a file and that the specified file exists.
   - **Body Section:** Use ls -l and grep command to find all the soft links attached to $1 positional parameter. Note that a file of type soft link is distinguished by lower case l. Be sure to find the soft links to the file defined in $1 and not other files.

Testing the Script:
- Test the script with no arguments
- Test the script with one argument
- Test the script with one argument that is not a file
- Test the script with one valid argument.

Testing the Effect of the Script:
- Check to make sure all the soft links you created are included in the list of soft links.

6. Create a script that simulates the ls -l command but prints only three columns of our choice.
   Preparation:
   - None
   Script:
   - **Script Name: `ls.scr`**
   - **Arguments:** Three numeric arguments defining the column number of the ls -l output to be printed in the order we specify.
   - **Validation:** The minimum validation requirements are :
       i. Ensure that exactly three arguments are entered.
       ii. Ensure that all three arguments are numeric
       iii. Ensure that each argument is less than or equal to the actual number of columns in the ls -l command output.

   - **Body Section:** Creates a new command that shows the output of the ls -l command to be printed in three columns in the order we like.

   Testing the Script:
   - Test the script with no arguments.
   - Test the script with one argument.
   - Test the script with two arguments.
   - Test the script with three arguments, one of them nonnumeric.
   - Test the script with three arguments, two of them nonnumeric.
   - Test the script with three arguments, one of them too large.
   - Test the script with three arguments,1 4 5
   - Test the script with three arguments,3 7 1

   Testing the Effect of the Script:
   - None
7. Create a script that sends contents of a message file to everybody who logged in..
   Preparation:
   - Create a file of a short friendly message and mention that this is a test message that should be discarded by the receiver
   Script:
   - **Script Name: `message.scr`**
   - **Arguments:** One argument, a message file.
   - **Validation:** The minimum validation requirements are :
       i. Ensure that exactly one argument is entered.
       ii. Ensure that the argument is a readable filename.
   - **Body Section:** Create a script that uses awk to create a temporary file containing the usernames of those users who are logged into the system at this moment. Then send the message contained in the first argument to every logged-in user. Note that a user who has logged in more than once should receive only one message.

Testing the Script:

- Test the script with no arguments.
- Test the script with two arguments.
- Test the script with one argument that is not a readable file.
- Test the script with one valid argument.

Testing the Effect of the Script:

- You should include yourself in the recipient list. Check to see if you have received the message.

8. Create a script that can be executed only from a specific terminal. This is done for security purposes. For example, a superuser may write scripts that can only be executed from his or her office and nowhere else.

Preparation:

- None

Script:

- **Script Name: `security.scr`**
- **Arguments:** None.
- **Validation:** The minimum validation requirements are :
  - **i.** Ensure that no argument is entered.
- **Body Section:** Create a script that prints a friendly message. However, the script can be executed only for one terminal. You can use the name of the terminal you are using when you write the script. If somebody uses the script from a terminal that is not authorized, the script is to exit immediately. Hint: Use the tty command to show your current terminal.

Testing the Script:

- Test the script with one argument.
- Test the script from right terminal.
- Log into the system using another terminal and test the script.

Testing the Effect of the Script:

- None

9. Create a script that finds each line in a file that contains a specified string.

Preparation:

- Create a file of at least 20 lines and insert a double quoted string, such as "hello," in several lines.

Script:

- **Script Name: `search.scr`**
- **Arguments:** Two arguments, the first is the string to be found; the second is the name of the file.
- **Validation:** The minimum validation requirements are :
  - **i.** Ensure that exactly two arguments are entered.
  - **ii.** Ensure that the second argument is the name of the file that exists and is not empty.

- **Body Section:** Create a script that uses grep and loops to find the line numbers in which the string is found. Note that grep should be applied to each line, not the whole file. The script should print the result in the following format:

Line Number : [Line contents]

Testing the Script:
- Test the script with no arguments.
- Test the script with one argument.
- Test the script with two argument but the second one is not a file.
- Test the script with two correct arguments.

Testing the Effect of the Script:
- Compare the results of your script with a printout of the file.

10. Create a script that compiles all C source files in your home directory and create executable files.

Preparation:
- Create at least five C source files in your home directory. The files do not have to be real C source files; at a minimum they should contain a comment line that contain a unique program name such as the following example:

/* ....file1.c ....*/

The name of the files should have a C source file extension (.c), such as file1.c.

Script:
- **Script Name: `compile.scr`**
- **Arguments:** Two arguments, the first is the string to be found; the second is the name of the file.
- **Validation:** The minimum validation requirements are :
    i. Ensure that there is no argument
- **Body Section:** Create a script that finds all files with extension (**.**c) under your home directory and compiles them one by one. Each executable file should have the same name as the source file except that the extension should be (**.**exe). For example, if the source filename is file1.c, the executable filename should be file1.exe. Use the following command to compile:

cc -o executable_filename source_filename

Testing the Script:
- Test the script with one or two arguments.
- Test the script with no arguments.

Testing the Effect of the Script:
- Verify that executable files were created under your home directory.

11. Create a script that finds all files in subdirectories that have the same filename.
Preparation:

- Make several directories, at different levels, under your home directory. For example, make ~/A, ~/B, ~/C, ~/A/AA, ~/A/BB, ~/A/AA/AAA, and so on until you have at least 15 directories. Copy a small junk file named file1 under some of these directories; do not change its name. Copy another small junk file named file2 under some other directories. Copy a third junk file under several directories. Be sure that some directories get a combination of file1 and file2 or file1 and file3. In at least three of the directories, create a junk file with a unique name.

Script:
- **Script Name: `duplicateName.scr`**
- **Arguments:** None
- **Validation:** The minimum validation requirements are :
  i. Ensure that there is no argument.
- **Body Section:** Create a script that uses find and awk commands to create a list of files that are duplicated; use the full pathname for the duplicated filenames. Hint: Use a basename command and an array in awk. The output should look like the following example:

file1:	~/A/file1	~/A/AA/file1	~/A/B/BB/BBB/file1
file2:	~/B/file2	~/C/file2	

Testing the Script:
- Test the script with one argument.
- Test the script with no arguments.

Testing the Effect of the Script:
- Use a recursive long list command to list the complete contents of your home directory. Verify the output of your script against the list command output.

12. Create a script that search for multiple occurrences of the specified string in each line.

Preparation:
- Create a file of at least 20 lines and insert a double quoted string, such as "hello," in several lines.
- Include two or three occurrences of the string in some lines.

Script:
- **Script Name: `search.scr`**
- **Arguments:** Two arguments, the first is the string to be found; the second is the name of the file.
- **Validation:** The minimum validation requirements are :
  i. Ensure that exactly two arguments are entered.
  ii. Ensure that the second argument is the name of the file that exists and is not empty.
- **Body Section:** Create a script that uses grep and loops to find the line numbers in which the string is found. Note that grep should be applied to each line, not the whole file. The script should print the result in the following format:

Line Number : [Line contents]

Testing the Script:
- Test the script with no arguments.
- Test the script with one argument.

- Test the script with two argument but the second one is not a file.
- Test the script with two correct arguments.

Testing the Effect of the Script:
- Compare the results of your script with a printout of the file.

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

CO1: **Develop** scripts compatible with different shells available under UNIX environment **(Apply)**

CO2: **Develop** scripts for automating the tasks of programmer during deployment and maintenance **(Apply)**

CO3: **Develop** scripts to automate task using programmable filters **(Apply)**

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III- Year I- Semester	Name of the Course	L	T	P	C
PC3102L	Advanced Java Programming Lab	0	0	3	1.5

Course Objectives:

• Implementation of JDBC

• Understanding Java Beans

• Develop web application using Servlets and JSP

• Understands MVC in web development

1. Design Employee Database for company or Organization (Employee Personal Details, Department, Salary (basic, DA, HRA.,) Details) and develop JDBC based java application for following tasks:

1. Insert Records into respective table

2. Select records of particular table of database

3. Delete Records from table.

Connect GUI application to database and perform SQL commands via JDBC API

2. Write a program in Java Beans to add a Button to the Bean and display the number of times the button has been clicked.

3. Write a program for Java Bean with Simple property by using SimpleBeanInfo class.

4. Write a program for Java Bean with Indexed Property by using SimpleBeanInfo class.

5. Write a program to develop a Enterprise Java Bean of "Session Bean" type.

6. Create Application for Datagram server and Client interaction as per given below.

i] Datagram server to send a message to client.

ii]Datagram client to receive the message sent by the server.

7. Write a client server program using TCP where client sends 10 numbers to server program and server program responds with the numbers in ascending order to respective client.

8. Verify installation and setting of Web container/Web Server/Tomcat and prepare an installation report, which contains setting of class path, server port, starting and shutting down of server.

9. Develop web Application to display a greeting message in the browser by using Servlet interface.

10. Create a simple Sign in and Signup web application using HTTPServlet class

11. Create Servlet for registering a new user and displaying the number of visits made by the existing user using cookies

12. Create JSP to output, "Welcome to JSP world. The time now is: system current time. Use a scriptlet for the complete string, including the HTML tags

13. Create a simple JSP application for online poll application that prompts the user to answer a question and display the results in bar graph representation

14. Create a simple web application for online poll application that prompts the user to answer a question and display the results in bar graph representation and use spring framework in development

OUTCOMES:
• Implementation of JDBC
• Understanding Java Beans
• Develop web application using Servlets and JSP
• Understands MVC in web development

Text Books:
1. Internet and World wide web- How to program, Dietel and Nieto, Pearson.
2. The Complete Reference, Java 2, 3ed, Patrik Naughton, Herbert Schildt, TMH.
3. Java Server Pages, Hans Bergstan, Oreilly
Reference Books
1. Jakarta Struts cook book, Bill Siggelkow, SPD, Oreilly
2. Murach's, Beginning Java JDK5, Murach, SPD.
3. An introduction to Web Design and Programming, Wang Thomson
e- Resources & other digital material
1.AbhayRedkar, JSF Developer, ―Struts2 Framework for beginners", Udemy.https://www.udemy.com/struts-2-framework-for-beginners/
2. Prof. I. Sengupta. (14th, May, 2017), Department of Computer Science & Engineering,
I.I.T.,Kharagpur, ―Internet Technologies", NPTEL videos.

Course Outcomes:

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

CO1: Implement JDBC Connectivity (L3)
CO2: Understands benefit of Java Beans (L2)
CO3: Implements Web Application using Servlets & JSP (L3)
CO4: Understands MVC in web development using spring and Struts (L2)

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III- Year I- Semester	Name of the Course	L	T	P	C
PC3103	Artificial Intelligence Lab	0	0	3	1.5

Course Objectives:

- Study the concepts of Artificial Intelligence.
- Learn the methods of solving problems using Artificial Intelligence.
- Introduce the concepts of machine learning.

Experiments:

1) Study of Prolog.

2) Write simple fact for the statements using PROLOG.

3) Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing

4) Write a program to solve the Monkey Banana problem.

5) Write a program in turbo prolog for medical diagnosis and show the advantageand disadvantage of green and red cuts

6) Write a program to implement factorial, Fibonacci of a given number

7) Write a program to solve 4-Queen and 8-puzzle problem.

8) Write a program to solve travelling salesman problem.

9) Write a program to solve water jug problem using LISP

10) Implementation of A* Algorithm using LISP /PROLOG

11) Implementation of Hill Climbing Algorithm using LISP /PROLOG

12) Implementation of Towers of Hanoi Problem using LISP

Course Outcomes:

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

CO1: Identify problems that are amenable to solution by AI methods.

CO2: Recognize appropriate AI methods to solve a given problem.

CO3: Discuss a given problem in the language /framework of different AI methods.

CO4: Develop basic AI algorithms

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III- Year II- Semester	Name of the Course	L	T	P	C
PC3201	Data Warehousing and Data Mining	3	0	0	3

Course Objectives:

1. To understand basic concepts, architectures and classical models in data warehousing
2. To understand data mining concepts and preprocessing techniques
3. To master in association analysis techniques in various applications like social, scientific and environmental context.
4. To develop skill in selecting the appropriate classification algorithm for solving practical problems
5. To characterize the kinds of patterns that can be discovered by clustering.

UNIT-I 12 Hrs

Introduction to Data Warehousing: Introduction to Data Ware House, Differences between operational data base systems and data Ware House, Data Ware House characteristics, Data Ware House Architecture and its components, Extraction-Transformation-Loading, Data warehouse Modeling, Schema Design, star and snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; Fact-Less-Facts, Dimension Table characteristics; OLAP cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

UNIT-II 14 Hrs

Introduction to Data Mining: Introduction, Definition, KDD, Challenges, Data Mining Functionalities. Data Objects and Attribute Types, Measuring Data Similarity and Dissimilarity, **Data Preprocessing**: Introduction, Data Preprocessing Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT- III 12 Hrs

Association Analysis: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation, APRIORI Algorithm, The Partition Algorithms, FP-Growth Algorithm, Compact Representation of Frequent Item Set-Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT -IV 13 Hrs

Classification: Problem definition, General Approaches to solving a classification problem, Evaluation of Classifiers, Classification techniques, Decision trees: Decision Tree Construction, Methods for expressing attribute test conditions, Measures for Selecting the Best split, Algorithm for Decision tree Induction, Naïve-Bayes Classifier, Bayesian Belief Networks; K-nearest neighbor classification-Algorithm and characteristics.

UNIT-V 14 Hrs

Clustering: Problem Definition, Clustering overview, Evaluation of clustering algorithms, Partitioning clustering K-Means Algorithm, K-Means Additional Issues, PAM Algorithm, Hierarchical Clustering-Algorithm- Agglomerative Methods and Divisive Methods, Basic Agglomerative Hierarchical Clustering Algorithm, DBSCAN Algorithm, Strengths and Weaknesses.

TEXT BOOKS:

1.Han, Kamber, "Data Mining Concepts and Techniques", 3rdEdition
2. P. N. Tan, M. Steinbach, Vipin Kumar, "Introduction to Data Miming", Pearson Education.

REFERENCE BOOKS:

1.Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2.Data Ware Housing Fundamentals, Pualraj Ponnaiah, Wiley Student Edition.

3.The Data Ware House Life Cycle Toolkit- Ralph Kimball, Wiley Student Edition.

4.Data Mining, Vikaram Pudi, P Radha Krishna, Oxford University.

Course Outcomes:

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

CO-1: Understand basic concepts, architectures and classical models in data Warehousing

CO-2: Understand data mining concepts and preprocessing techniques

CO-3: Master in association analysis techniques in various applications like social, scientific and environmental context.

CO-4: Develop skill in selecting the appropriate classification algorithm for solving practical problems

C0-5: Characterize the kinds of patterns that can be discovered by clustering.

