Progressive Education Society's

Modern College Of Engineering, Pune-05.

1186A, Shivaji Nagar, Pune- 411 005.

DEPARTMENT OF INFORMATION TECHNOLOGY

E- Curriculum Booklet

YEAR:2020-21 **SEMESTER: II**

CLASS:TE **DIV: A &B**

VISION AND MISSION OF THE INSTITUTE

Vision Statement:

To create a collaborative academic environment to foster professional excellence and ethical values

Mission Statement:

1. To develop outstanding professionals with high ethical standards capable of creating and managing globalenterprises
2. To foster innovation and research by providing a stimulating learningenvironment
3. To ensure equitable development of students of all ability levels andbackgrounds
4. To be responsive to changes in technology, socio-economic and environmental conditions
5. To foster and maintain mutually beneficial partnerships with alumni and industry

VISION AND MISSION OF THE DEPARTMENT

Vision Statement:

To develop proficient IT engineers for the Industry and Society.

Mission Statement:

1. To achieve academic excellence.
2. To develop students for being competent in dynamic IT environment.
3. To encourage research and innovation.
4. To inculcate moral and professional ethics.

PEO’s OF THE DEPARTMENT

1. Demonstrate sustained learning by building the profound foundation of math’s, science and engineering principles and make the students erudite self-reliant and adaptable to diverse culture of multidisciplinary environment.
2. Prepare graduate with strong knowledge and skills in the field of Information Technology to develop solutions of complex engineering problems.
3. To bring leadership skill with teamwork in continuous learning environment to bear with professional challenges.
4. To inculcate ethics towards issues of professional and social relevance.

PSO’s OF THE DEPARTMENT

1. Graduate exhibits skills to analyze, design and develop software.
2. Graduate demonstrate technical competency and leadership qualities to work in multidisciplinary environment.

PROGRAM OUTCOMES

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

LONG TERM GOALS

1. To Improve Industry Collaboration.
2. Promote Faculty for Research.
3. To Introduce Post Graduates Programme and Research Center.
4. To Enhance Infrastructure and lab development.

SHORT TERM GOALS

1. To enhance teaching learning process with effective utilization ofe-resources
    - Moodle
    - Activity BasedTeaching.
    - Online Courses. (NPTEL/SpokenTutorials)
2. To organize national level conference /workshop.
3. Focused Interaction with Alumni.
    - Forum for Career Guidance
    - Guidelines for Training and Placements
    - Expert/Webinar/Seminar
    - Suggestions on Programme Improvisation.

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STUDENT ACADEMIC PLANNER

- Exam form submission, SE Online Examination, FE, TE, BE In-Semester Examination, Theory Examination
-
- will be scheduled as per Savitribai Phule Pune University notification.
- Dates of M'Pulse, Sports and Cultural Activities are subject to change.
- These are tentative dates, subject to change.

Important Note:

- Schedule Parent's Meet after In-sem period.
- Periodic Assessment tools (Unit test/ MCQ/ Presentations/ Hands on/ Mini projects/ Activity etc.) are at the discretion of departmental end as per the necessity.

HOD
Mrs. S. D. Deshpande

STUDENT CO CURRICULER ACTIVITY CALENDAR

Sr No.	Date	Name of activity	Duration	Mapping with PO's and PSO's	Guest speaker with Organization	Beneficiaries	Faculty In charge
ITSA: Ms. Poonam Rakibe							
1	05/01/2021	SE TE BE orientation Program	1 Hr	--	All faculty Members IT Department	SE TE BE	Ms.Poonam Rakibe
2	3/2/2021	FE orientation Program	1 Hr	--	All faculty Members IT Department	FE	Mr.Rohit Tate
3	20/2/2021	DSE orientation	1 Hr	--	All faculty Members IT Department	DSE	Ms.Poonam Rakibe
4	06/03/2021	Session on Gender Equity	1 Hr	P012	Mr.Gaurav Sontakke, Infosys,Pune	SE ,TE	Ms.Shoma MItkari
5	8/3/2021	Women's Day Celebration	1 Hr	PO12, PO6	Dr.Gauri Borkar,SHrerukma Chikitsalay,Pune Pooja Shetty,Ayushveda Panchakrma Clinic	SE,TE,BE	Mrs.Mukta Jamage
6	13/03/2021	"Session on guidance of mentor mentee system"	1 Hr	PO 10	Mrs.Sujata Honap,Dyanprab	All faculty	Ms.Poonam Rakibe
7	17/3/2021	Session on Data Analytics	1 Hs	PO3,4,5,8, 11,12 PSO 1,2	Mr.Bhaskar Deshmukh, Tieto Pvt Ltd, Pune	TE	Swapna Bhavsar
8	20/3/2021	Guest session on Big Data Analytics using Hadoop	2 Hrs	PO2,3,5,6, 7,12 PSO 1	Yogesh Murumkar BharatSoft Solutions	TE	Anita Devkar
9	20/3/2021	Parents Teacher Meet	2 Hrs	-	Mr.Manoj A.	Parents	Academic Team
10	30/3/2021	Session "Introduction To Embedded C"	1 Hr	PO2,5,12 PSO 2	Mr.Amit Wavhal ,BMW	SE	Ms.Poonam Rakibe
11	23/3/2021	Session on "Angular Coding Style"	2 Hrs	PO1,3,5,11 ,12 PSO1,2	Mr. Ram MoHril, Capgemini India Pvt Ltd.	BE	Ms. Jyoti Jadhav
12	27/3/2021	Session on "Algorithmic approach to solve real time problems"	2 Hrs	PO2,PO3,P O4	Tushar Kute Mitu Skillologies	TE BE	Mrs.Mukta Jamage
App Club: Mr. Deepak Tamhane							

14	6/2/2021	Session on Github	2 Hrs	PO 1,2,3,4,5,11,12, PSO 1,2	Mr.Nilesh Verma, Software Development ScreenMagic, Pune	TE	Mr.Deepak Tamhane
15	20/3/2021	Session on App development using Python Programming	1 day	PO 1,2,3,4,5,11,12,13,14	Tejas Sancheti Infosys,Pvt Ltd	SE,TE	Mr.Deepak Tamhane
GraphiX Club: Ms. Poonam Rakibe							
16	12/03/2021	Workshop on"how to make video using modular tools"	1 day(6 Hrs)	PO5,9.10.11,12	Mr.Kshitij Ved,Mr.Viraj Shelar ,Thinsprout Infotech	SE,TE,BE	Mrs.Ketki Gawali,Mrs.Deepali Bhanage-Naik
17	26/03/2021	Creating animation Clips using animation tool	1 Hr	PO 5,9, 10, 11,12	Mr.Vedant Tapadia, Student, TE B	SE	Ms.Poonam Rakibe
PixInsight Club: Ms.Shoma Mitkari							
18	27/3/2021	Workshop on" Art of Painting"	2 Hrs	PO6	Mrs.Harshada Wani	SE,TE,BE	Ms.Shoma Mitkari
Audit Course: Mrs.Ketki Gawali							
19	13/2/2021	Guest lecture on E-waste & Pollution Control (Inter departmental)	2 Hrs	PO 6,7	Ms.Shweta Jambhulkar, Ass,Professor in Civil department, MCOE,Pune	SE	Mr. Rohit Tate
20	1/3/2021	Japanese Module-II	20Hrs	PO	Mrs.Amita Godse	SE	Mrs.Ketki M Gawali
21	16/03/2021	Online Quiz on e-waste and Pollution control	1 Hr	PO 6,7	Mr. Rohit Tate	SE	Mr. Rohit Tate
22	27/3/2021 & 28/3/2021	Udyojak-An Entrepreneur Development	1 day	PO 1,5,6,8,9 10, 11,12, PSO 2	Ms.Ashwini Bhavsar, CEO, Giftbuds, Thane Mr.Sunil Patil Motivational Speaker, MCEV Pune	BE	Mr. Digvijay Patil, Mr.Vishnu Kamble
23	3/4/2021	Guest Lecture on IP with the focus on Patent	2Hrs	PO6,12,2,3,4	Mr. Jyotiraman De, IPR Cluster Pune	TE	Mrs. Vandana Dixit and Ms. Anita Devkar
CSI: Ms.Asmita Pawar							
23	18/2/2021	"Introduction to JMeter and Performance Testing"	1 Hr	PO 8,9,10,11	Mr. Sagar Patil Gupshup Technologies, Mumbai	TE, BE	Ms. A. Pawar
ACM: Ms Asmita Pawar							
24	6/3/2021	Invicta 20-21	1.5 Hr	PO2,PO3,PO4	(Online Hacker Rank)	SE,TE,BE	Ms. Asmita Pawar

ISR/NSS: Mr.Deepak Tamhane							
25	6/3/2021	Online awareness to use ICT tools in Primary Schools	1 Day	PO6,9,12	Mr.Deepak Tamhane ,Mrs.Tanmayee Kute,	Primary school students	Mr.Deepak Tamhane ,Mrs.Tanmayee Kute,Mr.Shantanu Pawra
Project Activities: Mrs. V.G.Dixit							
26	11/2/2021	Orientation Session on “Project Based Learning”	2 Hrs	PO 9,10,11, 12	PBL Team	SE	PBL Team
27	22-24/2/2021	Project Review -3 by Internal Guide	2 Days	PO 1,2,3,4,5,12	ll Internal faculties	BE	Mrs. V. G. DIxit, Ms. A. L. Devkar
28	19-20/3/2021	PBL - Poster Competition	1 Day	PO 5,6,9,10,11,12	Mr. Sagar Patil Gupshup Technologies, Mumbai, Mr. Sagar Shende, TCS	SE	Ms. A. Pawar Mrs. V. G. Dixit
29	5-6/3/2021	Project Poster Competition	2 Days	PO 4,5,8,9,10, 11	Mr. Saurabh Kulkarni, Mrs. Shalaka Kadam	BE	Mrs. V. G. DIxit, Ms. A. L. Devkar
30	16-17/4/2021	Project Review - 4 by Industry Persons, “Dept Project Competition”	2 Days	PO 1,2,3,4,5,12	Mr. Purushottam Darshankar Mr.Mahesh Gawali Mr.Bhaskar Deshmukh Mr.Mahesh Deshpande Ajinkya Parakh Yogesh Rasal	BE	Mrs. V. G. DIxit, Ms. A. L. Devkar
Soft Skill Training and Placement (T&P): Mr. Vishnu Kamble							
31	18/2/2021	TE Placement Orientation	2 Hrs	PO8, 10	Mrs.Swati More TPO, MCOE	TE	Mrs.Ketki M Gawali
32	22/2/2021 to 2/3/2021	FUEL Aptitude Training	40Hrs	PO1,2, 12	Vikrant Sukhtankar, Fuel Solutions, Pune	TE	Mrs.Ketki M Gawali
ED Activities:Mr. Digvijay Patil							
33	27/3/2021 & 28/3/2021	Udyojak-An Entrepreneur Development	1 day	PO 1,5,6,8,9 10, 11,12, PSO 2	Ms.Ashwini Bhavsar, CEO, Giftbuds, Thane Mr.Sunil Patil Motivational Speaker, MCEV Pune	BE	Mr. Digvijay Patil, Mr.Vishnu Kamble
Career Guidance/Competitive Examinations: Mr. Vishnu Kamble							
34	25/04/2021	How to prepare for GATE	1 H	PO12	Mr.Baseer Alan	SE,TE	Mrs.Ketki M Gawali

		Examination	r		(ACE Institute Pune)		
III: Mrs.V.G.Dixit							
35	20/2/2021	Practitioner’s Approach: Towards Agile Software Development	1 Hr	PO9,10,11, 12	Ms. Chetana Kulkarni Brillio Technologies, Pune	SE, TE	Mrs. V. G. Dixit
36	10/4/2021	Recent Domain and Development in Networks	2 Hr	PO 1,2,5,10 11,12 PSO 1	Mr. Yogesh Murumkar Bharat Soft Solutions	SE, TE	Ms. A. L. Devkar
37	24/4/2021	Software Testing - Manual & Automated	2 Day	PO9,10,11, 12	Mr. Pravin Chothe Win-Win Solutions	SE, TE	Mr. D. Patil
Industrial Visit: Mr.Deepak Tamhane							
NIL							
FDP: Ms. Yogita Fatangare							
38	27/04/2021 to 1/05/2021	IPR and Art of Technical Writing	5 Days	PO 5,6, 10, 12	Dr. Parikshit Mahalle, Dr. Deepti Patil,	Faculties	Ms.Deepali Bhanage-Naik
Alumni Activities: Ms.Tanmayee Kute							
39	10/4/2021	Session on “Introduction to Azure Cloud	1 Hr	PO 8,9,10,11	Ms. Dhara Gangani	TE,BE	Mrs.Tanmayee Kute, Ms. Asmita A. Pawar
40	15/5/2021	Session on “MERN stack introduction”	1 Hr	PO 8,9,10, 11	Mr. Maitrey Mali Eternus Solutions, Pune	TE,BE	Mrs. Tanmayee Kute, Mr. V.S. Kamble
41	6/2/2021	Session on Github	2 Hrs	PO 1,2,3,4,5,1 1,12,13,14	Mr.Nilesh Verma, Software Development ScreenMagic, Pune	TE	Mr.Deepak Tamhane

TIME TABLE TE-A

DAY \ TIME	10.00 to 11.00	11.00 to 12.00	12.00 to 12.30	12.30 to 1.30	1.30 to 2.30	2.30 to 2.45	2.45 to 4.00
MON	Honours Course	SP (RS)	RECESS	CC (SP)	DAA (MK)	RECESS	SL VI (YDF)
TUE	Honours Course	CNT (DT)		SP (RS)	CC (SP)		SL V (MK)
WED	Honours Course	SP (RS)		DSBDA (YDF)	DAA (MK)		SL V (RS)
THU	Honours Course	CNT (DT)		DSBDA (YDF)	DAA (MK)		SL IV (DT)
FRI	SP (RS)	CNT (DT)		DAA (MK)	DSBDA (YDF)		
DAY \ TIME	**10.00 to 11.00**	**11.00 to 12.00**	**12.00 to 12.30**	**12.30 to 1.30**	**1.30 to 2.30**		
SAT	DSBDA (YDF)	CC (SP)		PBS (DAB/AAP)	Audit Course 4		

GFM : - Ms. Rajashri Sadafule

Name of the Subject	Teaching Staff & Seating Arrangement
SP : System Programming	RS: Ms.Rajashri Sadafule
DAA : Design and Analysis of Algorithm	MK : Mrs. Mukta Kore
DSBDA: Data Science and Big Data Analytics	YDF - Ms.Y.D.Phatangare
CC: Cloud Computing	SP : Mr. Shantanu Pawar
CNT: Computer Network Technology	DT : Mr. Deepak Tamhane
PBS : Project Based Seminar	DAB : Ms. Deepali Bhanage AAP : Ms. Asmita Pawar

TIME TABLE TE B

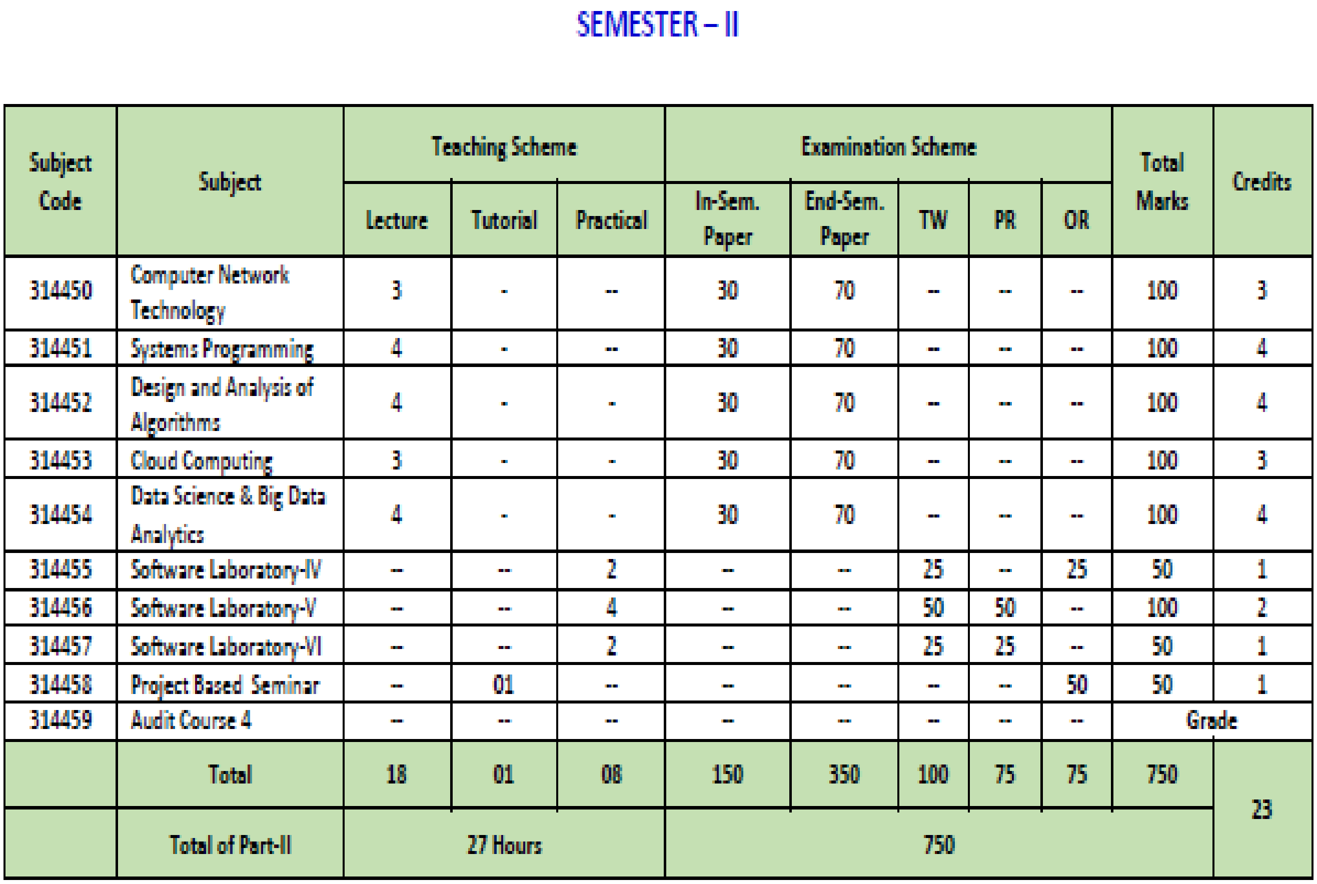
TE (Semester II)

DAY \ TIME	**10.00 to 11.00**	**11.00 to 12.00**	**12.00 to 12.30**	**12.30 to 1.30**	**1.30 to 2.30**	**2.30 to 2.45**	**2.45 to 4.00**
MON	Honours Course	SP (CAG)	RECESS	CC (SP)	DAA (AAP)	RECESS	SL VI (AD)
TUE	Honours Course	CNT (SDD)		SP (CAG)	CC (SP)		SL V (AAP)
WED	Honours Course	SP (CAG)		DSBDA (AD)	DAA (AAP)		SL V (CAG)
THU	Honours Course	CNT (SDD)		DSBDA (AD)	DAA (AAP)		SL IV (SDD/DT)
FRI	SP (CAG)	CNT (SDD)		DAA (AAP)	DSBDA (AD)		
DAY \ TIME	**10.00 to 11.00**	**11.00 to 12.00**	**12.00 to 12.30**	**12.30 to 1.30**	**1.30 to 2.30**		
SAT	DSBDA (AD)	CC (SP)		PBS (VGD/AD)	Audit Course 4		

GFM : - Ms. Anita Devkar

Name of the Subject	**Teaching Staff & Seating Arrangement**
SP : System Programming	CAG : Mr. C. A. Ghuge
DAA : Design and Analysis of Algorithm	AAP : Ms. Asmita Pawar
DSBDA: Data Science and Big Data Analytics	AD : Ms. Anita Devkar
CC: Cloud Computing	SP : Mr. Shantanu Pawar
CNT: Computer Network Technology	SDD : Dr. Mrs. Sarita Deshpande DT : Mr. Deepak Tamhane
PBS : Project Based Seminar	VGD : Mrs. Vandana Dixit AD : Ms.Anita Devkar

COURSE STRUCTURE



SEMESTER – II

Subject Code	Subject	Teaching Scheme			Examination Scheme					Total Marks	Credits
		Lecture	Tutorial	Practical	In-Sem. Paper	End-Sem. Paper	TW	PR	OR		
314450	Computer Network Technology	3	-	--	30	70	--	--	--	100	3
314451	Systems Programming	4	-	--	30	70	--	--	--	100	4
314452	Design and Analysis of Algorithms	4	-	-	30	70	--	--	--	100	4
314453	Cloud Computing	3	-	-	30	70	--	--	--	100	3
314454	Data Science & Big Data Analytics	4	-	-	30	70	--	--	--	100	4
314455	Software Laboratory-IV	--	--	2	--	--	25	--	25	50	1
314456	Software Laboratory-V	--	--	4	--	--	50	50	--	100	2
314457	Software Laboratory-VI	--	--	2	--	--	25	25	--	50	1
314458	Project Based Seminar	--	01	--	--	--	--	--	50	50	1
314459	Audit Course 4	--	--	--	--	--	--	--	--	Grade	
	Total	18	01	08	150	350	100	75	75	750	23
	Total of Part-II	27 Hours			750						

IMPORTANT INSTRUCTIONS

1. It is essential that the student attends all classes in time from the first day to the last day of each term.
2. Minimum of 75% attendance for lectures and practical sessions is mandatory forall students.
3. In case the attendance falls below 75% , term will not be granted and the student will not be allowed to appear for the University examination
4. Student should complete term work such as Journals, Files as per schedule. If thestudent fails to complete the term work to the entire satisfaction of the Head of the Department his/her term will not be granted and he/she will not be allowed to appear for the University examination.
5. Attendance to all class tests or internals exams is compulsory.
6. Students are always required to carry Identity card (duly signed by Authority) everyday to college and shall show the same on demand by any faculty/official of the Institute in the campus.
7. Students are advised to maintain good rapport with classmates andstaff.
8. Institute uniform is compulsory on specified days, during University examinations, for internal tests and special functions decently dressed on the other days of theweek.

