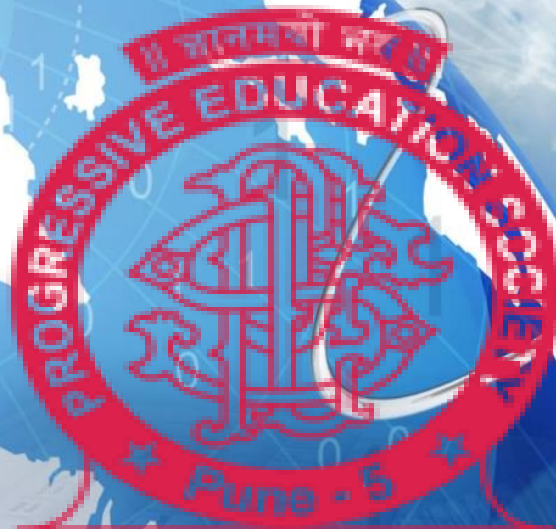


**Progressive Education Society's
Modern College of Engineering
Department of Computer Engineering**



**Modern College of Engineering
Pune - 5**

Curriculum Booklet

**Second Year
2019 Pattern
Semester-II**



Progressive Education Society's
Modern College of Engineering
DEPARTMENT OF COMPUTER ENGINEERING



**Progressive Education Society's
Modern College of Engineering, Shivajinagar, Pune-05.
Department of Computer Engineering**

Curriculum Booklet

2019 Pattern

Semester: II

Class: SE (COMPUTER ENGINEERING)



Vision of the Institute:

- Creation of a collaborative academic environment to foster professional excellence and ethical values.

Mission of the Institute:

- To develop outstanding professionals with high ethical standards capable of creating and managing global enterprises.
- To foster innovation and research by providing a stimulating learning environment.
- To ensure equitable development of students of all ability levels and backgrounds.
- To be responsive to changes in technology, socio-economic and environmental conditions.
- To foster and maintain mutually beneficial partnerships with alumni and industry.

Vision of the Department

- To achieve excellence in the field of computing through quality education.

Mission of the Department

- To develop promising professionals in the field of computing.
- To provide exposure to emerging technologies and inculcate ethics.
- To strengthen association with alumni and industry.



Objectives of the Institute:

- To develop infrastructure appropriate for delivering quality education
- To develop the overall personality of students who will be innovators and future leaders capable of prospering in their work environment.
- To inculcate ethical standards and make students aware of their social responsibilities.
- Promote close interaction among industry, faculty and students to enrich the learning process and enhance career opportunities.
- Encourage faculty in continuous professional growth through quality enhancement programs and research and development activities.

Foster a healthy work environment which allows for freedom of expression and protection of the rights of all stakeholders through open channels of communication

PEO

The graduates of Computer Engineering Department will be,

PEO1: Capable of solving real world problems.

PEO2: Capable of working with multidisciplinary projects.

PEO3: Capable to adapt to changing technologies and life management skills.

PEO4: Able to exhibit professional and ethical responsibilities.

Program Specific Outcomes

Graduate of computer engineering programme will demonstrate

- The ability to understand, analyze, develop and evaluate system based on various algorithmic approaches.
- The ability to pursue career in IT industries, to become an entrepreneur and have zest for higher studies.
- The ability to solve problems using engineering principles, tools and techniques.



Program Outcome

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



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Semester-IV														
Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credit Scheme			
		Lecture	Practical	Tutorial	Mid-Sem	End-Sem	Term work	Practical	Oral	Total	Lecture	Practical	Tutorial	Total
207003	Engineering Mathematics III	03	-	01	30	70	25	-	-	125	03	-	01	04
210252	Data Structures and Algorithms	03	-	-	30	70	-	-	-	100	03	-	-	03
210253	Software Engineering	03	-	-	30	70	-	-	-	100	03	-	-	03
210254	Microprocessor	03	-	-	30	70	-	-	-	100	03	-	-	03
210255	Principles of Programming Languages	03	-	-	30	70	-	-	-	100	03	-	-	03
210256	Data Structures and Algorithms Laboratory	-	04	-	-	-	25	25	-	50	-	02	-	02
210257	Microprocessor Laboratory	-	02	-	-	-	25	-	25	50	-	01	-	01
210258	Project Based Learning II	-	04	-	-	-	50	-	-	50	-	02	-	02
210259	Code of Conduct	-	-	01	-	-	25	-	-	25	-	-	01	01
210260	Audit Course 4													
Total Credit											15	05	02	22
Total		15	10	02	150	350	150	25	25	700	-	-	-	-



Curriculum

1. Name of the Course: Engineering Mathematics III (207003)

Weekly Work Load(in Hrs)	Lecture	Tutorial	Practical
	03		04

Online/ In-sem	Theory	Practical	Oral	Term-work	Total Marks	Credit
30	70	25	-	25	150	05

Course Objectives:

- To make the students familiar with concepts and techniques in Linear differential equations, Fourier
- transform and Z-transform, Statistical methods, Probability theory and Numerical methods. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance thinking power, useful in their disciplines.

Course Outcomes:

On completion of the course learner will able to-

CO1: Solve Linear differential equations, essential in modelling and design of computer-based systems.

CO2: Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.

CO3: Apply Statistical methods like correlation and regression analysis and probability theory for data analysis and predictions in machine learning.

CO4: Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques.

CO5: Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.



University Syllabus

Unit I Linear Differential Equations (LDE)

LDE of n^{th} order with constant coefficients, Complementary function, Particular integral, General method, Short methods, Method of variation of parameters, Cauchy's and Legendre's DE, Simultaneous and Symmetric simultaneous DE.

Unit II Transforms

Fourier Transform (FT): Complex exponential form of Fourier series, Fourier integral theorem, Fourier Sine and Cosine integrals, Fourier transform, Fourier Sine and Cosine transforms and their inverses, Discrete Fourier Transform.

Z - Transform (ZT): Introduction, Definition, Standard properties, ZT of standard sequences and their inverses. Solution of difference equations.

Unit III Statistics

Measures of central tendency, Measures of dispersion, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting: fitting of straight line, parabola and related curves, Correlation and Regression, Reliability of Regression Estimates.

Unit IV Probability and Probability Distributions

Probability, Theorems on Probability, Bayes theorem, Random variables, Mathematical Expectation, Probability density function, Probability distributions: Binomial, Poisson, Normal and Hypergeometric, Sampling distributions, Test of Hypothesis: Chi-Square test, t-test.

Unit V Numerical Methods

Numerical Solutions of System of linear equations: Gauss elimination, LU Decomposition,

Numerical Solution of Algebraic and Transcendental equations: Bisection, Secant, Regula-Falsi, Newton-Raphson and Successive Approximation Methods, Convergence and Stability. Cholesky, Jacobi and Gauss-Seidel Methods.

Unit VI Numerical Methods

and Predictor-Corrector methods.

Interpolation: Finite Differences, Newton's and Lagrange's Interpolation formulae, Numerical Differentiation. Numerical Integration: Trapezoidal and Simpson's rules, Bound of truncation error.

Solution of Ordinary differential equations: Euler's, Modified Euler's, Runge-Kutta 4th order methods



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Text Books:

Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).

Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).

Reference Books:

Advanced Engineering Mathematics, 10e, by Erwin Kreyszig (Wiley India).

Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).

Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Cengage Learning).

Differential Equations, 3e by S. L. Ross (Wiley India).

Introduction to Probability and Statistics for Engineers and Scientists, 5e, by Sheldon M. Ross (Elsevier Academic Press).

Numerical Methods for Scientific and Engineering Computation, by M. K. Jain, S. R. K. Iyengar And R. K. Jain, 5e, (New Age International Publication)

Teaching Plan

Sr. No.	Unit No.	Unit/ Topic Name	Start Date	End Date
1.	I	Linear Differential Equations (LDE)	Jan Week 4	Feb Week 2
2.	II	Transforms	Feb Week 2	Feb Week 4
3.	III	Statistics	Feb Week 4	March Week 3
4.	IV	Probability and Probability Distributions	March Week 3	March Week 5
5.	V	Numerical Methods-I	March Week 5	April Week 2
6.	VI	Numerical Methods-II	April Week 2	May Week 1



QUESTION BANK

Unit-1 LINEAR DIFFERENTIAL EQUATION

Sr. No.	Question	CO No.	Marks	University Year
1	Solve $\frac{d^3y}{dx^3} - 7\frac{dy}{dx} - 6y = e^{2x}(1+x)$	207003.1	4	November 2013
2	Solve $(D^2 + 4)y = \frac{1}{1+\sin 2x}$, by variation of parameter.		4	May 2015
3	Solve $(D^2 - 4D + 4)y = e^{2x} \cos^2 x$		4	May 2014
4	Solve $(D^2 + 5D + 6)y = e^{2x} x (1 + 2 \tan \tan x)$		4	May 2014
5	Solve $(D^2 + D + 1)y = x \sin \sin x$		4	May 2014
6	Solve $\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$, by variation of parameter.		4	Dec 2014
7	Solve $\frac{d^2y}{dx^2} + \frac{1}{x} \frac{dy}{dx} = A + B \log(\log x)$		4	November 2013
8	Solve $(3x+2)^2 \frac{d^2y}{dx^2} + 3(3x+2) \frac{dy}{dx} - 36y = 3x^2 + 4x + 1$		4	May 2014
9	Solve the following differential equation, $(D^2 - 2D + 2)y = e^x \tan x$ $(D^2 + 1)y = 3x - 8\cot x$ $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + 4y = \cos(\log x) + x \sin(\log x)$		4 4 4	NA
10	Solve, i) $\frac{dx}{y^2z} = \frac{dy}{x^2z} = \frac{dz}{y^2x}$ ii) $\frac{dx}{3z-4y} = \frac{dy}{4x-2z} = \frac{dz}{2y-3x}$ iii) $\frac{x^2 dx}{y^3} = \frac{y^2 dy}{x^3} = \frac{dz}{z}$		12	NA
11	Solve following simultaneous LDE, i) $(LD + 2R)x - Ry = E$; $(LD + 2R)y - Rx = 0$ Find the general		15	NA



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	values of x and y in terms of t. ii) $(D - 1)x + Dy = t ; 3x + (D + 4)y = t^2$ iii) $\frac{dx}{dt} + 5x - 2y = t ; \frac{dy}{dt} + 2x + y = 0$ having been given $x = y = 0$ at $t = 0$			
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UNIT-2 TRANSFORMS