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III- Year II- Semester	Name of the Course	L	T	P	C
PC3202	Computer Networks	3	0	0	3

Course Objectives:

1. To summarize OSI and TCP/IP reference models and Example networks, characteristics of transmission media and classify multiplexing techniques
2. To explain the Error Control, Flow Control and Medium Access Control Protocols
3. To Compute optimal path using Routing Algorithms.
4. To summarize the concepts of reliable unreliable transmission
5. To explain the knowledge on various application layer protocols

UNIT-I: Introduction to Computer Networks and Physical Layer   12 Hrs

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, Example Networks, Physical Layer – Fourier Analysis – Bandwidth Limited Signals – The Maximum Data Rate of a Channel Guided Transmission Media, Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing

UNIT-II : Data Link Layer   10 Hrs

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Control Protocols, Sliding Window Protocols, HDLC, PPP, Channel Allocation problem, Multiple Access Protocols, IEEE standards for Local Area Networks, WLAN, Bluetooth

UNIT– III: Network Layer   10 Hrs

Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Internet Protocol Header, IP Addresses, subnetting and super netting.

UNIT-IV: Transport Layer   8 Hrs

Transport Layer Design Issues, Connection Establishment, Connection Termination, Transport and User Datagram Protocols

UNIT – V: Application Layer   8 Hrs

Design Issues, DNS, WWW, HTTP/HTTPS, E-mail, FTP

Text Books:
1. Computer Networks, Andrew S Tanenbaum, Pearson, 5th Edition
2. Data Communications and Networking, Behrouz A Forouzan, Tata McGraw Hill, 4th Edition
Reference Book:
1. TCP/IP Protocol Suite, Behrouz A Forouzan, Tata McGraw Hill Edition, 3rd Edition
Web Resources:
1.https://youtube.com/playlist?list=PLbRMhDVUMngfpeFloB7kyiA40EptH1up
2.https://www.geeksforgeeks.org/computer-network-tutorials/
3.https://www.cisco.com/c/en/us/support/docs/ip/routing-information-protocol-rip/13788-3.html

Course Outcomes:

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

CO1: Explain OSI and TCP/IP reference models and Example networks, characteristics of transmission media and classify multiplexing techniques (L2)

CO2: Summarize various Error Control, Flow Control techniques and Medium Access Control Protocols (L2)

CO3: Compute optimal path using Routing Algorithms. (L3)

CO4: Explain the concepts of reliable unreliable transmission (L2)

CO5: Ilustrate the working of various application layer protocols (L3)

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III- Year II- Semester	Name of the Course	L	T	P	C
PC3203	Theory of Computation	3	0	0	3

Course Objectives:

- To learn fundamentals of Regular and Context Free Grammars and Languages
- To understand the relation between Regular Language and Finite Automata and machines
- To understand the relation between Contexts free Languages, Push Down Automata and Turing Machine
- To study various phases in the design of compiler and understanding the machine independent phases of compiler
- To understand machine dependent phases of compiler

UNIT-I: Finite Automata 12 hrs

Automata: Need for Automata Theory, Chomsky hierarchy, Acceptance of a string, Design of NFA with Є, NFA without Є, DFA, Equivalence of NFA and DFA

Finite Automata Conversions: Conversion from NFA Є to NFA, NFA to DFA, Minimization of DFA, Moore and Mealy Machines, Applications and Limitations of Automata.

UNIT-II: Regular Expressions, Grammar 14 hrs

Regular Expressions: Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets

Regular Grammars: Grammars, Classification of Grammars, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars, Normal Forms- Chomsky Normal Form, Griebach Normal Form.

Unit – III: Push Down Automata and Turing Machines 12 hrs

Push Down Automata (PDA): Design of PDA, Deterministic PDA, Non-deterministic PDA, Equivalence of PDA and Context Free Grammars, Applications of PDA.

Turing Machine (TM): Design of Turing Machine, Deterministic TM, Non-deterministic TM, Church's Thesis, Decidability Problems, Halting problems, Post's Correspondence Problems of Turing Machine, P and NP problems.

UNIT-IV: Machine Independent Phases 14 hrs

Lexical Analysis: Lexical Analysis Vs. Parsing – Token, patterns and Lexemes – Lexical Errors – Regular Expressions – Regular definitions for the language constructs – Strings, Sequences, Comments – Transition diagram for recognition of tokens, Reserved words and identifiers, Examples.

Syntax Analysis: Parsing definition, types of parsing, Brute force approach, left recursion, left factoring, Top down parsing – First and Follow- LL(1) Grammars, Non- Recursive predictive parsing, Bottom-up parsers- Operator Precedence Parsing, Shift Reduce Parsing- LR parsers, Comparison of Top down approaches with bottom up approaches, Error recovery in parsing.

Semantic Analysis: Syntax Directed Translation, SDT schemes, L-attributed and S-attributed definitions

Symbol tables: use and need of symbol tables.

UNIT-V: Machine Dependent Phases   **12 hrs**

Intermediate Code Generation: Intermediate code, three address code, quadruples, triples, abstract syntax trees. Types and declarations, type Checking

Code Optimization: Semantic preserving transformations, global common sub expression elimination, copy propagation, dead code elimination, constant folding, strength reduction, loop optimization. Instruction scheduling, inter procedural optimization.

Code generation: Issues, target language, Basic blocks & flow graphs, Simple code generator, Peephole optimization, Register allocation and assignment.

Runtime Environment: storage organization, stack allocation, access to non-local data, heap management, parameter passing mechanisms

Text Books:

1. Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
2. Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007
3. Compilers, Principles Techniques and Tools- Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman,2nd ed, Pearson,2007.

Reference Books

1. Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
2. Theory of Computation, V. Kulkarni, Oxford University Press, 2013
3. Principles of compiler design, V. Raghavan, 2nd ed, TMH, 2011.
4. Compiler construction, Principles and Practice, Kenneth C Louden, CENGAGE

e- Resources & other digital material

https://nptel.ac.in/courses/106/104/106104028/
https://nptel.ac.in/courses/106/105/106105190/

University Academy Youtube Channel for Automata Theory and Compiler Design:

https://www.youtube.com/playlist?list=PL-JvKqQx2AtdhlS7j6jFoEnxmUEEsH9KH
https://www.youtube.com/playlist?list=PL-JvKqQx2Ate5DWhppx-MUOtGNA4S3spT

GATE Lectures:

https://www.youtube.com/playlist?list=PLEbnTDJUr_IdM___FmDFBJBz0zCsOFxfK
https://www.youtube.com/playlist?list=PLMzYNEvC0P7FwwnrXwAjPq8zLTC4MDQKQ

Course Outcomes:

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

CO1: Classify machines by their power to recognize languages.

CO2: Summarize language classes and grammars relationship among them with the help of Chomsky hierarchy.

CO3: Employ finite state machines in problem solving and also illustrate deterministic and non-deterministic machines.

CO4: Design and implement scanners and parsers.

CO5: Perform code optimization to improve performance and apply algorithms to generate code.

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III- Year II- Semester	Name of the Course	L	T	P	C
PC3204	Web Technologies	3	0	0	3

Course Objectives:
- Creating web pages using HTML5 and CSS
- Implementing Interactive web interfaces with client side technologies.
- Create and validate XML documents.
- Understanding Server Side Scripting.
- Interactive Server side Scripting for an application

UNIT-I: 10 hrs

HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Html styles, Elements, Attributes, Heading, Layouts, Html media, Iframes Images, Hypertext Links, Lists, Tables, Forms, GET and POST method, HTML 5, Dynamic HTML.

CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution, CSS3

UNIT-II: 12 hrs

Javascript - Introduction to Javascript, Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions.

Introduction to Angular JS: ARRAY, Objects, Strings, Angular JS Form Validation & Form Submission.

Introduction to Node.js: Advantages, Node.js Process Model, Node JS Modules, Node JS File system, Node JS URL module, Node JS Events

Unit – III: 8 hrs

Working with XML: Document type Definition (DTD), XML schemas, XSLT, Document object model, Parsers - DOM and SAX.

AJAX A New Approach: Introduction to AJAX, Basics of AJAX, XML Http Request Object, AJAX UI tags, Integrating PHP and AJAX

UNIT-IV: 9 hrs

PHP Programming: XAMPP, LAMP and WAMP servers. Introduction to PHP, Creating PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions

UNIT-V: 11 hrs

File Operations: including and requiring Files, File Handling – Reading from file, Copying Files, Deleting a File, Updating a File and Uploading Files.

My SQL: Creating Database, Data Types, Basic Operations on tables (Create, Select, Delete and Update)

Working with Database & Forms: Querying a My SQL Database with PHP, Get and Post Methods, Query strings, HTML form handling.

Maintaining User State: Cookies and Sessions

OUTCOMES:
- Static web pages using HTML5 and CSS
- Interactive web interfaces with client side technologies.
- Create and validate XML documents.
- Understand Server Side Scripting.
- Interactive Server side Scripting for an application

Text Books:

1. HTML5 Black Book Covers CSS3, Javascript, XML, XHTML, AJAX, PHP and jQuery , Dreamtech Press (2011).
2. Robin Nixon, Learning PHP, My SQL, Java Script & CSS‖, 2nd Edition, O'REILLY (2012).

Reference Books

1. H. M. Deitel and P. J. Deitel, Internet & World Wide Web How to Program, 5th Edition, Prentice Hall, 2008

e- Resources & other digital material

1. http://php.net/manual/en/book.mysql.php

Course Outcomes:

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

CO1: Design and create static web pages using HTML5 and CSS (L3)
CO2: Create interactive web interfaces with client side technologies.
CO3: Create and validate XML documents.
CO4: Understand Server Side Scripting.
CO5: Design and Create Interactive Server side Scripting for an application

****

III- Year II- Semester	Name of the Course	L	T	P	C
PE3201-1	Professional Elective-IA Computer Graphics	3	0	0	3

Course Objectives:

1. To develop, design and implement two and three dimensional graphical structures
2. To enable students to acquire knowledge Multimedia compression and animations.
3. To learn Creation, Management and Transmission of Multimedia objects.

UNIT - I   12 Hours

Introduction to Computer Graphics : Applications of Computer Graphics, 2D Primitives:-Output Primitives: Points,Lines,Planes,Frame-Buffers,Video-display devices, Line Drawing Algorithms: DDA Line drawing, Bresenham's Line Drawing ,Parallel Line Drawing ,Circle and Ellipse Generation, Polygon Generation, Polygon Filling Algorithms,Attributes of Output Primitives.

UNIT - II   12 Hours

2D Transformations & Viewing : Basic Transformations :Translationa,Rotation,Scaling,Other Transformations: Reflection, Shear,Composite Transformations,Coordinate Transformation,Viewing Pipeline :Viewing Reference Frame, window, view-port, window-to-view-port Transformation,Multiple window transformation,Clipping: Line Clipping:cohen-sutherland line clipping algorithm , Polygon Clipping:Sutherland-Hodheman polygon clipping algorithm,Text Clipping. .

UNIT - III   14 Hours

3D Cincepts: 3D Object Representation: Polygons, Curved Lines, Splines, Quadric Surfaces, **3D Transformations : Basic :**Translation, Coordinate-axis-Rotation, Arbitrary-axis Rotation, Scaling, Other: Reflection, Shear, Composition of 3D transformations, ,Projections : Parallel, Perspective, 3D Viewing, Visible-Surface Detection Algorithms: Back face removal, Z-Buffer, A-Buffer, Area-sub-division, Depth-Sorting(painter's),BSP-Tree,Octree,3D Clipping

UNIT - IV   10 Hours

Graphics Programming Color Models – RGB, YIQ, CMY, HSV – Animations – General Computer Animation, Raster, Keyframe

Graphics programming using OPENGL – Basic graphics primitives –Drawing three dimensional objects - Drawing three dimensional scenes

Rendering Introduction to Shading models – Flat and Smooth shading – Adding texture to faces –Adding shadows of objects – Building a camera in a program – Creating shaded objects– Rendering texture – Drawing Shadows

UNIT - V   12 Hours

Fractals Fractals and Self similarity – Peano curves – Creating image by iterated functions – Mandelbrot sets – Julia Sets – Random Fractals.

Overview of Ray Tracing Intersecting rays with other primitives – Adding Surface texture – Reflections andTransparency – Boolean operations on Objects.

Text Books:

- Donald Hearn, Pauline Baker, Computer Graphics – C Version, second edition Pearson Education,2004.

- F.S. Hill, Computer Graphics using OPENGL, Second edition, Pearson Education, 2003.

Reference Books:

James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics-Principles and practice, Second Edition in C, Pearson Education, 2007.

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

CO1	**Understand** Applications, Video devices and **analyze** 2D Objects by learning output primitives
CO2	**Analyze** various 2D Object representation models by **learning** various visualization techniques
CO3	**Analyze** various 3D Object representation models by **learning** various visualization techniques
CO4	**Develop** programs in OPENGL by using apt functions for efficacy in Computer Graphics 2D/3D and Animation**Perform Rendering** of 2D/3D Objects by **learning** about shading, texture mapping techniques and drawing shadows
CO5	**Design** complicated Real World Scenes by **learning** Iterated Function Systems for implementing Fractals **Apply** 3D Solid Geometric Techniques for representing 3D objects

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III- Year II- Semester	Name of the Course	L	T	P	C
PE3201-2	Professional Elective-IB No-SQL Databases	3	0	0	3

Course Objectives:

- To make student understand about NoSQL, its characteristics and history, and the primary benefits for using NoSQL data
- To explore students about various types of NO-SQL databases (wide-column, document, key-value, graph and object-oriented) in adding content and running queries
- To make students in understanding the NoSQL data architecture patterns

UNIT-I: Introduction to No-SQL   12 hrs

What is No-SQL?, NoSQL Overview, NoSQL Database Environment, NoSQL Options, When to use No-SQL?, Introduction to No-SQL development

UNIT-II: Column-Oriented Databases   12 hrs

Column family, key and keyspace, Apache HBASE

Unit – III: Key Value Databases   12 hrs

What is key value store?, Key value databases, DynamoDB

UNIT-IV: Document based Databases   12 hrs

What is document?, Document Databases, MangoDB

UNIT-V: Graph Databases   12 hrs

What is Graph Database?, Graph Databases, Neo4J

Text Books:
1. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence , Author: Sadalage, P. & Fowler, Publication: Pearson Education

2. NoSQL Databases A Complete Guide - 2020 Edition, Author: Gerardus Blokdyk, Publisher : 5starcooks

Reference Books
1. Name: Redmond, E. &Wilson , Author: Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement Edition: 1st Edition.