TERM WORK EVALUATION CRITERIA

Final term work will be given based on throughout performance of the student. 100 marks are distributed in (60 for continuous assessment + 15 for internal test result + 5 for general behavior + 20 for attendance of student)

- 60 marks shall be awarded to the students, based on their journal work, whichincludes experiment's write up, program print out. Each assignment should be evaluated for 10 marks.
    - Distribution of 10 marks for each assignment is asfollows:

Sr. No.	Head	Marks
i.	Coding standards, proper indentation, Comments, Documentation	2 Marks
ii.	Timely submission	3 Marks
iii.	Test cases / originality / Understanding of Assignment	5 Marks

- 15marksshallbeallottedbasedonthemarksofClasstest/Assessmenttestperunit/ mock exam.
- 5 marks for General Behavior.
- 20 Marks as per the college policy for Term Work, marks are to be awarded for attendance as per the below, based on the percentage of attendance per subject, combining lectures and practical's together, whereverapplicable.

Sr .No.	%of attendee=total(Lectures + Practical's attended)	Marks
1	90 to 100	20
2	85to<90	16
3	80to<85	12
4	75 to <80	10

EXAM EVALUATION CRITERIA

Phase I: Theory examination of 30 marks, 60/90 minutes duration based on unit I, unit II and unit III of the subject

University Practical Examination of 50 marks oral/ practical duration 3 hr contains problem statement based on assignment submitted as term work during lab hours.

each chit will have only one problem statement. Every student will pick up one chit randomly.

- Distribution of 50 marks for external practical examination is as follows:
  - Proper execution of Practical assignment with all options and understanding of the assignment: 30Marks.
  - Proper documentation, coding standards, time and space complexity of functions used, suggested changes by the examiner(s) performed within specified time, the programming skills in the assignment he/she is performing : 20marks.

Note: student will be allowed for university practical examination only when done with submission of term work, all types of assignments given by respective staff and Satisfying attendance criteria

Phase II: Theory examination of 70 marks, 150/180 minutes duration, based on all the units of the subject, shall be conducted at the end of semester as per the schedule of the university.

Internal Examination

Pre in sem Test:
Theory examination of 30 marks, 1 Hour duration based on unit I, II and III of the subject.

Pre end sem Test:
Theory examination of 30 marks, 1 Hour duration based on unit IV, V and VI of the subject.

314450

Computer Network Technology

SYLLABUS

Teaching Scheme:	**Credits**	**Examination Scheme:**
Lectures: 3 Hours/Week	03	In-Semesters: 30 Marks End-Semester: 70 Marks

Prerequisites:

1. Foundation of Communication and Computer Networks.

Course Objectives:

1. To understand services offered at different layers of network.
2. To understand protocol used at different layers of network.
3. To fathom wireless network and different wirelessstandards.
4. To recognize differences in between different wireless networks and to learndifferent mechanism used at layers of wirelessnetwork.
5. To know the applications of network and use the understood concepts for newapplication development.
6. To explore recent trends innetworking.

Course Outcomes:

1. To know Responsibilities, services offered and protocol used at each layer ofnetwork.
2. To understand different addressing techniques used innetwork.
3. To know the difference between different types ofnetwork.
4. To know the different wireless technologies and IEEEstandards.
5. To use and apply the standards and protocols learned, for applicationdevelopment.
6. To understand and explore recent trends in networkdomain.

UNIT – INETWORKLAYER 06 Hours

Network Layer Services, IPv4 Addresses: Classful and Classless Addressing, Special Addresses, NAT, Subnetting, Supernetting, Delivery and Forwarding of IP Packet, Structure of Router, IPv4: Fragmentation, Options, Checksum, ARP: Address Mapping, ARP Protocol, RARP, DHCP, ICMPv4, Unicast Distance Vector Routing, Link State Routing, Unicast Routing Protocols: RIP,EIGRP,OSPF,BGP, IPv6Addressing.

UNIT – IITRANSPORT LAYER 06 Hours

Transport Layer Services, UDP: Datagram, Services, Applications, TCP: Services, Features, Segment, TCP Connection, Window in TCP, Flow control, Congestion Control, Congestion Control Algorithms, Leaky Bucket, Token Bucket and QoS, TCP Timers, Options, TCP Package, Applications, SCTP: Features, Services, Packet Format, Socket: TCP and UDP Socket, Applications.

UNIT – IIIAPPLICATION LAYER 06 Hours

Client Server Paradigm: Communication using TCP and UDP, Peer to Peer Paradigm, Application Layer Protocols: DNS, FTP, TFTP, HTTP, SMTP, POP, IMAP, MIME, Network Management: SNMP.

UNIT – IVWIRELESSSTANDARDS 06 Hours

Electromagnetic Spectrum: Spectrum Allocation, Radio Propagation Mechanism, Characteristics of Wireless Channel, Wireless LANs: Architectural Comparison, Characteristics, Access Control, IEEE 802.11: Architecture, MAC Sub Layer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture, Layers, IEEE 802.16/WiMax: Services, Architecture, Layers, Differences between Bluetooth, IEEE 802.11 and IEEE802.16.

UNIT – V ADHOCWIRELESSNEWTORK 06 Hours

Infrastructure Network and Infrastructure-less Wireless Networks, Issues in Adhoc Wireless Network, Adhoc Network MAC Layer: Design Issues, Design Goal, Classification, MACAW, Adhoc Network Routing Layer: Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks – Classifications of Routing Protocols, DSDV, AODV, DSR, Adhoc Transport Layer: Issues in Designing a Transport Layer Protocol for Ad hoc Wireless Networks – Design Goals of a Transport Layer Protocol for Ad hoc Wireless Networks –Classification of Transport Layer Solutions, TCP over Adhoc Wireless Networks.

UNIT – VI RECENT TRENDS INCOMMUNICATIONNETWORKS 06 Hours

Satellite Network: Operation, GEO Satellites, MEO Satellites, LEO Satellites, Wireless Sensor Network: Functioning, Characteristics, Operation, Cluster Management, Computational Grid: Design, Issues, Internet of Things: Vision, Trends, Significance, Technical Building Blocks, Issues and Challenges, Applications, IoE. Software Defined Network: SDN Implication for research and innovation, Genesis of SDN, Characteristics of SDN, SDN Operations, SDN Devices, SDN Controllers, SDN Application, OpeFLow Overview, Network Function

Virtualization: Introduction, Applications, Network Neutrality: Need, Requirements (e Reference from research papers and web)

Text Books

1. Behrouz A. Forouzan, TCP/IP Protocol Suite, McGraw Hill Education, ISBN: 978-0-07-070652-1, 4thEdition.
2. C. Siva Ram Murthy, B. S. Manoj, Adhoc Wireless Networks: Architecture and Protocols, Pearson Education, ISBN: 978-81-317-0688-6, 1stEdition.
3. Behrouz A. Forouzan, Data Communication and Networking, McGraw Hill Education, ISBN: 978-1- 25-906475-3, 5th Edition.

Reference Books

1. Andrew S. Tanenbaum, David J. Wethrall, Computer Network, Pearson Education, ISBN: 978-0-13-212695-3.
2. Kurose Ross, Computer Networking: A Top Down Approach Featuring the Internet, Pearson Education, ISBN:978-81-7758-878-1.
3. Charles E. Perkins, Adhoc Networking, Pearson Education,978-81-317-2096-7.
4. Andrea Goldsmith, Wireless Communication, Cambridge University Press, ISBN:978-0-521-83716-3.
5. Mayank Dave, Computer Network, Cengage Learning, ISBN:978-81-315-0986-9.
6. C. K. Toh, Ad Hoc Mobile Wireless Networks Protocols and Systems, Prentice Hall, ISBN: 978-01-324-42046.
7. Paul Goransson, Chuck Black, Software Defined Networks: A Comprehensive Approach, Morgan Kaufmann, ISBN:978-0124166752.
8. Natalia Olifer, Victor Olifer, Computer Networks: Principles, Technologies and Protocols for Network Design, Wiley India, ISBN:9788126509171.
9. KazemSohraby, Daniel Minoli, TaiebZnati, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley India, ISBN: 9788126527304.
10. P. Nicopolitidis, M.S. Obaidat, G.I. Papadimitriou, A.S. Pomportsis, Wireless Networks, Wiley India, ISBN :9788126522200.

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Unit/ Assignment	Assessment Technique	Blooms Taxonomy Category
CO314450.1	To know responsibilities, services offered and protocol used at each layer of network.	I,II,III ,IV,V	Pre in sem exam	L2-Understand
CO314450.2	To understand different addressing techniques used in network.	I,II		L2-Understand
CO314450.3	To illustrate the standards and protocols learned, for application development.	III		L3-Apply
CO314450.4	To know the different wireless technologies and IEEE standards.	IV,V	Pre end sem exam	L2-Understand
CO314450.5	To understand and explore recent trends in network domain.	VI		L2-Understand

PREREQUISITES

Sr. No.	Unit	Prerequisite subject name
1.	Network layer	Data communication, Basics of Network layer
2.	Transportlayer	Data communication, Basics of Transport layer
3.	Transportlayer	Data communication, Basics of Application layer
4.	Wireless standards	Data communication, Basics of Wireless Network
5.	Adhoc wireless Network	Data communication, Basics of Sensor Network
6.	Recent trends in communication Networks	Data communication ,Basics of Sensor Network

TEACHING PLAN

Teaching Plan Short

Academic Year:-2020-21 Semester:- II w. e. f. :- 16.12.19

Class :-TE Division: A &B

Subject:-Computer Network Technology Subject Code :-314450

Faculty In charge :- Mrs. S.D.Deshpande /Mr. Deepak Tamhane No. of Lectures/ weeks:3

- **Lecture Plan**

Sr. No.	Unit No.	Unit/ Topic Name	Start Date	End Date
1.	I	Network layer	Dec Week 3	Dec Week 4
2.	II	Transport layer	Jan Week 1	Jan Week 2
3.	III	Transport layer	Jan Week 3	Jan Week 4
4.	IV	Wireless standards	Feb Week 1	Feb Week 2
5.	V	Adhoc wireless newtork	Feb Week 3	Feb Week 4
6.	VI	Recent trends in communication networks	March Week 3	March Week 4

Detail Teaching Plan

	Unit No.	Main Topic to be Covered	Sub Topics to be Covered	Chap. No. & Reference Books	CO to Attain	Measurable to attain CO	Mode of Delivery
1	UNIT - I	NETWORK LAYER	Network Layer Services, IPv4 Addresses: Classful and Classless Addressing, Special Addresses	Andrew S. Tanenbaum, "Computer Networks", PHI, Fifth Edition,ISBN :978-0132-126953 and Data communication and networking by BehrouzFerrozoun, edition 5	CO31 4450.1	Pre-Insem	Chalk and talk
2			NAT, Subnetting				Chalk and talk
3			Supernetting, Delivery and Forwarding of IP Packet, Structure of Router				Chalk and talk
4			IPv4: Fragmentation, Options, Checksum				Chalk and talk
5			ARP: Address Mapping, ARP Protocol, RARP				Chalk and talk
6			DHCP, ICMPv4, Unicast Distance Vector Routing, Link State Routing				Chalk and talk
7			Unicast Routing Protocols: RIP,EIGRP,OSPF,BGP, IPv6 Addressing				Chalk and talk
8	UNIT - II	TRANSPORT LAYER	Transport Layer Services, UDP: Datagram, Services, Applications	Andrew S. Tanenbaum, "Computer Networks", PHI, Fifth Edition, ISBN	CO31 4450.2	Pre-Insem	Chalk and talk
9			TCP: Services, Features,				Chalk and talk

			Segment, TCP Connection	: 978-0132-126953 and Data communication and networking by BehrouzFerrozoun, edition 5			
10			Window in TCP, Flow control, Congestion Control				Chalk and talk
11			Congestion Control Algorithms, Leaky Bucket, Token Bucket and QoS				Chalk and talk
12			TCP Timers, Options, TCP Package, Applications				PPT's and Chalk And Talk
13			SCTP: Features, Services, Packet Format				PPT's and Chalk And Talk
14			Socket: TCP and UDP Socket, Applications.				PPT's and Chalk And Talk
15	UNIT - III	APPLICATION LAYER	Client/Server Model, Telnet	Andrew S. Tanenbaum, "Computer Networks", PHI, Fifth Edition,ISBN :978-0132-126953 and Data communication and networking by BehrouzFerrozoun, edition 5	CO314450.3	Pre-Insem	
16			Communication using TCP and UDP, Peer to Peer Paradigm,				Chalk and talk
17			Application Layer Protocols: DNS, FTP,				Chalk and talk
18			TFTP, HTTP, SMTP				Chalk and talk
10			POP, IMAP, MIME				Chalk and talk
20			Simple Network Management Protocol Class Test				Chalk and talk
21	UNIT - IV	Wireless Standards	Electromagnetic Spectrum: Spectrum Allocation, Radio Propagation Mechanism,	KazemSohraby, Daniel Minoli, TaiebZnati,	CO314450.4	End-sem	PPT's and Chalk And Talk

			Characteristics of Wireless Channel	Wireless Sensor Network", Wiley, ISBN :978-0-47174300-2 and C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols" Prentice Hall, 2004		End-sem	
22			Wireless LANs: Architectural Comparison, Characteristics, Access Control				
23			IEEE 802.11: Architecture, MAC Sub Layer, Addressing Mechanism				Chalk and talk
24			Physical Layer, Bluetooth: Architecture, LayersGroup,				Chalk and talk
25			IEEE 802.16/WiMax: Services, Architecture, Layers				Chalk and talk
26			Differences betweenBluetooth, IEEE 802.11 and IEEE802.16.				Chalk and talk
27			Class Test				Chalk and talk
28	UNIT - V	AD-HOC WIRELESS NETWORK	Infrastructure Network and Infrastructure-less Wireless Networks, Issues in Adhoc Wireless Network	KazemSohraby, Daniel Minoli, TaiebZnati, Wireless Sensor Network", Wiley, ISBN :978-0-47174300-2 . C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and	CO31 4450.4	End-sem	Chalk and talk
29			Adhoc Network MAC Layer: Design Issues, Design Goal, Classification, MACAW				Chalk and talk
30			Adhoc Network Routing Layer: Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks – Classifications of Routing Protocols, DSDV,				Chalk and talk

			AODV, DSR	Protocols” Prentice Hall, 2004			
31			Sensor Network Architectures (Concept of sink and source, Topologies, Design Principles)				Chalk and talk
32			Adhoc Transport Layer: Issues in Designing a Transport Layer Protocol for Ad hoc Wireless Networks				Chalk and talk
32			Design Goals of a Transport Layer Protocol for Ad hoc Wireless Networks – Classification of Transport Layer Solutions				Chalk and talk
34	UNIT – VI	RECENT TRENDS IN COMMUNICATION NETWORKS	Satellite Network: Operation, GEO Satellites, MEO Satellites, LEO Satellites,	KazemSohraby, Daniel Minoli, TaiebZnati, Wireless Sensor Network”, Wiley, ISBN :978-0-47174300-2 3. C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols” Prentice Hall, 2004	CO31 4450.4	Class Test, Lab Test	Chalk and talk
35			Wireless Sensor Network: Functioning, Characteristics, Operation, Cluster Management				Chalk and talk
36			Computational Grid: Design, Issues, Internet of Things: Vision, Trends, Significance, Technical Building Blocks				PPT’s and Chalk And Talk
37			Issues and Challenges, Applications, IoE. Software DefinedNetwork:				PPT’s and Chalk And Talk

			SDN Implication for research and innovation, Genesis of SDN				
38			Characteristics of SDN, SDN Operations, SDN Devices, SDN Controllers				PPT’s and Chalk And Talk
39			SDN Application, OpeFLow Overview, Network Function Virtualization: Introduction				PPT’s and Chalk And Talk
40			Applications, Network Neutrality: Need, Requirements				PPT’s and Chalk And Talk

HOME ASSIGNMENT QUESTIONS

Unit-I

Sr. No	Question	CO No.	Marks	University Year
1	Class B network 150.160.0.0 with default subnet mask, how can you divide it into 8 equal subnets? how many hosts can be accommodated in each subnetwork?	CO314450.1, CO314450.2	4	Nov 2019
2	What is the main idea of SMI and MIB in relation to SNMP?	CO314450.1	6	Nov 2019
3	What is the main idea of DHCP? What are the advantages of DHCP? Explain various Messages of DHCP?	CO314450.1, CO314450.3	6	May 2018
4	Explain what is happing in the operation of NAT with suitable example.	CO314450.1	4	May 2018
5	How would you summaries OSPF with its message format	CO314450.1	6	May 2018
6	Can you distinguish between circuit switching, packet switching and message switching with one example.	CO314450.1	6	May 2017
7	A company needs 6 subnets to its six departments. The company is granted site address 210.80.60.0. Design the subnets.	CO314450.1, CO314450.2	6	May 2017
8	How would you summaries addressing techniques? Explain it.	CO314450.2	4	Dec 2015
9	What is meant by fragmentation? Explain how it is supported to in IPV4 and IPV6?	CO314450.2	8	Dec 2011
10	How would you summaries ICMP message format and list ICMP message types	CO314450.1	6	Dec 2015
11	Can you write a brief outline of routing? How would you classify types of routing .Explain two interior gateway routing protocols.	CO314450.1	8	Dec 2013
12	Can you distinguish between distance vector routing protocols and link state routing protocols.	CO314450.1	8	May 2013
13	Can you distinguish between RIP and OSPF	CO314450.1	6	May 2007
14	What is the main idea of BGP? Explain what is happing in the operations of BGP with suitable example.	CO314450.1	8	Dec 2006
15	Can you distinguish between IPV4 and IPV6.	CO314450.2	4	Dec 2015

Unit-II

Sr.	Question	CO No.	Mar	University Year

No			ks	
1	Explain what happens when timers used with TCP.	CO314450.1	4	May 2018
2	What was the mail idea ofLeaky &Token bucket algorithm?	CO314450.1	6	May 2018
3	How would you summaries Quality of Service Parameter in Transport layer	CO314450.1	4	NOV 2019. May 2018
4	Can you write a brief outline about various transport layer services	CO314450.1	4	May 2017
5	Can you explain how TCP provides flow control?	CO314450.1	4	May 2017
6	How would you summaries the duties of transport layer and Can you distinguish between between connection oriented and connectionless service?	CO314450.2	9	Dec 2013
7	What can you say about UDP?	CO314450.1, CO314450.2	6	Dec 2002
8	Can you write a brief outline of TCP header?	CO314450.1, CO314450.2	8	May 06,11,13
9	Can you explain three way handshake algorithms for TCP connection establishment?	CO314450.2	8	Dec11,may 12,dec 13
10	What is meant by silly window syndrome? how to overcome it ?	CO314450.2	8	Dec 10,May 08,12

Unit: III

Sr. No	Question	CO No.	Marks	University Year
1	What is meant by DNS? Can you explain server hierarchy? Describe the process of name resolution happens in DNS.	CO314450.3	6	May 2018
2	How would you useSMTP protocol?	CO314450.3	4	May 2018, NOV 2019
3	Can you write a brief outline of functions of email system	CO314450.3	6	May 05
4	Can you write a brief outline of SMTP header format	CO314450.3	4	May 2015
5	What is meant by FTP? Why it requires two ports? Explain at least five user commands used in FTP?	CO314450.3	6	Dec 2013
6	Can you distinguish betweenpersistent and non-persistent HTTP connection	CO314450.3	8	May 08,11

7	How would you classify types of messages used in HTTP.	CO314450.3	8	Dec 2013
8	Explain SNMP model with its major components.	CO314450.3	8	May 2013
9	Can you distinguish betweenFTP and TFTP	CO314450.3	8	May 2016
10	What is meant by MIME? Discuss its roles in SMTP.	CO314450.3	4	Dec 2016
11	How would you summaries the Email Architecture and its services	CO314450.3	4	May 2015