Sr. No.	Question	CO No.	Ma rks	University Year
1	Find the Fourier transform of $f(x) = e^{- x }$	207003.2	4	November 2013
2	Find the Fourier transform of $f(x) = \begin{cases} 1 & x \leq a \\ 0 & x > a \end{cases}$		4	May 2014
3	Using Fourier cosine integral of $e^{-mx} (m > 0)$, show that $\int_0^{\infty} \frac{m \cos \lambda x}{m^2 + \lambda^2} = \frac{\pi}{2} e^{-mx}, (m > 0, x > 0)$		4	May 2015
4	Using Fourier integral representation, show that $\int_0^{\infty} \left(\frac{\cos \left(\frac{\lambda \pi}{2} \right) \cos \lambda x}{1 - \lambda^2} \right) dG = \begin{cases} \frac{\pi}{2} \cos x & x \leq \frac{\pi}{2} \\ 0 & , x > \frac{\pi}{2} \end{cases}$		4	November 2015
5	Find the Fourier cosine transform of $f(x)$ $f(x) = \begin{cases} \cos x, & 0 < x < a \\ 0 & x \geq a \end{cases}$		4	November 2013
6	Find Z transform of $f(k) = \begin{cases} \left(\frac{1}{4}\right)^k ; & k \geq 0 \\ \left(\frac{1}{3}\right)^k ; & k < 0 \end{cases}$		4	May 2014
7	Find Fourier sine transform of $f(x) = e^{-x} \cos x \ x > 0$.		4	-NA
8	Solve the integral equation $\int_0^{\infty} f(x) \cos \lambda x \ dx = \begin{cases} 1 - \lambda, & 0 \leq \lambda \leq 1 \\ 0, & \lambda > 1 \end{cases}$ and hence show that $\int_0^{\infty} \frac{\sin^2 z}{z^2} dz = \frac{\pi}{2}$.		4	NA
9	Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2, & x \leq 1 \\ 0, & x > 1 \end{cases}$ Hence evaluate $\int_0^{\infty} \left(\frac{x \cos x - \sin x}{x^3} \right) \cos \frac{x}{2} dx$.		4	NA
10	Find the solution of integral equation $\int_0^{\infty} f(x) \cos \lambda x \ dx =$		4	NA



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	$e^{-\lambda}, \lambda > 0$			
11	Find Z transform of $f(k) = ke^{3k} \sin(4k + 5); k \geq 0$		4	November 2015
12	Find Inverse Z transform of $F(z) = \frac{z^2}{(z-\frac{1}{2})(z-\frac{1}{3})}, z > \frac{1}{2}$		4	May 2016
13	Solve the following difference equation $f(k+1) - f(k) = 1; f(0) = 0, k \geq 0$		4	May 2017
14	Solve the following difference equation $6f(k+2) - 5f(k+1) + f(k) = 0; k \geq 0, f(0) = 0, f(1) = 3$		4	November 2015
15	Solve the following difference equation: $y(k+2) - 5y(k+1) + 6y(k) = 36, y(0) = y(1) = 0$		4	NA
16	Solve, (i) find the Z-transform of $f(k) = e^{-2k} \cos(5k + 3)$ (ii) Find the inverse Z-transform of $\frac{z(z+1)}{z^2-2z+1}, z > 1$		4	NA
17	Find inverse Z-transform of $\frac{3z^2+2z}{z^2+3z+2}, 1 < z < 2.$		4	-NA

UNIT-3 STATISTICS

Sr. No.	Question	CO No.	Marks	University Year																				
1	calculate coefficient of correlation for the following data <table border="1" style="margin-left: 40px;"> <tr> <td>x</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> </tr> <tr> <td>y</td> <td>9</td> <td>8</td> <td>10</td> <td>12</td> <td>11</td> <td>13</td> <td>14</td> <td>16</td> <td>15</td> </tr> </table>	x	1	2	3	4	5	6	7	8	9	y	9	8	10	12	11	13	14	16	15	207003. 3	4	November 2013
x	1	2	3	4	5	6	7	8	9															
y	9	8	10	12	11	13	14	16	15															
2	Calculate the coefficient of correlation for the following information: $n = 10, \sum_0^n x = 40, \sum_0^n x^2 = 190,$ $\sum_0^n y^2 = 200, \sum_0^n xy = 150, \sum_0^n y = 40$		4	May 2017																				



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3	The first four moments of distribution about value 4 of the variable are -1.5, 17, -30 and 108. Find the central moments, β_1 & β_2 .	4	May 2015																
4	The first four moment of a distribution about the value 2 are 1,2.5,5.5 and 16.obtain the first four central moment, mean, s.d and coefficient of skewness and kurtosis.	4	November 2015																
5	The regression equations are $8x - 10y + 66 = 0$ and $40x - 18y = 214$. the value of variation of x is 9. Find : The mean values of x and y. The correlation coefficient between x and y. The standard deviation of y.	4	November 2016																
6	Find the regression lines for the following data <table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>X</td> <td>2</td> <td>3</td> <td>5</td> <td>7</td> <td>9</td> <td>10</td> </tr> <tr> <td>Y</td> <td>2</td> <td>5</td> <td>8</td> <td>10</td> <td>12</td> <td>14</td> </tr> </tbody> </table>	X	2	3	5	7	9	10	Y	2	5	8	10	12	14	4	May 2014		
X	2	3	5	7	9	10													
Y	2	5	8	10	12	14													
7	The first four moment of a distribution about the value 2 are 1,2.5,5.5 and 16.obtain the first four central moment mean, a.m, s.d and coefficient of skewness and kurtosis.	4	November 2015																
8	Calculate the first four moments about the mean of the given distribution .also find β_1 & β_2 , A.M and S.D <table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>X</td> <td>2</td> <td>2.5</td> <td>3</td> <td>3.5</td> <td>4</td> <td>4.5</td> <td>5</td> </tr> <tr> <td>Y</td> <td>5</td> <td>38</td> <td>65</td> <td>92</td> <td>70</td> <td>40</td> <td>10</td> </tr> </tbody> </table>	X	2	2.5	3	3.5	4	4.5	5	Y	5	38	65	92	70	40	10	4	May 2016
X	2	2.5	3	3.5	4	4.5	5												
Y	5	38	65	92	70	40	10												
9	The two variation x and y have regression line : $3x + 2y - 26 = 0$ and $6x + y - 31 = 0$ find (i) the mean values of x and y (ii) correlation coefficient between x and y.	4	May 2017																
10	Calculate the coefficient of correlation for the following information: $n = 25$, $\sum_0^n x = 75$, $\sum_0^n x^2 = 250$, $\sum_0^n y^2 = 500$, $\sum_0^n xy = 325, \sum_0^n y = 100$	4	May 2016																



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11	Calculate coefficient of correlation for the following data <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td><td>23</td><td>28</td><td>42</td><td>17</td><td>26</td><td>35</td><td>29</td><td>37</td><td>16</td><td>46</td> </tr> <tr> <td>Y</td><td>25</td><td>22</td><td>38</td><td>21</td><td>27</td><td>39</td><td>24</td><td>32</td><td>18</td><td>44</td> </tr> </table>	X	23	28	42	17	26	35	29	37	16	46	Y	25	22	38	21	27	39	24	32	18	44		4	NA
X	23	28	42	17	26	35	29	37	16	46																
Y	25	22	38	21	27	39	24	32	18	44																
12	The first four moment of a distribution about the value 5 are 2,20,40 and 50.obtain the first four central		4	NA																						
13	The first four moments of distribution about value 4 of the variable are -1.5, 17, -30 and 108. Find the central moments , β_1 & β_2 .		4	-NA																						
14	find the regression lines for the following data. Also find i) y when x=6 ii) x when y=20 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td><td>2</td><td>3</td><td>5</td><td>7</td><td>9</td><td>10</td><td>12</td><td>15</td> </tr> <tr> <td>Y</td><td>2</td><td>5</td><td>8</td><td>10</td><td>12</td><td>14</td><td>15</td><td>16</td> </tr> </table>	X	2	3	5	7	9	10	12	15	Y	2	5	8	10	12	14	15	16		4	NA				
X	2	3	5	7	9	10	12	15																		
Y	2	5	8	10	12	14	15	16																		

UNIT 4 PROBABILITY AND PROBABILITY DISTRIBUTIONS

Sr. No.	Question	CO No.	Marks	University Year
1	Team A has a probability of $\frac{2}{3}$ winning whenever the team plays a particular game. If team A plays 4 games, find the probability that the team wins : Exactly two games and At least two games.	207003.3	4	November 2013
2	A manufacturer of electronic goods has 4% of his product defective. He sells the articles in packets of 300 and guarantees 90% good quality. Determine the probability that a particular packet will violate the guarantee		4	May 2014
3	Number of road accidents on a highway during a month follows a Poisson's distribution with mean 5,find the probability that in a certain month, number of accident on the highway will be a)Less than 3 b) Between 3 and 5		4	May 2015
4	The average test marks in particular class is 79 and standard deviation is 5. If the marks are normally distributed, how many student in a class of 200, did not receive marks between 75 and 82.given $z = 0.8$, $area = 0.2881$ and $z = 0.6$, $area = 0.2257$.		4	November 2015
5	If the probability that a concrete cube fails is 0.001. Determine		4	



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	the probability that out of 1000 cubes: Exactly two More than one cubes will fail.			November 2013
6	The average test marks in particular class is 79 and standard deviation is 5. If the marks are normally distributed, how many student in a class of 200, did not receive marks between 75 and 82.given $z=0.8$, $area=0.2881$ and $z=0.6$, $area=0.2257$.	4		May 2014
7	In a certain examination 200 students appeared. Average marks obtained were 50% with standard deviation 5% .how many students do you expect to obtain more than 60% of marks, supposing that the marks are distributed normally?	4		May 2016
8	The lifetime of a certain component has a normal distribution with mean of 400 hours and standard deviation of 50 hours. Assuming a normal sample of 1000 components determine approximately the number of component whose lifetime lies between 340 to 465 hours. Given : ($z = 1.2$, $area = 0.3849$, $z = 1.3$, $area = 0.4032$)	4		May 2016
9	An insurance agent accepts policies of 5 men of identical age and in good health. The probability that a man of this age will be alive 30 years hence is $\frac{2}{3}$. Find the probability that in 30 years:	4		May 2017
10	A manufacturer of cotter pins known that 2% of his product is defective .if he sells cotter pins in box of 100 pins and guarantee that not more than 5 pins will be defective in box ,find probability that a box will fail to meet the guaranteed quality.	4		November 2015
11	Between 2 pm and 3 pm the average number of phone calls per minute coming into company are 2. Find the probability that during one particular minute there will be 2 or less calls.	4		-----
12	In a shooting competition, the probability of man hitting a target is $1/5$. If he hit a target for 5 times, what is the probability of hitting the target at least two times?	4		-----



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13	A math's problem is given to the three students A, B, C whose chances of solving it are $\frac{1}{4}, \frac{3}{4}, \frac{1}{6}$ resp. what is the probability that the problem will be solved?		4	-----
14	What is the probability that a leap year selected at random will not contain 53 Saturdays?		4	-----
15	A five figure number is formed by the digits 0, 1, 2, 3, 4 (without repetition). Find probability that the number formed is divisible by 4.		4	-----

UNIT -5 NUMERICAL METHODS 1

Sr. No.	Question	CO No.	Ma rks	University Year
1	Use method of Bisection to find a root of equation, $\cos x = xe^x$. (4 iterations)	207003.4	4	NA
2	Use method of Regula Falsi to find a root of equation, $x^3 - 3x + 1 = 0$. (4 iterations)		4	NA
3	Use Secant method to find a root of equation, $x^3 - 3x + 1 = 0$. (4 iterations)		4	NA
4	Find value of $17^{\frac{1}{3}}$ by using Newton-Raphson method correct up to 3 decimal places.		4	NA
5	Solve the equation $x^2 - 4x + 2 = 0$ using method of simple iterations. (4 iterations)		4	NA
6	Solve the following system of equation by using Gauss elimination method, $4x_1 + x_2 + 4x_3 = 4$ $x_1 + 4x_2 - 2x_3 = 4$ $3x_1 + 2x_2 - 4x_3 = 6$		4	NA
7	Solve the system of equation by using L-U decomposition method $2x_1 + 2x_2 + 3x_3 = 4$ $4x_1 - 2x_2 + x_3 = 9$ $x_1 + 5x_2 + 4x_3 = 3$		4	NA
8	If $f(x) = x^2 - x - 2$ then for $\phi(x) = \frac{x+2}{x}$ with $x_0 = 1.5$, find four iteration for x		4	NA