2. NoSQL For Dummies, Author: Adam Fowler, Publisher: A wiley Brand

e- Resources & other digital material

1. https://www.guru99.com/hbase-tutorials.html
2. https://docs.mongodb.com/manual/tutorial/
3. https://dynobase.dev/dynamodb/
4.https://neo4j.com/developer/graph-db-vs-nosql/

Course Outcomes:

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

CO1: Outlines the importance of NoSQL and types of NoSQL Databases. (L1)
CO2: Demonstrates the working environment of Column-oriented databases. (L3)
CO3: Demonstrates the working environment of Key Value Databases. (L3)
CO4: Demonstrates the working environment of Document based Databases. (L3)
CO5: Demonstrates the working environment of Graph Databases.(L3)

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III- Year II- Semester	Name of the Course	L	T	P	C
PE3201-3	Full Stack – 1 Professional Elective IC	3	0	0	3

Course Objectives:

1. To learn Client side application development
2. To learn User Interface Developmemt
3. To focus on contemporary technologies like React

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

- Understand Client side design of the web.
- Explore different ES6 features in Java script.
- Implement components and props through React.
- Comprehend React Hooks
- Implement web API calls with axios and REDUX

Unit-1: Introduction to HTML 5, syntax, attributes, events, SVG, Web storage, Introduction to Canvas, Audio & Video, Geolocations, Drag & Drop, Web workers, working with Fonts, working with other graphics.
Style sheets: Introduction CSS, Applying CSS to HTML, Selectors, Properties and Values, CSS Colors and Backgrounds, CSS Box Model, CSS Margins, Padding, and Borders, CSS Text and Font Properties

Unit-2: Introduction to ES6 features, Arrow functions, default parameters, destructuring elements, Higher order functions, defining classes, accessing data members, constructors, inheritance, super.

Unit-3: ReactJS: Introduction, creating a simple react project, Templating using JSX, Components, Rendering, State and Props, Types of Components – Component Lifecycle, Forms and User Input, Event Handling, Communicate Between Components.

Unit-4: React **JS:** React Routing, Introduction to Hooks, State management, Types of Hooks – useState, useEffect, useContext. CORS policies, Usage of Web API calls- fetch and axios, Error Handling.

Unit-5: ReactJS: ReactJS with jQuery, React Routing, Communicate Between Components, Rendering List and Portals, C.R.U.D. with Firebase, Introduction to Redux, React with Redux

Text Books:
1) HTML5, Black book, Dreamtech Publications
2) Beginning React, Greg Lim
3) Learning AngularJS: A Guide to AngularJS Development, O' Reilly Publication
References:
1) React Cook Book, Carlos Santana Roldan
2) Learning React, 2nd Edition, O' Reilly publications.
3) React in Action by Mark Tielens Thomas
Web Resources:
1) https://www.youtube.com/watch?v=w7ejDZ8SWv8
2) https://www.youtube.com/watch?v=dGcsHMXbSOA

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III- Year II- Semester	Name of the Course	L	T	P	C
PE3201-4	Professional Elective-ID Software Testing Methodologies	3	0	0	3

Course Objectives:

1. Describe the principles and procedures for designing test cases.
2. Provide supports to debugging methods.
3. Acts as the reference for software testing techniques and strategies

Contents

UNIT - I   10 Hours

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   10 Hours

Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques. Dataflow testing: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing, **Domain Testing:** Domains and Paths, Nice & Ugly Domains, Domain testing, Domains and **Interfaces Testing**, Domain and Interface Testing, Domains and Testability.

UNIT - III   10 Hours

Paths, Path products and Regular expressions: Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection**. Syntax Testing**: Why, What and How, A Grammar for formats, Test Case Generation, Implementation and Application and Testability Tips. **Logic Based Testing**: Overview, Decision Tables, Path Expressions, KV Charts, and Specifications

UNIT - IV   10 Hours
State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, State Testing, and Testability Tips, Graph Matrices and Application: -Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.

UNIT - V   08 Hours
Software Testing Tools: Introduction to Testing, Automated Testing, Concepts of Test Automation, Introduction to list of tools like Win runner, Load Runner, Jmeter, About Win Runner, Using Win runner, Mapping the GUI, Recording Test, working with Test, Enhancing Test, Checkpoints, Test Script Language, Putting it all together, Running and Debugging Tests, Analysing Results, Batch Tests, Rapid Test Script Wizard.

Learning Resources
Text Books
1.Software testing techniques – Boris Beizer, Dreamtech, second edition.   2.Software Testing- Yogesh Singh, Camebridge
Reference Books

1.The Craft of software testing – Brian Marick, Pearson Education.
  2.Software Testing, 3rd edition, P.C. Jorgensen, Aurbach Publications (Dist.by SPD).
  3.Software Testing, N.Chauhan, Oxford University Press.

4.Introduction to Software Testing, P.Ammann&J.Offutt, Cambridge Univ.Press.
5.Effective methods of Software Testing, Perry, John Wiley, 2nd Edition, 1999.
6.Software Testing Concepts and Tools, P.NageswaraRao, dreamtech Press
7.Win Runner in simple steps by Hakeem Shittu, 2007Genixpress.
8.Foundations of Software Testing, D.Graham& Others, Cengage Learning.

e- Resources & other digital material
1.Coursera Online Learning Material
2.Lecture Notes and Teaching Material supplied Via MS Teams STM Course Channel
3.Open Access e-Resources like **SWAYAM by nptel** etc

e-books
1.Directory of Open Access Books (DOAB)
2.AICTE Open Library

Online links for FOSS Testing Tools
http://docs.seleniumhq.org/   http://www.autoitscript.com/site/   www.hp.com/go/LoadRunner   jmeter.apache.org/   http://portswigger.net/burp/   http://www.acunetix.com/   http://wiki.eclipse.org/SWTBot/UsersGuide   http://docs.seleniumhq.org/   http://www.autoitscript.com/site/

Course Outcomes:

CO1	To **infer** the rationale of Software Testing and **apply** Path Testing (Understand & apply) (L2)
CO2	To **perform** transaction flow, domain and interface analysis by **applying** apt testing techniques **(Apply & Analyse) (**L3)
CO3	To **perform** syntax and logic analysis of given software by **applying** apt testing technique **(Apply & Analyse)**(L3)
CO4	To **perform** state and transition analysis by **applying** apt testing technique (**Apply & Analyse**) (L2)
CO5	To **implement** automation testing tools for software testing of relevant products (**Create**) (L4)

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III- Year II- Semester	Name of the Course	L	T	P	C
PE-3201-5	Professional Elective-IE Distributed Systems	3	0	0	3

Course Objectives:

1.To give an introduction to the fundamentals of distributed computer systems.

2. To create an awareness of the major technical challenges in distributed systems design and implementation

3. To explain the characteristics of Interprocess Communication and get a practical exposure on it.And to provide students with mechanisms such as client/server communication, remote procedure call (RPC/RMI), multicasting.

4. Get exposure to current research issues in the field of distributed systems

5. To provide experience in the implementation of typical algorithms used in distributed systems.

UNIT-I

CharacterizationofDistributedSystems: Introduction,ExamplesofDistributedSystems,ResourceSharing and theWeb, Challenges.

System   Models: Introduction,ArchitecturalModels-SoftwareLayers,SystemArchitecture, Variations,Interface   andObjects,DesignRequirementsfor   DistributedArchitectures, Fundamental Models-Interaction Model,FailureModel, SecurityModel.

UNIT-II

Interprocess Communication: Introduction, The API for the Internet Protocols- The

Characteristics ofInterprocess communication, Sockets, UDPDatagramCommunication, TCP Stream   Communication;ExternalData   RepresentationandMarshalling;   Client   Server Communication;Group   Communication-IPMulticast-   animplementationof   group communication, Reliabilityand OrderingofMulticast.

UNIT-III

Distributed Objects and Remote Invocation: Introduction, Communication between

Distributed Objects- ObjectModel, Distributed ObjectModal, DesignIssuesfor RMI, Implementationof RMI,DistributedGarbage Collection; Remote Procedure Call,Eventsand Notifications, CaseStudy: JAVA RMI

UNIT-IV

OperatingSystemSupport: Introduction,TheOperatingSystemLayer,Protection,Processes and Threads –Address Space, Creation ofaNewProcess, Threads.

Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems:

Introduction, Napsterand itsLegacy, Peer-to-PeerMiddleware,RoutingOverlays.

UNIT-V

Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication.

Transactions &Replications: Introduction, System Model and Group Communication,

Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction

Recovery; Replication-Introduction, Passive (Primary)Replication, Active Replication.

TEXT BOOKS:

1. Ajay D Kshemkalyani, Mukesh Sighal, "Distributed Computing, Principles, Algorithms andSystems", Cambridge

2. GeorgeCoulouris,Jean Dollimore,TimKindberg, "Distributed Systems-Conceptsand Design", Fourth Edition, Pearson Publication

Course Outcomes:

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

CO1: Able to understand the nature of distributed systems and the common design problems, issues in the descriptive models.
CO2: Able to acquire knowledge on the characteristics of protocols for inter-process communication in a distributed environment and to support communication patterns.
CO3: Able to describe the features and applications of programming models in distributed systems. Able to describe the operating system supports the middleware layer in providing invocations upon shared resources.
CO4: Able to understand the distributed file systems architectures and implementations, how a set of processes can coordinate their actions.
CO5: Able to understand the mechanisms for concurrency control and the role of replication in distributed environment.

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PROFESSIONAL ELECTIVE – II MOOCS-PE3202/Conventional Mode

III- Year II- Semester	Name of the Course	L	T	P	C
32101L	Web Technologies Lab	0	0	3	1.5

Course Objectives:
- Creating web pages using HTML5 and CSS
- Implementing Interactive web interfaces with client side technologies.
- Create and validate XML documents.
- Understanding Server Side Scripting.
- Interactive Server side Scripting for an application

1) Design the following static web pages required for an online book store web site:

(a) **HOME PAGE:**

The static home page must contain three **frames**.

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

Left frame: At least four links for navigation, which will display the catalogue of respective links.

For e.g.: When you click the link **"MCA"** the catalogue for MCA 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.

(b) **LOGIN PAGE:**

(c) **CATOLOGUE PAGE:**

The catalogue page should contain the details of all the books available in the web site in a table:
The details should contain the following:
1. Snap shot of Cover Page.
2. Author Name.

3. Publisher.
4. Price.
5. Add to cart button.

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

(d). **REGISTRATION PAGE:**
Create a "*registration form* "with the following fields
1) Name (Text field) 2) Password (password field)
3) E-mail id (text field) 4) Phone number (text field)
5) Sex (radio button) 6) Date of birth (3 select boxes)
7) Languages known (check boxes – English, Telugu, Hindi, Tamil)
8) Address (text area)

2) Design a web page using **CSS (C**ascading **S**tyle **S**heets**)** which includes the following: Use different font, styles: In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles

3) Design a dynamic web page with validation using JavaScript

4) Design a HTML having a text box and four buttons viz Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate javascript function should be called to display
a. Factorial of that number
b. Fibonacci series up to that number
c. Prime numbers up to that number
d. Is it palindrome or not

5) Write JavaScript programs on Event Handling
a. Validation of registration form
b. Open a Window from the current window
c. Change color of background at each click of button or refresh of a
page
d. Display calendar for the month and year selected from combo box
e. On Mouse over event

6) 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
a) Write a Document Type Definition (DTD) to validate the above XML file.
b) Write a XML Schema Definition (XSD) to validate the above XML file.

7) Create Web pages using AJAX.
8) User Authentication:
Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.
1. Create a Cookie and add these four user id's and passwords to this Cookie.
2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.
If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user ''.
Use init-parameters to do this

9) Example PHP program for registering users of a website and login.
10) Install a database (Mysql or Oracle).
Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form).
Write a PHP program to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.
Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page (week2).

11) Write a PHP which does the following job:
Insert the details of the 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he submits the login form using the user name and password from the database (similar to week8 instead of cookies).

Text Books:
1. HTML5 Black Book Covers CSS3, Javascript, XML, XHTML, AJAX, PHP and jQuery , Dreamtech Press (2011).
2. Robin Nixon, Learning PHP, My SQL, Java Script & CSS‖, 2nd Edition, O'REILLY (2012).
Reference Books
1. H. M. Deitel and P. J. Deitel, Internet & World Wide Web How to Program, 5th Edition, Prentice Hall, 2008

e- Resources & other digital material
1. http://php.net/manual/en/book.mysql.php
Course Outcomes:

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

CO1: Design and create static web pages using HTML5 and CSS (L3)
CO2: Create interactive web interfaces with client side technologies.
CO3: Create and validate XML documents.
CO4: Understand Server Side Scripting.
CO5: Design and Create Interactive Server side Scripting for an application
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III- Year II- Semester	Name of the Course	L	T	P	C
32102L	Data Mining Lab	0	0	3	1.5

OBJECTIVES:

- Practical exposure on implementation of well known data miningalgoriyhms.
- Exposure to real life data sets for analysis andprediction.
- Learning performance evaluation of data mining algorithms.
- Handling a small data mining project for a given practicaldomain.

System/Software Requirements:

- · **Intel based desktopPC**
- · **WEKATOOL**

1.Create an **arff** file for student data set.

2.Create a **csv** file for employee data set

3.Demonstration of preprocessing on datasetstudent.arff

4.Demonstration of preprocessing on datasetlabor.arff

5.Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm

6.Demonstration of Association rule process on dataset test.arff using apriorialgorithm

7.Demonstration of classification rule process on dataset student.arff using j48& id3 algorithms.

8.Demonstration of classification rule process on dataset employee.arff using naïvebayes algorithm

9.Demonstration of clustering rule process on dataset iris.arff using simplek-means

10.Demonstration of clustering rule process on dataset student.arff using simple k-means.

OUTCOMES:

- The data mining process and important issues around data cleaning, pre-processing
- The principle algorithms and techniques used in data mining, such as clustering, association mining, classification.

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III- Year II- Semester	Name of the Course	L	T	P	C
MC3201	Employability Skills-II	3	0	0	0

Components

5. Verbal Ability
6. Quantitative Ability
7. Reasoning Ability
8. Soft Skills

UNIT-1: Geometry

Properties of Triangles, Quadrilaterals, polygons and circles,Areas of different two dimensional figures (Triangles, Quadrilaterals, circles) Surface areas &Volumes of three dimensional figures &Coordinate Geometry

UNIT-2:

Logical Venn Diagrams, Blood Relations, Symbols and Notations, Clocks, Calendars, Ranking and Group ordering, Crypto-arithmetic, Cubes and Dice, Counting Figures, Finding missing terms

UNIT-3:
Part-1- Analytical Reasoning
Linear arrangements, Circular Arrangements, Queue arrangements, Time and Sequence, Problems on Miscellaneous models.

Part – 2 –Logical Reasoning
Syllogism, Logical Connectives, Statements and Assumptions, Statements and Arguments, Statements and Conclusions, statements and courses of an action, Cause and Effect, Assertions and Reason, Input and Output, Decision Making.

Unit-4 – Verbal Ability

iv)   Grammar: Sentence structure and components, nouns, Subject-Verb Agreement, verb-tense, articles, prepositions and conjunctions, adjectives, synthesis of sentences, errors, corrections and improvements

v)   Writing skills : Basic mechanics of writing, sentence ordering, passage ordering, thematic writing, report writing.