Unit IV

Sr. No	Question	CO No.	Marks	University Year
1	Can you write a brief outline of architecture of Bluetooth?	CO314450.4	8	NOV 2019
2	Can you write a brief outline of 802.16 Protocol stack and its frame format.	CO314450.4	4	NOV 2019
3	Can you explain the basic architecture of WLAN and discuss various components in it	CO314450.4	8	NOV2019, May 2018
4	Can you distinguish between Bluetooth and IEEE 802.11 . What are the limitations of Bluetooth?	CO314450.4	8	May 2018
5	How would you summaries MAC layer mechanism of IEEE 802.11	CO314450.4	8	May 2018
7	Can you write in your own words about features of Bluetooth and architecture with suitable example.	CO314450.4	10	May 2017
8	Can you write a brief outline frame format of 802.16	CO314450.4	8	May 2017
9	Can you explain what is hidden station problem.	CO314450.4	6	Dec 11,12
10	Can you explain what is IEEE 802.11 FHSS and DSSS.	CO314450.4	8	Dec 2015
11	Can you explain what are the different technical issues to implement WLAN?	CO314450.4	8	May 2015
12	How would you summaries Bluetooth.	CO314450.4	6	May 09,Dec 13
14	What differences exist between the Bluetooth and wireless LAN	CO314450.4	4	Dec 2016

Unit-V

Sr. No	Question	CO No.	Marks	University Year
1	Can you write a brief outline on MACAW?	CO314450.4	8	NOV 2019

2	What differences exist between Infrastructure network and infrastructure less network and what are the issues in Adhoc wireless network?	CO314450.4	8	NOV 2019, May 2018
3	Can you write a brief outline on routing protocols in details?	CO314450.4	8	May 2018
4	Can you write a brief outline on LEACH algorithm?	CO314450.4	8	May 2018
5	Explain MAC Layer design issues for WSN.	CO314450.4	8	May 2017
6	Can you write a brief outline on different routing protocols used in WSN.	CO314450.4	8	May 2017
7	Can you explain what is DSDV routing protocol.	CO314450.4	8	NOV 2019, May 2017
8	Can you write a brief outline on task of address management in WSN	CO314450.4	8	May 2017
9	What is meant by AODV.	CO314450.4	6	Dec 15,16
10	What is meant by DSR.	CO314450.4	6	NOV 2019, ,May16

Unit VI

Sr. No	Question	CO No.	Marks	University Year
1	How would you summaries each component in Sensor node architecture.	CO314450.5	10	NOV 2019, May 2018
2	What differences exist between LEO,MEO and GEO	CO314450.5	8	NOV 2019
3	How would you summaries following points: (any two) a) SDN b) IOT c) LEACH	CO314450.5	18	NOV 2019
4	How would you summaries following points:: A. IOT B. Wireless sensor Network.	CO314450.5	8	May 2018
5	Can you explain what SDN And Satellite is?	CO314450.5	8	May 2018
6	Can you explain what are the different design constraints of WSN	CO314450.5	6	May 2015
7	Can you explain what the operating environmental constraint in WSN are?	CO314450.5	8	Dec 2016
8	Describe each component in sensor node architecture.	CO314450.5	8	Dec 2016
9	List any six applications of sensor network.	CO314450.5	6	Dec 2014

10	What can you say aboutIOT.	CO314450.5	6	May16,Dec 16
11	Can you explain the setup and steady state phase of LEACH protocol	CO314450.5	8	Dec 2014

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UNIT WISE QUESTION BANK

NETWORK LAYER (Unit-I)

Sr. No	Question	CO No.	Marks	University Year
1	Class B network 150.160.0.0 with default subnet mask, how can you divide it into 8 equal subnets? how many hosts can be accommodated in each subnetwork?	CO314450.1, CO314450.2	4	Nov 2019
2	What is the purpose of SMI and MIB in relation to SNMP?	CO314450.1	6	Nov 2019
3	What is DHCP? What are the advantages of DHCP? Explain various Messages of DHCP?	CO314450.1, CO314450.3	6	May 2018
4	Explain the operation of NAT with suitable example.	CO314450.1	4	May 2018
5	Explain OSPF with its message format	CO314450.1	6	May 2018
6	Difference between circuit switching, packet switching and message switching with one example.	CO314450.1	6	May 2017
7	A company needs 6 subnets to its six departments. The company is granted site address 210.80.60.0. Design the subnets.	CO314450.1, CO314450.2	6	May 2017
8	What is addressing techniques? Explain it.	CO314450.2	4	Dec 2015
9	What is fragmentation? Explain how it is supported to in IPV4 and IPV6?	CO314450.2	8	Dec 2011
10	State ICMP message format and list ICMP message types	CO314450.1	6	Dec 2015
11	What is routing? State different types of routing .Explain two interior gateway routing protocols.	CO314450.1	8	Dec 2013
12	Compare between distance vector routing protocols and link state routing protocols.	CO314450.1	8	May 2013
13	Compare and contrast between RIP and OSPF	CO314450.1	6	May 2007
14	What id BGP? Explain the operations of BGP with suitable example.	CO314450.1	8	Dec 2006
15	Compare IPV4 and IPV6.	CO314450.2	4	Dec 2015

TRANSPORT LAYER (Unit-II)

Sr. No	Question	CO No.	Marks	University Year
1	Explain timers used with TCP.	CO314450.1	4	May 2018
2	Explain Leaky &Token bucket algorithm.	CO314450.1	6	May 2018

3	Write a short note of Quality of Service Parameter in Transport layer	CO314450.1	4	NOV 2019. May 2018
4	Explain various transport layer services	CO314450.1	4	May 2017
5	Explain how TCP provides flow control?	CO314450.1	4	May 2017
6	Explain the duties of transport layer and differentiate between connection oriented and connectionless service.	CO314450.2	9	Dec 2013
7	Write an short note on UDP.	CO314450.1, CO314450.2	6	Dec 2002
8	Explain the all fields of TCP header.	CO314450.1, CO314450.2	8	May 06,11,13
9	Explain three way handshake algorithms for TCP connection establishment.	CO314450.2	8	Dec11,may 12,dec 13
10	What is silly window syndrome ?how to overcome it ?	CO314450.2	8	Dec 10,May 08,12

APPLICATION LAYER (Unit: III)

Sr. No	**Question**	**CO No.**	**Marks**	**University Year**
1	What is DNS? What server hierarchy? Describe the process of name resolution happens in DNS.	CO314450.3	6	May 2018
2	Explain in brief SMTP protocol?	CO314450.3	4	May 2018, NOV 2019
3	Explain the functions of email system	CO314450.3	6	May 05
4	Where and why do we use MIME	CO314450.3	4	May 09
5	Describe the SMTP header format	CO314450.3	4	May 2015
6	What is FTP? Why it requires two ports? Explain at least five user commands used in FTP?	CO314450.3	6	Dec 2013
7	Differentiate between persistent and non-persistent HTTP connection	CO314450.3	8	May 08,11
8	Explain the two types of messages used in HTTP.	CO314450.3	8	Dec 2013
9	Explain SNMP model with its major components.	CO314450.3	8	May 2013
10	Compare FTP and TFTP	CO314450.3	8	May 2016
11	What id MIME? Discuss its roles in SMTP.	CO314450.3	4	Dec 2016
12	Explain the Email Architecture and its services	CO314450.3	4	May 2015

WIRELESS STANDARDS (UNIT IV)

Sr. No	Question	CO No.	Marks	University Year
1	Explain architecture of Bluetooth ?	CO314450.4	8	NOV 2019
2	Explain 802.16 Protocol stack and its frame format.	CO314450.4	4	NOV 2019
3	Explain the basic architecture of WLAN and discuss various components in it	CO314450.4	8	NOV2019, May 2018
4	Compare between Bluetooth and IEEE 802.11 . What are the limitations of Bluetooth?	CO314450.4	8	May 2018
5	Describe MAC layer mechanism of IEEE 802.11	CO314450.4	8	May 2018
6	Explain the basic architecture of WLAN and discuss various components in it.	CO314450.4	10	May 2017
7	Explain Bluetooth features and architecture with suitable example.	CO314450.4	10	May 2017
8	Explain frame format of 802.16	CO314450.4	8	May 2017
9	Write a short note on hidden station problem.	CO314450.4	6	Dec 11,12
10	Explain IEEE 802.11 FHSS and DSSS.	CO314450.4	8	Dec 2015
11	What are the different technical issues to implement WLAN?	CO314450.4	8	May 2015
12	Write a short note on Bluetooth.	CO314450.4	6	May 09,Dec 13
13	Explain the detail architecture of bluetooth	CO314450.4	6	May 2015
14	Compare the Bluetooth and wireless LAN	CO314450.4	4	Dec 2016

AD-HOC WIRELESS NETWORK (UNIT-V)

Sr. No	Question	CO No.	Marks	University Year
1	Write a short note on MACAW?	CO314450.4	8	NOV 2019
2	Differences between Infrastructure network and infrastructure less network and what are the issues in Adhoc wireless network?	CO314450.4	8	NOV 2019, May 2018
3	Explain routing protocols in details.	CO314450.4	8	May 2018
4	Explain in detail LEACH algorithm.	CO314450.4	8	May 2018
5	Explain MAC Layer design issues for WSN.	CO314450.4	8	May 2017
6	Explain different routing protocols used in WSN.	CO314450.4	8	May 2017
7	Explain DSDV routing protocol.	CO314450.4	8	NOV 2019,

				May 2017
8	Explain the task of address management in WSN	CO314450.4	8	May 2017
9	Write a short note on AODV.	CO314450.4	6	Dec 15,16
10	Write a short note on DSR.	CO314450.4	6	NOV 2019, ,May16

RECENT TRENDS IN COMMUNICATION NETWORKS (UNIT VI)

Sr. No	Question	CO No.	Marks	University Year
1	Describe each component in Sensor node architecture.	CO314450.5	10	NOV 2019, May 2018
2	Compare LEO,MEO and GEO	CO314450.5	8	NOV 2019
3	Write a short note on following : (any two) d) SDN e) IOT f) LEACH	CO314450.5	18	NOV 2019
4	Short note on: C. IOT D. Wireless sensor Network.	CO314450.5	8	May 2018
5	Short note on SDN And Satellite.	CO314450.5	8	May 2018
6	Explain the different design constraints of WSN	CO314450.5	6	May 2015
7	What are the operating environmental constraint in WSN?	CO314450.5	8	Dec 2016
8	Describe each component in sensor node architecture.	CO314450.5	8	Dec 2016
9	List any six applications of sensor network.	CO314450.5	6	Dec 2014
10	Write short note on IOT.	CO314450.5	6	May16, Dec 16
11	Explain the setup and steady state phase of LEACH protocol	CO314450.5	8	Dec 2014

ADDITIONAL RESOURCES

1. https://www.youtube.com/watch?v=OymtD3A-JbQ&t=16s
2. https://www.youtube.com/watch?v=Rvk_L9vJlWA&list=PLnpwocHJ4uP6cG7UhTCcQbXD99pf993RP
3. https://www.youtube.com/watch?v=B7-7RcZCIbM
4. https://www.youtube.com/watch?v=-JOw6R790gQ
5. https://www.youtube.com/watch?v=PhrP45Vm5Bg
6. https://www.youtube.com/watch?v=WMbXgtxTrBY
7. https://www.youtube.com/watch?v=X0GMtmBAhOk
8. https://www.youtube.com/watch?v=7XJ6j0ZqiJU&t=245s
9. https://www.youtube.com/watch?v=4PPUvRj2PvM

314451
Systems Programming

SYLLABUS

314451: SYSTEMS PROGRAMMING

Teaching Scheme:	Credits	Examination Scheme:
Lectures:4Hours/Week	04	In-Semester : 30Marks
		End-Semester: 70 Marks

Course Objectives:-

1. To study and understand different system software like Assembler, Macro-processorand Loaders /Linkers.
2. To design and develop useful system software.
3. To study and understand compiler design.
4. To understand semantic analysis and storage allocation in compilation process.
5. To understand different code generation techniques.
6. To study different code optimization methods.

Course Outcome:-

1. To learn basic principle of system software.
2. To design and implement Assemblers, Macro Processor and Loaders.
3. Demonstrate LEX tool for generation of Lexical Analyzer.
4. Demonstrate YACC tool for generation of Syntax Analyzer.
5. To construct output for all the phases of compiler.
6. To explain Semantic Analysis, Code optimization in the compilationprocess.

UNIT – I INTRODUCTION TO SYSTEMS PROGRAMMING AND ASSEMBLERS 08 Hours

Introduction: Need of System Software, Components of System Software, Language Processing Activities, Fundamentals of Language Processing.

Assemblers: Elements of Assembly Language Programming, A simple Assembly Scheme, Pass structure of Assemblers, Design of Two Pass Assembler, Single pass assembler.

UNIT – II MACROPROCESSORS, LOADERS AND LINKERS 08 Hours

Macro Processor: Macro Definition and call, Macro Expansion, Nested Macro Calls and definition, Advanced Macro Facilities, Design of two-pass Macro Processor.

Loaders: Loader Schemes, Compile and Go, General Loader Scheme, Absolute Loader Scheme, Subroutine Linkages, Relocation and linking concepts, Self-relocating programs, Relocating Loaders, Direct Linking Loaders, Overlay Structure.

UNIT - III INTRODUCTION TO COMPILERS 08 Hours

Phase structure of Compiler and entire compilation process.

Lexical Analyzer: The Role of the Lexical Analyzer, Input Buffering. Specification of Tokens, Recognition of Tokens, Design of Lexical Analyzer using Uniform Symbol Table, Lexical Errors.

LEX: LEX Specification, Generation of Lexical Analyzer by LEX.

UNIT – IV PARSERS 08 Hours

Role of parsers, Classification of Parsers: Top down parsers- recursive descent parser and predictive parser. Bottom up Parsers – Shift Reduce: SLR, CLR and LALR parsers. Error Detection and Recovery in Parser. YACC specification and Automatic construction of Parser (YACC).

UNIT – V SEMANTIC ANALYSIS AND STORAGE ALLOCATION 08 Hours

Need, Syntax Directed Translation, Syntax Directed Definitions, Translation of assignment Statements, iterative statements, Boolean expressions, conditional statements, Type Checking and Type conversion.

Intermediate Code Formats: Postfix notation, Parse and syntax tress, Three address code, quadruples and triples.

Storage Allocation: Storage organization and allocation strategies.

UNIT – VI CODE GENERATION AND OPTIMIZATION 08 Hours

Code Generation: Code generation Issues. Basic blocks and flow graphs, A Simple Code Generator.

Code Optimization: Machine Independent: Peephole optimizations: Common Sub-expression elimination, Removing of loop invariants, Induction variables and Reduction in strengths, use of machine idioms, Dynamic Programming Code Generation.

Machine dependent Issues: Assignment and use of registers, Rearrangement of Quadruples for code optimization.

Text Books

1. D. M. Dhamdhere, Systems Programming and Operating Systems, Tata McGraw-Hill, ISBN 13:978-0-07-463579-7, Second Revised Edition.
2. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Compilers Principles, Techniques and Tools, Addison Wesley, ISBN: 981–235–885 - 4, Low Price Edition.
3. J. J. Donovan, Systems Programming, McGraw-Hill, ISBN 13:978-0-07-460482-3, Indian Edition.

Reference Books

Leland L. Beck, “System Software An introduction to Systems Programming”,
Pearson Education,ISBN13: 9788177585551.

COURSE OUTCOMES

Subject Name: System Programming **Subject Code: 314451**

Class: TE (A/B) **Pattern: 2015**

Staff In-charge: ,Mrs. R. S. Sadafule, Mr. C. A. Ghuge

CO No.	Course Outcome	Mapping With Unit/ Assignment	Assessment Technique	Blooms Taxonomy Category
C314451.1	To learn basic principle of system software.	I	Pre in sem exam	L2-Understanding
C314451.2	To design and implement Assemblers, Macro Processor and Loaders.	II		L3 -Applying
C314451.3	Demonstrate LEX tool for generation of Lexical Analyzer.	III		L3 - Applying
C314451.4	Demonstrate YACC tool for generation of Syntax Analyzer.	IV	Pre end sem exam	L3 - Applying
C314451.5	To construct output for all the phases of compiler.	V		L3- Applying
C314451.6	To explain Semantic Analysis, Code optimization in the compilation process.	VI		L2 - Understanding

PREREQUISITES

SR. No.	Unit Number	Prerequisite subject name
1.	I	Computer Organization and architecture
2.	II	Computer Organization and architecture
3.	III	Theory of Computation: DFA, NFA, Regular expressions, Grammars.
4.	IV	Theory of Computation: Grammars.
5.	V	Discrete Structure, Theory of Computation :Grammars
6.	VI	Discrete Structure, COA

TEACHING PLAN

Teaching Plan
Short

Academic Year:-2020-21 Semester :-II w. e. f. :-16/12/2019

Class : - TE Division: A,B

Subject :- SYSTEMS PROGRAMMING Subject Code :- 314451

Faculty In charge :- Ms. Rajashri Sadafule, Mr.C. A. Ghuge No. of Lectures/ weeks: 4

- **Lecture Plan**

Sr. No.	Unit No.	Unit/ Topic Name	Start Date	End Date
1.	I	Introduction To Systems Programming And Assemblers	Dec Week3	Jan Week1
2.	II	Macro processors, Loaders And Linkers	Jan Week2	Jan Week3
3.	III	Introduction To Compilers	Jan Week4	Feb Week3
4.	IV	Parsers	Feb Week4	Mar Week1
5.	V	Semantic Analysis And Storage Allocation	Mar Week2	Mar Week3
6.	VI	Code Generation And Optimization	Mar Week3	April Week1

Detail Teaching Plan

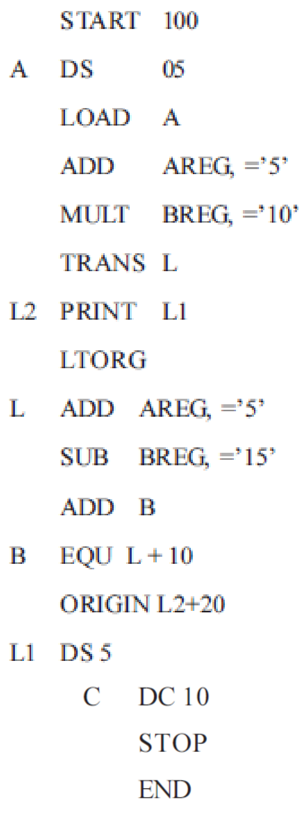
Lect. No	Unit No.	Main Topic to be Covered	Sub Topics to be Covered	Chap. No. & Reference Books	CO to Attain	Measurable to attain CO	Mode of Delivery
1	**I**	**Introduction To Systems Programming And Assemblers**	Prerequisite of subject, Need of System Software	John J Donovan ,”Systems Programming”, Chapter 2,3,4 D.M. Dhamdhere ,”Systems Programming and Operating Systems Chapter 1,2,3,4	C314451.1, C314457.2	Pre Insem	Chalk and Talk, PPT
2			Components of System Software, Language Processing Activities				Chalk and Talk, PPT
3			Fundamentals of Language Processing.				Chalk and Talk, PPT
4			Assemblers: Elements of Assembly Language Programming, A simple Assembly Scheme				Chalk and Talk, PPT
5			Pass structure of Assemblers, Design of Two Pass Assembler				Chalk and Talk, PPT, Video
6			Examples on Two Pass Assembler				Chalk and Talk, PPT,Video
7			Single pass assembler and examples				Chalk and Talk, PPT, Video
8			Revision of topic with examples				Chalk and Talk, PPT
9	**II**	**Microprocessors, Loaders And Linkers**	Macro Processor: Macro Definition and call, Macro Expansion	John J Donovan ,”Systems Programming” D.M. Dhamdhere ,”Systems	C314457.2	Pre Insem	Chalk and Talk, PPT,Video
10			Nested Macro Calls and definition examples				
11			Advanced Macro Facilities				Chalk and Talk, PPT,Video
12			Design of two-pass Macro Processor and its examples				Chalk and Talk, PPT

				Programming and Operating Systems			,Video
13			Loaders: Loader Schemes, Compile and Go				Chalk and Talk, PPT
14			General Loader Scheme, Absolute Loader Scheme, Subroutine Linkages				Chalk and Talk, PPT
15			Relocation and linking concepts, Self-relocating programs				Chalk and Talk, PPT
16			Relocating Loaders, Direct Linking Loaders, Overlay Structure.				Chalk and Talk, PPT
17	**III**	**Introduction To Compiler**	Phase structure of Compiler and entire compilation process.	Alfred V. Aho, Ravi Sethi, Reffrey D. Ull man, “Compilers Principles, Techniques, and Tools”, LEX & YaCC O’ Reilly	C314451.3, C314457.5	Pre Insem	Chalk and Talk, PPT
18			Lexical Analyzer: The Role of the Lexical Analyzer				Chalk and Talk, PPT,Video
19			Input Buffering. Specification of Tokens				Chalk and Talk, PPT
20			Recognition of Tokens, Design of Lexical Analyzer Lexical Analyzer using Uniform Symbol Table				Chalk and Talk, PPT
21			Lexical Errors. Assignment Explanation				Chalk and Talk, PPT
22			RE to DFA example				Chalk and Talk, PPT,Video
23			LEX: LEX Specification,				Chalk and Talk, PPT,Video
24			Generation of Lexical Analyzer by LEX.				Chalk and Talk, PPT,Video
	Assessment Technique test on UNIT I,II,III						
25	**IV**	**Parsers**	Role of parsers, Classification of Parsers : Top down parsers	Alfred V. Aho, Ravi Sethi, Reffrey D. Ull	C314451.4		Chalk and Talk, PPT
26			recursive descent parser, predictive parser				Chalk and Talk, PPT