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9	Solve the system of equation by using Gauss Seidel iteration method. $x_1 + 5x_2 + 2x_3 = -6$ $x_1 + 2x_2 + 3x_3 = -4$ $4x_1 + x_2 + x_3 = 2$ <p style="text-align: center;">(3 iteration)</p>		4	NA
10	Solve the system of equation by using Gauss Jordan method. $x_1 + 2x_2 + x_3 = 8$ $2x_1 + 3x_2 + 4x_3 = 20$ $4x_1 + 3x_2 + 2x_3 = 16$		4	NA
11	Using secant method, the first four approximation to a root of equation $x^3 - 5x - 7 = 0$, if $x_0 = 2.5$ and $x_1 = 3$		4	NA
12	By using Bisection method, solve equation, $x^3 - 3x + 1 = 0$ (given root belongs to interval $[0, 1]$)		4	NA

UNIT-6 NUMERICAL METHODS-II

Sr. No.	Question	CO No.	Marks	University Year			
1	1 Solve the differential equation $2 \frac{d^2y}{dx^2} = 3x \frac{dy}{dx} - 9y + 9$; $y(0) = 1, y'(0) = -2$. To estimate y for $x = 0.1$ and $x = 0.2$ using Taylor's series method.	207003.5	4	NA			
2	Use Euler's method to solve the equation, $\frac{dy}{dx} = 1 + xy$ Subject to the condition $y = 1$, at $x = 0$. And tabulate y for $x = (0.1)$ to $x = 0.5$		4	NA			
3	Determine using modified Euler's method the value of y when $x = 0.1$ Given that $\frac{dy}{dx} = x^2 + y, y(0) = 1$		4	NA			
4	Using fourth order Runge Kutta method solve the differential equation $y' = -2ty^2$ Subject to condition $y(0) = 1$ to find y at $t = 0.1$ taking $h =$		4	NA			
5	Find Lagranges interpolating polynomial passing through set of points <table border="1" style="display: inline-table; margin-left: 20px;"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> </tr> </table>		x	0	1	2	4
x	0	1	2				



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	<table border="1" style="display: inline-table;"> <tr> <td>y</td> <td>4</td> <td>3</td> <td>6</td> </tr> </table>	y	4	3	6										
y	4	3	6												
	Use it to find y at $x = 1.5$, $\frac{dy}{dx}$ at $x = 0.5$ and find $\int_0^3 y dx$.														
6	Find a polynomial passing through points (0,1), (1,1), (2,7), (3,25), (4,61), (5,121). Using Newtons interpolation formula and hence find y and $\frac{dy}{dx}$ at $x = 0.5$	4	NA												
7	Use Trapezoidal rule to numerically evaluate, $I = \int_0^1 x e^{x^2} dx$ by taking $h = 0.1$	4	NA												
8	Evaluate $\int_0^3 \frac{dx}{1+x}$ with 7 ordinates by using Simpsons $\frac{3}{8}$ th rule and hence calculate $\log 2$.	4	NA												
9	Use Simpsons $\frac{1}{3}$ rd rule to obtain $\int_0^{\pi/2} \frac{\sin x}{x} dx$, by dividing The interval into four parts.	4	NA												
10	Find using Euler's method the value of y at $x = 0.4$ in solving Differential equation, $\frac{dy}{dx} = x + y$, with $y(0) = 1$, $h = 0.1$.	4	NA												
11	Evaluate $I = \int_0^{0.4} y dx$ for following data, <table border="1" style="margin-left: 20px;"> <tr> <td>x</td> <td>0</td> <td>0.1</td> <td>0.2</td> <td>0.3</td> <td>0.4</td> </tr> <tr> <td>y</td> <td>0.1</td> <td>0.3</td> <td>.75</td> <td>0.9</td> <td>1</td> </tr> </table> By using, Trapezoidal rule Simpson's $\frac{1}{3}$ rd rule Simpson's $\frac{3}{8}$ th rule Notice the difference between numerical value of integral solved by using them.	x	0	0.1	0.2	0.3	0.4	y	0.1	0.3	.75	0.9	1	4 4 4	NA
x	0	0.1	0.2	0.3	0.4										
y	0.1	0.3	.75	0.9	1										



Curriculum

2. Name of the Course: Data Structures and algorithms (210252)

Weekly Work Load(in Hrs)	Lecture	Tutorial	Practical
	03		04

Online/ In-sem	Theory	Practical	Oral	Term-work	Total Marks	Credit
30	70	25	-	25	150	05

Course Objectives

- To develop a logic for graphical modeling of the real life problems.
- To suggest appropriate data structure and algorithm for graphical solutions of the problems.
- To understand advanced data structures to solve complex problems in various domains.
- To operate on the various structured data
- To build the logic to use appropriate data structure in logical and computational solutions.
- To understand various algorithmic strategies to approach the problem solution.

Course Outcomes

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

C213.1 Identify and articulate the complexity goals and benefits of a good hashing scheme for real- world applications

C213.2 Apply non-linear data structures for solving problems of various domain.

C213.3 Design and specify the operations of a nonlinear-based abstract data type and implement them in a high-level programming language.

C213.4 Analyze the algorithmic solutions for resource requirements and optimization

C213.5 Use efficient indexing methods and multiway search techniques to store and maintain data

C213.6 Use appropriate modern tools to understand and analyze the functionalities confined to the secondary storage



University Syllabus

Unit	<u>Course Contents</u>	<u>Hours</u>
I	<u>Introduction to data structures and algorithms</u>	07
	<p>Introduction: From Problem to Program (Problem, Solution, Algorithm, Data Structure and Program). Data Structures: Data, Information, Knowledge, and Data structure, Abstract Data Types (ADT), Data Structure Classification (Linear and Non-linear, Static and Dynamic, Persistent and Ephemeral data structures).</p> <p>Algorithms: Problem Solving, Introduction to algorithm, Characteristics of algorithm, Algorithm design tools: Pseudo-code and flowchart. Complexity of algorithm: Space complexity, Time complexity, Asymptotic notation- Big-O, Theta and Omega, finding complexity using step count method, Analysis of programming constructs-Linear, Quadratic, Cubic, Logarithmic. Algorithmic Strategies: Introduction to algorithm design strategies- Divide and Conquer, and Greedy strategy.</p>	
II	Linear Data Structures and using Sequential organization	07
	<p>Concept of Sequential Organization, Overview of Array, Array as an Abstract Data Type, Operations on Array, Merging of two arrays, Storage Representation and their Address Calculation: Row major and Column Major, Multidimensional Arrays: Two-dimensional arrays, n-dimensional arrays. Concept of Ordered List, Single Variable Polynomial: Representation using arrays, Polynomial as array of structure, Polynomial addition, Polynomial multiplication.</p>	
III	Searching and Sorting	07
	<p>Searching: Search Techniques-Sequential Search/Linear Search, Variant of Sequential Search- Sentinel Search, Binary Search, Fibonacci Search, and Indexed Sequential Search.</p> <p>Sorting: Types of Sorting-Internal and External Sorting, General Sort Concepts-Sort Order, Stability, Efficiency, and Number of Passes, Comparison Based Sorting Methods-Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Shell Sort, Non-comparison Based Sorting Methods-Radix Sort, Counting Sort, and Bucket Sort, Comparison of All Sorting Methods and their complexities</p>	
IV	Linked List	07
	<p>Introduction, of Linked Lists, Realization of linked list using dynamic memory management, operations, Linked List as ADT, Types of Linked List: singly linked, linear and Circular Linked Lists, Doubly Linked List, Doubly Circular Linked List, Primitive Operations on Linked List- Create, Traverse, Search, Insert, Delete, Sort, Concatenate. Polynomial</p>	



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	Manipulations-Polynomial addition. Generalized Linked List (GLL) concept, Representation of Polynomial using GLL.	
V	Stack	07
	Basic concept, stack Abstract Data Type, Representation of Stacks Using Sequential Organization, stack operations, Multiple Stacks, Applications of Stack- Expression Evaluation and Conversion, Polish notation and expression conversion, Need for prefix and postfix expressions, Postfix expression evaluation, Linked Stack and Operations. Recursion- concept, variants of recursion- direct, indirect, tail and tree, backtracking algorithmic Strategy, use of stack in backtracking.	
VI	Queue	07
	Basic concept, Queue as Abstract Data Type, Representation of Queue using Sequential organization, Queue Operations, Circular Queue and its advantages, Multi-queues, Linked Queue and Operations. Deque-Basic concept, types (Input restricted and Output restricted), Priority Queue-Basic concept, types (Ascending and Descending).	



Teaching Plan

Detail Schedule / Plan of conduction of assessment tool:

Units	Co No.	Assessment Tool	Marks	Schedule
I	213.01	Assignment 1	10	1 st week of Feb. 2020
I & II	213.2	Test 1	20	2 nd week of march 2020
	213.3	Test 2	20	1st week of April 2020
V&VI	213.4	Test	50	2 nd week of Apr 2020

Question bank:

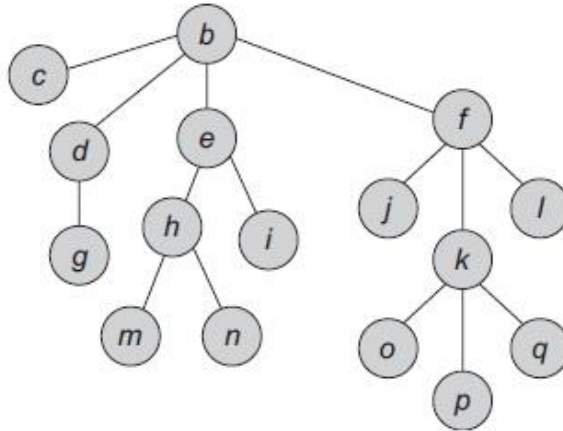
UNIT I-Question Bank

1. What is Inorder Traversal ? Write the recursive function Inorder Traversal.
2. Construct a binary tree using the following two traversals:
Inorder : D B H E A I F J C G

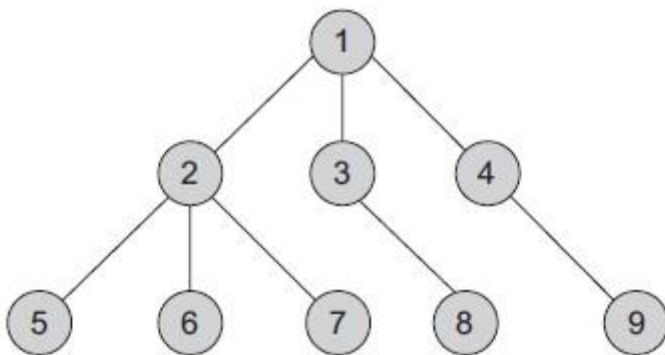
Sr. No.	Unit	Broad Topics to be Covered	Total Lecture Planned
1	III	Hash Table, hash functions, Collision resolution strategies, Dictionary as ADT, Skip List	07
2	II	Adjacency matrix, adjacency list, Traversals, minimum spanning tree, Dijkstra Single source shortest path	07
3		Tree Basic terminology, Binary tree, traversals, Binary Search Tree (BST), Threaded Binary Tree (TBT)	07
4	IV	Symbol Table, Introduction to Dynamic Programming, Optimal Binary Search Tree (OBST), Height Balanced Tree-AVL tree	07
5	V	Indexing and Multi way Trees, Types of search tree, Set ADT, Heap	07
6	VI	Sequential file organization, Direct Access File, Indexed sequential file organization, Linked Organization	07

Preorder: A B D E H C F I J G

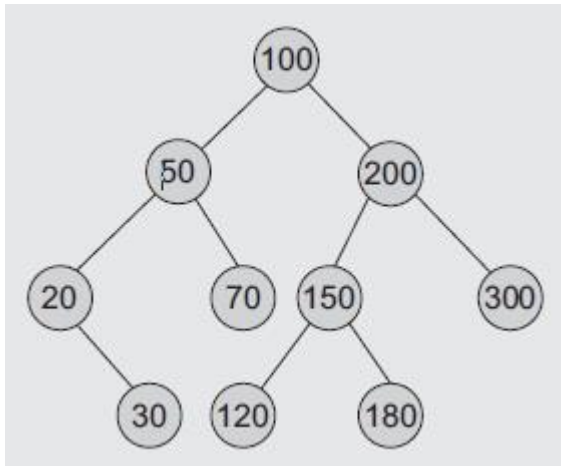
3. Convert the general tree in into its corresponding binary tree.