Unit-5 – Soft Skills

Career Options , Goal Setting, Corporate awareness, Personality Development: Positive Attitude, Team Work, Body Language and Time Management. Resume, Mock Interviews

Reference Books

25. Quantitative Aptitude for Competitive Examination by Dr R S Agarwal

26. Fast Track Objective Arithmetic Paperback – 2018 by Rajesh Verma

27. Teach Yourself Quantitative Aptitude, by Arun Sharma

28. The Pearson Guide To Quantitative Aptitude For Competitive Examination by Dinesh Khattar

29. Quantitative Aptitude for all Competitive Exam by Abhijit Gupta

30. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma

31. Modern Approach to Verbal and Non-Verbal Reasoning by Dr R S Agarwal

32. How to Prepare for Data Interpretation by Arun Sharma

33. Analytical Reasoning by M K Pandey

34. Logical Reasoning Data Interpretation by Nishit K. Sinha

35. How to prepare for Verbal Ability and Reading Comprehension – Arun Sharma and Meenakshi Upadhyay

36. Word Power Made Easy by Norman Lewis

37. Random House Roget's Thesaurus ---- By Random House

38. Cambridge Complete PET Students Book ----Emma Heyderman and Peter May

39. The Verbal Reasoning Test Workbook----- By Mike Bryon

40. Master the GRE (Peterson's) ---- By Margaret Moran

41. How to Prepare for Verbal Ability and Reading Comprehension for CAT ----- By Arun Sharma

42. ABC of Common Grammatical Errors ----- By Nigel D. Turton

43. English Collocations in Use: Advanced ---- By Felicity O'Dell and Michael McCarthy

44. Writing Remedies ----By Edmond H Weiss

45. Objective English for Competitive Examination ---B y Edgar Thorpe, Showick Thorpe, Pearson Education India.

46. Contemporary English Grammar Structures and Composition ----- By David Green (2010), MacMillan Publishers, New Delhi.2010.

47. The study of Language ---- George Yule, Cambridge University Press UK.

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IV- Year I- Semester	Name of the Course	L	T	P	C
PC4101	Cryptography and Network Security (Common to CSE and IT Branches)	3	0	0	3
Prerequisites : Mathematical Foundation of Computer Science, Computer Networks					

Course Objectives:

1. To understand and classify various security attacks, services mechanisms and classical cryptographic techniques
1. To analyse the design principles of block ciphers and their implementation.
1. To compute and analyse asymmetric key cryptographic algorithms
1. To evaluate Authentication, Hash Codes and verify the digital signatures
1. To impart the knowledge on Network security concepts.

UNIT-I: Introduction to Cryptography and Network Security   10 Hrs

Introduction: Security attacks, services & mechanisms, Network Security Model, Symmetric Cipher Model, Mathematics of Cryptography, Substitution Ciphers, Transposition Ciphers Techniques, Steganography.

UNIT-II: Symmetric Key Cryptography   10 Hrs

Mathematics of Symmetric Key Cryptography, Modern Block Ciphers, Modes of Block Ciphers, Design Principles of Block Ciphers, Feistel Cipher, Data Encryption Standard, Double DES, Triple DES, International Data Encryption Algorithm, CAST-128, Blowfish, Advanced Encryption Standard

UNIT–III: Asymmetric (Public) Key Cryptography   10 Hrs

Mathematics of Asymmetric Key Cryptography: Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorem, Chinese Remainder Theorem, Primitive Roots, Discrete Logarithms, Principles of Public Key Cryptosystems, Applications, RSA, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, El-Gammal Key Exchange.

UNIT-IV: Data Integrity, Digital Signatures, Authentication Protocols   10 Hrs

Requirements of Hash Functions and Message Authentication Codes, Hash Algorithms: MD5, SHA-160,256,512, RIPEMD, Properties of Digital Signatures, DSS, Authentication Applications: Kerberos Version4 and Version 5.

UNIT – V: Network Security   10 Hrs

IP Security: IP Security Overview, Architecture, Authentication Header, Encapsulating Security Payload,

Web Security: Overview, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction,

Email Security: Pretty Good Privacy, S/MIME,

System Security: Intruders, Password Management, Viruses and Worms.

Text Books:

1. Cryptography and Network Security Principles and Practices: William Stallings, Pearson Education, 5th Edition
2. Cryptography and Network Security, Behrouz A Forouzan, Tata McGraw Hill, 3rd Edition

Reference Book:

1. Practical Cryptography, Bruce Schneier, Wiley, Deamtech India Pvt Ltd.

Web Resources:

1. https://crypto.stanford.edu/~dabo/courses/OnlineCrypto/
1. https://nptel.ac.in/courses/106105162

Course Outcomes:
By the end the of the course, the student will be able to
CO1: **Classify** various security attacks, services mechanisms and classical cryptographic techniques
CO2: Analyse the design principles of block ciphers and their implementation.
CO3: **Computes** and **Analyse** various Asymmetric Key Cryptographic techniques
CO4: **Evaluate** Authentication, Hash Codes and verify the digital signatures
CO5: Impart the knowledge on Network security concepts.

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IV- Year I- Semester	Name of the Course	L	T	P	C
4102	Machine Learning Common to CSE and IT Branches	3	0	0	3
Prerequisites: Basic Mathematics, Artificial Intelligence, Data Mining					

Course Objectives:

The student should be able to:

1. Recognize the importance and characteristics of machine learning.
2. Apply supervised machine learningtechniques for data handling and to gain knowledge from it.
3. Apply advanced supervised machine learningand probabilistic models for classification problems.
4. Apply unsupervised machine learning models to real world problems.
5. Evaluate the performance of algorithms and to provide solution for various real-world applications using ensemble models.

UNIT-I Introduction to Machine Learning   **14 Hrs**

Introduction, Components of Learning, Learning Models, Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, Designing a Learning System, Types of Learning, Supervised, Unsupervised, Reinforcement, Perspectives and Issues, Version Spaces, PAC Learning, VC Dimension.

UNIT-II Supervised Learning   **12 Hrs**

Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification, Decision Trees: ID3, Classification and Regression Trees (CART), Regression: Linear Regression, Multiple Linear Regression, Logistic Regression.

UNIT-III Advanced Supervised Learning   **12 Hrs**

Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Support vector machines: Linear and Non-Linear, Kernel Functions, K-Nearest Neighbors.
Probabilistic Models

Bayesian Learning, Bayes Optimal Classifier, Naïve Bayes Classifier, Bayesian Belief Networks.

UNIT– IV:Unsupervised Learning   **11 Hrs**

Introduction to clustering, K-means clustering, K-Mode Clustering, Distance based clustering, Clustering around mediods, Silhouettes, Hierarchical Clustering.

UNIT-V: Ensemble Learning   **11 Hrs**

Ensemble Learning Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: RandomForest Trees, Boosting: Adaboost, Stacking.

Text Books:

1. EthemAlpaydin,"Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014.
2. MehryarMohri, AfshinRostamizadeh, AmeetTalwalkar "Foundations of Machine Learning", MIT Press, 2012
3. Machine Learning: The art and Science of algorithms that make sense of data, Peter Flach, Cambridge University Press, 2012

Reference Books:

1. Chris Albon : Machine Learning with Python Cookbook , O'Reilly Media, Inc.2018.
2. TomMitchell,"MachineLearning",McGrawHill,3rdEdition, 1997.
3. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", 2nd Edition, CRC Press, 2015.
4. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012 Jiawei Han and MichelineKambers and Jian Pei, "Data Mining –Concepts and Techniques", 3rd Edition,Morgan Kaufman Publications, 2012.
5. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, "Mathematics for Machine Learning", Cambridge University Press, 2019.

E- Resources & Other Digital Material:

1. Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012, https://www.cs.ubc.ca/~murphyk/MLbook/pml-intro-5nov11.pdf.
2. Professor S. Sarkar , IIT Kharagpur "Introduction to machine learning", https://www.youtube.com/playlist?list=PLYihddLFCgYuWNL55Wg8ALkm6u8U7gps.
3. Professor Carl Gustaf Jansson, KTH, Video Course on Machine Learning https://nptel.ac.in/noc/individual_course.php?id=noc19-cs35.
4. Tom Mitchell, "Machine Learning", http://www.cs.cmu.edu/~tom/10701_sp11/lectures.shtml

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

CO1 **Recognize** the characteristics of machine learning.
{Understand level, KL2} {Analyze level, KL4}
CO2 Applyvarioussupervisedlearningmethodstoappropriateproblems.
{Understand level, KL2} {Apply level, KL3}
CO3 **Identify**andintegratemorethanonetechniquetoenhancetheperformanceoflearning and **Create**probabilisticmodelsforhandlingunknownpattern.
{Understand level, KL2} {Apply level, KL3}{Evaluate level, KL5}
CO4 **Apply** unsupervisedlearningmodelse.g. clustering algorithms to handle the unknown labeled data.
{Apply level, KL3}{Analyze level, KL4}
CO5 **Apply** Ensemble models toanyreal-worldproblemto **Analyze**itsperformance effectively.
{Apply level, KL3} {Analyze level, KL4}{Evaluate level, KL5}

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IV- YearI- Semester	Name of the Course	L	T	P	C
4103	Mobile Computing	3	0	0	3
Prerequisites: Computer Networks					

Course Objectives:

1.To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
2.To understand the typical mobile networking infrastructure through a popular GSM protocol.
3.To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
4.To understand the database issues in mobile environments & data delivery models.
5.To understand the ad hoc networks and related concepts.
6.To understand the platforms and protocols used in mobile environment.

UNIT- I   **11 Hrs**
 Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.
 GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS.

UNIT –II   **8 Hrs**
 (Wireless) Medium Access Control (MAC) : Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

UNIT –III   **8 Hrs**
 Mobile Network Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

UNIT –IV   **10Hrs**
 Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.
Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

UNIT- V   **13Hrs**
  Data Dissemination and Synchronization : Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination,Data Synchronization – Introduction, Software, and Protocols.
 Mobile Ad hoc Networks (MANETs) : Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, etc.
 Protocols and Platforms for Mobile Computing : WAP, Bluetooth, XML, J2ME, Windows CE, Linux for Mobile Devices, Android.

TEXT BOOKS:
1.Jochen   Schiller,"Mobile   Communications",Addison-Wesley,Second   Edition,   2009.
2.Raj Kamal,"Mobile Computing",Oxford University Press, 2007,ISBN: 0195686772

REFERENCE BOOKS:

1.ASOKE K T ALUKDER, HASAN AHMED, ROOP A R Y A V AGAL, "Mobile Computing, Technology Applications and Service Creation" Second Edition, Mc Graw Hill.

2.UWE Hansmann, Lother Merk, Martin S. Nocklous, Thomas Stober, "Principles of Mobile Computing," Second Edition, Springer.

Web Resources:

1.http://nptel.ac.in/courses/106106147/1

2.http://nptel.ac.in/courses/106106147/2

3.https://www.youtube.com/watch?v=OxdUs9E8Aps&list=PLcp8IgxOPM4LATpwQ6qxbItS22 wT3UEau

4.https://www.youtube.com/watch?v=mssEMMvbL_Q&list=PLcp8IgxOPM4LATpwQ6qxbItS2 2wT3Ueau&in dex=12

5.https://www.youtube.com/watch?v=7tbia3T7S0A&list=PLcp8IgxOPM4LATpwQ6qxbItS22w T3Ueau&index =21

Course Outcomes:

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

CO1:Interpret various mobile communication and computing terminologies,paradigms and architectures.

CO2:Analyze problems in wireless MAC and infer different multiplexing techniques.

CO3: Interpret the working of mobile network layer, based on Mobile IP.

CO4: Analyze the working of conventional TCP/IP and infer different protocols for mobile transport layer.

CO5: Should be able to analyze data synchronization, data hoarding issues and interpret the working of MANETs and technologies in mobile computing environment..

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Reference Books:

1. Victor Shoup, A Computational Introduction to Number Theory and Algebra, 2nd edition, Cambridge University Press, 2008.
2. Richard A. Mollin, An Introduction to Cryptography, 2nd Edition, Chapman & Hall/CRC, 2006.
3. Wenbo Mao, Modern Cryptography: Theory and Practice, Prentice Hall, 2003.

e-Resources:

1. https://nptel.ac.in/courses/106/105/106105184/
2. https://onlinecourses.nptel.ac.in/noc20_cs02/preview

Course Outcomes:

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

1. Apply the number theory concepts to cryptographic algorithms
2. Evaluate the algebraic structures for cryptography
3. Analyze the computational aspects of number theory
4. Analyze the various cryptographic attacks and their notations
5. Analyze the various cryptographic protocols and algorithms

Reference Book:
1. V. Shoup, A Computational Introduction to Number Theory and Algebra, Cambridge Press, 2008.
2. Wenbo Mao, Modern Cryptography, Theory and Practice, Prentice Hall, 2003.

Web Resources:
1. https://crypto.stanford.edu/~dabo/courses/OnlineCrypto/

Course Outcomes:

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

CO1: Explain basic Number theory concepts and their applicability.

CO2: Prove the concept of congruence, theorems and Algebraic Structures and their usage in Modern cryptography.

CO3: Compute and test various large mathematical problems in cryptography.

CO4: Analyse various notation of formal cryptographic attacks under Indistinguishability and Malleability.

CO5: Analyse the security of different security protocols and cryptographic algorithms.

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IV- Year II- Semester	Name of the Course	L	T	P	C
4104	Supply Chain Management Open Elective IB Common to CSE and IT	3	0	0	3
Prerequisites: MEFA					

Course Objective:

1. To understand the importance of a supply chain process to be investigated in an industry.

2. To learn the various concepts related to logistics management.

3. To understand performance drivers of supply chain management.

4. To understand the concepts of warehousing importance in a supply chain.

5. To understand the relationship between supply chain and CRM- linkage.

Course Outcomes:

After completion of the course, students will be able to

CO1: Understand the importance of a supply chain process to be investigated in an industry.

CO 2. Learn the various concepts related to logistics management.

CO 3. Understand performance drivers of supply chain management.

CO 4. Understand the concepts of warehousing importance in a supply chain.

CO 5. Understand the relationship between supply chain and CRM- linkage.

Unit I Supply Chain Concepts   **(10 Hours)**

Supply Chain Concepts: Objectives of a Supply Chain, Stages of Supply chain, Value Chain Process, Cycle view of Supply Chain Process, Key issues in SCM, logistics & SCM, Supply Chain Drivers and obstacles, Supply chain strategies, strategic fit, Best practices in SCM, Obstacles of streamlined SCM.

Unit II   Logistics   **(11 Hours)**

Logistics :Evolution, Objectives, Components and Functions of Logistics Management, Distribution related Issues and Challenges; Gaining competitive advantage through Logistics Management, Transportation- Functions, Costs, and Mode; Network and Decision, Containerization, Cross docking.

Unit III Supply Chain Performance   **(10 Hours)**

Supply Chain Performance: Bullwhip effect and reduction, Performance measurement: Dimension, Tools of performance measurement, SCOR Model. Demand chain management, Global Supply chain- Challenges in establishing Global Supply Chain, Factors that influences designing Global Supply Chain Network.

Unit IV Warehousing   **(12 Hours)**

Warehousing: Concept and types, Warehousing strategy, Warehouse facility location & network design, Reverse logistics, Outsourcing- Nature and concept, Strategic decision to Outsourcing, Third party logistics (3PL), Fourth party logistics (4PL).

UNIT V Supply Chain and CRM- Linkage   **(10 HOURS)**

Supply Chain and CRM- Linkage, IT infrastructure used for Supply Chain and CRM, Functional components for CRM, Green supply chain management, Supply Chain sustainability.