27			Examples on Top down parsers	man, “Compilers Principles, Techniques, and Tools”,		Pre End Sem	Chalk and Talk, PPT
28			Bottom up Parsers- Shift Reduce: SLR, CLR and LALR parsers				Chalk and Talk, PPT,Video
29			SLR, CLR and LALR parsers				Chalk and Talk, PPT
30			Error Detection and Recovery in Parser				Chalk and Talk, PPT
31			YACC specification				Chalk and Talk, PPT, Video
32			Features Automatic construction of Parser (YACC).				Chalk and Talk, PPT, Video
33	**V**	**Semantic Analysis And Storage Allocation**	Semantic Analysis And Storage Allocation Need, Syntax Directed Translation	Alfred V. Aho, Ravi Sethi, Reffrey D. Ull man, “Compilers Principles, Techniques, and Tools”,	C314451.5	Pre End Sem	Chalk and Talk, PPT
34			Syntax Directed Definitions, Translation of assignment Statements				Chalk and Talk, PPT
35			Iterative statements, Boolean expressions, conditional statements				Chalk and Talk, PPT
36			Type Checking and Type conversion.				Chalk and Talk, PPT
37			Intermediate Code Formats: Postfix notation, Parse and syntax tress				Chalk and Talk, PPT
38			Three address code, quadruples and triples.				Chalk and Talk, PPT
39			Storage Allocation: Storage organization and allocation strategies.				Chalk and Talk, PPT
40	**VI**	**Code Generation And Optimization**	Code Generation: Code generation Issues. Basic blocks and flow graphs	Alfred V. Aho, Ravi Sethi, Reffrey D. Ull man, “Compilers Principles, Techniques, and	C314451.6	Pre End Sem	Chalk and Talk, PPT
41			A Simple Code Generator.				Chalk and Talk, PPT
42			Code Optimization: Machine Independent: Peephole optimizations: Common Sub-expression elimination				Chalk and Talk, PPT

43			Removing of loop invariants, Induction variables and Reduction in strengths	Tools”			Chalk and Talk, PPT
44			Use of machine idioms, Dynamic Programming Code Generation.				Chalk and Talk, PPT
45			Machine dependent Issues: Assignment and use of registers				Chalk and Talk, PPT
46			Rearrangement of Quadruples for code optimization				Chalk and Talk, PPT
	Assessment Technique on UNIT IV,V,VI						

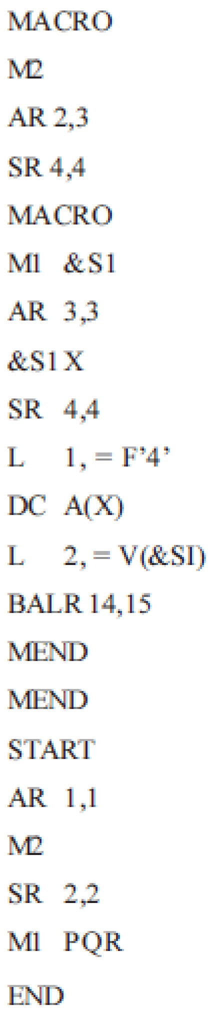
HOME ASSIGNMENT

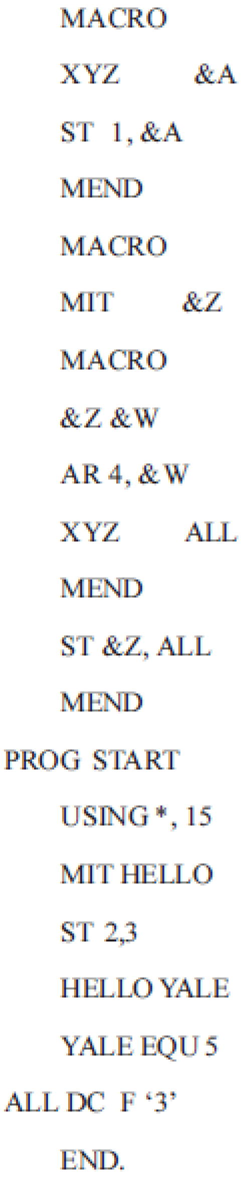
Sr. No.	Question	CO No.	Marks	University Year
	UNIT I: Introduction To Systems Programming And Assemblers			
1	Show symbol table, literal table, pool table intermediate code generation target code for the given assembler program. Assume a hypothetical instruction set with every instruction of length 1. 	314451.1	8	Feb 2016

```
     START  100
A    DS     05
     LOAD   A
     ADD    AREG, ='5'
     MULT   BREG, ='10'
     TRANS  L
L2   PRINT  L1
     LTORG
L    ADD   AREG, ='5'
     SUB   BREG, ='15'
     ADD   B
B    EQU  L + 10
     ORIGIN L2+20
L1   DS 5
       C     DC 10
             STOP
             END
```

Sr. No.	Question	CO No.	Marks	University Year
2	Explain in detail data structures used in Pass I and Pass II of assembler	314451.2	5	Feb 2015,2016,Nov 2017
3	How would you summarize the following terms with examples. i) Compiler ii) Interpreter iii) Loader iv) Assembler v) Macroprocessor	314451.1	5	Nov 2017
4	Compare Single Pass Assembler and Two Pass Assembler	314451.1	4	Apr-18
5	Explain need of TII in Single Pass Assembler	314451.1	5	May-18

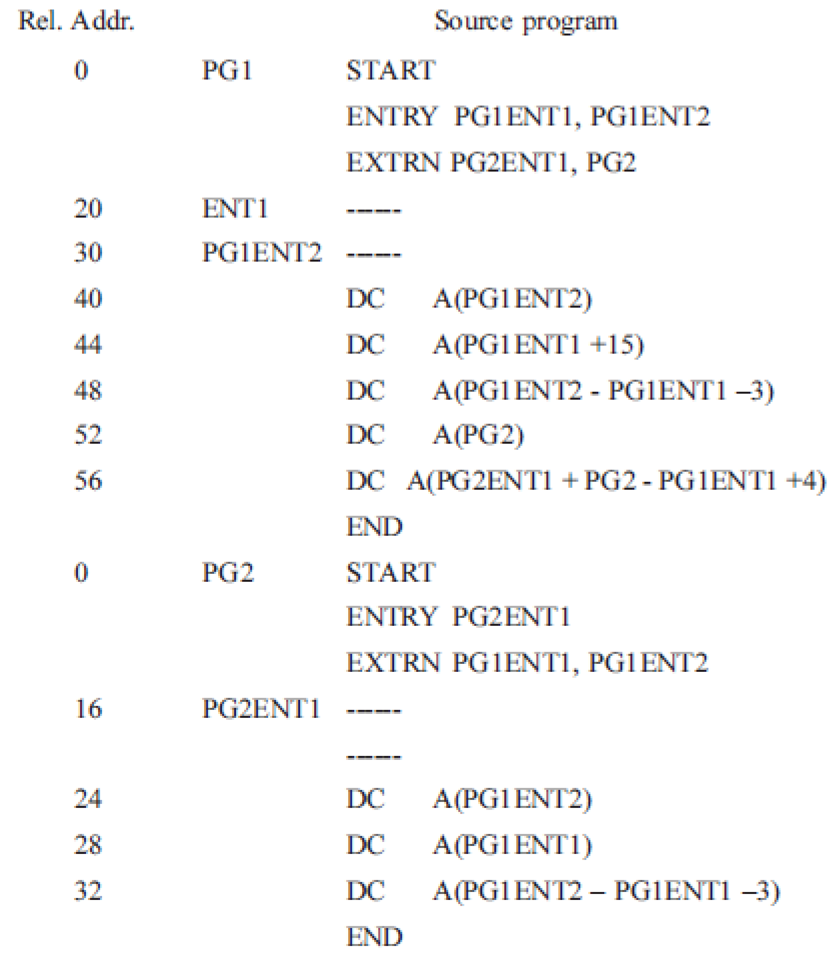
UNIT II: Macro processors, Loaders And Linkers

<table>
<tr><th>Sr. No.</th><th>Question</th><th>CO No.</th><th>Marks</th><th>University Year</th></tr>
<tr><td>1</td><td>nstruct single pass macro processor algorithm and generate expanded code for the given code
<pre>
MACRO
M2
AR 2,3
SR 4,4
MACRO
M1   &S1
AR 3,3
&S1 X
SR   4,4
L   1, = F'4'
DC A(X)
L   2, = V(&SI)
BALR 14,15
MEND
MEND
START
AR 1,1
M2
SR   2,2
M1   PQR
END
</pre></td><td>314451.2</td><td>6</td><td>Feb 2016</td></tr>
<tr><td>2</td><td>For the following program construct MNT, MDT,ALA, and expanded assembly language code.</td><td>314451.2</td><td>8</td><td>May 2016</td></tr>
</table>

```
      MACRO
      XYZ       &A
      ST  1, &A
      MEND
      MACRO
      MIT       &Z
      MACRO
      &Z &W
      AR 4, &W
      XYZ       ALL
      MEND
      ST &Z, ALL
      MEND
PROG  START
      USING *, 15
      MIT HELLO
      ST  2,3
      HELLO YALE
      YALE EQU 5
ALL DC  F '3'
      END.
```

3	Build ESD,TXT and RLD cards for both PG1,PG2 for the following assembly language code	314451.2	6	May 2016



```
Rel. Addr.                  Source program
   0        PG1        START
                       ENTRY  PG1ENT1, PG1ENT2
                       EXTRN PG2ENT1, PG2
   20       ENT1       ----
   30       PG1ENT2    ----
   40                  DC     A(PG1ENT2)
   44                  DC     A(PG1ENT1 +15)
   48                  DC     A(PG1ENT2 - PG1ENT1 –3)
   52                  DC     A(PG2)
   56                  DC  A(PG2ENT1 + PG2 - PG1ENT1 +4)
                       END
   0        PG2        START
                       ENTRY  PG2ENT1
                       EXTRN PG1ENT1, PG1ENT2
   16       PG2ENT1    ----
                       ----
   24                  DC     A(PG1ENT2)
   28                  DC     A(PG1ENT1)
   32                  DC     A(PG1ENT2 – PG1ENT1 –3)
                       END
```

4	How would you use following macro directives :MACRO, MEND, AIF, AGO, LBL, GBL	314451.2	6	Apr-2018
5	Compare Compile and Go Loader v/s Absolute Loader	314451.2	4	Nov 2017 Apr-2018

UNIT III: Introduction To Compilers

Sr. No.	Question	CO No.	Marks	University Year

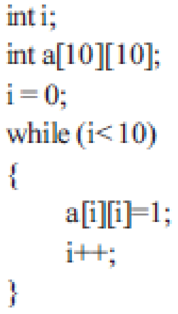
1	For the ‘C’ code given below, Construct the different tables that would be generated as output of lexical analysis.
	main ( )
	{
	int i = 1, sum = 0, n;
	float avg;
	printf(“Enter a value for n:”);
	scanf(“%d”, &n);
	sum = ¢;
	do
	{
	sum = sum + i;
	i ++;
		314451.3	6	Nov 2017

	}
	while (i <= n);
	avg = sum / (float)n;
	printf(“average : %f”, avg);
	getch ( );
	}			

2	How would you show your understanding for phases of a compiler.	314451.4	5	Nov 2017,Apr-2018
3	How would you show 3 phases of compiler with the help of the statement (b2-4ac)/2a	314451.4	6	Feb 2017
4	Build DFA for RE: (a+b)*+(a+c)*	314451.3	6	May 2015
5	Explain structure of LEX programming	314451.4	4	Apr-2018

UNI IV: Parsers				
Sr. No.	**Question**	**CO No.**	**Marks**	**University Year**
1	Consider the following grammar $S \rightarrow CC$ $C \rightarrow cC / d$ Construct LALR parser and parse for ccd string	314451.4	10	May 2016
2	Explain YACC file structure	314451.4	4	May 2016
3	Define table driven predictive parser. For the following grammar S → aSbS/bSaS/ε Construct table - driven predictive parser and parse the string “ab”.	314451.4	8	Nov 2017
4	Construct the operator precedence parse table for the following grammar and show its shift-reduce actions for the input string “ abab”. S → aSbS | bSaS | ε	314451.4	6	
5	Consider the following grammar S → AS | b A → SA | a Construct the SLR parse table for the grammar. Show the actions of the parser for the input string “abab”	314451.4	6	

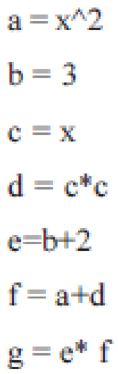
UNIT V: Semantic Analysis And Storage Allocation				
Sr. No.	**Question**	**CO No.**	**Marks**	**University Year**
1	How would you show your understanding of three address code for the following C code.	314451.5	6	Nov 2018

```
int i;
int a[10][10];
i = 0;
while (i< 10)
{
        a[i][i]=1;
        i++;
}
```

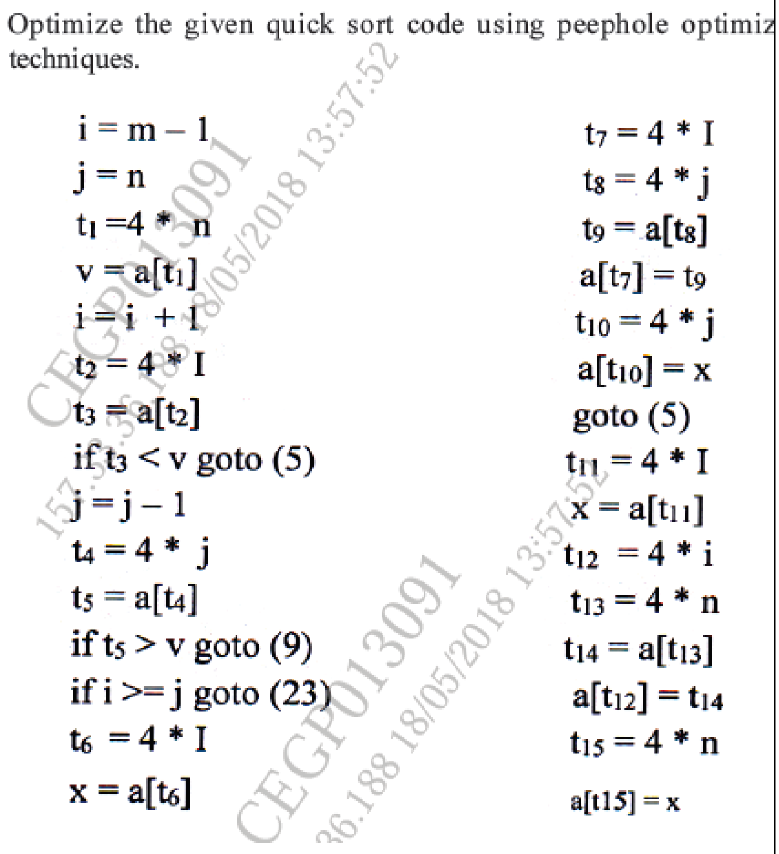
2	For the given piece of code Build TAC :
	X, Y : ARRAY [1 – 10, 1 – 10] OF INTEGER;
	for (j = 1; j <=5; j++)
	X[2*i – 1][j] = Y[2 * i] [j]
		314451.5	8	Nov 2017

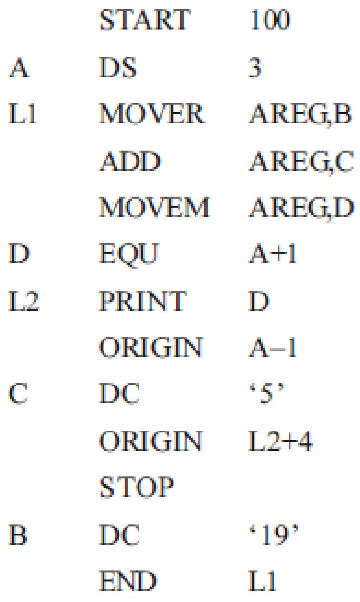
3	For the statement given below, build intermediate code in the form of: i) postfix notation ii) Parse Tree iii) Quadruple iv) Triple S = (a + b)/(c – d)	314451.5	8	Nov 2017

4	Optimize following code
	
	a = x^2
	b = 3
	c = x
	d = c*c
	e=b+2
	f = a+d
	g = e* f
		314451.5	6	

5	How would you show your understanding for the followig terms i) Syntax Directed Definition ii) Syntax Directected Translation iii) Synthesized Attribute iv) Inherited Attributes	314451.5	8	May 2018

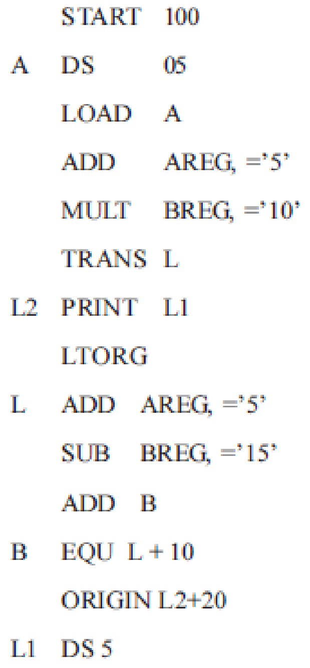
UNIT VI: Code Generation And Optimization

Sr. No.	Question	CO No.	Marks	University Year
1	How would you Explain following machine independent optimization techniques : i) Loop invariation ii) Common sub - expression elimination. iii) Dead code elimination iv) Strength reduction	314451.6	8	May 2016,Nov 2017
2	Compare machine dependent and independent optimization.	314451.6	4	May 2016,Nov 2017,May-2018
3	How would you Explain factors affecting target code optimization.	314451.6	8	
4	Optimize the given quick sort code using peephole optimiz techniques. $i = m - 1$ $j = n$ $t_1 = 4 * n$ $v = a[t_1]$ $i = i + 1$ $t_2 = 4 * I$ $t_3 = a[t_2]$ if $t_3 < v$ goto (5) $j = j - 1$ $t_4 = 4 * j$ $t_5 = a[t_4]$ if $t_5 > v$ goto (9) if $i >= j$ goto (23) $t_6 = 4 * I$ $x = a[t_6]$ $t_7 = 4 * I$ $t_8 = 4 * j$ $t_9 = a[t_8]$ $a[t_7] = t_9$ $t_{10} = 4 * j$ $a[t_{10}] = x$ goto (5) $t_{11} = 4 * I$ $x = a[t_{11}]$ $t_{12} = 4 * i$ $t_{13} = 4 * n$ $t_{14} = a[t_{13}]$ $a[t_{12}] = t_{14}$ $t_{15} = 4 * n$ $a[t15] = x$	314451.6	8	May-2018
5	Explain dynamic code genration algorithm	314451.6	4	May-2018

Sr. No.	Question	CO No.	Marks	University Year
UNIT I: Introduction To Systems Programming And Assemblers				
1	How content of symbol table at the end of pass I and generate intermediate code. 	314451.1	8	May 2015

```
        START   100
A       DS      3
L1      MOVER   AREG,B
        ADD     AREG,C
        MOVEM   AREG,D
D       EQU     A+1
L2      PRINT   D
        ORIGIN  A–1
C       DC      ‘5’
        ORIGIN  L2+4
        STOP
B       DC      ‘19’
        END     L1
```

Sr. No.	Question	CO No.	Marks	University Year
2	Generate symbol table, literal table, pool table intermediate code generation target code for the given assembler program. Assume a hypothetical instruction set with every instruction of length 1.	314451.1	8	Feb 2016

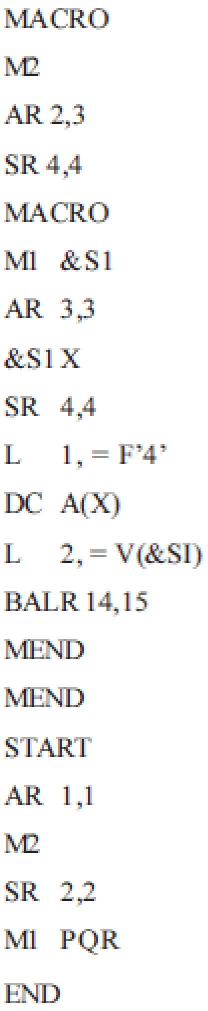


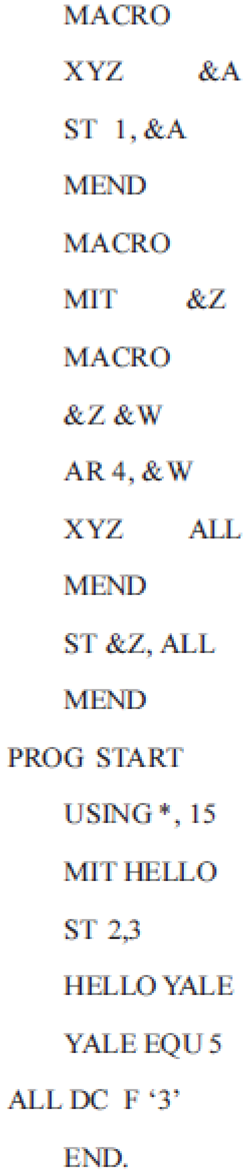
```
        START   100
A       DS      05
        LOAD    A
        ADD     AREG, ='5'
        MULT    BREG, ='10'
        TRANS   L
L2      PRINT   L1
        LTORG
L       ADD   AREG, ='5'
        SUB   BREG, ='15'
        ADD   B
B       EQU  L + 10
        ORIGIN L2+20
L1      DS 5
          C     DC 10
                STOP
                END
```