4. Write the C++ or C code for the function to insert a node in BST.
5. What is Binary Search Tree and write its properties.
6. Represent $AB + D * EFAD * + / + C +$ as an expression tree.
7. What is meant by Huffmans algorithm.
8. What is Depth-first Traversal and write C++ function for it.
9. Write C++ function for Breadth-first Traversal.
10. Write C++ code for non-recursive preorder.
11. Write the merits of representing binary trees using arrays
12. Write the demerits of representing binary trees using arrays
13. Convert the following tree in into a binary tree.



14. Write the inorder, postorder, and preorder



15. Difference Between Binary Tree and Binary Search Tree

16. What is the difference between Complete Binary Tree and Full Binary Tree?

17. **What is meant Threaded Binary Tree ?**

18. **write a C++ function to create inorder threaded binary search tree**

19. **Write C++ code for non-recursive preorder.**

20. Write algorithm for postfix expression from left to right.

21. Using

Inorder: 20 30 50 70 100 120 150 180 200 300

Postorder: 30 20 70 50 120 180 150 300 200 100

Draw the binary search tree.

22. What is the difference between avl tree and binary search tree?

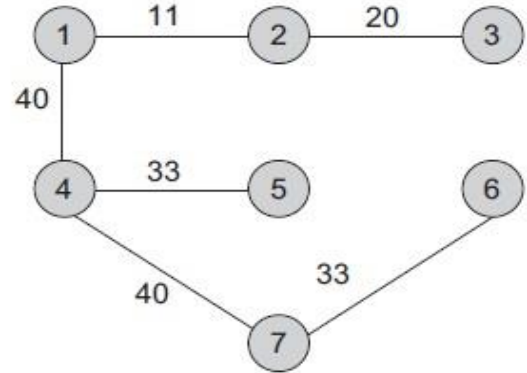
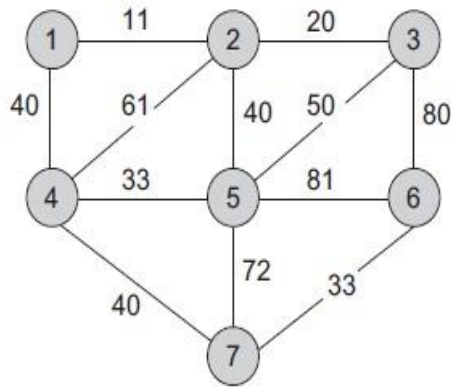
23. Draw BST using given expression $((A * B) + (C - D)) / (C - E)$

24. Write the advantages of threaded binary tree over a non-threaded binary tree.

UNIT II-Question Bank

Q. 1 Explain what is meant by Adjacency List

Q.2 Construct minimum spanning tree using Prim's algorithm.



Q.3 Write C++ Code for to find Shortest distance using Dijkstra's algorithm

Q.4 Define Adjacency matrix

Q.5 Define Spanning tree

Q.6 Explain directed graph with example.

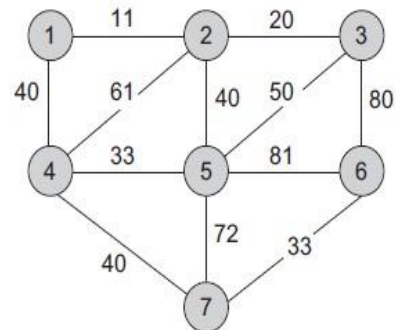
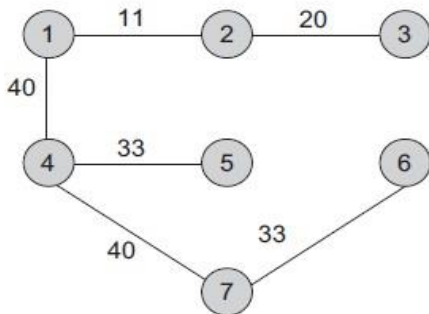
Q.7 Explain **Undirected Graph with example.**

Q.8 Difference between directed and undirected graph.

Q.9 Difference between BFS and DFS.

Q.10 Define Adjacency multilist

Q.11 Construct minimum spanning tree using Kruskal's Algorithm



Q.12 Write C++ programs to implement the Prim's algorithm to generate a minimum cost spanning tree

Q.13 What is the difference between Kruskal's and Prim's Algorithm?

Q.14 Define Dijkstra's algorithm.

Q.15 Write C++ programs to implement the kruskals algorithm to generate a minimum cost spanning tree

Q.16 Define Warshall's algorithm

Q.17 Write recursive algorithm for DFS

Q.18 Write DFS traversal in C++ where the graph is stored as an adjacency matrix.

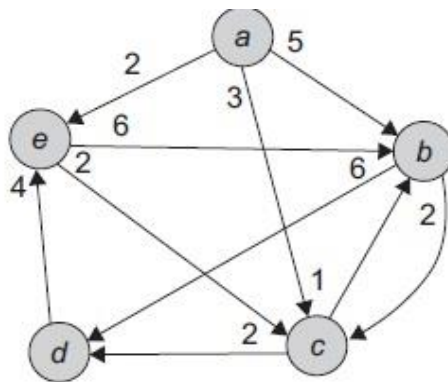
Q.19 Write BFS traversal in C++ where the graph is stored as an adjacency matrix.

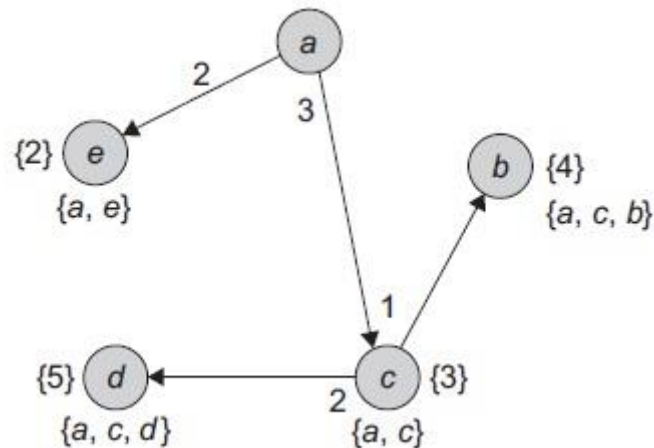
Q.20 Difference between adjacency list and adjacency matrix

Q.21 What is the difference between time complexity of Prims and kruskals algorithm

Q.22 Define inverse adjacency list.

Q.23 Compute the shortest path between a and all other vertices





- Q. 24 What is the need of an adjacency matrix? How it differs from an adjacency lists? Explain them briefly.
- Q. 25 Write and explain the Prim's and Kruskal's algorithms with an example.
- Q. 26 What is spanning Tree? Explain the procedure for obtaining the minimum cost spanning tree using Prim's algorithm.
- Q. 27 What is hash function? Discuss about different hashing functions.
- Q. 28 What is closed hashing? How to analyze the time complexity for closed hashing.
- Q. 29 What is DFS? Give examples.
- Q. 30 Write a non recursive procedure for Depth first search.
- Q. 31 Write the algorithm, discuss and analyze the DFS recursive and non recursive traversal algorithms using a simple graph.
- Q. 32 Define Graph. How to represent a graph? Explain various basic operations performed on a graph with sample code and example.
- Q. 33 Write and explain the Dijkstra's algorithm with an example.
- Q. 34 Write the applications of DFS & BFS
- Q. 35 What are the Applications of minimum cost spanning trees?
- Q. 36 Write the Differences between spanning tree and minimum spanning tree.



UNIT III-Question Bank

- Q.1 What is hashing?
- Q.2 What are issues in hashing ?
- Q.3 Explain Open addressing and state its types.
- Q.4 Store the following data into a hash table of size 10 and bucket size 1.
Use linear probing for collision resolution.
12, 01, 04, 03, 07, 08, 10, 02, 05, 14
Assume buckets from 0 to 9 and bucket size = 1 using hashing function $key \% 10$.
- Q.5 Store the following data into a hash table of size 10 and bucket size 1.
Use linear probing for collision resolution.
12, 01, 04, 03, 07, 08, 10, 02, 05, 14
Assume buckets from 0 to 9 and bucket size = 1 using hashing function $key \% 10$.
- Q.6 Suppose $Max = 8$ and keys A, B, C, D have hash values $Hash(A) = 3$,
 $Hash(B) = 0$, $Hash(C) = 4$, and $Hash(D) = 3$. Use linear probing for collision resolution.
- Q.7 Define Quadratic Probing
- Q.8 Define Double Hashing
- Q.9 Let the hash function be $Key \% 10$, $Max = 10$, and the keys be 12, 01, 18, 56, 79, 49. Perform double hashing.
- Q.10 Comparison of chaining and rehashing
- Q.11 Define **Rehashing**
- Q.12 Define Load Density and Load Factor.
- Q.13 Differences between hashing and skip lists:
- Q.14 What is the difference between linear probing with and without replacement.
- Q.16 Define Open or external hashing and Closed or internal hashing
- Q.17 Defines a function for inserting a record using linear probing without replacement.
- Q.18 Difference between open and closed hashing.
- Q.19 What is hash and perfect hash function ?
- Q.20 Define Good function and its features.
- Q.21 Define the following terms.



UNIT IV-Question Bank

- 1) A size-balanced binary tree in which for every node, the difference between the number of nodes in the left and right subtree is utmost 1. The distance of a node from the root is the length of path from the root to the node. The height of a binary tree is the maximum distance of a leaf node from the root.
 - Prove by using induction on h that a size-balanced binary tree of height h contains at least 2^h nodes.
 - In a fixed-balanced binary tree of height $h \geq 1$, how many nodes are at distance $h - 1$ from the root?
- (a) In a binary tree, a full node is defined to be a node with two children. Use induction on the height of the binary tree to prove that the number of full nodes plus one is equal to the number of leaves.
- (b) Draw the min-heap that results from the insertion of the following elements in order into an initially empty min-heap: 7, 6, 5, 4, 2, 3, 1. Show the result after the deletion of the root of this heap.
- 2) Consider the following array and draw the heap that this array represents.