TEXT BOOKS:

1. Chopra, Sunil, Meindl, Peter and Kalra, D. V.; Supply Chain Management: Strategy,6/E , Pearson Education.

2. Altekar, Rahul V.; Supply Chain Management: Concepts and Cases; PHI Learning

REFERENCES:

1. Books 4. Ballou, Ronald H.; Supply Chain Management; Pearson Education

2. Sahay, B.S.; Supply Chain Management; Macmillan

3. Ballou, R.H. Business Logistics Management. Prentice-Hall Inc.

4. Bowersox D.J. ,Closs D.J. , Logistical Management, McGraw-Hill, 1996

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IV- Year II- Semester	Name of the Course	L	T	P	C
4104	MATLAB for Engineering Applications Open Elective IC (Common to CSE and IT)	3	0	0	3
Prerequisites: Basic Programming					

MATLAB for Engineering Applications

CourseObjectives:

1. TolearnfeaturesofMATLABasaprogrammingtool.
2. Topromotenewteachingmodelthatwillhelptodevelopprogrammingskillsandtech niquetosolvemathematicalproblems.
3. TounderstandMATLABgraphicfeatureanditsapplications.
4. TouseMATLABasasimulationtool.

Unit1.IntroductiontoMATLAB

- TheMATLABEnvironment
- MATLABBasics–Variables,Numbers,Operators,Expressions,Inputandoutput.
- Vectors,Arrays–Matrices

Unit2.MATLABFunctions
- Built-inFunctions
- UserdefinedFunctions

Unit3.GraphicswithMATLAB
- FilesandFileManagement–Import/Export
- Basic2D,3Dplots
- Graphichandling

Unit4.ProgrammingwithMATLAB
- ConditionalStatements,Loops
- MATLABPrograms–ProgrammingandDebugging.
- ApplicationsofMATLABProgramming.

Unit5.MathematicalComputingwithMATLAB Algebraicequations
- BasicSymbolicCalculusandDifferentialequations
- NumericalTechniquesandTransforms

Textbooks:

1. "AGuidetoMATLAB– forBeginnersandExperiencedUsers",2ndEd.,BrianR.Hunt,RonaldL.Lipsman,J onathanM.Rosenberg,CambridgeUniversityPress,(2006).
2. "EssentialsofMATLABProgramming",2ndEd.,StephenJ.Chapman,CengageLearning ,(2009).
3. "MATLABDemystified",DavidMcMahon,TheMcGraw-HillCompanies,(2007).
4. "MATLAB®forEngineers",3rdEd.,HollyMoore,PearsonEducation,Inc.,(2012).
5. "EngineeringcomputationwithMATLAB",2ndEd.,DavidM.Smith,PearsonEd ucation,Inc.,(2010).

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IV- Year II- Semester	Name of the Course	L	T	P	C
4104	Operations Management Open Elective ID (Common to CSE and IT)	3	0	0	3
Prerequisites: MEFA					

Course Objective:
1. To understand the importance of an effective production and operations strategy to an organization.
2. To understand the various production and operations design decisions and how they relate to the overall strategies of organizations.
3. To understand the importance of materials, product and service design decisions and its impact other design decisions and operations.
4. To obtain an understanding of quality management practice in organizations and how total quality management and six-sigma facilitate organizational effectiveness.
5. To understand the relationship of the various planning practices of project planning and scheduling.

Course Outcomes: After completion of the course, students will be able to
CO1: Effective production and operations strategy to an organization are understood.
CO 2: Production and operations design decisions and how they relate to the overall strategies of organizations is observed.
CO 3: Importance of materials, product and service design decisions and its impact other design decisions and operations are recorded.
CO 4. Quality management practice in organizations and how total quality management and six-sigma facilitate organizational effectiveness are understood.
CO 5. Relationship of the various planning practices of project planning and scheduling are analyzed.

UNIT I Introduction to Operations Management   **12HRS**
Definition and its importance-History - Contribution of Henry Ford, Deming, Cross by, Taguchi-Functions and roles in operations management- Nature of International Operations Management.-The Relationship of Operations Management w.r.t. other departments-strategies-levels-principles-current priorities and recent trends-Automation.

UNIT II Process Selection, Facility Location and Facility Layout   **12HRS**
Process Selection - Types of manufacturing Processes- Overview of qualitative and quantitative methods- Product Design – Influencing factors.
Facility Location – Theories, Steps in Selection, Factors affecting location, Location Models.
Facility Layout- Principles, Types, planning tools and techniques-Factors affecting layout.

UNIT III MATERIALS MANAGEMENT   **10 HRS**
Materials Management – Objectives, Planning, Budgeting and Control. Purchasing – Objectives, Functions, Policies, Vendor rating and Value Analysis. Stores Management – Nature, Layout, Classification and Coding. Inventory – Objectives, Costs and control techniques. Overview of JIT.

UNIT IV: Quality Assurance and Control   **12 HRS**
Inspection, Statistical process control, Control charts (X-R, n, p, c, np), acceptance sampling concept, risks, cost of quality control; ISO Quality Systems: ISO:9000, ISO:14000, Total Quality Control - concept, KAIZEN, six sigma concepts.

UNIT V: PROJECT PLANNING   10 HRS

Project Management – Scheduling Techniques, PERT, CPM, Crashing CPM networks – Simple Problems.

TEXT BOOKS:

1. Aswathappa K and Shridhara Bhat K, Production and Operations Management, Himalaya Publishing House, 6th Edition, 2010.

2. Pannerselvam R, Production and Operations Management, Prentice Hall India, 3 rd Edition, 2013.

3. Norman Gaither and Gregory Frazier, Operations Management, South Western Cengage Learning, 2006.

REFERENCE BOOKS:

1. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2007.

2. Russel and Taylor, Operations Management, Wiley, 7 th Edition, 2010.

3. Chary S. N, Production and Operations Management, Tata McGraw Hill, 5 th Edition, 2008.

4. Chase Jacobs, Aquilano & Agarwal., Operations Management, Tata McGraw Hill, 11th edition, 2006.

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IV- Year I- Semester	Name of the Course	L	T	P	C
4104	Green Buildings	3	0	0	3
Prerequisites:					

UNIT I

Green Buildings within the Indian Context, Types of Energy, Energy Efficiency and Pollution, Better Buildings, Reducing energy consumption, Low energy design.

UNIT II:

Renewable Energy sources that can be used in Green Buildings – Conventional and Non Conventional Energy, Solar energy, Passive Solar Heating, Passive Solar collection, Wind and other renewables. A passive solar strategy, Photovoltaics, Rainwater Harvesting Climate and Energy, Macro and Microclimate. Indian Examples.

UNIT III:

Building Form – Surface area and Fabric Heat Loss, utilizing natural energy, Internal Planning, roufing of buildings. Building Fabrics- Windows and doors, Floors, Walls, Masonry, Ecological walling systems, Thermal Properties of construction material.

UNIT IV:

Infiltration and ventilation, Natural ventilation in commercial buildings, passive cooling, modelling air flow and ventilation, Concepts of daylight factors and day lighting, daylight assessment, artificial lighting, New light sources. Cooling buildings, passive cooling, mechanical cooling. Water conservation- taps, toilets and urinals, novel systems, collection and utilization of rain water.

UNIT V:

Energy awareness, monitoring energy consumption, Building Environmental Assessment - environmntal criteria - assessment methods - assessment tools (e.g. LEED, GRIHA & IGBC Certification for buildings. Eco homes, Sustainable architecture and urban design – principles of environmental architecture, Benefits of green buildings – Energy Conservation Building code - NBC -Case Studies – Green Buildings in Auroville and Dakshina Chitra, Tamil Nadu, India

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IV- Year I- Semester	Name of the Course	L	T	P	C
4105	Big Data Analytics Professional Elective III A (Common to CSE and IT)	3	0	0	3
Prerequisites: Java Programming, DBMS, Data Mining					

Course Objectives: The student should be able to

1. Understand the Big Data Concepts and Big Data Technologies
2. Provide an overview of Apache Hadoop
3. Provide HDFS Concepts and Interfacing with HDFS
4. Understand Map Reduce Jobs
5. Provide hands on Hadoop Eco System (HDFS, MapReduce, Pig & Hive)

UNIT-I: Introduction to Big Data and Hadoop 14 hrs

Introduction to Big Data:
Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity), Data in theWarehouse and Data in Hadoop, Why is Big Data Important? Patterns for Big DataDevelopment, Examples of Big Data Analytics.

Introduction to Hadoop:
Working with Big Data: Google File System, A Brief History of Hadoop, ApacheHadoop and the Hadoop Ecosystem, Hadoop Releases, Hadoop Installation Modes.

Hadoop Distributed File System:
HDFS, Building Blocks of Hadoop (Namenode, Datanode, Secondary Namenode,JobTracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local, Pseudo distributed mode, Fully Distributed mode), Configuring XML files

UNIT-II : Map Reduce 12 hrs

Introduction, How MapReduce works? MR Execution Flow with an Example, Understanding Hadoop API for MapReduce Framework (Old and New), Components of MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner; MapReduce Programs for Word Count, Weather Dataset.

UNIT– III: Hadoop IO 12 hrs

The Writable Interface, WritableComparable and Comparators, Writable Classes:Writable wrappers for Java primitives, Text, BytesWritable, NullWritable,ObjectWritable and GenericWritable, Writable collections, Implementing a CustomWritable: Implementing a RawComparator for speed, Custom Comparators.

UNIT-IV: PIG 11Hrs

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Installation and Running of Pig, Execution Types, Evaluating Local and Distributed Modes, Pig Latin Editors, Comparison with databases, Pig Latin, Functions, Data Processing Operators, Checking out the Pig Script Interfaces, Scripting with Pig Latin, Running PigPrograms.

UNIT – V: Hive   **11 hrs**

Installing Hive, Comparison with Traditional Databases, Running Hive, ApplyingStructure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is PutTogether, Getting Started with Apache Hive, Examining the Hive Clients, Working withHive Data Types, Creating and Managing Databases and Tables, Seeing How the HiveData Manipulation Language Works, Querying and Analyzing Data.

Text Books:
1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC.
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly.
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C. Zikopoulos, Roman B. Melnyk, BruceBrown, Rafael Coss.

References:
1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, Srinath Perera, Thilina Gunarathne

Software Links:
1. Hadoop: http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
Pig Latin: http://pig.apache.org/docs/r0.7.0/tutorial.html

CO-PO-PSO
Course Outcomes:

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

CO1   **Understand** the concepts of Big Data Analytics, **Master** the concepts of Hadoop Distributed File System and Hadoop Architecture {Understand level, KL2} {Apply level, KL3} {Analyze level, KL4}
CO2   **Acquire** knowledge on Map Reduce Framework. {Evaluate level, KL5}
CO3   **Understand** the concepts of Hadoop IO formats and methods. {Understand level, KL2}
CO4   **Apply** Pig concepts for Data Processing. {Evaluate level, KL5}
CO5   **Apply** Hive concepts for Data Processing. {Evaluate level, KL5}

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IV- Year I- Semester	Name of the Course	L	T	P	C
4105	Software Project Management Professional Elective IIIB Common to CSE and IT	3	0	0	3
Prerequisites: Software Engineering					

Course Objectives:
1. To study how to plan and manage projects at each stage of the software development life cycle (SDLC)
2. To train software project managers and other individuals involved in software project planning
3. To Study Tracking and oversight in the implementation of the software project management process.
4. To understand successful software projects that support organization's strategic goals.
5. To study Software Project monitoring and control ,software quality.

UNIT -I: Introduction Project, Management, Software Project Management activities, Challenges in software projects, Stakeholders, Objectives & goals Project Planning: Step-wise planning, Project Scope, Project Products & deliverables, Project activities, Effort estimation, Infrastructure.

UNIT -II: Project Approach Lifecycle models, Choosing Technology, Prototyping Iterative & incremental Process Framework: Lifecycle phases, Process Artifacts, Process workflows.

UNIT -III: Effort estimation & activity Planning Estimation techniques, Function Point analysis, SLOC, COCOMO, Use case-based estimation , Activity Identification Approaches, Network planning models, Critical path analysis.

UNIT -IV: Risk Management& Risk categories: Identification, Assessment, Planning and management, PERT technique, Monte Carlo approach.

Project Monitoring & Control, Resource Allocation
Creating a framework for monitoring & control, Progress monitoring, Cost monitoring, Earned value Analysis, Defects Tracking, Issues Tracking, Status reports, Types of Resources, Identifying resource requirements, Resource scheduling.

UNIT-V
Software Quality and Planning Quality:, Defining Quality – ISO 9016, Quality Measures, Quantitative Quality Management Planning, Product Quality & Process Quality Metrics, Statistical Process Control Capability Maturity Model, Enhancing software Quality

TEXT BOOKS: 1. Software Project Management, Bob Hughes & Mike Cotterell, TATA Mcgraw-Hill 2. Software Project Management, Walker Royce: Pearson Education, 2005. 3. Software Project Management in practice, Pankaj Jalote, Pearson.
 REFERENCE BOOKS: 1. Software Project Management, Joel Henry, Pearson Education.

Course Outcomes:
By the end the of the course, the student will be able to
CO1: Match organizational needs to the most effective software development model and to understand the basic concepts and issues of software project management

CO2: Effectively Plan the software projects and to implement the project plans through managing people, communications and change.

CO3: Select and employ mechanisms for tracking the software projects.

CO4: Conduct activities necessary to successfully complete and close the Software projects.

CO5: Develop the skills for tracking and controlling software deliverables.

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IV- Year I- Semester	Name of the Course	L	T	P	C
4105	Internet of Things Professional Elective IIIC	3	0	0	3
Prerequisites: Computer Networks					

Unit–1: Introduction (10 hrs)

Definition and Characteristics of IoT – IoT Architectures-Challenges and Issues - Physical Design of IoT, Logical Design of IoT - IoT Functional Blocks, Security.

Unit–2: Control units (9 hrs)

Communication modules – Bluetooth – Zigbee – Wi-Fi – GPS- IoT Application and Network Layer Protocols (IPv6, 6LoWPAN, RPL, CoAP, MQTT, AMQP, etc.), Wired Communication, Power Sources.

Unit–3: Four Pillars of IoT Paradigm (10 hrs)

RFID, Wireless Sensor Networks, SCADA (Supervisory Control and Data Acquisition), M2M - IoT Enabling Technologies – Big Data Analytics, Cloud Computing, Embedded Systems, IoT levels and deployment templates.

Unit–4: IoT System Design (10 hrs)

Working principles of sensors – IoT Platform design methodology- IoT deployment for Raspberry Pi /Arduino/Equivalent platform – Reading from Sensors, Communication: Connecting microcontroller with mobile devices – communication through Bluetooth, wifi and USB - Contiki OS Cooja Simulator. Clustering, Clustering for Scalability, Clustering Protocols for IoT.

Unit–5: API Development Tools (9 hrs)

Python based API development, Set up cloud environment –Cloud access from sensors– Data Analytics for IoT- Case studies- Smart Healthcare – Smart Cities – Other recent projects.