3	Define term forward reference and explain w.r.t to above example	314451.2	2	Feb 2016
4	What is language processor explains with diagram	314451.1	4	Feb 2015
5	Explain in detail data structures used in Pass I and Pass II of assembler	314451.2	5	Feb 2015,2016, Nov 2017
6	Write short note on Single Pass Assembler.	314451.2	6	
7	What is forward reference? How to handle forward reference in single pass Assembler.	314451.2	6	
8	Define system software with examples	314451.1	4	
9	List system software's explain any three in brief.	314451.1	6	
10	Define the following terms with examples. i) Compiler ii) Interpreter iii) Loader iv) Assembler v) Macroprocessor	314451.1	5	Nov 2017
11	What is language processing? Explain application ,PL and execution domain	314451.1	4	Apr-18
12	Compare Single Pass Assembler and Two Pass Assembler	314451.1	4	Apr-18
13	Explain need of TII in Single Pass Assembler	314451.1	5	May-18

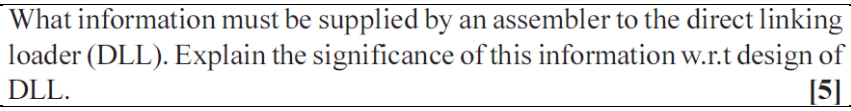
UNIT II : Macro processors, Loaders And Linkers

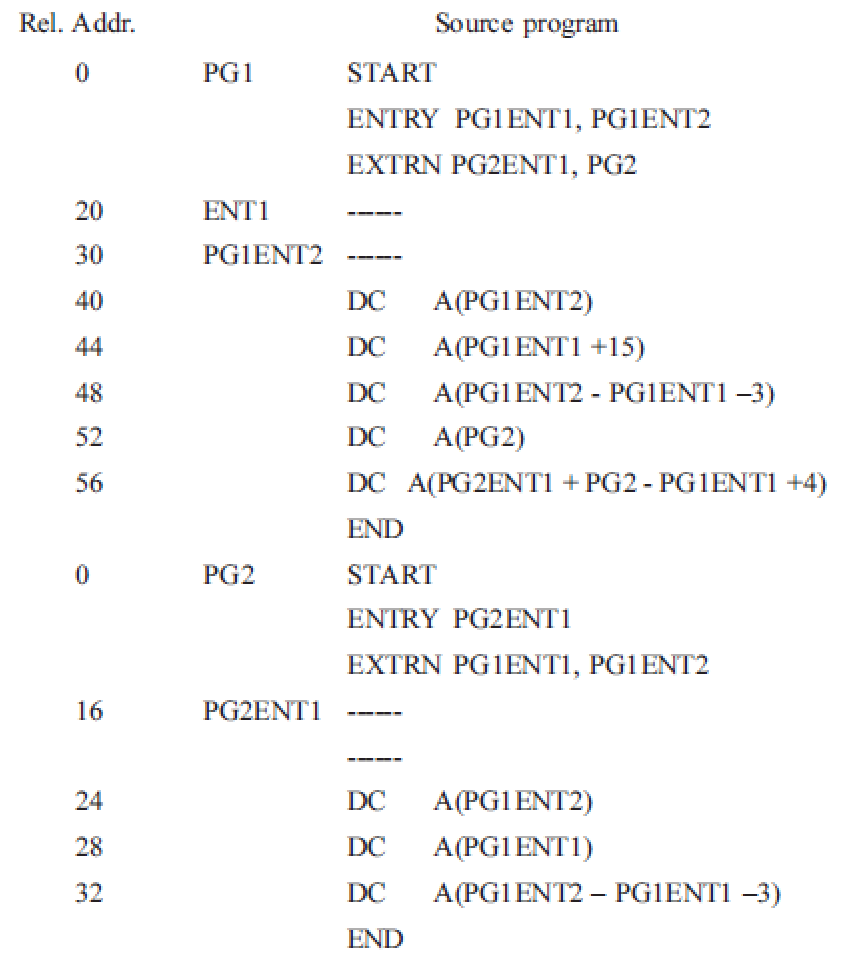
Sr. No.	Question	CO No.	Marks	University Year
1	What are the types of cards used in direct linking loader? Explain	314451.2	6	Feb 2015

	with example			
2	Explain compile and Go loader scheme with advantages and disadvantages	314451.2	6	Feb 2015
3	Differentiate between absolute loader and relocatable loader	314451.2	4	Feb 2015
4	Explain concept of overlay with example	314451.2	4	Feb 2015
5	Design Macroprocessor and explain nested macro call	314451.2	6	Feb 2015
6	rform single pass macro processor algorithm and generate expanded code for the given code  MACRO M2 AR 2,3 SR 4,4 MACRO MI &S1 AR 3,3 &S1 X SR 4,4 L 1, = F’4’ DC A(X) L 2, = V(&SI) BALR 14,15 MEND MEND START AR 1,1 M2 SR 2,2 MI PQR END	314451.2	6	Feb 2016
7	For the following program show MNT, MDT,ALA, and expanded assembly language code.	314451.2	8	May 2016

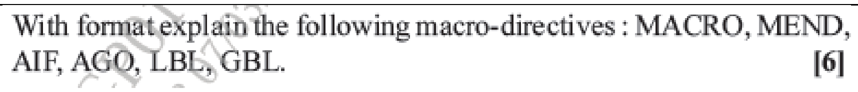
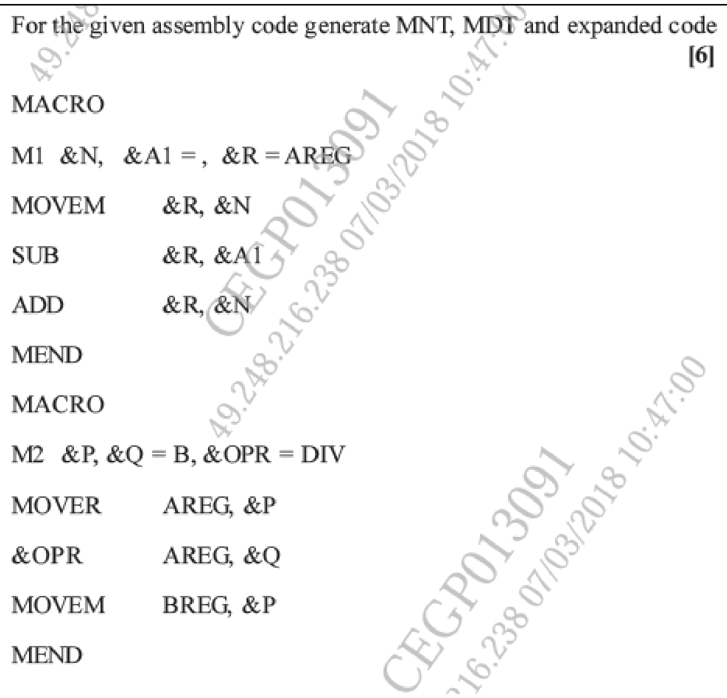


```
          MACRO
          XYZ      &A
          ST  1, &A
          MEND
          MACRO
          MIT      &Z
          MACRO
          &Z &W
          AR 4, &W
          XYZ      ALL
          MEND
          ST &Z, ALL
          MEND
      PROG  START
          USING *, 15
          MIT HELLO
          ST  2,3
          HELLO YALE
          YALE EQU 5
      ALL DC  F '3'
          END.
```

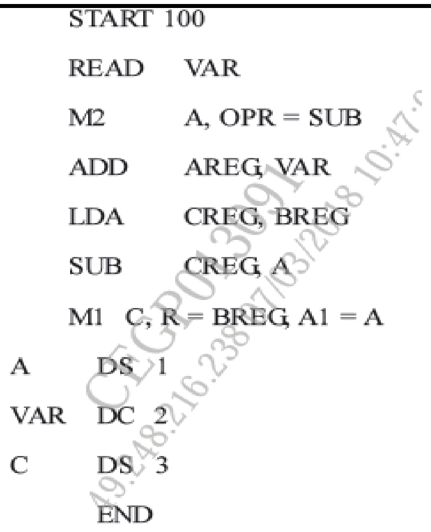
8	 What information must be supplied by an assembler to the direct linking loader (DLL). Explain the significance of this information w.r.t design of DLL. **[5]**	314451.2	5	Feb 2016
9	Explain the design of absolute loader	314451.2	5	Feb 2016
10	Explain the absolute loader and advantages and disadvantages	314451.2	4	May 2016
11	Explain flow chart / Algorithm of pass I of direct linkingloader.	314451.2	6	Nov 2017
12	Give ESD,TXT and RLD cards for both PG1,PG2 for the following assembly language code	314451.2	6	May 2016



```
Rel. Addr.                Source program
    0        PG1        START
                        ENTRY  PG1ENT1, PG1ENT2
                        EXTRN PG2ENT1, PG2
    20       ENT1       ----
    30       PG1ENT2    ----
    40                  DC     A(PG1ENT2)
    44                  DC     A(PG1ENT1 +15)
    48                  DC     A(PG1ENT2 - PG1ENT1 –3)
    52                  DC     A(PG2)
    56                  DC  A(PG2ENT1 + PG2 - PG1ENT1 +4)
                        END
    0        PG2        START
                        ENTRY  PG2ENT1
                        EXTRN  PG1ENT1, PG1ENT2
    16       PG2ENT1    ----
                        ----
    24                  DC     A(PG1ENT2)
    28                  DC     A(PG1ENT1)
    32                  DC     A(PG1ENT2 – PG1ENT1 –3)
                        END
```

13	 With format explain the following macro-directives : MACRO, MEND, AIF, AGO, LBL, GBL. **[6]**	314451.2	6	Apr-2018
14	What is subroutine linkage? How it is resolved	314451.2	4	Apr-2018
15	 For the given assembly code generate MNT, MDT and expanded code **[6]**	314451.2	6	Apr-2018

```
MACRO
M1  &N,  &A1 = ,  &R = AREG
MOVEM       &R, &N
SUB         &R, &A1
ADD         &R, &N
MEND
MACRO
M2  &P, &Q = B, &OPR = DIV
MOVER       AREG, &P
&OPR        AREG, &Q
MOVEM       BREG, &P
MEND
```



```
START 100
READ    VAR
M2      A, OPR = SUB
ADD     AREG, VAR
LDA     CREG, BREG
SUB     CREG, A
M1  C, R = BREG, A1 = A
A     DS  1
VAR   DC  2
C     DS  3
      END
```

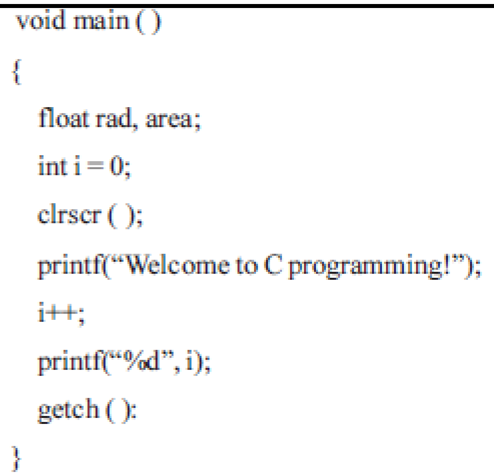
16	Compare Compile and Go Loader v/s Absolute Loader	314451.2	4	Nov 2017 Apr-2018

UNIT III: Introduction To Compilers

Sr. No.	Question	CO No.	Marks	University Year

1	For the 'C' code given below, give the different tables that would be generated as output of lexical analysis.
	main ( )
	{
	int i = 1, sum = 0, n;
	float avg;
	printf("Enter a value for n:");
	scanf("%d", &n);
	sum = ¢;
	do
	{
	sum = sum + i;
	i ++;
	}
	while (i <= n);
	avg = sum / (float)n;
	printf("average : %f", avg);
	getch ( );
	}
		314451.3	6	Nov 2017

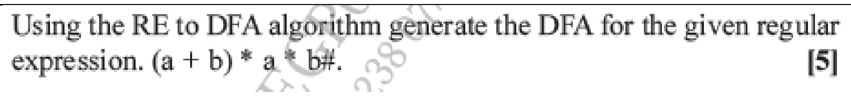
2	List down the phases of a compiler.	314451.4	5	Nov 2017,Apr-2018
3	Discuss the phases of compiler with the help of the statement p: = initial + rate × 60.	314451.4	5	Feb 2016
4	Discuss the 3 phases of compiler with the help of the statement (b2-4ac)/2a	314451.4	6	Feb 2017
5	For the given code perform lexical analysis and generate various tables	314451.3	5	Feb 2016



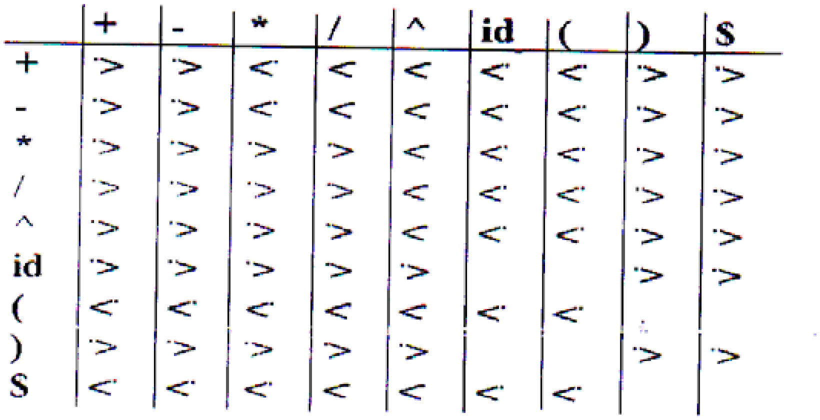
```
void main ( )
{
   float rad, area;
   int i = 0;
   clrscr ( );
   printf(“Welcome to C programming!”);
   i++;
   printf(“%d”, i);
   getch ( ):
}
```

6	Convert RE to DFA for (a/b)*abb.	314451.3	6	Feb 2017
7	Convert RE to DFA for (a/b)*a*b	314451.3	8	Feb 2016
8	Convert RE to DFA for (a+b)*+(a+c)*	314451.3	6	May 2016
9	Lexical analyzer builds an UST. What is the use of this table	314451.3	2	Feb 2016

10	What is the role of the lexical analyzer? Explain b. Identify the token and, lexemes in the following function:
	function gcd (m, n: integer): integer;
	begin
	if n = 0 then gcd := m
	else gcd := gcd (n, m mod n)
	end; (* of gcd*)
		314451.3		

11	Convert RE to DFA for (a+b)*+(a+c)*	314451.3	6	May 2015
12	Explain first three phases of compiler for given example (b2-4ac)/2a.	314451.4	6	Apr-2018
13	 Using the RE to DFA algorithm generate the DFA for the given regular expression. (a + b) * a * b#. **[5]**	314451.3	6	Apr-2018
14	Explain structure of LEX programming	314451.4	4	Apr-2018

UNI IV: Parsers				
Sr. No.	**Question**	**CO No.**	**Marks**	**University Year**
1	Using the table given, parse the string id – id* (id-id)/id using an operator precedence parser.	314451.4	10	Nov 2017

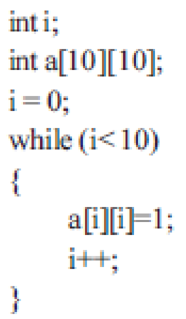
	+	-	*	/	^	id	(	)	$
+	>	>	<	<	<	<	<	>	>
-	>	>	<	<	<	<	<	>	>
*	>	>	>	>	<	<	<	>	>
/	>	>	>	>	<	<	<	>	>
^	>	>	>	>	<	<	<	>	>
id	>	>	>	>	>			>	>
(	<	<	<	<	<	<	<		
)	>	>	>	>	>			>	>
$	<	<	<	<	<	<	<		

2	With a neat diagram explain the classification of parser	314451.4	6	May 2016
3	Compare bottom up and top down parser	314451.4	4	May 2016,Nov 2017
4	Explain the concept of handle in bottom up parsing and explain it w.r.t. the given example : S → SS+/SS*/a for the string aaa*a++	314451.4	4	Nov 2017
5	Compare LALR and CLR parsers	314451.4	4	May 2016,Nov 2017
6	Consider the following grammar S → CC C → cC / d Construct LALR parser and parse for ccd string	314451.4	10	May 2016
7	Explain YACC file structure	314451.4	4	May 2016
8	Define table driven predictive parser. For the following grammar S → aSbS/bSaS/ε Construct table - driven predictive parser and parse the string “ab”.	314451.4	8	Nov 2017
9	With a neat diagram explain the classification of parsers.	314451.4	6	Nov 2017
10	Write a short note on Lex and Yacc	314451.4	4	Feb 2017,Nov 2017
11	Draw a Parse tree for the assignment statement using appropriate grammar. position : = initial + rate* 60	314451.4	6	
12	Consider the arithmetic expression grammar, show left most and right most derivation for id + id * id and draw their parse trees	314451.4	6	
13	Construct the operator precedence parse table for the following grammar and show its shift-reduce actions for the input string “ abab”. S → aSbS | bSaS | ε	314451.4	6	
14	Construct an LR parsing table for the following grammar a. E -> E + T b. E -> T c. T -> T*F d. T -> F	314451.4	6	

	e. F -> (E) f. F-> id			
15	Consider the following grammar S → AS | b A → SA | a Construct the SLR parse table for the grammar. Show the actions of the parser for the input string "abab"	314451.4	6	
16	Draw the parse tree for the arithmetic expression id + (id * id)	314451.4	6	
17	Construct LALR(1) parsers for the following grammar. S → L = R S → R L → * R L → id R → L	314451.4	6	May-2018
18	Explain YACC file structure	314451.4	6	May-2018
19	S → S + S / S-S / (S) / S*S / a **[6]** Remove ambiguity and left recursion from the given grammar.	314451.4	6	May-2018
20	Write short note on recursive descent parser	314451.4	4	May-2018

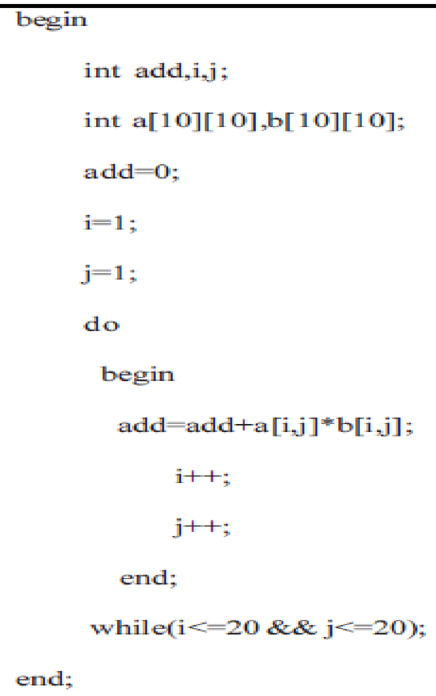
UNIT V:Semantic Analysis And Storage Allocation

Sr. No.	**Question**	**CO No.**	**Marks**	**University Year**
1	Translate the following C code into three address code.	314451.5	6	



```
int i;
int a[10][10];
i = 0;
while (i< 10)
{
        a[i][i]=1;
        i++;
}
```

Sr. No.	**Question**	**CO No.**	**Marks**	**University Year**
2	Translate the following C code into three address code.	314451.5	6	

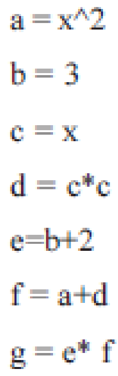


```
begin
      int add,i,j;
      int a[10][10],b[10][10];
      add=0;
      i=1;
      j=1;
      do
        begin
          add=add+a[i,j]*b[i,j];
               i++;
               j++;
          end;
       while(i<=20 && j<=20);
end;
```

3	Construct a DAG for the expression a=b*-c + b*-c	314451.5		

4	For the given piece of code generate TAC :
	X, Y : ARRAY [1 – 10, 1 – 10] OF INTEGER;
	for (j = 1; j <=5; j++)
	X[2*i – 1][j] = Y[2 * i] [j]
		314451.5	8	Nov 2017

5	Explain the need for intermediate code generation.	314451.5	4	Nov 2017
6	For the statement given below, generate intermediate code in the form of: i) postfix notation ii) Parse Tree iii) Quadruple iv) Triple S = (a + b)/(c – d)	314451.5	8	Nov 2017
7	Draw the DAG for the statement a=(a*b+c)-(a*b+c).	314451.5	6	