90	80	40	50	60	10	20	30
----	----	----	----	----	----	----	----

- 3) What is OBST? Derive the various equations to calculate the cost and weight of each node in OBST. Write the pseudo-C code for the OBST algorithm.
- 4) Insert the following numbers in an AVL tree and show at each stage the required transformations:-
50, 60, 108, 8, 0, 48, 32, 40

Show the BF of each node throughout the process.
- 5) Compare OBST with AVL tree.
- Give one example for each of the four types of rotations possible in an AVL tree.
- 6) Consider a list of subjects studied in a computer engineering course.

Assume that the insertions are made in the following order:

MP, MBS, MMT, NCP, AI, ACA, OPCS, DC, DS, OOP, OOMD



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7) find an OBST using a dynamic programming for $n = 4$ and keys $(k_1 = k_2 = k_3 = k_4) = \{\text{do, if, int, while}\}$ given that $p(1:4) = (3, 3, 1, 1)$ and $q(0:4) = (2, 3, 1, 1, 1)$.

8) Given the keys $= \{\text{while, do, if}\}$ and probabilities $p(i) = q(i) = 1/7$ for all i . Compute the cost of all possible BSTs and find the OBST.

9) Write a Insertion Operation in AVL. Give the example.

10) Construct an AVL tree for the following data:

30, 31, 32, 23, 22, 28, 24, 29, 26, 27, 34, 36

11) Construct an AVL tree for the set of keys $= \{50, 55, 60, 15, 10, 40, 20, 45, 30, 70, 80\}$.

12) Write a Deletion Operation in AVL. Give example.

13) demonstrates the working procedure to balance a BST. Let us write an algorithm for it. In general, a node in a tree stores data of and pointers to the left and right children. In an AVL tree, each node stores these three fields. To simplify the work, we can store the height of its subtree in each node. Hence, we will define each AVL tree node having as four fields.

Consider an AVL tree node that has the following structure

14) Explain Dynamic Programming.

15) Give Recursive solution for OBST.

16) Find the optimal binary search tree for $N = 6$, having keys $k_1 \dots k_6$ and weights $p_1 = 10, p_2 = 3, p_3 = 9, p_4 = 2, p_5 = 0, p_6 = 10; q_0 = 5, q_1 = 6, q_2 = 4, q_3 = 4, q_4 = 3, q_5 = 8, q_6 = 0$. The following figure shows the arrays as they would appear after the initialization and their final disposition.

17) Write a pseudo C/C++ code for LR rotations in AVL Trees.

18) Write non-recursive functions for insertion and deletion for AVL Trees.

19) Enlist the names of static tree tables with suitable example.

20) Consider the data (case,for,if,main,of) which an OBST is to be built. The success probabilities are (2,4,5,6,3). The failure probabilities are (3,2,6,5,4,1). Construct the equivalent OBST and display the cost.

21) Insert the following sequence of keys into an AVL tree. Find out the type of rotation required in each case (1 2 3 4 8 7 6 5 11 10 12)

22) Draw a maximum height AVL tree with 7 nodes.



23) Starting an empty binary tree, obtain the height balance tree on the following sequence of insertions: DEC, JAN, APR, MAR, JUL, AUG, OCT, FEB, NOV, MAY, JUN.

24) Construct the AVL tree for the following data by inserting each data item one at a time.
15, 20, 24, 10, 13, 7, 30, 36, 25.

UNIT V-Question Bank

1) What is a B-tree? Draw the tree B-tree of order 3 created by inserting data arriving in the following sequence:

82, 14, 7, 8, 12, 9, 23, 5, 6, 16, 19, 20, 78

2) Why do we need index file? Compare the linear and tree index organization. What are static and dynamic indices?

3) Explain the steps to build a B-tree of order 5 for the following data:

78, 21, 14, 11, 97, 85, 74, 63, 45, 42, 57, 20, 16, 19, 52, 30, 21

4) Draw diagrams to show the different stages during the building of a B⁺ tree for the keys arriving in the following sequence: A, Z, B, Y, C, X, D, W, E, V, F, M, R.

5) In each case of question 4, show the balance factors of all nodes and name the type of rotation used for balancing.

• 6) Explain splay tree and its type.

7) Compare B-tree and B⁺ tree.

8) Write a C⁺⁺ code for Searching in a B-tree

9) Sort the following in ascending order using heap sort:

15, 10, 40, 25

10) Explain Insertion of node in B⁺ tree

11) Sort the following using heap sort:

48, 0, -1, 82, 108, 72, 54

12) Write a C⁺⁺ code for Traversing a trie and print in lexical order.

13) Build the min heap for following data:



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25, 12, 27, 30, 5, 10, 17, 29, 40, 35

- 14) Write a C++ code for Counting the nodes in a B-tree
- 15) Explain Red-Black tree in detail.
- 16) What are the advantages of the variations of balanced binary tree—splay tree, KD tree, and red-black tree?
- 17) Write a C++ code for Inserting and deleting in a B-tree.
- 18) What is a B+ tree ? Give structure of its internal node.
- 19) Create a three way B Tree by inserting following data one at a time
5, 3, 21, 9, 1, 13, 2, 7, 10, 12, 4, 8
- 20) Give the order and characteristics of B+ tree
- 21) Explain Cylinder surface indexing in detail.
- 22) Give the properties of Red Black tree.
- 23) Explain how Deletion of node from B+ tree.
- 24) Write a pseudo code to sort data in ascending order using heap sort.
- 25) Create a B tree of order 3 for the following data:
20, 10, 30, 15, 12, 40, 50

Unit VI-Question Bank

- 1) A file of employees records, has 'employee no' as a primary key and the 'department code' and the 'designation code' as the secondary keys. Write a procedure to answer the following query— 'Which employees from systems department are above designation level 4?'
- 2) What is a file. Explain with Example.
- 3) Write short notes on:
 - Factors affecting the file organization
 - Indexed sequential files
 - Indexing techniques
- 4) Compare sequential, indexed sequential, and direct access files.



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- 5) Describe the basic types of file organization each with one example.
- 6) Explain link organization.
- 7) Define clustering indices in details.
- 8) Write notes on:
 - Inverted files
 - Cellular partition
- 9) What is a multi-index file? Give suitable examples.
- 10) Explain types of Indices in details.
- 11) Explain any three operations carried out on sequential file.
- 12) Explain the various modes on opening the file in C & C++.
- 13) Compare sequential file organization with direct access file organization. Write a C implementation of primitives for either of the two organizations.
- 14) Give the Primitive Operation On file in detail.
- 15) Define sequential file organization.
- 16) What are indexed files? Explain with a suitable example. Compare sequential and direct access files.
- 17) Explain inverted File Organisation.
- 18) Give the Factors Affecting File Organization.
- 19) State the advantages, disadvantages, and primitive operation of sequential files.



Name of the Course: Software Engineering (210253)

Weekly Work Load(in Hrs)	Lecture	Tutorial	Practical
	03		

Online/ In-sem	Theory	Practical	Oral	Term-work	Total Marks	Credit
30	70				100	03

Course Objectives:

- The main objective of this course is to introduce the students to software engineering- the fundamentals of software engineering principles and practices, including project management, configurations management, requirements definition, system analysis, design, testing, and deployment with hands-on experience in a group software development project.
- To learn and understand the principles of Software Engineering.
- To be acquainted with methods of capturing, specifying, visualizing and analyzing software requirements.
- To apply design and testing principles to software project development.
- To understand project management through life cycle of the project.

Course Outcomes:

On completion of the course, learner will be able to-

CO1: Analyze software requirements and formulate design solution for a software.

CO2: Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.

CO3: Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.

CO4: Model and design User interface and component-level.

CO5: Identify and handle risk management and software configuration management.

CO6: Utilize knowledge of software testing approaches, approaches to verification and validation.

CO7: Construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain efficient, reliable, robust and cost-effective software solutions.



University Syllabus:

Unit	<u>Course Contents</u>
	<p style="text-align: center;">UNIT – I</p> <p>Topic – Software Engineering Fundamentals: Introduction to software engineering, The Nature of Software, Defining Software, Software Engineering Practice. Software Process: A Generic Process Model, defining a Framework Activity, Identifying a Task Set, Process Patterns, Process Assessment and Improvement, Prescriptive Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, A Final Word on Evolutionary Processes. Unified Process, Agile software development: Agile methods, plan driven and agile development.</p>
	<p style="text-align: center;">UNIT – II</p> <p>Topic – Software Requirements Engineering and Analysis</p> <p>Modeling: Requirements Engineering, Establishing the Groundwork, Identifying Stakeholders, Recognizing Multiple Viewpoints, working toward Collaboration, Asking the First Questions, Eliciting Requirements, Collaborative Requirements Gathering, Usage Scenarios, Elicitation Work Products, Developing Use Cases, Building the Requirements Model, Elements of the Requirements Model, Negotiating Requirements, Validating Requirements. Suggested Free Open Source tools: StarUML, Modelio, SmartDraw.</p>
	<p style="text-align: center;">UNIT – III</p> <p>Topics – Estimation and Scheduling</p> <p>Estimation for Software Projects: The Project Planning Process, Defining Software Scope and Checking Feasibility, Resources management, Reusable Software Resources, Environmental Resources, Software Project Estimation, Decomposition Techniques, Software Sizing, Problem-Based Estimation, LOC-Based Estimation, FP-Based Estimation, Object Point (OP)-based estimation, Process-Based Estimation, Process-Based Estimation, Estimation with Use Cases, Use-Case—Based Estimation, Reconciling Estimates, Empirical Estimation Models, The Structure of Estimation Models, The COCOMO II Mode, Preparing Requirement Traceability Matrix Project Scheduling: Project Scheduling, Defining a Task for the Software Project, Scheduling. Suggested Free Open Source Tools: Gantt Project, Agantty, Project Libre.</p>
	<p style="text-align: center;">UNIT – IV</p> <p>Topics – Design Engineering</p> <p>Design Concepts: Design within the Context of Software Engineering, The Design Process,</p>



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Software Quality Guidelines and Attributes, Design Concepts - Abstraction, Architecture, design Patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Refinement, Aspects, Refactoring, Object-Oriented Design Concept, Design Classes, The Design Model , Data Design Elements, Architectural Design Elements, Interface Design Elements, Component-Level Design Elements, Component Level Design for Web Apps, Content Design at the Component Level, Functional Design at the Component Level, Deployment-Level Design Elements. Architectural Design: Software Architecture, What is Architecture, Why is Architecture Important, Architectural Styles, A brief Taxonomy of Architectural Styles. Suggested Free Open Source Tool: Smart Draw

UNIT – V

Topics – Risk and configuration Management

Risk Management: Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Monitoring, and Management, The RMMM Plan. Software Configuration Management: Software Configuration Management, The SCM Repository The SCM Process, Configuration Management for any suitable software system. Suggested Free Open Source Tools: CF Engine Configuration Tool, Puppet Configuration Tool.

UNIT – VI

Topics – Software Testing

A Strategic Approach to Software Testing, Verification and Validation, Organizing for Software Testing, Software Testing Strategy—The Big Picture, Criteria for Completion of Testing, Strategic Issues, Test Strategies for Conventional Software, Unit Testing, Integration Testing, Test Strategies for Object-Oriented Software, Unit Testing in the OO Context, Integration Testing in the OO Context, Test Strategies for WebApps, Validation Testing, Validation-Test Criteria, Configuration Review. Suggested Free Open Source Tools: Selenium, JUnit.



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Internal Assessment Tools (20% Weightage)

Sr. No.	Assessment Tool	Total in number	Marks
1	Class Test (T1 to T3)	(T1-20 marks + T2-20 marks + T3-50 marks)	90
2	Assignment I	20 marks	20
3	Knowledge Survey	20 marks	20
Total			130

Assessment tools

Class Tests (T1 to T3), each of 20 marks.