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IV- Year I- Semester	Name of the Course	L	T	P	C
4105	Network Programming Professional Elective III D	3	0	0	3
Prerequisites: Computer Networks					

Course Objectives:

1. To summarize OSI model, Unix standards, TCP,connecionestablishment,UDP
2. To understand socket API and its basic functions .
3. To gain knowledge on TCP Services and related unix system calls
4. To understand UD Services and related unix system calls
5. To gain theunderstandingof remote procedure calls and interprocesscommunication, implementationofdifferent forms ofIPCinclient-server environment

UNIT-I: Introduction to Network Programming: OSI model, Unix standards, TCP and UDP &TCP connection establishment and Format, Buffer sizes and limitation, standard internet services,Protocolusagebycommon internet application.

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

UNIT– III: TCP client server: Introduction, TCP Echo server functions, Normal startup, terminateandsignalhandlingserverprocesstermination,CrashingandRebootingofserverhostshutdo wnofserverhost. **I/O Multiplexing andsocket options:** I/O Models, select function, Batch input, shutdown function, poll function, TCPEcho server, get-sockopt and set-sockopt functions. Socket states, Generic socket option IPV6socketoptionICMPV6 socketoptionIPV6socketoptionand TCP socket options

UNIT-IV: Elementary UDP sockets: Introduction UDP Echo server function, lost datagram,summary of UDP example, Lack of flow control with UDP, determining outgoing interface withUDP. **Elementary name and Address conversions:** DNS, get-host by Name function, Resolveroption,Function andIPV6 support, unamefunction, othernetworking

UNIT – V: IPC- Introduction, File and record locking, Pipes, FIFOs streams and messages, Namespaces, systemIPC, Message queues, Semaphores.

Remote Login: Terminal line disciplines,Pseudo-
Terminals,Terminalmodes,ControlTerminals,rloginOverview,RPCTransparencyIssues.

Text Books:
1. UNIX Network Programming, Vol. I, Sockets API, 2nd Edition. - W.RichardStevens,Pearson Edn.Asia
2. UNIXNetworkProgramming,1stEdition, -W.RichardStevens.PHI
Reference Book:
1.UNIXforProgrammersandUsers,3rdEditionGrahamGLASS,Kingabl s,PearsonEducation
2.AdvancedUNIXProgramming2ndEditionM.J.ROCHKIND,PearsonEducation

Course Outcomes:

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

CO1: Summarize OSI model, Unix standards, TCP connection establishment, UDP

CO2: Understand socket API and its basic functions

CO3: Gain knowledge on TCP Services and related unix system calls

CO4:Understand UDP services and related unix system calls.

CO5: Gain theunderstandingof remote procedure calls and interprocesscommunication, implementationofdifferent forms ofIPCinclient-server environment

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IV- Year I- Semester	Name of the Course	L	T	P	C
	Mobile Application Development Lab	0	0	3	1.5
Prerequisites: Basic Programming					

Course objectives:

The main objectives are

   1. To introduce the characteristics, basic concepts and systems issues in mobile and pervasive computing

   2.To illustrate architecture and protocols in pervasive computing and to identify the trends and latest development of the technologies in the area

   3.To give practical experience in the area through the design and execution of a modest

   4.To design successful mobile and pervasive computing applications and services research project To evaluate critical design tradeoffs associated with different mobile technologies, architectures, interfaces and business models and how they impact the usability, security, privacy and commercial viability of mobile and pervasive computing services and applications

   5.To discover the characteristics of pervasive computing applications including the major

List of Programs

1. Write an Android application program that displays Hello World using Terminal.

2. Write an Android application program that displays Hello World using Eclipse.

3. Write an Android application program that accepts a name from the user and displays the hello name to the user in response as output using Eclipse.

4. Write an Android application program that demonstrates the following:

(i) Linear Layout

(ii) Relative Layout

(iii) Table Layout

(iv) Grid View layout

5. Write an Android application program that converts the temperature in Celsius to Fahrenheit.

6. Write an Android application program that demonstrates intent in mobile application development.

7.Write an Android application program to create an AlertDialog box.

8.Write an Android application program that displays Analog Clock and Digital Clock.

9.Write an Android application program to create a Popup menu.

10.Write an Android application program that demonstrates a SearchView over layout, searching the data in a ListView.

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

CO1	To analyze the strengths and limitations of the tools and devices for development of pervasive computing systems
CO2	To explore the characteristics of different types of mobile networks on the performance of a pervasive computing system
CO3	To analyze and compare the performance of different data dissemination techniques and algorithms for mobile real-time applications
CO4	To develop an attitude to propose solutions with comparisons for problems related to pervasive computing system through investigation

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IV- Year I- Semester	Name of the Course	L	T	P	C
	UML Lab	0	0	3	1.5

Pre-Requisites: Prior knowledge Software Engineering, Object Oriented Concepts
COURSE OBJECTIVES:

- o Construct UML diagrams for static view and dynamic view of the system.
- o Generate creational patterns by applicable patterns for given context.
- o Create refined model for given Scenario using structural patterns.
- o Construct behavioural patterns for given applications.

Week 1:

For each case study: Familiarization with Rational Rose or
Umbrello Analyse the following systems:
- a. Library Management System
- b. Automated Teller Machine
- c. Online Shopping System
- d. Point of Sale

Week 2, 3 & 4:

For each case study:

a. Identify and analyse events

b. Identify Use cases

c. Develop event table

d. Identify & analyse domain classes

e. Represent use cases and a domain class diagram using Rational Rose

f. Develop CRUD matrix to represent relationships between use cases and problem domain classes
Week 5 & 6:

For each case study:

a. Develop Use case diagrams

b. Develop elaborate Use case descriptions & scenarios

c. Develop prototypes (without functionality)

d. Develop system sequence diagrams

Week 7, 8, 9 & 10:

For each case study:

a. Develop high-level sequence diagrams for each use case

b. Identify MVC classes / objects for each use case

c. Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing Interactions among all the three-layer objects

d. Develop detailed design class model (use GRASP patterns for responsibility assignment)

e. Develop three-layer package diagrams for each case study

Week 11 & 12:

For each case study:

a. Develop Use case Packages

b. Develop component diagrams

c. Identify relationships between use cases and represent them

d. Refine domain class model by showing all the associations among classes

Week 13 onwards:

For each case study:

a) Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams

COURSE OUTCOMES:
- Understand the Case studies and design the Model.
- Understand how design patterns solve design problems.
- Develop design solutions using creational patterns.
- Construct design solutions by using structural and behavioural patterns

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IV- Year I-Semester	Name of the Course	L	T	P	C
PR	Project-I	**0**	**0**	0	3

IV- Year I-Semester	Name of the Course	L	T	P	C
MC4101	**INTELLECTUAL PROPERTY RIGHTS AND PATENTS**	3	0	0	0

Objectives:

*To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.

*Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.

Unit I: Introduction to Intellectual Property Rights (IPR)
Conccpt of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

Unit II: Copyrights and Neighboring Rights
Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act

UNIT III: Patents
Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

UNIT IV: Trademarks
Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V: Trade Secrets
Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law.
Cyber Law and Cyber Crime: Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

• Relevant Cases Shall be dealt where ever necessary.

References:
1.Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2.Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3.PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4.Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5.Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6.Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7.R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8.M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

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IV- Year II- Semester	Name of the Course	L	T	P	C
HS4201	Management and Organizational Behaviour Common to CSE and IT Branches	3	0	0	3
Prerequisites:					

Course Objective:

CO 1: To familiarize with the process of management, principles, leadership styles and basic concepts on Organization.

CO 2: To provide conceptual knowledge on functional management that is on Human resource management and Marketing management.

CO 3: To provide basic insight into select contemporary management practices and Strategic Management.

CO 4: To learn theories of motivation and also deals with individual behavior, their personality and perception of individuals.

CO 5: To understand about organizations groups that affect the climate of an entire organization this helps employees in stress management.

Course Outcomes: After completion of the Course the student will acquire
CO1: The knowledge on management functions, global leadership and organizational structure.

CO2: Familiarize with the concepts of functional management that is HRM and Marketing of new product developments.

CO3: Think in strategically through contemporary management practices.

CO4: Develop positive attitude through personality development and can equip with motivational theories.

CO5: Attain the group performance and grievance handling in managing the organizational culture.

Unit I Introduction   12 Hrs

Management and organizational concepts of management and organization- Nature and Importance of Management, Functions of Management, System approach to Management – Taylor's Scientific Management Theory, Fayol's Principles of Management, Leadership Styles, Social responsibilities of Management. Designing Organizational Structures: Basic concepts related to Organization – Departmentation and Decentralization, MBO, Process and concepts.

Unit II Functional Management   12 Hrs

Human Resource Management (HRM) Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Wage and Salary

Administration, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating. – Marketing Management: Concepts of Marketing, Marketing mix elements and marketing strategies.

Unit III Strategic Management: **12 Hrs**

Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

Unit IV Individual Behavior: **12 Hrs**

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 V Group Dynamics: **12 Hrs**

Types of Groups, Stages of Group Development, Group Behaviour 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. Management Science, Aryasri, Tata McGraw Hill, 2014.
2. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, 'Introduction to *Management Science'* Cengage, Delhi, 2012.
3. G Srinivasa Rao: 'Management Science', The Hi-Tech Publishers, 2004.
4. Mullins, J. Laurie, Management and Organizational Behaviour, Oxford Publishers, 2007.

Reference Books:

1. Principles of Marketing: A South Asian Perspective, Kotler Philip, Gary Armstrong, Prafulla Y. Agnihotri, and Eshan ul Haque , 17th Edition, Pearson Education/ Prentice Hall of India, 2018.
2. Human Resource Management: Gary Dessler, 14th Edition, pearson 2015.
3. Production and Operations Management: S N Chary, TMH, 2019, 6e.
4. Strategic Management: John A Pearce, Richard B Robinson, TMH 12th Edition, 2017.
5. Robbins, Stephen & S. Sanghi, Organizational Behaviour, Pearson Education. 2010.
6. Parikh, M. Gupta, R, Organizational Behavour, Tata McGraw-Hill, 2010.

Web links:

1. www.managementstudyguide.com
2. www.tutorialspoint.com
3. www.lecturenotes.in

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IV- Year II- Semester	Name of the Course	L	T	P	C
4202	Statistics with R Programming Open Elective IIA Common to CSE and IT	3	0	0	3
Prerequisites: Basic Programming, Statistics					

COURSE DESCRIPTION

Using this course students learn R programming language to perform statistical programming, graphics and modeling of data. R programming language is useful to use in their research and in data science projects**.**

COURSE OBJECTIVES

1. To understand R programming and how to use for statistical programming, computation, graphics, modeling.
2. To identify different features available in R programming language to use in different applications.
3. To apply R programming language to fit some basic types of statistical models using case studies.
4. To apply R programming language in analytics and research using real time case studies.
5. To expand R knowledge in solving real time applications and problems by using visualization features of R.
6. To apply R language features in solving statistical problems and learn statistical models using R.

UNIT-I: **11hrs**

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Object oriented programming using R- s3,s4 classes**.**

UNIT-II: **8hrs**

R Programming Structures, Control Statements, Loops, - Looping Over Nonvector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, String manipulation functions, Regular Expressions, No Pointers in R, Recursion, A Quicksort Implementation-Extended Example: A Binary Search Tree.

UNIT-III: **8hrs**

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability- Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files. Accessing built-in datasets and real time datasets to perform data analysis tasks. Case Study: Working Through a HW Problem(W1).

UNIT-IV: **8hrs**

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files, creating 3D plots. String manipulation functions, Regular expressions, Interfacing R to other languages, using R from python. Reading data into R from various data sources. Installing and using packages in R. Case Study II: A JAMA Paper on Cholesterol (W2)

UNIT-V:9hrs

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA. Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests,

TEXT BOOKS:
1.   The Art of R Programming, Norman Matloff, Cengage Learning
2.   R for Everyone, Lander, Pearson

REFERENCE BOOKS:

1.   R Cookbook, PaulTeetor, Oreilly.
2.   R in Action,Rob Kabacoff, Manning

E-RESOURCES
1.   https://www.cyclismo.org/tutorial/R/hwI.html
2.   https://www.cyclismo.org/tutorial/R/hwI.html

COURSE OUTCOMES

CO-1	Understand R programming and how to use R for statistical programming, computation, graphics and modeling
CO-2	Identify different features available in R programming language to use in different applications.
CO-3	Apply R programming language to fit some basic types of statistical models using case studies.
CO-4	Apply R programming language in analytics and research using real time case studies.
CO-5	Expand R knowledge in solving real time applications and problems by using visualization features of R.
CO-6	Apply R language features in solving statistical problems and learn statistical models using R.

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IV- Year II-Semester	Name of the Course	L	T	P	C
4202	Fuzzy sets, Logic and Systems Open Elective IIB Common to CSE and IT	3	0	0	3
Prerequisites: Basic Mathematics, Artificial Intelligence, Data Mining					

COURSE OBJECTIVES:

1. To develop the fundamental concepts such as fuzzy sets, operations and fuzzy relations.
2. To lean about the fuzzification of scalar variables and the defuzzification of membership functions.
3. To learn three different inference methods to design fuzzy rule-based system.
4. To develop fuzzy decision making by introducing some concepts and also Bayesian decisionmethods.

5. To learn different fuzzy classification methods.

COURSE OUTCOMES:

After successful completion of the course, the students are able to
1. understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also aboutfuzzy relations.
2. understand the basic features of membership functions, fuzzification process and defuzzificationprocess.
3. design fuzzy rule-based system.
4. know about combining fuzzy set theory with probability to handle random and non-randomuncertainty, and the decision-making process.
5. gain the knowledge about fuzzy C-Means clustering.

UNIT I
Classical sets: Operations and properties of classical sets, Mapping of classical sets to the functions. Fuzzy sets - Membership functions, Fuzzy set operations, Properties of fuzzy sets.
Classical and Fuzzy relations: Cartesian product, crisp relations-cardinality, operations and properties of crisp relations. Fuzzy relations-cardinality, operations, properties of fuzzy relations, fuzzy Cartesian product and composition, Fuzzy tolerance and equivalence relations, value assignments and other format of the composition operation.

UNIT II
Fuzzification and Defuzzification: Features of the membership functions, various forms, fuzzification, defuzzification to crisp sets, - cuts for fuzzy relations, Defuzzification to scalars. Fuzzy logic and approximate reasoning, other forms of the implication operation.

UNIT III
Fuzzy Systems: Natural language, Linguistic hedges, Fuzzy (Rule based) System, Aggregation of fuzzy rules, Graphical techniques of inference, Membership value assignments: Intuition, Inference, rank ordering, Fuzzy Associative memories.

UNIT IV

Fuzzy decision making: Fuzzy synthetic evaluation, Fuzzy ordering, Preference and consensus, Multiobjective decision making, Fuzzy Bayesian, Decision method, Decision making under Fuzzy states andfuzzy actions.