8	Optimize following code
	
	a = x^2
	b = 3
	c = x
	d = c*c
	e=b+2
	f = a+d
	g = e* f
		314451.5	6	

9	Give quadruples and triples for an assignment statement a := b*-c + b*-c.	314451.5	6	

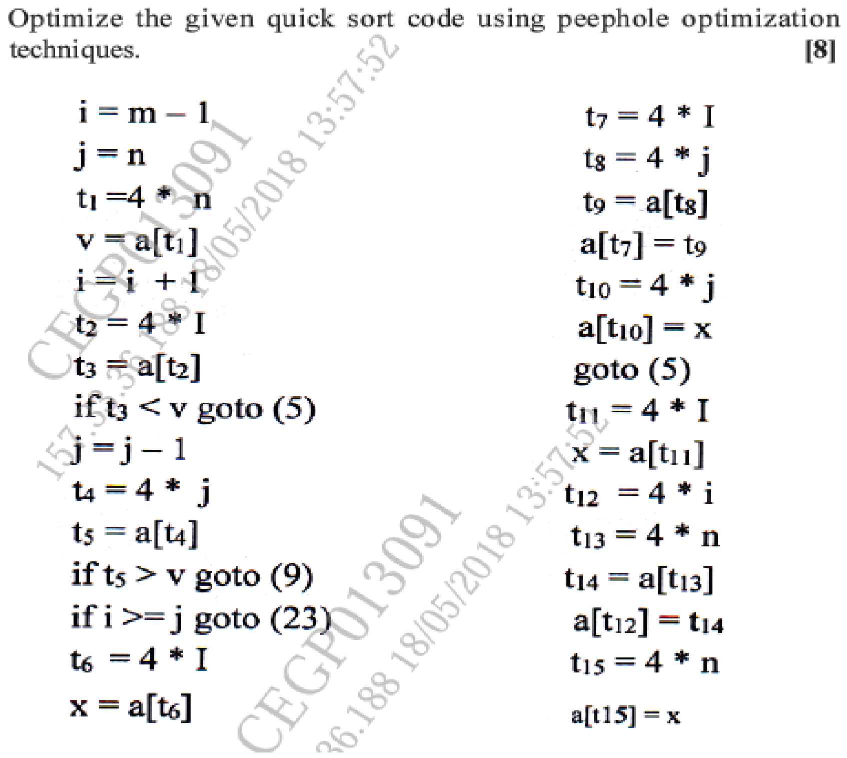
10	Write quadruple and triple for the expression. -(a*b)+(c+d)-(a+b+c+d)	314451.5	8	May 2016
11	Define the following: i) Syntax Directed Definition ii) Syntax Directed Translation iii) Synthesized Attributes iv) Inherited Attributes	314451.5	8	May 2018

12	Generate three address code for
	For(i=0;i<=10;i++)
	x=y+z;
		314451.5	4	May 2018

13	Explain Stack and heap storage allocation strategies	314451.5	6	May 2018
14	Explain Explicit and Implicit type conversion	314451.5	2	May 2018

UNIT VI: Code Generation And Optimization

Sr. No.	Question	CO No.	Marks	University Year
1	Discuss code generation issues.	314451.6	8,4	May 2016,Nov 2017
2	Discuss with suitable example machine dependent code optimization	314451.6	8	May 2016,Nov 2017
3	Write a short note on activation record.	314451.6	4	May 2016,Nov 2017
4	Explain following machine independent optimization techniques : i) Loop invariation ii) Common sub - expression elimination. iii) Dead code elimination iv) Strength reduction	314451.6	8	May 2016,Nov 2017
5	Compare machine dependent and independent optimization.	314451.6	4	May 2016,Nov 2017,May-2018
6	Explain different storage allocation strategies.	314451.6	4	May 2016,Nov 2017
7	Describe and explain the issues in code generation	314451.6	8	May -2018
8	Explain any two machine independent code optimization techniques with example	314451.6	8	
9	Explain machine independent code optimization techniques by taking appropriate examples.	314451.6		
10	Discuss factors affecting target code optimization.	314451.6	8	

11	Optimize the given quick sort code using peephole optimization techniques. **[8]** $i = m - 1$ $j = n$ $t_1 = 4 * n$ $v = a[t_1]$ $i = i + 1$ $t_2 = 4 * I$ $t_3 = a[t_2]$ if $t_3 < v$ goto (5) $j = j - 1$ $t_4 = 4 * j$ $t_5 = a[t_4]$ if $t_5 > v$ goto (9) if $i >= j$ goto (23) $t_6 = 4 * I$ $x = a[t_6]$ $t_7 = 4 * I$ $t_8 = 4 * j$ $t_9 = a[t_8]$ $a[t_7] = t_9$ $t_{10} = 4 * j$ $a[t_{10}] = x$ goto (5) $t_{11} = 4 * I$ $x = a[t_{11}]$ $t_{12} = 4 * i$ $t_{13} = 4 * n$ $t_{14} = a[t_{13}]$ $a[t_{12}] = t_{14}$ $t_{15} = 4 * n$ a[t15] = x	314451.6	8	May-2018
12	Explain dynamic code genration algorithm	314451.6	4	May-2018

ADDITIONAL RESOURCES

You Tube Links

https://www.youtube.com/playlist?list=PLmTa8pFVIi6fYw4aG8cUDvQnS6D3z9Su7

https://www.youtube.com/channel/UCDKSDtvKoOpKF78KL7wn5lA

Web Links

https://www.tutorialspoint.com/compiler_design/compiler_design_overview.htmhttps://www.tutorialspoint.com/compiler_design/compiler_design_overview.htmhttps://whatis.techtarget.com/definition/compiler

314452

Design and Analysis of Algorithms

SYLLABUS

314452: DESIGN AND ANALYSIS OF ALGORITHMS

Teaching Scheme:	**Credits:**	**Examination Scheme:**
Lectures:4Hours/Week	04	In-Semester:30Marks End-Semester:70Marks

Pre-requisites:

1. Fundamentals of Data Structures, Data Structures and Files
2. Discrete Structure
3. Basic mathematics: Induction, probability theory, logarithms.

Course Objectives:

1. To understand the problem solving and problem classification.
2. To know the basics of computational complexity analysis and various algorithm design paradigms.
3. Provide students with solid foundations to deal with a wide variety of computational problems.
4. To provide a thorough knowledge of the most common algorithms and data structures.
5. To analyze a problem and identify the computing requirements appropriate for its solutions.
6. To understand the design of parallel algorithms.

Course Outcomes:

1. To calculate computational complexity using asymptotic notations for various algorithms.
2. To Apply Divide and Conquer as well as Greedy approach to design algorithms.
3. To practice principle of optimality.
4. To illustrate different problems using Backtracking.
5. To compare different methods of branch and bound strategy.
6. To explore the concept of P, NP. NP- complete, NP-hard and parallel algorithms.

UNIT – I INTRODUCTION 08 Hours

Brute Force method: Introduction to Brute Force method & Exhaustive search, Brute Force solution to 8queens' problem. **Proof Techniques:** Minimum 2 examples of each: Contradiction, Mathematical Induction, Direct proofs, Proof by counterexample, Proof by contraposition. **Analysis of Algorithm:** Efficiency- Analysis framework, asymptotic notations–big O, theta and omega. **Amortized Analysis**: Aggregate, Accounting & Potential method with the example of stack operations. **Analysis of Non-recursive and recursive algorithms:** Solving Recurrence Equations (Homogeneous and non-homogeneous).

UNIT – II DIVIDE AND CONQUER AND GREEDYMETHOD 08 Hours

Divide & Conquer: General method, Control abstraction, Merge sort, Quick Sort – Worst, Best and average case. Binary search, Finding Max-Min, Large integer Multiplication (for all above algorithms analysis to be done with recurrence).**Greedy Method:** General method and characteristics, Prim's method for MST , Kruskal's method for MST (using nlogn complexity), Dijkstra's Algorithm, Optimal storage on tapes, Fractional Knapsack problem, Job Sequencing.

UNIT - III DYNAMIC PROGRAMMING 08 Hours

General strategy, Principle of optimality, 0/1 knapsack Problem, Bellman-Ford Algorithm , Multistage Graph problem, Optimal Binary Search Trees, Travelling Salesman Problem.

UNIT – IV BACKTRACKING 08 Hours

General method, Recursive backtracking algorithm, Iterative backtracking method. 8-Queen problem, Sum of subsets, Graph coloring, Hamiltonian Cycle , 0/1 Knapsack Problem.

UNIT – V BRANCH AND BOUND 08 Hours

The method, Control abstractions for Least Cost Search, Bounding, FIFO branch and bound, LC branch and bound, 0/1 Knapsack problem – LC branch and bound and FIFO branch and bound solution, Traveling sales person problem.

UNIT – VI COMPUTATIONAL COMPLEXITY AND PARALLEL ALGORITHMS08 Hour

Computational Complexity: Non Deterministic algorithms, The classes: P, NP, NP Complete, NP Hard, satisfiability problem, Proofs for NP Complete Problems: Clique, Vertex Cover. **Parallel Algorithms**: Introduction, models for parallel computing, computing with complete binary tree, Pointer doubling algorithm.

Text Books

1. Horowitz and Sahani, Fundamentals of computer Algorithms, Galgotia, ISBN 81-7371-612-9.
2. S. Sridhar, Design and Analysis of Algorithms, Oxford, ISBN 10: 0-19-809369-1.

Reference Books

1. Thomas H Cormen and Charles E.L Leiserson, Introduction to Algorithm, PHI, ISBN:81-203-2141-3.

2. R. C. T. Lee, SS Tseng, R C Chang, Y T Tsai, Introduction to Design and Analysis of Algorithms, A Strategic approach, Tata McGraw Hill, ISBN-13: 978-1-25-902582-2. ISBN-10: 1-25-902582-9.

3. Anany Levitin, Introduction to the Design & Analysis of Algorithm, Pearson, ISBN 81- 7758-835-4.
4. Steven S Skiena, The Algorithm Design Manual, Springer, ISBN 978-81-8489-865-1.
5. George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Desktop Quick Reference, O’Reilly, ISBN: 9789352133611.
6. Gilles Brassard, Paul Bratle, Fundamentals of Algorithms, Pearson, ISBN 978-81-317-1244-3.
7. Michael T. Goodrich, Roberto Tamassia, Algorithm Design: Foundations, Analysis and Internet Examples, Wiley India, ISBN: 9788126509867
8. Rod Stephens, Essential Algorithms: A Practical Approach to Computer Algorithms, Wiley India, ISBN: 9788126546138

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Unit/ Assignment	Assessment Technique	Blooms Taxonomy Category
C314452.1	To calculate computational complexity using asymptotic notations for various algorithms.	I	Pre-Insem Test	L5-Evaluating
C314452.2	To Apply Divide and Conquer as well as Greedy approach to design algorithms.	II		L3- Applying
C314452.3	To practice principle of optimality.	III		L2- Understanding
C314452.4	To illustrate different problems using Backtracking.	IV	Pre-Endsem Test	L2- Understanding
C314452.5	To compare different methods of branch and bound strategy.	V		L2- Understanding
C314452.6	To explore the concept of P, NP. NP- complete, NP-hard andparallel algorithms.	VI		L2- Understanding

PREREQUISITES

Sr. No.	Unit Number	Prerequisite subject name
1.	I	Discrete Structures, Basic mathematics: Induction, probability theory, logarithms
2.	II	Fundamentals of Data Structures, Data Structures and Files
3.	III	Fundamentals of Data Structures, Data Structures and Files
4.	IV	Fundamentals of Data Structures, Data Structures and Files
5.	V	Fundamentals of Data Structures, Data Structures and Files
6.	VI	Fundamentals of Data Structures, Data Structures and Files, Discrete Structures.

TEACHING PLAN

Teaching Plan Short

Academic Year:-2020-21 Semester: - II w. e. f.:- 16/12/2019

Class:-TE Division: A & B

Subject:-Design and Analysis of Algorithms Subject Code:-314452

Faculty In charge: - Mrs. Mukta Jamage & Ms. Asmita Pawar No. of Lectures/ weeks: 4

- **Lecture Plan**

Sr. No.	Unit No.	Unit/ Topic Name	Start Date	End Date
1.	I	Introduction	December 3rd week	December 4th week
2.	II	Divide And Conquer And Greedy Method	January 1st week	January 3rd week
3.	III	Dynamic Programming	January 3rd week	February 1st week
4.	IV	Backtracking	February 2nd week	February 4th week
5.	V	Branch And Bound	March 1st week	March 2nd week
6.	VI	Computational Complexity And Parallel Algorithms	March 3rd week	March 4th week

Detail Teaching Plan

Lect .No	Unit No.	Main Topic to be Covered	Sub Topics to be Covered	Chap. No. &Reference Books	CO to Attain	Measurable to Attain CO	Mode of Delivery
1	I	INTRODUCTION	**Brute Force method:** Introduction to Brute Force method & Exhaustive search, Brute Force solution to 8 queens' problem.	Horowitz and Sahani, Fundamentals of computerAlgorithms, Galgotia, ISBN 81-7371-612-9.	CO314452.1	Pre-Insem Test	Online lecture, PPT
2			**Proof Techniques:** Minimum 2 examples of each: Contradiction, Mathematical Induction, Direct proofs, Proof by counter example, Proof by contraposition				Online lecture, PPT
3			**Analysis of Algorithm:** Efficiency-Analysis framework, asymptotic notations –big O, theta and omega.				Online lecture, PPT
4			**Amortized Analysis:** Aggregate, Accounting & Potential method with the example of stack operations				Online lecture, PPT
5			**Analysis of Non-recursive and recursive algorithms:** Solving Recurrence Equations (Homogeneous and non -homogeneous)				Online lecture, PPT
6							
7			Practice problems and doubt clearing session.				Online lecture, PPT
8							

9	**II**	**Divide & Conquer**	General method, Control abstraction, Merge sort, Quick Sort –Worst, Best and average case.	Horowitz and Sahani, Fundamentals of computer Algorithms, Galgotia, ISBN 81-7371-612-9.	CO314452.2	Pre-Insem Test	Online lecture, PPT
10			Binary search, Finding Max-Min				Online lecture, PPT Online lecture, PPT
11			Large integer Multiplication (for all above algorithms analysis to be done with recurrence).(Long topic ,it will take 2 lectures)				Online lecture, PPT
12							Online lecture, PPT
13		**Greedy**	**Greedy Method**: General method and characteristics,	Horowitz and Sahani, Fundamentals of			Online lecture, PPT Online lecture, PPT
14			Prim's method for MST , Kruskal's method for MST (using nlogn complexity)				Online lecture, PPT
15			Dijkstra's Algorithm, Optimal storage on tapes,				Online lecture, PPT

16		**Method**	Fractional Knapsack problem, Job Sequencing.	computerAlgorithms, Galgotia, ISBN 81-7371-612-9.			Chalk and Talk
17			Practice problems				Chalk and Talk
18	**III**	**DYNAMIC PROGRAMMING**	General strategy, Principle of optimality	S. Sridhar, Design and Analysis of Algorithms, Oxford, ISBN 10 : 0-19	CO314452.3	Pre-Insem Test	Online lecture, PPT
19			0/1 knapsack Problem (Practice problems)				Online lecture, PPT
20			Bellman Ford Algorithm,				Online lecture, PPT
21			Example problem on bellman ford				Online lecture, PPT
22			Multistage Graph problem				Online lecture, PPT
23			Optimal Binary Search Trees				Online lecture, PPT
24			Travelling Salesman Problem				Online lecture, PPT
25			Practice problems of unit-III				Online lecture, PPT

26	**IV**	**BACKTRACKING**	General method, Recursive backtracking algorithm	Horowitz and Sahani, Fundamentals of computerAlgorithms, G algotia , ISBN 81-7371-612-9.	CO314452.4	Pre-Endsem Test	Online lecture, PPT
27			Iterative backtracking method.				Online lecture, PPT
28			8 Queen problem				Online lecture, PPT
29			Sum of subsets				Online lecture, PPT
30			Graph coloring				Online lecture, PPT
31			Hamiltonian Cycle				Online lecture, PPT
32			0/1 Knapsack Problem				Online lecture, PPT
33			Practice problems				Online lecture, PPT
34	**V**	**BRANCH AND BOUND**	The method, Control abstractions for Least Cost Search	Horowitz and Sahani, Fundam entals of computer	CO314452.5	Pre-Endsem Test	Online lecture, PPT
35			Bounding function				Online lecture, PPT
36			FIFO branch and bound				Online lecture, PPT
37			LC branch and bound				Online lecture, PPT

38			0/1 Knapsack problem- LC branch and bound and FIFO branch and bound solution,	Algorithms, G algotia, ISBN 81-7371-612-9.			Online lecture, PPT
39			Example problem on branch and bound				Online lecture, PPT
40			Traveling sales person problem				Online lecture, PPT
41			Practice problems				Online lecture, PPT
42	VI	**COMPUTATIONAL COMPLEXITY AND**	Computational Complexity: Non Deterministic algorithms	Horowitz and Sahani, Fundamentals of computerAlgorithms, G algotia, ISBN 81-7371-612-9.	CO314452.6	Pre-Endsem Test	Online lecture, PPT Online lecture, PPT
43			The classes- P, NP, NPC , NP Hard,				Online lecture, PPT
44			Satisfiability problem,				Online lecture, PPT Online lecture, PPT
45			Problems: clique, Vertex Cover				Online lecture, PPT Online lecture, PPT
46			Proofs for NPC				Online

		PARALLEL ALGORITHM					lecture, PPT Online lecture, PPT
47			**Parallel Algorithms**: Introduction, models for parallel computing,				Online lecture, PPT
48			computing with complete binary tree, Pointer doubling algorithm				Online lecture, PPT Online lecture, PPT

HOME ASSIGNMENTS

Unit I Introduction

Sr. No.	Question	CO No.	Marks	University Year
1.	consider the following algorithm: Intsq(n) If n=0 then return 0 Else return 2n+sq(n-1)-1 Prove by mathematical induction that the above code always returns a square of numbers.	CO314452.1	5	2011
2.	Prove by mathematical induction that for each positive number n 1+2+3+…….+n=n(n+1)/2.	CO314452.1	5	Apr 2018
3.	Apply the knowledge of time complexity and Reorder the following complexity from smallest to largest nlog2(n), n+n2+n3, 24, sqrt(n) n2, 2n, nlog2(n), log2(n), n3 nlog(n), n8, n2/logn, (n2-n+1) n!, 2n, (n+1)!, 22n, nn, nlogn	CO314452.1	10	2016
4.	Apply recurrence relation using backward substitution method. T(n)=T(n-1)+1 T(0)=0	CO314452.1	5	2013
5.	Prove by contradiction that "square root off 2 is irrational".	CO314452.1	8	2013

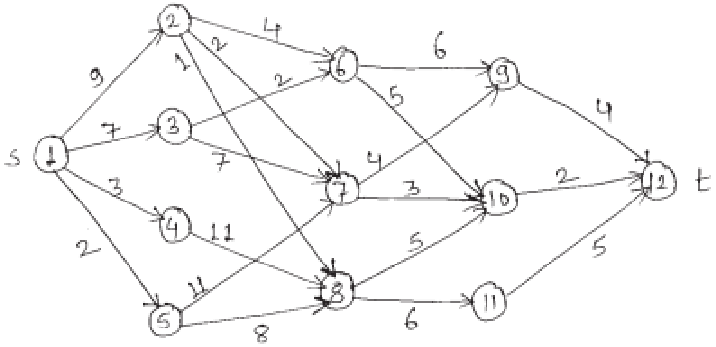
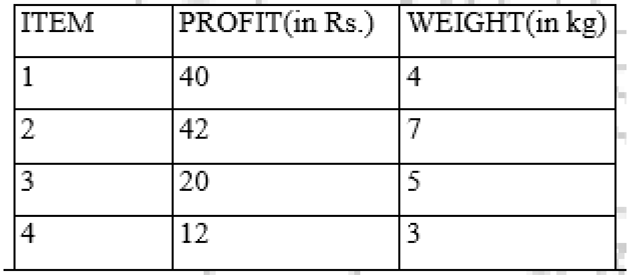
Unit II Divide and Conquer and Greedy Method

Sr. No.	Question	CO No.	Marks	University Year
1.	Let n=3 and(11,12,13)=(5,10,3) construct the solution for the optimal ordering on tapes using Greedy method.	CO314452.2	5	Apr 2018
2.	Apply divide and conquer for finding the maximum and minimum element and verify its complexity.	CO314452.2	5	Apr 2018
3.	Write and solve the recurrence for integer multiplication problem using divide and conquer approach.	CO314452.2	8	2016

4.	Consider following instance for simple knapsack problem. Build the solution using Greedy method N=8
	P={11,21,31,33,43,53,55,65}
	W={1,11,21,23,33,43,45,55} M=110.
		CO314452.2	8	2016

5.	Solve the following job sequencing problem using Greedy algorithm. N(number of jobs)=4. Profits associated with jobs(P1,P2,P3,P4)=(100,10,15,27).Deadline associated with jobs(d1,d2,d3,d4)=(2,1,2,1).	CO314452.2	5	2015

Unit III Dynamic Programming

<table>
<tr><th>Sr. No.</th><th>Question</th><th>CO No.</th><th>Marks</th><th>University Year</th></tr>
<tr><td>1</td><td>Distinguish between Divide and Conquer Technique and Dynamic Programming.</td><td>CO314452.3</td><td>4</td><td>2013</td></tr>
<tr><td>2</td><td>Demonstrate the understanding of multistage graph concept by Finding the minimum cost path from source (s) to sink (t) of the following multistage graph.