Knowledge Survey (KS)–

20 questions of 1 mark each to check if the student has understood the concept/topic.

Assignment (A1), of 20 marks

Teaching Plan

Sr. No	Unit	Broad Topic to be covered	Books Referred	Total Lectures Planned	Mode of Delivery
1	I	Software Process Models	T1 & T2	6	Discussion, Presentations and Video
2	II	Software Requirement Engineering & Analysis	T1 & T2	7	Discussion, Presentations and Video
3	III	Estimation and Scheduling	T1 & T2	7	Discussion, Presentations and Video
4	IV	Design Engineering	T1 & T2	7	Discussion, Presentations and Video
5	V	Risk & Configuration Management	T1 & T2	7	Discussion, Presentations and Video
6	VI	Software Testing	T1 & T2	7	Discussion, Presentations and Video



Text Books

- T1 Roger Pressman, "Software Engineering: A Practitioner's Approach/111, McGraw Hill, ISBN 0-07-337597-7
- T2 Ian Sommerville, "Software Engineering" II, Addison and Wesley, ISBN 0-13-703515-2

Reference Books

- R1 Carlo Ghezzi, "Fundamentals of Software Engineering", PHI, ISBN-10: 0133056996
- R2 Rajib Mall, "Fundamentals of Software Engineering"II, PHI, ISBN-13: 978-8120348981
- R3 Pankaj Jalote, "An Integrated Approach to Software Engineering"II, Springer, ISBN 13: 9788173192715.
- R4 S K Chang, "Handbook of Software Engineering and Knowledge Engineering"II, World Scientific, Vol I, II, ISBN: 978-981-02-4973-1
- R5 Eldad Perahia, Robert Stacey, "Next Generation Wireless LANs", Cambridge, ISBN-10: 1107016762; ISBN-13: 978-1107016767
- R6 Tom Halt, "Handbook of Software Engineering", Clanye International ISBN-10: 1632402939

Question Bank

Module 1

- Q.1)** What are the design issues of layer? Explain it. **(Aug 17)**
- Q.2)** What are the different network devices? Explain difference between switch and hub. **(Aug 17, Dec 17)**
- Q.3)** What is encoding? Give the Manchester line code and differential Manchester code for the bit sequence : 1100110. **(Aug 17)**
- Q.4)** Differentiate between OSI and TCP/IP reference model. **(Dec 17, May 18)**
- Q.5)** Represent 101011100 using Manchester and differential Manchester line coding technique. **(Dec 17)**
- Q.6)** Explain in brief FHSS and DSSS. **(Dec 17, May 18, Dec 18)**
- Q.7)** What are different type of topology? Explain any one. **(Dec 18)**
- Q.8)** For the bit sequence 10000101111 draw the waveform for
- (i) Manchester Encoding
 - (ii) Differential Manchester Encoding. **(Dec 18)**



Module 2

Q.1) Compare and contrast the Go Back N ARQ protocol with Selective Repeat ARQ. **(Aug 17, Dec 17, May 18, Dec 18)**

Q.2) Explain control field of HDLC w.r.t. I-frame, S-frame and U-frame. **(Aug 17, Dec 17, May 18)**

Q.3) The data word 1101011011 is to be sent using generator polynomial $x^4 + x + 1$. Use CRC to compute the code word at the sender side. **(Aug 17)**

Q.4) A bit stream 1001101 is transmitted using an hamming code. Show the actual bit string transmitted. Suppose 7th bit from left is inverted during transmission, show that this error is detected and corrected at the receivers end. **(Dec 17)**

Q.5) Explain the working of cyclic redundancy check (CRC) using the following example (show the complete steps of division).

Data Bit: 1101110110

Generator polynomial : $x^3 + x + 1$.

Write the redundant bits that will be sent along with the data bits. **(Dec 18)**

Q.6) In a stop-and-wait system, the b/w of the line is 2 Mbps and 1 bit takes 20 milliseconds to make a round trip. What is the b/w delay product? If the system data packets are 2000 bits in length, What is the utilization percentage of the link? **(Dec 17, May 18)**

Q.7) Calculate the throughput for stop and wait protocol, If the frame size is 4800 bits, bit rate is 9600bps, within distance 2000km with speed of propagation 200000 km/s. **(May 18)**

Q.8) In a stop-and-wait system, the b/w of the line is 1 Mbps and 1 bit takes 10 milliseconds to make a round trip. What is the b/w delay product? If the system data packets are 1000 bits in length, What is the utilization percentage of the link? **(Dec 18)**



Module 3

- Q.1)** Explain working of CSMA/CD. **(Aug 17, May 18)**
- Q.2)** Draw flowchart of CSMA/CA. **(Dec 17)**
- Q.3)** Explain in brief: FHSS and DSSS. **(Dec 17, May 18, Dec 18)**
- Q.4)** Draw and explain frame format of 802.16. **(Aug 17)**
- Q.5)** Explain Bluetooth 802.15 frame format. **(May 18)**
- Q.6)** Explain 802.11 wireless frame format. **(Dec 18)**
- Q.7)** Explain MAC 802.3 frame format. **(Dec 18)**
- Q.8)** Build and Consider a CSMA/CD network running at 1 Gbps over a 1km cable with no repeaters. The signal speed in the cable is 2,00,000 km/sec, what is the minimum frame size?
(Aug 17)
- Q.9)** Write short note on: Wireless LAN.
- Q.10)** Explain WLAN Architecture.
- Q.11)** What are the principal of Ad-hoc routing protocol?
- Q.12)** Explain 802.11 wireless frame format in detail.
- Q.13)** Explain the working MACA and MACW protocol with neat diagram.
- Q.14)** A slotted ALOHA network transmit 200-bit frames using a shared channel with a 200-kbps bandwidth. Find the throughput if the system (All stations together) produce:
1. 1000 frames per second **(Dec 17)**
 2. 500 frames per second
- Q.15)** Explain the Ethernet and their different types.

Module 4

- Q.1)** Suppose a router has built up the routing table shown below. The router can deliver packet directly over interface 0 or 1 or it can forward packets to router R2, R3 or R4. Describe what the router does with a packet addressed to each of the following destinations? 1. 128.96.39.10
(May 16)



2. 128.96.40.12
3. 128.96.40.151
4. 192.4.153.17
5. 192.4.153.90

Subnet Number	Subnet Mask	Next Hop
128.96.39.0	255.255.255.128	Interface 0
128.96.39.0	255.255.255.128	Interface 1
128.96.40.0	255.255.255.128	R2
192.4.153.0	255.255.255.192	R3
(Default)		R4

Q.2) What is fragmentation in IPv4? Explain with example. An IPv4 datagram arrives with fragmentation offset of 0 and an Mbit (More fragment bit) of 0. Is this a first fragment, middle fragment or last fragment?
(May 16, Dec 17)

Q.3) Explain design issue of network layer. **(Dec 09, Dec 11, Dec 13)**

Q.4) Explain switching techniques used in computer data communication. **(Dec 05, Dec 11, Dec 13, May 11)**

Q.5) Write short note on: Routing Algorithm. **(Dec 09, Dec 13, Dec 11)**

Q.6) Mention the different routing algorithm, Give different between static and dynamic routing algorithm with suitable example. **(Dec 06)**

Q.7) Explain the flooding routing algorithm with example.

Q.8) Explain distance vector routing algorithm.

Q.9) Explain in detail working principal behind distance vector and link state routing.

Q.10) What is count to infinity problem? Explain with suitable example.

Q.11) Discuss the link state routing algorithm with example.

Q.12) Explain congestion. How do we control the same? Which packet are used practically for this purpose? At what layer this is done?

Q.13) Describe working of ARP with suitable example.

Q.14) A IP header from an IP packet received at destination 4500003c1c4640004006b16ac100a63 ac100a0c. Map these values to IP header and explain all bits.

Q.15) For the address 132.7.21.84 find the types of network and network address.



Q.16) A Company is granted a site address 201.70.64.0. The company needs six subnets. Design the subnets.

Module 5

Q.1) Build for each of the following applications determine whether TCP or UDP is used as the used as the transport layer protocol and explain the reason for your choice.

- a) Watching a real time streaming video **(Nov 17)**
- b) Web browser
- c) A voice over IP (VOP) telephone conversation
- d) You Tube video

Q.2) What are general techniques to improve quality of service? Explain any one in detail. **(Nov 17, May 18)**

Q.3) What causes silly window syndrome? How it is avoided? Explain. **(Nov 17, May 18, Nov 18)**

Q.4) What type of socket? Explain various socket primitives used in connection oriented client server approach. **(Nov 17, May 18, Nov 18)**

Q.5) Explain UDP header, below is an hexadecimal dump of an UDP datagram captured. e2 a7 00 0D 00 20 74 9e 0e ff 00 00 00 01 00 00 00 00 00 00 06 69 73 61 74 70 00 00 01 00 01 **(Nov 17)**

Q.6) Explain TCP header in detail. **(May 18)**

Q.7) Explain UDP header in detail. **(May 18)**

Q.8) Differentiate between TCP and UDP protocol. **(Nay 18)**

Q.9) Explain state transition diagram of TCP. **(Nov 18)**

Q.10) Explain Token Bucket Algorithm. **(Dec 15)**

Q.11) Explain Leaky Bucket Algorithm. **(Dec 15)**

Q.12) What is QoS? **(May 15)**

Q.13) Write short note on SCTP header.

Q.14) Write short note on Fast Transmit.



Q.15) Why TCP need for different timers? Explain the function of each.

Q.16) A computer on a 6-Mbps network is regulated by token bucket. Token bucket filled at a rate of 1 Mbps. It is initially filled to a capacity with 8 megabits. How long can computer transmit at the full 6 Mbps?

Module 6

Q.1) What is different between persistence and non-persistence HTTP? Explain HTTP request and reply message. **(Nov 17)**

Q.2) Write short on DHCP. **(Nov 17, May 18, Nov 18)**

Q.3) Write short on MIME. **(Nov 17, May 18, Nov 18)**

Q.4) Explain DNS message format. **(Nov 17)**

Q.5) Explain FTP, can we specify file transfer in a webpage? Explain with the help of suitable example. **(Nov 17, May 18, Nov 18)**

Q.6) Explain HTTP request and reply message. **(May 18, Nov 18)**

Q.7) Explain various FTP commands. **(Nov 18)**

Q.8) What is DNS? Explain its various resource records with one example. **(Nov 18)**

Q.9) Explain Telnet Control Function.

Q.10) Write short on Telnet.

Q.11) Write short on Webmail.

Q.12) Describe POP commands.

Q.13) Write short on Domain Name Syntax.

Q.14) What are function of Application Layer.



Curriculum

4. Name of the Course: Microprocessor (210254)

Weekly Work Load(in Hrs)	Lecture	Tutorial	Practical
	03		04

Online/ In-sem	Theory	Practical	Oral	Term-work	Total Marks	Credit
30	70	25	-	25	150	05

Course Objectives

- To Describing basics of 80386 programming model with instruction set.
- To Explaining internal system architecture with memory classification.
- To Implementing protection mechanism using multitasking.
- Carrying out concepts of exception & interrupts.

Course Outcomes:

After successful completion of the course, the learner will be able

to- **CO1:** Exhibit skill of assembly language programming for the application. **CO2:** **Classify** Processor architectures.

CO3: **Illustrate** advanced features of 80386 Microprocessor.