UNIT V

Fuzzy Classification: Classification by equivalence relations-crisp relations, Fuzzy relations, Clusteranalysis, Cluster validity, C-Means clustering, Hard C-Means clustering, Fuzzy C-Means algorithm,Classification metric, Hardening the Fuzzy C-Partition.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Timothy J.Ross - Fuzzy logic with engineering applications, 3rd edition, Wiley,2010.
2. George J.KlirBo Yuan - Fuzzy sets and Fuzzy logic theory and Applications, PHI, New Delhi,1995.
REFERENCE BOOK(s):

S.Rajasekaran, G.A.Vijayalakshmi - Neural Networks and Fuzzy logic and Genetic Algorithms, Synthesis and Applications, PHI, New Delhi,2003.

WEB RESOURCES:

http://www.nptel.ac.in/syllabus/syllabus.php?subjectId=111106048

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Prerequisites: Basic Mathematics

Course Objective:
1. To understand the overview of optimization techniques, concepts of design space, constraint surfaces and objective function.
2. To formulate real-life problems with Linear Programming models using graphical and simplex methods.
3. To formulate real-life transportation, assignment and travelling salesman problems to find the optimum solution using transportation algorithms and to find out probability of expected completion time using PERT-CPM networks.
4. To apply dynamic programming and integer programming to optimize multi stage decision problems.
5. To determine the level of game theory and simulation modelling that a business must maintain to ensure smooth operation.

Course Outcomes: After completion of the course, students will be able to
CO 1. Understand the overview of optimization techniques, concepts of design space, constraint surfaces and objective function.
CO 2. Formulate real-life problems with Linear Programming models using graphical and simplex methods.
CO 3. Formulate real-life transportation, assignment and travelling salesman problems to find the optimum solution using transportation algorithms and to find out probability of expected completion time using PERT-CPM networks.
CO 4. Apply dynamic programming and integer programming to optimize multi stage decision problems.
CO 5. Determine the level of game theory and simulation modelling that a business must maintain to ensure smooth operation.

UNIT I   **14 hrs**
Introduction to Classical Optimization Techniques
Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

Classical Optimization Techniques
Single variable Optimization, Multi variable Optimization with and without constraints, Multivariable Optimization with equality constraints - solution by method of Lagrange multipliers, Multivariable Optimization with inequality constraints - Kuhn – Tucker conditions.
UNIT II

Linear Programming   **12 hrs**
Various definitions, statements of basic theorems and properties, Advantages, Limitations and Application areas of Linear Programming, Graphical method of Linear Programming problem.

Simplex Method –
Phase I of the Simplex Method, Primal and Dual Simplex Method, Big –M method.

UNIT III   **10 hrs**

Transportation Problem
Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.
Network Analysis
Introduction, Project scheduling by CPM and PERT, Network diagram representations, Rules to construct Network diagrams, Time estimates in network analysis-EST, EFT, LST, LFT, float/slack and critical path, Time estimates and Probability considerations in PERT, Crashing in PERT

UNIT IV: **12 hrs**

Dynamic Programming
Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.
 Integer Programming
Pure and mixed integer programming problems, Solution of Integer programming problems – Gomory's all integer cutting plane method and mixed integer method, branch and bound method, Zero-one programming.

UNIT V: **10 hrs**
Game theory:
Theory Of Games: Introduction – Terminology, Solution of games with saddle points and without saddle points, 2×2 games, dominance principle, m X 2 & 2 X n games, Graphical method.

Simulation Modelling
Introduction, Definition and types, Limitations, Various phases of modelling, Monte Carlo method, Applications, advantages and limitations of simulation

TEXT BOOKS:

1. Engineering optimization: Theory and practice"-by S.S.Rao, New Age International (P) Limited.
2. Operations Research: An Introduction" by H A Taha, 5th Edition, Macmillan, New York.
3. Operations Research by P K GUPTA AND D S HIRA BY SCHAND PUBLICATIONS, 7E

REFERENCE BOOKS:

1. Optimization Methods in Operations Research and systems Analysis" – by K.V. Mittal and C. Mohan, New Age, International (P) Limited, Publishers
2. Operations Research – by S.D.Sharma, KedarnathRamanath& Co
3. Linear programming, G. Hadley, Narosa Publishing House, New Delhi.
4. Industrial Engineering and Production Management, M. Mahajan, DhanpatRai& co
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IV Year II- Semester	Name of the Course	L	T	P	C
4202	Environmental Pollution and Control Open Elective IID	3	0	0	3
Prerequisites:					

CourseObjectives:

1. To introduce the concepts of Air Pollution and the control methods.
2. To impart the knowledge of the Solid Waste generation problem.
3. To familiarize the best practices for management of solid wastes adopted at the service provider level.
4. To elucidate noise pollution problems and emphasize the necessity to control them.

CourseOutcomes:

Upon successful completion of the course, the students will be able to

1. Evaluate the ambient air quality based on the analysis of air pollutants and relate the polluting plume behavior with weather data.
2. Identify suitable control methods depending on the severity and type of air pollution.
3. Classify solid wastes and identify suitable collection and transfer mechanisms.
4. Suggest suitable solid waste management methods based on the nature of solid waste and the quantities to be handled.
5. Identify the sources of noise pollution and suggest methods for mitigating the problem.

UNITI

Air Pollution

Definitions, scope, significance and episodes – Types of pollutants, their sources and impacts (on plants, animals, materials) – Classifications, natural & artificial, primary & secondary, point &non point, linear & areal sources, stationary & mobile – Sampling and analysis of air pollutants – Ambient air quality standards by WHO (World Health Organization) & CPCB (Central Pollution Control Board).

Air Pollution Meteorology

Properties of atmosphere: heat, pressure, wind forces, moisture and relative humidity – Lapse rates – Influence of terrain and meteorological phenomena on plume behavior and air quality – Wind rose diagrams, plume rise models.

UNITII

Air Pollution Control and Monitoring

Control of particulates: control at sources, process changes, equipment modifications – Design and operation of control equipments, settling chambers, cyclone separators, fabric filters, scrubbers, electrostatic precipitators – Control of gases like SO_x , NO_x , CO and HC, Air-fuel ratio, computation and control of products of combustion – Monitoring of SPM, SO_2 , NO_x and CO, Stack Monitoring for flue gases.

UNITIII

Solid Waste Generation and Collection

Characteristics – types, sources, and properties of solid waste – Generation, typical generation rates, estimation of solid waste quantities, factors that affect generation of wastes – Collection services, types of collection systems, determination of vehicle and labour requirement and transportation of solid waste – Transfer stations, transfer means and methods.

UNIT IV

Solid Waste Management and Disposal

Engineered systems for solid waste management (refuse, reduce, reuse, recover, recycle) – Reuse of solid waste materials, processing techniques, materials recovery system, recovery of biological, thermal conversion products and recovery of energy from conversion products – Recycling of segregated waste materials – Ultimate Disposal of solid waste (Land filling, incineration, composting).

UNITV

Noise Pollution and Control

Sources of noise pollution, impacts of noise, measurement of noise and permissible limits of noise, control methods of noise pollution, The Noise Pollution (Regulation and Control) Rules, 2000 as per CPCB.

TEXTBOOKS:

1. Air Pollution, M.N.Rao, H.V.N.Rao, 1st Edition, McGraw Hill Education.

2. Solid and Hazardous Waste Management, M.N.Rao, Razia Sultana, 1st Edition, BS Publications.

3. Noise Pollution and Its Control,H.C.Bhatia, 1st Edition, Atlantic Publisher

REFERENCES:

1. Advanced Air and Noise Pollution Control, Lawrence K.Wang, Norman C. Pereira, Yung-Tss Hung, 2005 Edition, Humana Press.

2. Municipal Solid Waste Management, P.Jayarama Reddy, 1st Edition, B.S.Publications.

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IV- Year II- Semester	Name of the Course	L	T	P	C
4203	Object Oriented Analysis and Design Professional Elective IVA	3	0	0	3
Prerequisites: Object Oriented Programming Concepts					

Course Objectives:

- To compare structure oriented with object –oriented approaches to solve complex problems and frame solutions
- To identify classes and objects through classification approaches
- To make use of basic UML constructs and develop class and object diagram.
- To identify interaction and behaviours with use cases, model the use case diagram, interaction diagram, and activity diagram and state chart diagram
- To build component and deployment diagrams with Build component and deployment diagrams with Architectural modelling concepts.

UNIT-1

Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems, Evolution of Object Model, Foundation of Object Model, Elements of Object Model, Applying the Object Model.

UNIT-2

Classes and Objects: Nature of object, Relationships among objects, Nature of a Class, Relationship among Classes, Interplay of Classes and Objects, Identifying Classes and Objects, Importance of Proper Classification, Identifying Classes and Objects, Key abstractions and Mechanisms.

UNIT-3

Introduction to UML: Why we model, Conceptual model of UML, Architecture, Classes, Relationships, Common Mechanisms, Class diagrams, Object diagrams.

UNIT-4

Basic Behavioral Modeling: Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams.

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT-5

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams. Case Study: The Unified Library application.

TEXT BOOKS:
1. "Object- Oriented Analysis And Design with Applications", Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, 3rd edition, 2013, PEARSON.
2. "The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, 12th Impression, 2012, PEARSON

REFERENCE BOOKS:
1. "Object-oriented analysis and design using UML", Mahesh P. Matha, PHI
2. "Head first object-oriented analysis and design", Brett D. McLaughlin, Gary Pollice, Dave West, O"Reilly

3. "Object-oriented analysis and design with the Unified process", John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning
4. "The Unified modeling language Reference manual", James Rumbaugh, Ivar Jacobson, Grady Booch, Addison-Wesley

Course Outcomes:

CO1: Compare structure oriented with object –oriented approaches to solve complex problems and frame solutions

CO2: Identify classes and objects through classification approaches

CO3: Make use of basic UML constructs and develop class and object diagram.

CO4: Identify interaction and behaviours with use cases, model the use case diagram, interaction diagram, and activity diagram and state chart diagram

CO5: Build component and deployment diagrams with Build component and deployment diagrams with Architectural modelling concepts.

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IV- Year II- Semester	Name of the Course	L	T	P	C
4203	Data Science Professional Elective IVB	3	0	0	3
Prerequisites: Basic Mathematics, Data Mining, Statistics					

Course Objectives:
1. To gain knowledge in the basic concepts of Data Analysis
2. To acquire skills in data preparatory and preprocessing steps
3. To learn the tools and packages in Python for data science
4. To gain understanding in classification and Regression Model
5. To acquire knowledge in data interpretation and visualization techniques

UNIT I   **6hrs**
Introduction: Need for data science – benefits and uses – facets of data – data science process – setting their search goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.

UNIT II   **8hrs**
Describing Data I: Frequency distributions – Outliers – relative frequency distributions – cumulative frequency distributions – frequency distributions for nominal data – interpreting distributions – graphs –averages – mode – median – mean – averages for qualitative and ranked data – describing variability – range – variance – standard deviation – degrees of freedom – inter quartile range –variability for qualitative and ranked data.

UNIT III   **8hrs**
Python for Data Handling: Basics of Numpy arrays – aggregations – computations on arrays – comparisons, masks, Boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – hierarchical indexing – combining datasets –aggregation and grouping – pivot tables.

UNIT IV   **10hrs**
Describing Data II: Normal distributions – z scores – normal curve problems– finding proportions – finding scores –more about z scores – correlation – scatter plots – correlation coefficient for quantitative data –computational formula for correlation coefficient – regression – regression line – least squares regression line – standard error of estimate – interpretation of r^2– multiple regression equations –regression toward the mean.

UNIT V   **8hrs**
Python for Data Visualization: Visualization with matplotlib – line plots – scatter plots – visualizing errors – density and contour plots – histograms, binnings, and density – three dimensional plotting – geographic data – data analysis using state models and seaborn – graph plotting using Plotly – interactive data visualization using Bokeh.

Text Books
1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (first two chapters for Unit I)
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Chapters 1–7 for Units II and III)
3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Chapters 2– 4 for Units IV and V)

Reference Books:
1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

Course Outcomes:
By the end the of the course, the student will be able to
CO1: Gain knowledge in the basic concepts of Data Analysis
CO2: Acquire skills in data preparatory and preprocessing steps
CO3: Learn the tools and packages in Python for data science
CO4: Gain understanding in classification and Regression Model
CO5: Acquire knowledge in data interpretation and visualization techniques

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Course Objectives:

This course aims to further develop students' competency in:

- To Produce dynamic and creative graphic solutions for multimedia productions.
- To Introduce basic concepts and techniques of interactive authoring.
- To introduce the advanced scripting skills necessary for implementing highly interactive, rich internet applications using multimedia technologies and authoring tools.
- To develop aesthetic value and competencies in multimedia authoring.
- To learn about Artistic visual style and layout design are stressed, as well as the editing and integration of graphic images, animation, video and audio files.
- To master industry-wide software and technologies to create highly interactive, rich internet applications.

UNIT – I: Fundamental concepts in Text and Image: Multimedia and hypermedia, World Wide Web, overview of multimedia software tools. Graphics and image data representation graphics/image data types, file formats, Color in image and video: color science, color models in images, color models in video.

UNIT – II: Fundamental concepts in video and digital audio: Types of video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio. Multimedia Data Compression: Lossless compression algorithms, Lossy compression algorithms, Image compression standards.

UNIT – III: Basic Video compression techniques, Case study: MPEG Video Coding I, Basic Audio compression techniques, Case study: MPEG Audio compression. Web 2.0: What is web 2.0, Search, Content Networks, User Generated Content, Blogging, Social Networking, social media, Tagging, Social Marking.

UNIT – IV: Rich Internet Applications (RIAs) with Adobe Flash: Adobe Flash- Introduction, Flash Movie Development, Learning Flash with Hands-on Examples, publish your flash movie, creating special effects with Flash, Creating a website splash screen, simple Action script.

Rich Internet Applications (RIAs) with Flex 3 - Introduction, Developing with Flex 3, Working with Components, Advanced Component Development, Visual Effects and Multimedia.

UNIT – V

Action scripts – Tools for action script code, Flash programs, Expressions, Event based execution model, classes, objects and packages, constructors, Instance methods, loops, Constructors, Inheritance, simple scripts.

Text Books:

1. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew PHI Learning, 2004 (UNITS 1, 2, 3.)

2. Action scripts 3.0, O Reilly publications (Unit 5)

Reference Books:

1. Professional Adobe Flex 3, Joseph Balderson, Peter Ent, et al, Wrox Publications, Wiley India, 2009. (For unit 4)

2. Multimedia Communications: Applications, Networks, Protocols and Standards, Fred Halsall, Pearson Education, 2001, RP 2005.

3. Multimedia making it work, Tay Vaughan, 7th edition, TMH, 2008.

Course Outcomes: After completing this course, Students will be able to-

CO-1: Understand development of Multimedia & Color models

CO-2: Work with Image, audio and compression techniques

CO-3: Understand Video compression techniques.