</td><td>CO314452.3</td><td>10</td><td>Apr 2018</td></tr>
<tr><td>3</td><td>Demonstrate the understanding of 0/1 Knapsack problem using dynamic programming by an optimal solution for the following. Instance n=4 with capacity 10 kg. Such that ITEM PROFIT (in Rs.) WEIGHT(in kg)

<table>
<tr><th>ITEM</th><th>PROFIT(in Rs.)</th><th>WEIGHT(in kg)</th></tr>
<tr><td>1</td><td>40</td><td>4</td></tr>
<tr><td>2</td><td>42</td><td>7</td></tr>
<tr><td>3</td><td>20</td><td>5</td></tr>
<tr><td>4</td><td>12</td><td>3</td></tr>
</table></td><td>CO314452.3</td><td>8</td><td>2014</td></tr>
<tr><td>4</td><td>Explain the 0/1 Knapsack Problem to solve it using dynamic Programming.</td><td>CO314452.3</td><td>8</td><td>2014</td></tr>
<tr><td>5.</td><td>Explain Travelling Salesman Problem using dynamic Programming.</td><td>CO314452.3</td><td>6</td><td>2014, 15</td></tr>
</table>

Unit IV Backtracking

Sr. No.	Question	CO No.	Marks	University Year
1.	Explain a recursive and iterative algorithm of backtracking method.	CO314452.4	8	Apr 2018
2.	What Are Planner Graph? Explain Graph Coloring.	CO314452.4	6	2013, 14
3.	Write an algorithm for backtracking solution to the 0/1 knapsack problem.	CO314452.4	8	Apr 2018

4.	Explain the following terms: I. State space tree II. Live node III. E-node IV. Dead node	CO314452.4	8	Apr 2018
5.	Explain implicit and explicit constraints.	CO314452.4	6	2014

Unit V Branch and Bound

Sr. No.	Question	CO No.	Marks	University Year
1.	Demonstrate the understanding of LC branch and bound concept by Solving the following instance of 0/1 knapsack problem by LC branch and bound approach N=4, (p1,p2,p3,p4)=(10,10,12,18) (w1,w2,w3,w4)=(2,4,6,9) and M=15	CO314452.5	10	Apr 2018
2.	Write an algorithm for FIFO branch and bound.	CO314452.5	8	Apr 2018
3.	Explain travelling salesman problem? Find the solution of the following travelling salesman problem using branch and bound method. $\text{cost matrix} = \begin{bmatrix} \infty & 4 & 2 \\ 3 & \infty & 4 \\ 1 & 8 & \infty \end{bmatrix}$	CO314452.5	12	Apr 2018
4.	Explain the following terms: 1. Branch and bound 2. LC search 3. Bounding Function	CO314452.5	6	Apr 2018
5.	Explain implicit and explicit constraints.	CO314452.5	6	2014

Unit VI Computational Complexity and Parallel Algorithms

Sr. No.	Question	CO No.	Marks	University Year
1.	What is Nondeterministic algorithm? Write the nondeterministic algorithm for sorting the element of an array.	CO314452.6	8	Apr 2018
2.	Explain complexity classes P and NP. And differentiate between NP complete and NP hard.	CO314452.6	8	Apr 2018
3.	Prove that Clique Decision problem is NP complete.	CO314452.6	8	Apr 2018
4.	Explain the Flynn's classification for parallel computing.	CO314452.6	8	Apr 2018
5.	Explain Pointer doubling algorithm?	CO314452.6	8	2015,16, 17

UNIT WISE QUESTION BANK

Unit I Introduction

Sr. No	Question	CO No.	Marks	University Year
1.	List the properties of various asymptotic notations.	CO314452.1	5	Nov 2019
2.	Describe the strategy to analyze the non recursive algorithm with suitable example.	CO314452.1	5	Nov 2019
3.	Compare apriori and posteriory analysis of algorithms.	CO314452.1	4	Nov 2019
4.	Write an algorithm to solve 8 queen's problem using Brute Force Method.	CO314452.1	5	Apr 2018
5.	Prove by mathematical induction that for each positive number n 1+2+3+…….+n=n(n+1)/2.	CO314452.1	5	Apr 2018
6.	Reorder the following complexity from smallest to largest nlog2(n), n+n2+n3, 24,sqrt(n) n2, 2n, nlog2(n), log2(n), n3 nlog(n), n8, n2/logn,(n2-n+1) n!, 2n, (n+1)!, 22n, nn,nlogn	CO314452.1	10	2011,2016
7.	What do we mean by Worst case, Average case and Best case complexity of an algorithm? Explain with suitable example.	CO314452.1	5	2013
8.	Prove by contradiction that " square root off 2 is irrational".	CO314452.1	8	2013
9.	What is the framework for analysis of algorithms? Discuss all the components.	CO314452.1	6	2013
10.	Suppose you have an array of 1000 records in which only a few are of order and they are not very far from their positions. Which sorting algorithm would you use to put the whole array in order? Justify your answer with time complexity of your algorithm.	CO314452.1	10	2012
11.	What do you mean by time and space complexity of an algorithm? How do we measure the time and space complexity of an algorithm? Explain with suitable	CO314452.1	10	2012

	example.			
12	Find out the time complexity for the recurrence equation as follows:T(n)=T(n/2)+1 T(n)=2T(n/2)+n	CO314452.1	10	2012
14	Suggest an improved algorithm and indicate its efficiency class. If you cannot do it, try to prove that it cannot be done.	CO314452.1	8	2012
15	Suppose you have algorithms with the running time listed below (Assume these are exact running time). How much slower do each of these algorithms get when you Double the input size Increase the input size by one? (i)100n2 (ii)nlogn (iii) 2n (iv)n^2	CO314452.1	8	2011
16	What is the purpose of proof techniques to apply on the algorithms? Explain the method of proof by contradiction in detail and how do we apply the proof by contradiction “to prove that there are infinitely many prime numbers”.	CO314452.1	10	2011
17	How do we analyze and measure the time complexity of algorithm?	CO314452.1	3	2011
18	What are the basic components, which contribute to space complexity?	CO314452.1	4	2011
19	consider the following algorithm : Intsq(n) If n=0 then return 0 Else return 2n+sq(n-1)-1 Prove by mathematical induction that the above code always returns a square of numbers.	CO314452.1	5	2011
20	Solve the following recurrence relation using backward substitution method. T(n)=T(n-1)+1 T(0)=0	CO314452.1	5	-

Unit II Divide and Conquer and greedy Method

TE (Semester II)

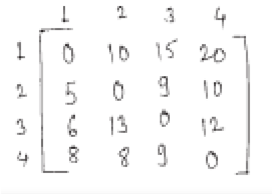
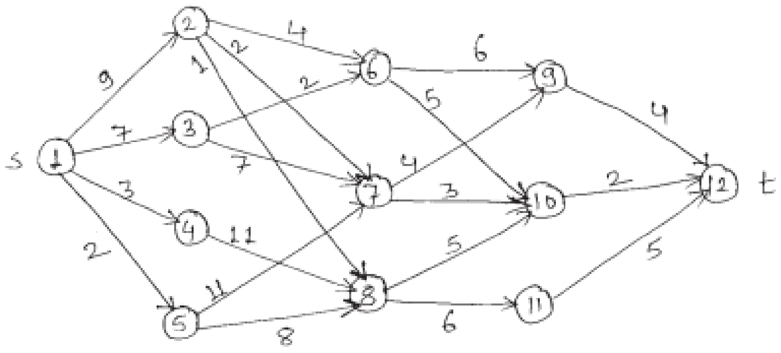
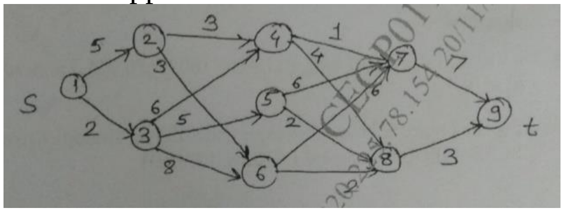
Sr No.	Question	CO No.	Marks	University Year
1.	Let n=3 and(11,12,13)=(5,10,3) find the optimal ordering on tapes using Greedy method.	CO314452.2	5	Apr 2018
2.	Write an algorithm for finding the maximum and minimum element using divide and conquer and verify its complexity.	CO314452.2	5	Apr 2018
3.	Define Greedy Method.	CO314452.2	2	Apr 2018
4.	Write an algorithm for binary search and write its recurrence relation. Give its time complexity	CO314452.2	6	Nov 2019

5.	Consider following instance for simple knapsack problem. Find solution using Greedy method
	N=8
	P={11,21,31,33,43 ,53,55,65}
	W={1,11,21,23,33,43,45,55}
	M=110.
		CO314452.2	8	2016

6.	Write and solve the recurrence for integer multiplication problem using divide and conquer approach.	CO314452.2	8	2016
7.	Explain the concept of divide and conquer technique. Write master Theorem.	CO314452.2	6	2013,14,16 ,17
8.	Write Kruskal's algorithm to find minimum spanning tree.	CO314452.2	5	2015
9.	Solve the following job sequencing problem using Greedy algorithm. N(number of jobs)=4. Profits associated with jobs(P1,P2,P3,P4)=(100,10,15,27).Deadline associated with jobs(d1,d2,d3,d4)=(2,1,2,1).	CO314452.2	5	2015
10.	Design and analyze a divide and conquer algorithm for finding minimum and max number in the array of n numbers that uses (3n/2)-2 comparison for any n.	CO314452.2	10	2011,12
11.	Compare Prim's algorithm and Kruskal's algorithm for finding the Minimum spanning tree. Analyze the time complexity of these algorithms.	CO314452.2	10	2012
12.	Discuss partition exchange sort and analyze it.	CO314452.2	8	2011,12
13.	State which algorithmic strategy is used by quick sort and merge sort algorithm? Though they follow same algorithmic strategy their worst case complexities are different? Why?	CO314452.2	5	2012
14.	What are the characteristics of greedy method?	CO314452.2	4	2014
15.	Explain the following term with reference to greedy Technique.	CO314452.2	4	2013

	Feasible solution optimal solution			
16.	Write Prims algorithm of MST. Mention its time complexity.	CO314452.2	7	2013,15

Unit III Dynamic Programming

Sr. No.	Question	CO No.	Marks	University Year
1.	Find the solution of following travelling salesman problem using dynamic programming. Cost Matrix=  $\begin{array}{c\|cccc} & 1 & 2 & 3 & 4 \\ \hline 1 & 0 & 10 & 15 & 20 \\ 2 & 5 & 0 & 9 & 10 \\ 3 & 6 & 13 & 0 & 12 \\ 4 & 8 & 8 & 9 & 0 \end{array}$	CO314452.3	8	Apr 2018
2.	Find the minimum cost path from source (s) to sink (t) of the following multistage graph.  s t 1 2 3 4 5 6 7 8 9 10 11 12 9 7 3 2 4 2 1 2 7 11 11 8 6 5 4 3 5 6 4 2 5	CO314452.3	10	Apr 2018
3.	Compare Dijikstra's Algorithm and Bellman ford algorithm to find single source shortest path.	CO314452.3	5	Nov 2019
4.	State the principle of optimality. Explain its significance in brief	CO314452.3	5	Nov 2019
5.	Solve the following instance of Multistage graph by dynamic programming backward approach.  s t 1 2 3 4 5 6 7 8 9 5 2 3 3 6 5 8 1 4 6 2 6 7 3	CO314452.3	10	Nov 2019
6.	State “principle of optimality”.	CO314452.3	2	2013,

<table>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>7.</td><td>State Applications of Dynamic Programming?</td><td>CO314452.3</td><td>4</td><td>2013</td></tr>
<tr><td>8.</td><td>Distinguish between Divide and Conquer Technique and Dynamic Programming.</td><td>CO314452.3</td><td>4</td><td>2013</td></tr>
<tr><td>9.</td><td>Define the 0/1 Knapsack Problem. How to solve it using dynamic Programming.</td><td>CO314452.3</td><td>8</td><td>2014</td></tr>
<tr><td>10.</td><td>What is BST? What is OBST?</td><td>CO314452.3</td><td>8</td><td>2018</td></tr>
<tr><td>11.</td><td>Compute and construct OBST for given values using dynamic programming n=4 , (a1,a2,a3,a4) = (do, if, int, while) let p(1:4) = (3,3,1,1) ,
q(0:4) = (2,3,1,1,1)</td><td>CO314452.3</td><td>10</td><td>2015, 17</td></tr>
<tr><td>12.</td><td>Define and solve Travelling Salesman Problem using dynamic Programming.</td><td>CO314452.3</td><td>6</td><td>2014, 15</td></tr>
<tr><td>13.</td><td>Find an optimal solution for the following 0/1 Knapsack problem using dynamic programming. Instance n=4 with capacity 10 kg. Such that
<table>
<tr><th>ITEM</th><th>PROFIT(in Rs.)</th><th>WEIGHT(in kg)</th></tr>
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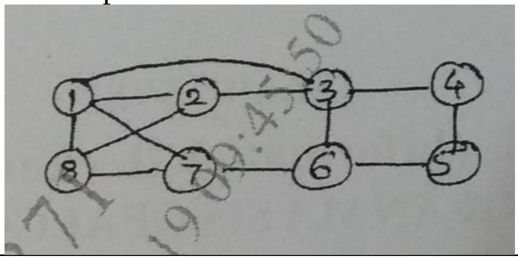
</table>
</td><td>CO314452.3</td><td>8</td><td>2014</td></tr>
</table>

Unit IV Backtracking

Sr. No.	Question	CO No.	Marks	University Year
1.	Write a recursive and iterative algorithm of backtracking method.	CO314452.4	8	Apr 2018
2.	Let W= {5,10,12,13,15,18} and M=30. Find all possible subsets of W that sum to M. Draw the portion of state space tree.	CO314452.4	8	Apr 2018
3.	Write an algorithm for backtracking solution to the 0/1 knapsack problem.	CO314452.4	8	Apr 2018
4.	Explain the following terms: V. State space tree VI. Live node VII. E-node VIII. Dead node	CO314452.4	8	Apr 2018

5.	Find Hamiltonian cycle for given graph using backtracking method.Draw a state-space tree for the same.  	CO314452.4	8	Nov 2019
6.	Write an algorithm for graph coloring problem using backtracking method.	CO314452.4	8	Nov 2019
7.	Write an iterative and a recursive backtracking algorithm for N-Queens problem.	CO314452.4	8	Nov 2019
8.	Let W={5,10,12,13,15,18} & M=30 Find all possible subsets of W that sum to M	CO314452.4	8	Nov 2019
9.	Explain 8-Queens problem and explain the following with respect to 8-Queens problem. i)State space tree ii)Solution State iii) State space iv)Answer State v)Static tree vi) Dynamic tree vii)Live node viii)Bounding function	CO314452.4	10	Nov 2019
10.	State the principle of backtracking.	CO314452.4	4	2013
11.	Explain Implicit Or Explicit Constraints.	CO314452.4	6	2014
12.	Write recursive backtracking algorithm for the sum of subset problem.	CO314452.4	8	2015,16, 17
13.	Analyze n Queen Problem Using Backtracking.	CO314452.4	8	2011

14.	Solve Sum Of Subset problem using
	Backtracking On Data n=4
	M=31
	W = (w1,w2,w3.w4) = {11,13,24,7}
		CO314452.4	8	2011,12

15.	Find The Hamiltonian Cycle By Using Backtracking.	CO314452.4	8	2013,16
16.	What Are Planner Graph? Explain Graph Coloring.	CO314452.4	6	2013,14

Unit V branch and Bound

Sr. No.	**Question**	**CO No.**	**Marks**	**University Year**
1.	Solve the following instance of 0/1 knapsack problem by LC branch and bound approach N=4, (p1,p2,p3,p4)=(10,10,12,18)	CO314452.5	10	Apr 2018

<table>
<tr><td></td><td>(w1,w2,w3,w4)=(2,4,6,9) and M=15</td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>Write an algorithm for FIFO branch and bound.</td><td>CO314452.5</td><td>8</td><td>Apr 2018</td></tr>
<tr><td>3.</td><td>What is travelling salesman problem? Find the solution of the following travelling salesman problem using branch and bound method.
cost matrix = $\begin{bmatrix} \infty & 4 & 2 \\ 3 & \infty & 4 \\ 1 & 8 & \infty \end{bmatrix}$</td><td>CO314452.5</td><td>12</td><td>Apr 2018</td></tr>
<tr><td>4.</td><td>Explain the following terms:
4. Branch and bound
5. LC search
6. Bounding Function</td><td>CO314452.5</td><td>6</td><td>Apr 2018</td></tr>
<tr><td>5.</td><td>Differentiate between Backtracking and branch and bound. Illustrate with example of knapsack problem.</td><td>CO314452.5</td><td>8</td><td>Nov 2019</td></tr>
<tr><td>6.</td><td>Solve the following instance of the knapsack problem by branch and bound algorithm.
n=4,W(1,4)={10,7,8,4}, P(1:4)={100,63,56,12}, knapsack capacity M=16</td><td>CO314452.5</td><td>8</td><td>Nov 2019</td></tr>
<tr><td>7.</td><td>Explain branch and bound technique and different strategies used in it like LCBB,FIFOBB,compare LCBB &FIFOBB.</td><td>CO314452.5</td><td>10</td><td>Nov 2019</td></tr>
<tr><td>8.</td><td>Differentiate between branch and bound and backtracking. Illustratewith example of 4-Queens problem.</td><td>CO314452.5</td><td>6</td><td>2011, 14</td></tr>
<tr><td>9.</td><td>What is LC search? How does it help in finding a solution for branch and bound algorithm?</td><td>CO314452.5</td><td>6</td><td>2016</td></tr>
<tr><td>10.</td><td>Explain for branch and bound
a. LIFOsearch
b. FIFOsearch
c. LCsearch</td><td>CO314452.5</td><td>12</td><td>2012, 13,</td></tr>
<tr><td>11.</td><td>Write an algorithm for upper bound function for 0/1 Knapsack problem.</td><td>CO314452.5</td><td>8</td><td>14,16 2013</td></tr>
<tr><td>12.</td><td>Explain significance of Bounding functions.</td><td>CO314452.5</td><td>4</td><td>2014, 16</td></tr>
<tr><td>13.</td><td>What is Travelling salesman problem? Find the solution of TSP using branch and bound approach by taking an suitable data.</td><td>CO314452.5</td><td>12</td><td>2012</td></tr>
<tr><td>14.</td><td>Consider 0/1 Knapsack Problem instance n=4 with capacity 10 kg such that
<table>
<tr><td>Item</td><td>Profit</td><td>Weight</td></tr>
<tr><td>1</td><td>40</td><td>4</td></tr>
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<tr><td>3</td><td>25</td><td>5</td></tr>
</table></td><td>CO314452.5</td><td>8</td><td>2015</td></tr>
</table>

	4 | 12 | 3 Find optimal solution using Dynamic Programming.			

Unit VI Computational Complexity and Parallel Algorithms

Sr. No.	Question	CO No.	Marks	University Year
1.	What is Nondeterministic algorithm? Write the nondeterministic algorithm for sorting the element of an array.	CO314452.6	8	Apr 2018
2.	Explain complexity classes P and NP. And differentiate between NP complete and NP hard.	CO314452.6	8	Apr 2018
3.	Prove that Clique Decision problem is NP complete.	CO314452.6	8	Apr 2018
4.	Explain the Flynn’s classification for parallel computing.	CO314452.6	8	Apr 2018
5.	Write an algorithm for pointer doubling problem. What is its time complexity?	CO314452.6	8	Nov 2019
6.	Show that 3-SAT problem is NP-Complete.	CO314452.6	8	Nov 2019
7.	Explain NP-Hard, NP-Complete, Decision problem & Polynomial time algorithm.	CO314452.6	8	Nov 2019
8.	Explain in detail models for parallel computing.	CO314452.6	8	Nov 2019
9.	What is deterministic and non- deterministic algorithm? Write a non-deterministic algorithm for searching an element.	CO314452.6	8	2013
10.	Prove that a clique problem is NP complete.	CO314452.6	8	2014 ,15
11.	Write a short note on satisfiability problem.	CO314452.6	4	
12.	Explain NP-complete, NP-hard, Decision Problem and Polynomial Time Algorithm.	CO314452.6	12	2013
13.	Explain what non-deterministic algorithm with example.	CO314452.6	8	2013
14.	Prove that 3SAT problem is NP-Complete.	CO314452.6	8	-
15.	What is Reduction in NP-completeness? What are the types of Reductions?	CO314452.6		
16.	Explain relationship between P, NP, NP-complete and NP hard problem .With an example of each class.	CO314452.6		-
17.	How do you prove that problem is NP hard?	CO314452.6	4	2013
18.	Explain Pointer doubling algorithm?	CO314452.6	8	2015, 16, 17

ADDITIONAL RESOURCES

1. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/lecture-videos/
3. https://nptel.ac.in/courses/106101060/
4. https://www.youtube.com/watch?v=aGjL7YXI31Q
5. http://www.vssut.ac.in/lecture_notes/lecture1428551222.pdf

314453
Cloud Computing

SYLLABUS

314453 : CLOUD COMPUTING

Teaching Scheme: TH:03Hours/Week	Credits: 03	In-Semester : 30 Marks End-Semester: 70Marks

Prerequisite:

1. Operating Systems.
2. Fundamentals of Computer Networks

Course Objectives:

1. To become familiar with Cloud Computing and its ecosystem.
2. To learn basics of virtualization and its importance.
3. To evaluate in-depth analysis of Cloud Computing capabilities.
4. To give technical overview of Cloud Programming and Services.
5. To understand security issues in cloud computing.
6. To be exposed to Ubiquitous Cloud and Internet of Things

Course Outcomes:

1. To understand the need of Cloud based solutions.
2. To understand Security Mechanisms and issues in various Cloud Applications
3. To explore effective techniques to program Cloud Systems.
4. To understand current challenges and trade-offs in Cloud Computing.
5. To find challenges in cloud computing and delve into it to effective solutions.
6. To understand emerging trends in cloud computing.