CO4: **Compare** and **contrast** different processor modes.

CO5: **Use** interrupts mechanism in applications

CO6: **Differentiate** between Microprocessors and Microcontrollers.

CO7: **Identify** and **analyze** the tools and techniques used to design, implement, and debug microprocessor-based systems.



University Syllabus:

Unit	Course Content
I	80386DX- Basic Programming Model and Applications Instruction Set
	Memory Organization and Segmentation- Global Descriptor Table, Local Descriptor Table, Interrupt Descriptor Table, Data Types, Registers, Instruction Format, Operand Selection, Interrupts and Exceptions Applications Instruction Set- Data Movement Instructions, Binary Arithmetic Instructions, Decimal Arithmetic Instructions, Logical Instructions, Control Transfer Instructions, String and Character Transfer Instructions, Instructions for Block Structured Language, Flag Control Instructions, Coprocessor Interface Instructions, Segment Register Instructions, Miscellaneous Instructions.
II	Systems Architecture and
	Memory Systems Architecture -Systems Registers, Systems Instructions. Memory Management- Segment Translation, Page Translation, Combining Segment and Page Translation.
III	Protection and Multitasking
	Protection- Need of Protection, Overview of 80386DX Protection Mechanisms, Segment Level Protection, Page Level Protection, Combining Segment and Page Level Protection. Multitasking- Task State Segment, TSS Descriptor, Task Register, Task Gate Descriptor, Task Switching, Task Linking, Task Address Space.
IV	Input-Output, Exceptions and Interrupts
	Input- Output- I/O Addressing, I/O Instructions, Protection and I/O Exceptions and Interrupts- Identifying Interrupts, Enabling and Disabling Interrupts, Priority among Simultaneous Interrupts and Exceptions, Interrupt Descriptor Table (IDT), IDT Descriptors, Interrupt Tasks and Interrupt Procedures, Error Code, and Exception Conditions.



V	Initialization of 80386DX, Debugging and Virtual 8086 Mode
	Initialization- Processor State after Reset, Software Initialization for Real Address Mode, Switching to Protected Mode, Software Initialization for Protected Mode, Initialization Example, TLB Testing. Debugging- Debugging Features of the Architecture, Debug Registers, Debug Exceptions, Breakpoint Exception.
VI	80386DX Signals, Bus Cycles and 80387 Coprocessor
	80386DX Signals- Signal Diagram, Description of Signals 80386DX. Bus Cycles- System Clock, Bus States, Pipelined and Non-pipelined Bus Cycles. 80387 NDP- Control Register bits for Coprocessor support, 80387 Register Stack, Data Types, Load and Store Instructions, Trigonometric and Transcendental Instructions, Interfacing signals of 80386DX with 80387

Text Books:

1. Douglas Hall, "Microprocessors & Interfacing", McGraw Hill, Revised 2 Edition, 2006 ISBN 0-07-100462-9
2. A.Ray, K.Bhurchandi, "Advanced Microprocessors and peripherals: Arch, Programming & Interfacing", Tata McGraw Hill, 2004 ISBN 0-07-463841-6
3. Intel 80386 Programmer's Reference Manual 1986, Intel Corporation, Order no.: 231630-011, December 1995.
4. Intel 80386 Hardware Reference Manual 1986, Intel Corporation, Order no.: 231732-001, 1986.
5. James Turley- "Advanced 80386 Programming Techniques", McGraw-Hill, ISBN: 10:0078813425, 13: 978-0078813429.

Reference Books:

1. Chris H. Pappas, William H. Murray, "80386 Microprocessor Handbooks", McGraw-Hill Osborne Media, ISBN-10: 0078812429, 13: 978-0078812422.
2. Walter A. Triebel, "The 80386Dx Microprocessor: Hardware", Software, and Interfacing, Pearson Education, ISBN: 0137877307, 9780137877300.



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3. Brey, Barry B, “8086/8088, 80286, 80386 and 80486 Assembly Language Programming”, Prentice Hall, ISBN: 13: 9780023142475.
4. Mohammad Rafiquzzaman, "Microprocessors: Theory and Applications: Intel and Motorola", Prentice Hall, ISBN:-10:0966498011, 13:978:0966498011.
5. Introduction to 64 bit Intel Assembly Language Programming for Linux, 2nd Edition, Ray Seyfarth, ISBN10: 1478119209, ISBN-13: 9781478119203, 2012.
6. Assembly Language Step-by-step: Programming with Linux, 3rd Edition, Jeff Duntemann, Wiley ISBN:-10 0470497025, ISBN-13: 978-0470497029, 2009.

Teaching Plan

Sr. No.	Unit	Topics to be covered	Total Lectures Planned
1	80386DX- Basic Programming Model and Applications Instruction Set	Memory Organization and Segmentation- Applications Instruction Set- Data Movement Instructions, Miscellaneous Instructions.	9
2	Systems Architecture and Memory Management 09 Hours Systems Architecture	Systems Registers, Systems Instructions. Memory Management- Segment Translation, Page Translation, Combining Segment and Page Translation.	5
3	Protection and Multitasking	Protection- Need of Protection, Overview of 80386DX Protection Mechanisms,. Multitasking- Task State Segment, TSS Descriptor, Task Register	7
4	Input-Output, Exceptions and Interrupts	Need of Protection, Overview of 80386DX Protection Mechanisms:, Concept of DPL, CPL, RPL, EPL. Page Level Protection, Combining Segment and Page Level Protection.	7
5	Initialization of 80386DX, Debugging and Virtual 8086 Mode	Multitasking- Task State Segment, TSS Descriptor, Task Register Task Linking, Virtual Mode – Features, Memory management in Virtual Mode	5
6	80386DX Signals, Bus Cycles and 80387 Coprocessor	Interrupts and Exceptions: Identifying Interrupts, Enabling and Disabling Interrupts, Priority among Simultaneous Interrupts and Exceptions, Interrupt Descriptor Table (IDT), Introduction to Microcontrollers: Architecture, Characteristics and applications of Microcontrollers.	9



Question Bank

Unit I

Sr. No.	Questions
1	Explain the different operating modes of 80386.
2	Explain the various data types supported by 80386.
3	Explain Memory organization and segmentation in 80386DX.
4	Explain how physical address is formed in 80'386 Dx Microprocessor.
5	What is maximum size of segment for 80386DX Microprocessor?Why?
6	List and Explain the iteration control instructions of 80386 Dx microprocesosr.
7	How IMUL is different from MUL?
8	What is the use of bit test and modify instructions.
9	How to define and use the macro in assembly language programming ?
10	Compare procedure and macro in assembly language programming.
11	Explain four different processor control instruction
12	Explain the following instruction of 80386 Dx. a)SLDT b)LEA c)CMP d)Out e)XCHG
13	Differentiate between JMP and CALL instruction.



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Unit-II

Sr. No	Questions
1	Draw the functional block diagram of 80386DX and explain the main functional Units.
2	Describe Call gate descriptor
3	Describe in detail Memory Management Unit of 80386Dx.
4	Define Segment Descriptor.
5	What is LDT descriptor ?
6	What are the different types of descriptors?
7	Draw and explain flag register of 80386 processor
8	Describe in detail of Control Register, Debug Register and Test Register.
9	Explain in brief linear to physical address translation
10	Explain GDT,LDT and IDT.

Unit III

Sr. No	Questions
1	Explain the four level hierarchical protection in 80386 DX Microprocessor.
2	What is DPL,RPL,CPL
3	What is the meaning of privilege level instructions?Explain any two.
4	What are the privilege checks made if accessed area is code,data or stack.
5	How will you access a function from higher privilege level?Explain.
6	How stacks are handled when privilege level is changed through call Gate.
7	Discuss the use of TSS in multitasking
8	What is TSS descriptor?
9	What is the use of task gate descriptor?
10	How does TSS support task switching?
11	What is Nested task?How are they handled in 80386?
12	Write note on Task Address Space.
13	Explain task linear to physical space mapping.



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Unit IV

Sr . No.	Questions
1	What is difference between I/O mapped I/O and Memory mapped I/O.
2	Explain the different I/O instructions in 80386
3	How does I/O permission bit map helps in accessing I/O devices?
4	What is the difference between Interrupt,Fault,trap and Abort.
5	How to handle simultaneous interrupt
5	What happened when interrupt is recognised?
6	Give significance of descriptors in IDT.
7	What is the difference between IVT of Real mode and IDT of protected mode?
8	Explain Error Code and Exception Conditions.

Unit-V

Sr. No	Questions
1	Explain the Reset Activity of the 80386 and self test
2	What is TLB?Explain the use of TLB while accessing the memory
3	What is V-86 mode?Explain in detail.
4	How to switch from protected mode to virtual 86 mode?
5	How will you switch from real mode to protected mode
6	How are exceptions handled in virtual mode?
7	State and explain the difference between all operating modes of 80386.
8	What is significance of debug registers?Explain DR6 and DR7.
9	Explain entering and leaving V86 mode in detail.
10	Explain how to set V86 mode.



Unit -VI

Sr. No	Questions
1	What is function of following signal of 80386DX processor: 1)Byte Enable(0-3) 2)BUSY # 3)READY#
2	What is the use of HOLD and HLDA instruction ?
3	Explain the following 80387 NDP instruction with one example each. 1)Data transfer Group 2)Trigonometric and Transcendental Group. 3)Processor Control Instructions. 4)Compare Group.
4	Explain control word and status word of 80387 NDP
5	Draw and explain the architecture of 80387 NDP.
6	Explain the following instruction of NDP. 1)FBSTP 2)FMUL
7	Draw and explain the architecture of 80387 NDP.
8	Explain working of stack of 80387(NDP)
9	Draw and explain interfacing signals of 80386DX with 80387.
10	Draw the timing diagram of write machine cycle for 80386.Show status of important signals and list activities carried out in sequence.
11	Draw the timing diagram of read machine cycle for 80386.Show status of important signals and list activities carried out in sequence.



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12	What is the differences between pipelined and non pipelined machine cycle
13	What are the characteristics of address pipelining in 80386DX?
14	Draw the timing diagram for write cycle with pipelined address.
15	Draw the timing diagram for read cycle with pipelined address.
16	Explain wait and idle state machine cycle with the help of timing diagram.



Curriculum

5. Name of the Course: Principles of Programming Languages (210255)

Weekly Work Load(in Hrs)	Lecture	Tutorial	Practical
	03		04

Online/ In-sem	Theory	Practical	Oral	Term-work	Total Marks	Credit
30	70	25	-	25	150	05

Course Objectives:

- To learn basic principles of programming languages and programming paradigms.
- To learn structuring the data and manipulation of data, computation and program structure.
- To learn Object Oriented Programming (OOP) principles using Java Programming Language.
- To learn basic concepts of logical and functional programming language.

Course Outcomes:

On completion of the course, learner will be able-

C216.1 Make use of basic principles of programming languages.

C216.2 Develop a program with Data representation and Computations.

C216.3 Develop programs using Object Oriented Programming language : Java.

C216.4 Develop application using inheritance, encapsulation, and polymorphism.

C216.5 Demonstrate Multithreading for robust application development.

C216.6 Develop a simple program using basic concepts of Functional and Logical programming paradigm.