CO-4: Summarize Rich application development through Flash & Flex

CO-5: Build action scripts for animation

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IV- Year II- Semester	Name of the Course	L	T	P	C
4203	Fullstack-II Professional Elective IVD	3	0	0	3
Prerequisites: Web Programming, Java Programming					

Course Objectives:
1. To focus on contemporary front-end technologies like Angular
2. To understand data access through NodeJS
3. To understand Database design with MongoDB
4. To Understand essential Java micro services.

Course Outcomes: by the end of the course the student will be able to
- Interpret the differences between React and AngularJS
- Use NodeJs for data availability
- Create database with MongoDB
- Understand essential Java micro services.
- Develop real time web application

Unit-1:Angular JS: Introduction, MVC Architecture, setting up the environment, Expressions, Modules, Data binding,
Controllers, Scope, Filters and Services, HTTP, Forms, Events and Validations. API and Routing.

Unit-2: Node JS: Overview, Node js - Basics and Setup, Node js Console, Node js Command Utilities, Node js Modules, Node js Concepts, Node js Events, Node js with Express js, Node js Database Access.

Unit-3: MongoDB: Overview of MongoDB,features and drawbacks of MongoDB,MangoDB-CRUD operations, sorting, indexing

Unit-4: **Java Micro services**: Basics, Architecture, Need of micro services, Merits and Demerits, Differences between MSA Vs SOA, Creating a simple micro service, Deploying and Testing. Java micro services with spring.

Unit-5: Case study
Text Books:

1. HTML5, Black book, Dreamtech Publications
2. Beginning React, Greg Lim
3. Learning AngularJS: A Guide to AngularJS Development, O' Reilly Publication

References:
1. React Cook Book, Carlos Santana Roldan
2. Learning React, 2nd Edition, O' Reilly publications.
3. React in Action by Mark Tielens Thomas

Web Resources:
https://developer.mozilla.org/en-US/docs/Web/JavaScript
https://reactjs.org/docs/getting-started.html
https://nodejs.org/en/docs/

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IV- Year II- Semester	Name of the Course	L	T	P	C
4202	Blockchain Technologies Professional Elective IVE	3	0	0	3
Prerequisites: Basic Mathematics, Artificial Intelligence, Data Mining					

COURSE OUTCOMES

CO1: Infer and explore the working of Blockchain technology (Understanding)

CO2: Differentiate the working of Smart Contracts (Analyze)

CO3: identifies and illustrates the working of Hyperledger (Analyze).

CO4: Demonstrates the learning of solidity and de-centralized apps on Ethereum (Apply).

CO5: Interprets various applications

UNIT -1

Introduction of Cryptography and Blockchain: What is Blockchain, Blockchain Technology Mechanisms & Networks, Blockchain Origins, Objective of Blockchain, Blockchain Challenges, Transactions and Blocks, P2P Systems, Keys as Identity, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Blockchain

UNIT -2

BitCoin and Cryptocurrency: What is Bitcoin, The Bitcoin Network, The Bitcoin Mining Process, Mining Developments, Bitcoin Wallets, Decentralization and Hard Forks, Ethereum Virtual Machine (EVM), Merkle Tree, Double-Spend Problem, Blockchain and Digital Currency, Transactional Blocks, Impact of Blockchain Technology on Cryptocurrency

UNIT -3

Introduction to Ethereum: What is Ethereum, Introduction to Ethereum, Consensus Mechanisms, How Smart Contracts Work, Meta mask Setup, Ethereum Accounts, Receiving Ether's What's a Transaction? Smart Contracts

UNIT -4

Solidity Programming: Solidity – Language of Smart Contracts, Installing Solidity & Ethereum Wallet, Basics of Solidity, Layout of a Solidity Source File & Structure of Smart Contracts, General Value Types (Int, Real, String, Bytes, Arrays, Mapping, Enum, address)

UNIT -5

Blockchain Applications: Internet of Things, Medical Record Management System, Domain Name Service and Future of Blockchain, Alt Coins.

TEXT Books:

3. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular

Blockchain frameworks by Bashir, Imran,2017.

4. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder.

Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University

Press, 2016.

5. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and

cryptocurrency, IEEE Symposium on security and Privacy, 2015.

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IV- Year II- Semester	Name of the Course	L	T	P	C
4204	Devops Professional Elective VA	3	0	0	3
Prerequisites: Software Engineering					

Course Objectives:

- DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

Course Outcomes:

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

- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility
- Describe DevOps & DevSecOps methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools

UNIT I

Phases of Software Development life cycle, Values and principles of agile software development,

UNIT II

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

UNIT III

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT IV

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment , Benefits of CI/CD, Metrics to track CI/CD practices

UNIT V

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Text Books:

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.

2. What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

Reference Books:
1. Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.
2. The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Microservices, 1st Edition, Viktor Farcic, CreateSpace Independent Publishing Platform publications, 2016
3. Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.
4. Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and microservices, 1st Edition, Dave Harrison, Knox Lively, Apress publications, 2019

e-Resources:
1. https://www.javatpoint.com/devops
2. https://github.com/nkatre/Free-DevOps-Books-1/blob

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IV- Year II- Semester	Name of the Course	L	T	P	C
4204	Deep Learning Professional Elective VB	3	0	0	3
Prerequisites: Basic Mathematics, Artificial Intelligence, Machine Learning					

Course Objectives:

5. To understand basic concepts of neural networks.
6. To emphasize on learning, optimization techniques.
7. To learn CNN,RNN, Autoencoder models.
8. To learn deep learning algorithms to solve real world problems.

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

- Demonstrate basic neural network models
- Perform optimization and evaluate performance of the neural network Model.
- Able to implement mathematical model of neural network.
- Design convolutional neural network for solving problems.
- Design RNN's, Auto encoders.

Unit-1: Introduction to Deep learning, machine learning vs deep learning Artificial Neural Network: Biological Model of a Neuron, Models of a Neuron, Perceptron, Activation functions, Realizing logic gates using perceptron, Network Architectures.

Unit-2: Single Layer Perceptron: Adaptive filtering problem, unconstrained optimization techniques, Least Mean Square algorithm, Perceptron as a classifier, Proof of Convergence.
Multilayer Perceptron- Preliminaries, functionality of neurons in different layers.

Unit-3: Back propagation algorithm-training and convergence, Practical and design issues, Linear and logistic regression using MLP.
Convolution Neural Networks: the convolution operation, Motivation, Pooling.

Unit-4: Variants of the basic convolution function, Data types, efficient convolution algorithms, Neuro scientific basis for convolution neural networks.
Recurrent Neural Networks: recurrent neural networks, Bidirectional RNNs, Encoder and Decoder sequence to sequence architectures.

Unit-5: Recurrent Neural Networks: Deep Recurrent Networks, Recursive Neural Networks, The long short term memory and other gated RNNs. Autoencoders:Under complete Autoencoders, Regularized Autoencoders, Stochastic Encoders and Decoders,Denoising Autoencoders,Contractive Autoencoders.

Text Books:

1. Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.
2. Goodfellow I, BengioY, and Courville A, Deep Learning, MIT Press, 2016.

References:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Aurélien Géron, Neural networks and deep learning, O'Reilly Media, 2018.

Web Resources:

https://www.deeplearningbook.org/contents/convnets.html
https://www.deeplearningbook.org/contents/rnn.html
https://www.deeplearningbook.org/contents/autoencoders.html

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IV- Year II- Semester	Name of the Course	L	T	P	C
4204	Biometrics Professional Elective VC	3	0	0	3
Prerequisites: Basic Mathematics, Artificial Intelligence, Data Mining					

CourseObjectives:

1. The basic objective in offering this course is to study the state-of-the-art in biometrics technology can explore the way to improve the current technology.

2. The students can learn and implement various biometrics technologies using advanced algorithm

Course outcomes: On completion of this program student will:

1. Understand the basic definition of 'Biometric Recognition' and the distinctive of this form of biometrics.

2. State precisely what functions these systems perform.

3. Draw a system-level diagram for any biometric system and discuss its components.

4. Solve verification, identification, and synthesis problems for a variety of biometrics such as fingerprint, face, iris, hand gestures and cryptography.

5. Use the biometrics ingredients of existing system to obtain a given security goal and able to design a biometric solution for a given

Unit I: Introduction of Biometrics

Biometrics: definition, history, basic working architecture, types; Performance measures of biometrics; applications and benefits of biometrics; design of biometrics; biometric identification versus verification

Unit II: Face and Iris Biometrics

Background of face and iris recognition; Face recognition methods: Eigen face methods, contractive transformation method; Challenges of face biometrics; Design of iris biometrics: image segmentation, image preprocessing, determination of iris region; Advantages and disadvantages of face and iris biometrics

Unit III: Fingerprint and Sign Language Biometrics

Fingerprint matching: image acquisition, image enhancement and segmentation, image binarization, minutiae extraction and matching; Sign language biometrics: Indian sign language (ISL) biometrics, SIFT algorithm, advantages and disadvantages of ISL and fingerprint biometrics.

Unit IV: Biometric Cryptography and Privacy Enhancement

Introduction to biometric cryptography; general purpose cryptosystems; Cryptographic algorithms: DES and RSA; Privacy concerns and issues related to biometrics; biometrics with privacy enhancement; soft biometrics; comparison of various biometrics; Identity and privacy

Unit V: Scope of Biometrics and Biometric Standards Multimodal biometrics:

Basic architecture and fusion scheme, application, example of AADHAAR; scope and future market of biometrics; role of biometrics in enterprise and border security; DNA biometrics; biometric standards; biometric APIs.

Text Books:

1. Biometrics: concepts and applications by Dr G R Sinha and Sandeep B. Patil, Wiley India Publications, 2013.
2. Introduction to biometrics by Anil K Jain, Arun Ross and Karthik Nandakumar, Springer, 2011.

Reference Books

1. Biometrics Identity verification in a networked world by Samir nanawati, Michael Thieme and Raj Nanawati, US edition of Wiley India, 2012

e- Resources & other digital material

1. https://archive.nptel.ac.in/courses/106/104/106104119/

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IV- Year II- Semester	Name of the Course	L	T	P	C
4204	Image Processing Professional ElectiveVD	3	0	0	3
Prerequisites: Computer Graphics, Fundamental 2DGraphics, Multimedia					

Course Objectives:

Students undergoing this course are expected to:

1. Familiarize with basic concepts of digital image processing

2. Learn various image processing techniques like image enhancement

3. Understand Color fundamentals and different Color models

4. Understand Image Compression & Morphological Image Processing

UNIT – I: Introduction

Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Representing Digital Images (Data structure), Some Basic Relationships Between Pixels- Neighbors and Connectivity of pixels in image, Applications of Image Processing: Medical imaging, Robot vision, Character recognition, Remote Sensing.

UNIT – II: Image Enhancement in The Spatial Domain:

Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods

UNIT – III: Color Image Processing

Color Fundamentals, Color Models, Pseudo color image processing, Color transformation, Smoothing and sharpening, Image segmentation based on Color, Noise in Color images

UNIT – IV: Image Compression & Morphological Image Processing

Image Compression - Fundamentals, Some basic compression methods, Digital Image water marking.Morphological Image Processing - Erosion and Dilation, Opening and Closing, Hit-or-Miss Transformation, Some basic morphological algorithms, Gray-scale morphology.

UNIT – V: Image Segmentation:

Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold

TEXT BOOKS

    1. Digital Image Processing, Third Edition, Rafael C Gonzalez, Richard E Wood

Reference Books:

1. Milan Sonka "Image Processing, analysis and Machine Vision", Thomson Press India Ltd, Fourth Edition.

2. Fundamentals of Digital Image Processing- Anil K. Jain, 2nd Edition, Prentice Hall of India.

3. S. Sridhar, Digital Image Processing, Oxford University Press, 2nd Ed, 2016.

Course Outcomes: After completing this course, Students will be able to-

CO1: Understand Digital Image Fundamentals

CO2: Perform various Image enhancement techniques

CO3: Analyze pseudo and full color image processing methods

CO4: Use various compression techniques and morphological operations.

CO5: various Image segmentation methods

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CourseObjectives:
- Ableto identifysecurityrisksand takepreventivesteps
- Tounderstandtheforensicsfundamentals
- Tounderstandtheevidencecapturingprocess
- Tounderstandthepreservationofdigitalevidence

CourseOutcomes:

Attheend ofthecourse,studentwillbeableto
- Enumeratethecomputerforensicsfundamentals
- Describethetypesofcomputerforensicstechnology
- Analyzevariouscomputerforensicssystems
- Illustratethemethodsfor datarecovery,evidencecollectionanddataseizure
- IdentifytheRoleofCERT-InSecurity

UNITI
IntroductiontoCybercrime: Introduction,Cybercrime:DefinitionandOriginsof theWord,Cybercrime and Information Security, Cybercriminals, Classifications ofCybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation ofMobileandWirelessDevices, SecurityChallengesPosedbyMobileDevices,AttacksonMobile/CellPhones,NetworkandComputerAttacks.

UNITII
Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking, KeyloggersandSpywares,VirusandWorms,TrojanHorsesandBackdoors,Steganography,Sniffers,Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, BufferOverflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and SocialEngineering,PortScanning,Enumeration.

UNITIII
CyberCrimeInvestigation:Introduction,InvestigationTools,eDiscovery,DigitalEvidenceCollection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-MailRecovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure ofComputers,RecoveringDeletedEvidences,PasswordCracking.

UNITIV
ComputerForensicsandInvestigations:UnderstandingComputerForensics,PreparingforComputer Investigations. Current Computer Forensics Tools: Evaluating Computer ForensicsTools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating andTesting Forensics Software, Face,Iris and FingerprintRecognition,AudioVideoAnalysis,Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mailInvestigations,CellPhone andMobileDevice Forensics.

UNITV
Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cyber crime Scenario in India , Consequences of Not Addressing the Weakness in Information Technology Act, Digital

SignaturesandtheIndianITAct,AmendmentstotheIndianITAct,CybercrimeandPunishment,Cyberlaw,TechnologyandStudents:IndianScenario.

TextBooks:

1) SunitBelapureNinaGodbole"CyberSecurity:UnderstandingCyberCrimes,ComputerForensicsandLegalPerspectives",WILEY,2011.
2) NelsonPhillipsandEnfingerSteuart,"ComputerForensicsandInvestigations",CengageLearning,NewDelhi,2009.

ReferenceBooks:

1) Michael T.Simpson,KentBackman and James E.Corley,"Hands on Ethical HackingandNetworkDefence",Cengage,2019.
2) ComputerForensics,ComputerCrimeInvestigationbyJohnR.Vacca,FirewallMedia,New Delhi.
3) AlfredBasta,NadineBasta,MaryBrownandRavinderKumar"CyberSecurityandCyberLaws",Cengage,2018.

e-Resources:

1) CERT-In Guidelines-http://www.cert-in.org.in/
2) https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks[OnlineCourse]
3) https://computersecurity.stanford.edu/free-online-videos[FreeOnlineVideos]
4) NickolaiZeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Instituteof Technology: MIT OpenCourseWare, https://ocw.mit.edu. License:Creative CommonsBY-NC-SA.

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IV- Year II- Semester	Name of the Course	L	T	P	C
PR	Project-II	0	0	14	7