University Syllabus



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UNIT	Content
I	Fundamentals of Programming
	Importance of Studying Programming Languages, History of Programming Languages, Impact of Programming Paradigms, Role of Programming Languages, Programming Environments. Impact of Machine Architectures: The operation of a computer, Virtual Computers and Binding Times. Programming paradigms- Introduction to programming paradigms, Introduction to four main Programming paradigms- procedural, object oriented, functional, and logic and rule based.
II	Structuring the Data, Computations and Program
	Elementary Data Types : Primitive data Types, Character String types, User Defined Ordinal Types, Array types, Associative Arrays, Record Types, Union Types, Pointer and reference Type. Expression and Assignment Statements: Arithmetic expression, Overloaded Operators, Type conversions, Relational and Boolean Expressions, Short Circuit Evaluation, Assignment Statements, Mixed mode Assignment. Statement level Control Statements: Selection Statements, Iterative Statements, Unconditional Branching. Subprograms: Fundamentals of Sub Programs, Design Issues for Subprograms, Local referencing Environments, Parameter passing methods. Abstract Data Types and Encapsulation Construct: Design issues for Abstraction, Parameterized Abstract Data types, Encapsulation Constructs, Naming Encapsulations.
III	Java as Object Oriented Programming Language- Overview
	Fundamentals of JAVA, Arrays: one dimensional array, multi-dimensional array, alternative array declaration statements, String Handling: String class methods, Classes and Methods: class fundamentals, declaring objects, assigning object reference variables, adding methods to a class, returning a value, constructors, this keyword, garbage collection, finalize() method, overloading methods, argument passing, object as parameter, returning objects, access control, static, final, nested and inner classes, command line arguments, variable - length arguments.
IV	Inheritance, Packages and Exception Handling using Java
	Inheritances: member access and inheritance, super class references, Using super, multilevel hierarchy, constructor call sequence, method overriding, dynamic method dispatch, abstract classes, Object class. Packages and Interfaces: defining a package, finding packages and CLASSPATH, access protection, importing packages, interfaces (defining, implementation, nesting, applying), variables in interfaces, extending interfaces, instance of operator. fundamental, exception types, uncaught exceptions, try, catch, throw, throws, finally, multiple catch clauses, nested try statements, built-



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	<p>in exceptions, custom exceptions (creating your own exception sub classes). Managing I/O: Streams, Byte Streams and Character Streams, Predefined Streams, Reading console Input, Writing Console Output, Print Writer class.</p>
V	Multithreading in Java
	<p>Concurrency and Synchronization, Java Thread Model: Thread priorities, Synchronization, Messaging, Main Thread, Creating thread: Implementing Thread using thread class and Runnable interface. Creating multiple threads using is Alive() and join(). Web Based Application in Java: Use of JavaScript for creating web based applications in Java, Introduction to Java script frameworks- ReactJS, VueJS, AngularJS (open source).</p>
VI	Logical and Functional Programming

Teaching Plan

Sr. No.	Unit	Topics to be covered	Total Lectures Planned
1	Fundamentals of Programming	Importance of Studying Programming Languages, Impact and History of Programming Languages, Role of Programming Languages, Programming Environments. Impact of Machine Architectures: Programming paradigms-	7
2	Structuring the Data, Computations and Program	Elementary Data Types :Primitive data Types, User Defined Ordinal Types, Array types, Associative Arrays, Record Types, Union Types, Pointer and reference Type. Arithmetic expression, Overloaded Operators, Statements, Mixed mode Assignment. Statement level Control Statements: Subprograms: passing methods. Design issues for Abstraction,	7
3	Java as Object Oriented Programming Language- Overview	Fundamentals of JAVA, Arrays: one dimensional array, multi-dimensional array, alternative array declaration statements, String Handling: String class methods, Classes and Methods: class fundamentals, declaring objects, assigning object reference variables,	7



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		adding methods to a class, returning a value, constructors, this keyword, garbage collection, finalize() method, overloading methods, argument passing, object as parameter, returning objects, access control, static, final, nested and inner classes, command line arguments, variable - length arguments.	
4	Inheritance, Packages and Exception Handling using Java	Inheritances: Packages and Interfaces: defining a package, finding packages and CLASSPATH, (defining, implementation, nesting, applying), variables in interfaces, extending interfaces, instance of operator. fundamental, exception types, uncaught exceptions, try, catch, throw, throws, finally, multiple catch clauses, nested try statements, built-in exceptions, custom exceptions (creating your own exception sub classes). Managing I/O: Streams, Input, Writing Console Output, Print Writer class.	7
5	Multithreading in Java	Concurrency and Synchronization, Java Thread Model: Thread priorities, Synchronization, Messaging, Main Thread, Creating thread: Implementing Web Based Application in Java: Use of JavaScript for creating web based applications in Java, Introduction to Java script	7
6	Logical and Functional Programming	Functional Programming Paradigm: Understanding symbol manipulation, Basic LISP functions, definitions, predicates, conditionals and scoping, Recursion and iteration, Properties List array and access functions, Using lambda definitions, printing, reading and atom manipulation. Logic Programming Paradigm: Operators, Arithmetic, Using Structures.	7

MCQ Test

The following statement forces the next iteration of the loop to take place.



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- A. Break
- B. Goto
- C. Continue
- D. None of the above

ANSWER: C

Java is called as platform independent language.

- A. True
- B. False

ANSWER: A

JVM will differ from platform to platform but still all understand the Same Java Bytecode.

- A. True
- B. False

ANSWER: A

Java is made useful for distributed system. It is possible due to ____ feature of java.

- A. Inheritance
- B. API
- C. RMI
- D. Polymorphism

ANSWER: C

Arrange the following statements in correct order. 1. Running the java command Statement 2. Main method of that class is executed Statement.3.JRE is loaded along with the class you specify.

- A. Statement: 2 1 3
- B. Statement: 2 3 1
- C. Statement: 1 2 3
- D. Statement: 1 3 2

ANSWER: D

What is garbage collection in the context of Java?

- A. The operating system periodically deletes all of the java files available on the system.



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- B. Any package imported in a program and not used is automatically deleted.
- C. When all references to an object are gone, the memory used by the object is automatically reclaimed.
- D. The JVM checks the output of any Java program and deletes anything that doesn't make sense.

ANSWER: C

Bytecode is given as input to _____

- A. JRE
- B. Linker
- C. JVM
- D. Assembler

ANSWER: C

A recursive function is said to be _____ recursive if there are no pending operations to be performed on return from a recursive call.

- A. Tail
- B. Pass
- C. linear
- D. End

ANSWER: A

System.out.println(). What is System in the statement

- A. Method
- B. Constructor
- C. Class
- D. Package

ANSWER: D

The process of accessing and processing each element of an array A exactly once is called _____.

- A. Deleting
- B. Inserting
- C. traversing
- D. Searching



ANSWER: C

How many instances of an abstract class can be created?

- A. 1
- B. 2
- C. 3
- D. 0

ANSWER: D

How will the class protect the code inside it?

- A. Using access specifiers
- B. Using abstraction
- C. Use of inheritance
- D. All of the above

ANSWER: A

Which of the following concept is often expressed by the phrase, 'One interface, multiple methods'?

- A. Abstraction
- B. Polymorphism
- C. Inheritance
- D. Encapsulation

ANSWER: B

_____ diagram shows crossed flow paths with no clear path from beginning to end, which causes poor structure

- A. Spaghetti
- B. Class
- C. Activity
- D. Sequence

ANSWER: A

Largeness of program relates size and complexity of the problem being solved than to the final size of a program in terms of the _____



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- A. Number of keywords.
- B. Number of source lines.
- C. Collection of primitive data types.
- D. Collection of variables

ANSWER: B

_____ allows us to design and build program from smaller pieces called modules.

- A. Subprogramming
- B. program divide method
- C. Abstraction
- D. Modularity

ANSWER: D

A good modular decomposition is one that is based on modules that are as independent from each other as possible.

- A. True
- B. False

ANSWER: A

JDK means ?

- A. Java Development Kit
- B. Just Designed key
- C. Java Designer kit
- D. Java decided key

ANSWER: A

_____ statements allow the program to choose different parts of the execution based on the outcome of an expression.

- A. Creation
- B. Assignment
- C. Iteration
- D. Selection



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ANSWER : D

_____ statements enable program execution to repeat one or more statements.

- A. Creation
- B. Assignment
- C. Iteration
- D. Selection

ANSWER : C

_____ statements enable your program to execute in a non-linear fashion

- A. Selection
- B. Assignment
- C. Iteration
- D. Jump

ANSWER: D

AWT and Swing are used in java for creating standalone applications

- A. True
- B. false

ANSWER: A

Which one of the following is not a built-in data type?

- A. Integer
- B. String
- C. Boolean
- D. Structure

ANSWER: C

Which one of the following is not the Dynamic Data Structure?

- A. Array
- B. Stack
- C. Linked list
- D. Queue



ANSWER: A

What will the output of following java statement? `System.out.println(16/(int)5.0);`

- A. 3.0
- B. 3.2
- C. 3
- D. syntax error

ANSWER: C

Question bank

Q.1 What is interpretation and translation process ? With neat diagram state the purpose of each activity in language processing with interpretation and translation.

[Marks: 7]

[CO:215.1, Bloom's Level :L2]

Q.2 Explain with example the use of following data aggregates to construct compound data types: a) Sequencing b) Cartesian product.

[Marks: 7]

[CO:215.2, Bloom's Level: L2]

Q.3 List out challenges for programming in large? How these are addressed in programming languages.

[Marks: 7]

[CO:215.2, Bloom's Level: L1]

Q.4 What do you mean by Syntax? State and draw the EBNF definition for syntax rules.

[Marks: 7]

[CO:215.2, Bloom's Level: L2]

Q.5 Explain any three of the following

[Marks: 6]

[CO:215.3, Bloom's Level: L2]

- a) Final keyword & Static keyword
- b) Static and dynamic binding
- c) Garbage collection
- d) Finalize method.

Q.6 What is an Applet ? Write a generic skeleton of Java Applet and explain the use of each block.

[Marks: 6]

[CO:215.4: Bloom's Level: L3]

Q.7 Differentiate between abstract class and interface in JAVA

[Marks: 7]

[CO:215.3, Bloom's Level: L2]

Q.8 What are advantages of Inheritance? show by example the simple inheritance in Java.

[Marks: 7]



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[CO:215.3, Bloom's Level: L2]

Q.9 Write a program in Java using switch case statement to perform addition, division, multiplication, subtraction of given two numbers and print the result. Does the program generate any exception ?

[Marks: 8]

[CO:215.2, Bloom's Level: L3]

OR

Q.10 Identify and write the use of PrintStream and PrintWriter classes? Which methods are supported by these classes ? Construct example of each.

[Marks: 8]

[CO:215.4, Bloom's Level: L3]

Q.11 Write a program in Java to calculate the value of $((x+y)/(x-y))$. Program should prevent the condition $x-y=0$.

[Marks: 8]

[CO:215.3, Bloom's Level: L2]

Q.12 What is the use of CharacterArrayReader() and CharacterArrayWriter() methods in Java? Write a program which reads string of 10 characters from the user. Program extracts and prints the substring from the given string using above methods.

[Marks: 8]

[CO:215.3, Bloom's Level: L3]

Q.13 What is Method Overriding in Java?

State with example the following in built exceptions in Java.

- a) IndexOutOfBoundsException()
- b) NullPointerException()
- c) ArrayIndexOutOfBoundsException()

[Marks: 7]

[CO:215.3, Bloom's Level: L2]

Q.14 What is the importance of maintainability and reliability to programming languages? list the factors which ensures the reliability and maintainability.

[Marks: 7]

[CO:215.1, Bloom's Level: L1]