UNIT – I FUNDAMENTALS OF CLOUD COMPUTING 6 Hours

Origins and Influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges, Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models,Cloud Deployment Models, FederatedCloud/Intercloud, Types of Clouds.

Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology, Web Technology, Multitenant Technology, Service Technology.

UNIT – II VIRTUALIZATION AND COMMON STANDARDS IN CLOUD COMPUTING 6 Hours

Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management,Virtualization for Data-Center Automation.

Common Standards: The Open Cloud Consortium, Open Virtualization Format, Standards for Application Developers: Browsers (Ajax), Data (XML, JSON), Solution Stacks (LAMP and LAPP), Syndication (Atom, Atom Publishing Protocol, and RSS), and Standards for Security.

UNIT – III **CLOUDPROGRAMMING, ENVIRONMENTS AND APPLICATIONS** **6 Hours**

Features of Cloud and Grid Platforms, Programming Support of Google App Engine, Programming on AmazonAWS and Microsoft Azure, Emerging Cloud Software Environments, Understanding Core OpenStackEcosystem.

Applications: Moving application to cloud, Microsoft Cloud Services, Google Cloud Applications, Amazon Cloud Services, Cloud Applications (Social Networking, Email, Office Services, Google Apps, Customer Relationship Management).

UNIT – IV **CLOUD SECURITY AND ISSUES** **6 Hours**

Basic Terms and Concepts, Threat Agents, Cloud Security Threats and Attacks, Additional Considerations.

Cloud Security Mechanisms: Encryption, Hashing, Digital Signature, Public Key Infrastructure (PKI), Identity and Access Management (IAM), Single Sign-On (SSO), Hardened Virtual Server Images.

Cloud Issues: Stability, Partner Quality, Longevity, Business Continuity, Service-Level Agreements, Agreeing on the Service of Clouds, Solving Problems, Quality of Service, Regulatory Issues and Accountability.

UNIT – V **UBIQUITOUS CLOUDS AND THE INTERNET OF THINGS** **6 Hours**

Cloud Trends in Supporting Ubiquitous Computing, Performance of Distributed Systems and the Cloud, Enabling Technologies for the Internet of Things (RFID, Sensor Networks and ZigBee Technology, GPS), Innovative Applications of the Internet of Things (Smart Buildings and Smart Power Grid, Retailing and Supply-Chain Management, Cyber-Physical System), Online Social and Professional Networking.

UNIT - VI **FUTURE OF CLOUD COMPUTING** **6 Hours**

How the Cloud Will Change Operating Systems, Location-Aware Applications, Intelligent Fabrics, Paints, and More, The Future of Cloud TV, Future of Cloud-Based Smart Devices, Faster Time to Market for Software Applications, Home-Based Cloud Computing, Mobile Cloud, Autonomic Cloud Engine, Multimedia Cloud, Energy Aware Cloud Computing, Jungle Computing.

Docker at a Glance: Process Simplification, Broad Support and Adoption, Architecture, Getting the Most from Docker, the Docker Workflow.

Text Books

1. R. Gilberg, B. Forouzan, "Data Structures: A pseudo Code Approach with C++", Cengage Learning, ISBN 9788131503140.
2. E. Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi, 1995, ISBN 16782928.

Reference Books

1. Bruno R Preiss, “Data Structures and Algorithms with Object-Oriented Design Patterns in C++”, Wiley India Edition
2. G. A.V, PAI , “Data Structures and Algorithms “, McGraw Hill, ISBN -13: 978-0-07-066726-6
3. Y. Langsam, M. Augenstin, A. Tannenbaum, "Data Structures using C and C++", 2nd Edition, Prentice Hall of India, 2002, ISBN-81-203-1177-9.
4. A. Tharp ,"File Organization and Processing", 2008 ,Willey India edition, 9788126518685
5. J. Tremblay, P. Soresan, "An Introduction to Data Structures with Applications", 2nd edition, Tata McGraw Hill International Editions, 1984, ISBN-0-07-462471-7.
6. M. Folk, B. Zoellick, G. Riccardi, "File Structure An Object Oriented Approach with C++", Pearson Education, 2002, ISBN 81 - 7808 - 131 - 8.
7. M. Weiss, "Data Structures and Algorithm Analysis in C++", 2nd edition, Pearson Education, 2002, ISBN-81-7808-670-0
8. Goodrich, “Data Structures and Algorithms in C++ “, Wiley, ISBN-9788126512607

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Unit	Assessment Technique	Blooms Taxonomy Category
C314453.1	To understand the need of Cloud based solutions.	I	Pre in sem exam	L2: Understanding
C314453.2	To understand Security Mechanisms and issues in various Cloud Applications.	IV		L2: Understanding
C314453.3	To explore effective techniques to program Cloud Systems.	II		L4: Analyzing
C314453.4	To understand current challenges and trade-offs in Cloud Computing.	III	Pre end sem exam	L2: Understanding
C314453.5	To find challenges in cloud computing and delve into it to effective solutions.	V		L1: Remembering
C314453.6	To understand emerging trends in cloud computing.	VI		L2: Understanding

PREREQUISITES

Sr. No.	Unit Number	Prerequisite subject name
1.	I	Operating Systems. Fundamentals of Computer Networks.
2.	II	Operating Systems. Fundamentals of Computer Networks.
3.	III	Operating Systems. Fundamentals of Computer Networks.
4.	IV	Operating Systems. Fundamentals of Computer Networks.
5.	V	Operating Systems. Fundamentals of Computer Networks.
6.	VI	Operating Systems. Fundamentals of Computer Networks.

TEACHING PLAN

TEACHING PLAN

Academic Year:-2020-21 Semester :- II w. e. f. :-16.12.2019

Class : - TE Division: A, B

Subject :- Cloud Computing Subject Code :- 314453

Faculty In charge :- Mr. Shantanu Pawar No. of Lectures/ weeks: 3

- **Lecture Plan**

Sr. No.	Unit No.	Unit/ Topic Name	Start Date	End Date
1.	I	FUNDAMENTALS OF CLOUD COMPUTING	December 3rd week	January 1st week
2.	II	VIRTUALIZATION AND COMMON STANDARDS IN CLOUD COMPUTING	January 2nd week	January 3rd week
3.	III	CLOUD PROGRAMMING,ENVIRONMENTS AND APPLICATIONS	January 4th week	February 1st week
4.	IV	CLOUD SECURITY AND ISSUES	February 2nd week	February 4th week
5.	V	UBIQUITOUS CLOUDS AND THE INTERNET OF THINGS	February 5th week	March 2nd week
6.	VI	FUTURE OF CLOUD COMPUTING	March 3rd week	March End week

Detail Teaching Plan

Lect. No	Unit No.	Main Topic to be Covered	Sub Topics to be Covered	Chap. No. & Reference Books	CO to Attain	Measurable to Attain CO	Mode of Delivery
1	**I**	**FUNDAMENTALS OF CLOUD COMPUTING**	Origins and Influences, Basic Concepts and Terminology	Chap No: 1, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN: 9788131776513.	C314453.1	Pre In semester Test and Home Assignment	Video Lecture and Chalkboard and Talk
2			Goals and Benefits, Risks and Challenges, Roles and Boundaries	Chap No: 4, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN: 9788131776513.			Chalkboard and Talk
3			Cloud Characteristics, Cloud Delivery Models	Chap No: 4, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN: 9788131776513.			Chalkboard and Talk
4			Cloud Deployment Models, Federated Cloud/Intercloud, Types of Clouds.	Chap No: 4, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN: 9788131776513.			Chalkboard and Talk
5			**Cloud-Enabling Technology:** Broadband Networks and Internet Architecture	Chap No: 1, Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing: Foundations and Applications Programming, McGraw Hill, ISBN: 978 1259029950, 1259029956.			Chalkboard and Talk
6			Data Center Technology, Virtualization Technology,	Chap No: 1, Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing: Foundations and			Chalkboard and Talk

			Web Technology, Multitenant Technology, Service Technology.	Applications Programming, McGraw Hill, ISBN: 978 1259029950, 1259029956.			
		Unit I Assessment: Pre In semester Test and Home Assignment					
7	**II**	**VIRTUALIZATION AND COMMON STANDARDS IN CLOUD COMPUTING**	Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms.	Chap No: 5, Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, ISBN: 978 9332535923, 9332535922, 1st Edition.	C314453.3	Pre In semester Test and Home Assignment	Video Lecture and Chalkboard and Talk
8			Types of Hypervisors, Virtualization of CPU	Chap No: 5, Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, ISBN :978 9332535923, 9332535922, 1st Edition			Video Lecture and Chalkboard and Talk
9			Memory, and I/O Devices, Virtual Clusters and Resource Management	Chap No: 5, Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, ISBN :978 9332535923, 9332535922, 1st Edition			Chalkboard and Talk
10			Virtualization for Datacenter Automation.	Chap No: 1, Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing: Foundations and Applications Programming, McGraw Hill, ISBN: 978 1259029950, 1259029956.			Chalkboard and Talk
11			**Common Standards**: The Open Cloud Consortium, Open Virtualization Format,	Chap No: 5, Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing: Foundations and Applications Programming, McGraw Hill, ISBN: 978 1259029950, 1259029956.			Chalkboard and Talk
12			Standards for Application	Chap No: 5, Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering			Chalkboard and Talk

			Developers: Browsers (Ajax), Data (XML, JSON)	Cloud Computing: Foundations and Applications Programming, McGraw Hill, ISBN: 978 1259029950, 1259029956.			
13			Standards for Application Developers: Solution Stacks (LAMP and LAPP), Syndication (Atom, Atom Publishing Protocol, and RSS), Standards for Security.	Chap No: 5, Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing: Foundations and Applications Programming, McGraw Hill, ISBN: 978 1259029950, 1259029956.			Chalkboard and Talk
		Unit II Assessment: Pre In semester Test and Home Assignment					
14	**III**	**CLOUD PROGRAMMING, ENVIRONMENTS AND APPLICATIONS**	Features of Cloud and Grid Platforms, Programming Support of Google App Engine	Chap No: 31, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN: 9788131776513.	C314453.4	Pre In semester Test and Home Assignment	Chalkboard and Talk
15			Programming on Amazon AWS and Microsoft Azure,	Chap No: 31, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN: 9788131776513.			Chalkboard and Talk
16			Cloud Software environments, Understanding Core OpenStack Ecosystem.	Chap No: 5, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN: 9788131776513.			Chalkboard and Talk
17			**Applications:** Moving application to cloud, Microsoft Cloud Services	Chap No: 32, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN: 9788131776513Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation,			Chalkboard and Talk

				Pearson, ISBN: 9788131776513.			
18			Google Cloud Applications, Amazon Cloud Services, Cloud Applications	Chap No: 32, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN: 9788131776513.			Chalkboard and Talk
19			Social Networking, E-mail, Office Services, Google Apps, Customer Relationship Management	Chap No: 32, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN: 9788131776513.			Chalkboard and Talk
		Unit III Assessment: Pre In semester Test and Home Assignment					
20	**IV**	**CLOUD SECURITY AND ISSUES**	Basic Terms and Concepts, Threat Agents	Chap No: 5, Ronald L. Krutz and Russell D. Vines, Cloud Security: A Comprehensive guide to Secure Cloud Computing, Wiley, ISBN: 9788126528097.	C314453.2	Pre End semester Test and Home Assignment	Chalkboard and Talk
21			Cloud Security Threats and Attacks, Additional considerations	Chap No: 5, Ronald L. Krutz and Russell D. Vines, Cloud Security: A Comprehensive guide to Secure Cloud Computing, Wiley, ISBN: 9788126528097.			Chalkboard and Talk
22			**Cloud Security Mechanisms**: Encryption, Hashing,	Chap No: 5, Ronald L. Krutz and Russell D. Vines, Cloud Security: A Comprehensive guide to Secure Cloud Computing, Wiley, ISBN: 9788126528097.			Chalkboard and Talk
23			Digital Signature, Public Key Infrastructure (PKI),	Chap No: 5, Ronald L. Krutz and Russell D. Vines, Cloud Security: A Comprehensive guide to Secure Cloud Computing, Wiley, ISBN: 9788126528097.			Chalkboard and Talk
24			Identity and Access Management (IAM), Single Sign On (SSO), Hardened Virtual Server Images.	Chap No: 5, Ronald L. Krutz and Russell D. Vines, Cloud Security: A Comprehensive guide to Secure Cloud Computing, Wiley, ISBN:			Chalkboard and Talk

				9788126528097.			
25			**Cloud Issues** : Stability, Partner Quality, Longevity, Business Continuity Service -Level Agreements,	Chap No: 1, Ronald L. Krutz and Russell D. Vines, Cloud Security: A Comprehensive guide to Secure Cloud Computing, Wiley, ISBN: 9788126528097.			Chalkboard and Talk
26			**Cloud Issues** : Agreeing on the Service of Clouds , Solving Problems, Quality of Service, Regulatory Issues and Accountability.	Chap No: 1, Ronald L. Krutz and Russell D. Vines, Cloud Security: A Comprehensive guide to Secure Cloud Computing, Wiley, ISBN: 9788126528097.			Chalkboard and Talk
		Unit IV Assessment: Pre End semester Test and Home Assignment					
27	**V**	**UBIQUITOUS CLOUDS AND THE INTERNET OF THINGS**	Cloud Trends in Supporting Ubiquitous Computing,	Chap No: 10, Brian J.S. Chee and Curtis Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, CRC Press, ISBN :9781439806128	C314453.5	Pre End semester Test and Home Assignment	Video Lecture and Chalkboard and Talk
28			Performance of Distributed Systems and the Cloud	Chap No: 10, Brian J.S. Chee and Curtis Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, CRC Press, ISBN :9781439806128			Video Lecture and Chalkboard and Talk
29			Enabling Technologies for the Internet of Things	Chap No: 10, Brian J.S. Chee and Curtis Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, CRC Press, ISBN :9781439806128			Chalkboard and Talk
30			(RFID, Sensor Networks and ZigBee Technology, GPS)	Chap No: 10, Brian J.S. Chee and Curtis Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, CRC Press, ISBN :9781439806128			Chalkboard and Talk
31			Innovative Applications of	Chap No: 10, Brian J.S. Chee and Curtis			Chalkboard

			the Internet of Things (Smart Buildings and Smart Power Grid, Retailing.	Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, CRC Press, ISBN :9781439806128			and Talk
32			Supply Chain Management, Cyber-Physical System), Online Social and Professional Networking.	Chap No: 10, Brian J.S. Chee and Curtis Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, CRC Press, ISBN :9781439806128			Chalkboard and Talk
		Unit V Assessment: Pre End semester Test and Home Assignment					
33	**VI**	**FUTURE OF CLOUD COMPUTING**	How the Cloud Will Change Operating Systems, Location-Aware Applications, Intelligent Fabrics	Chap No: 33, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN :9788131776513.	C314453.6	Pre End semester Test and Home Assignment	Chalkboard and Talk
34			Future of Cloud-Based Smart Devices	Chap No: 33, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN :9788131776513			Chalkboard and Talk
35			Faster Time to Market for Software Applications, Home Based Cloud Computing	Chap No: 33, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN :9788131776513			Chalkboard and Talk
36			Mobile Cloud, Autonomic Cloud Engine, Multimedia Cloud, Energy Aware Cloud Computing, Jungle Computing	Chap No: 33, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN :9788131776513			Chalkboard and Talk
37			Docker at a Glance: Process Simplification, Broad Support and Adoption	Chap No: 33, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN :9788131776513			Chalkboard and Talk

38			Docker at a Glance: Architecture, Getting the Most from Docker, The Docker Workflow	Chap No: 33, Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN :9788131776513			Chalkboard and Talk
		Unit VI Assessment: Pre End semester Test and Home Assignment					

a) Textbooks

1. Jack J. Dongarra, Kai Hwang, Geoffrey C. Fox, Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Elsevier, ISBN: 9789381269237, 9381269238, 1st Edition.
2. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, ISBN: 978 9332535923, 9332535922, 1st Edition.

b) Reference Books

1. Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN: 9788131776513.
2. Brian J.S. Chee and Curtis Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, CRC Press, ISBN :9781439806128
3. Kris Jamsa, Cloud Computing: Saas, Paas, Iaas, Virtualization, Business Models, Mobile, Security, and More, Jones and Bartlett, ISBN: 9789380853772.
4. John W. Ritting house, James F. Ransome, Cloud Computing Implementation, Management, and Security, CRC Press, ISBN : 978 1439806807, 1439806802.
5. Karl Matthias, Sean P. Kane, Docker: Up and Running, OReilly, ISBN: 9781491917572, 1491917571.
6. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing: Foundations and Applications Programming, McGraw Hill, ISBN: 978 1259029950, 1259029956.

7. Barrie Sosinsky, Cloud Computing Bible, Wiley, ISBN: 978 8126529803.
8. Gautham Shroff, Enterprise Cloud Computing, Cambridge, ISBN: 9781107648890.
9. Ronald L. Krutz and Russell D. Vines, Cloud Security: A Comprehensive guide to Secure Cloud Computing, Wiley, ISBN: 9788126528097.
10. Scott Adkins, John Belamaric, Vincent Giersch, Denys Makogon, Jason E. Robinson, OpenStack: Cloud Application Development, Wrox, ISBN :9781119194316
11. Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing: Principles and Paradigms, Wiley India, ISBN: 978812654125
12. Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Cloud Computing Black Book ,Wiley Dreamtech,ISBN:9789351194187

13. Barrie Sosinsky, Cloud Computing Bible Wiley India, ISBN :9788126529803

Unit Wise Home Assignment

Unit I- FUNDAMENTALS OF CLOUD COMPUTING

Sr. No.	Question	CO No.	Marks	University Year
1	Explain in brief any 6 characteristics of Cloud Computing.	C314453.1	6	2019
2	Explain advantages and limitations of cloud computing in brief.	C314453.1	6	2018
3	Compare and contrast IaaS, SaaS, PaaS related to consumer activities and provider activities.	C314453.1	6	2019
4	Explain any four cloud enabling technologies.	C314453.1	8	2018
5	Compare Private cloud versus Public cloud.	C314453.1	4	2018

Unit II- VIRTUALIZATION AND COMMON STANDARDS IN CLOUD COMPUTING

Sr. No.	Question	CO No.	Marks	University Year
1	How would you explain different types of hypervisors with example?	C314453.3	6	2018, 2019
2	How would you explain different abstraction levels of virtualization?	C314453.3	6	2018
3	Compare KVM, Xen and Vmware workstation.	C314453.3	6	2018, 2019
4	How would you explain concept of syndication and RSS?	C314453.3	6	2019
5	Compare Horizontal and Vertical Scaling with examples.	C314453.3	4	2019

Unit III- CLOUDPROGRAMMING, ENVIRONMENTS AND APPLICATIONS

Sr. No.	Question	CO No.	Marks	University Year
1	Explainprogramming environment for Google App Engine.	C314453.4	6	2018
2	Explain cloud implementation and application.	C314453.4	6	2018
3	Compare Cloud and Cloudlet.	C314453.4	8	2019
4	Explain the pros and cons of Amazon EC2 Cloud.	C314453.4	5	
5	Explain the pros and cons of Open Stack.	C314453.4	5	

Unit IV- CLOUD SECURITY AND ISSUES

Sr. No.	Question	CO No.	Marks	University Year
1	Explain Cloud Security with various threat agents.	C314453.2	8	2018
2	Explain Hardened Virtual Server image.	C314453.2	6	2018
3	Explain with suitable example i) Encryption ii) Hashing	C314453.2	8	2018
4	Compare Public Key Infrastructure and Private Key Infrastructure.	C314453.2	6	
5	Summarize Service-Level Agreements in details.	C314453.2	5	

Unit V- UBIQUITOUS CLOUDS AND THE INTERNET OF THINGS

Sr. No.	Question	CO No.	Marks	University Year
1	What is Ubiquitous Computing? Explain in details.	C314453.5	5	
2	What is RFID? How RFID works?	C314453.5	8	2018
3	List Innovative Applications of the Internet of Things and explain any two of them.	C314453.5	6	
4	What is SCM? Explain in detail.	C314453.5	5	
5	What is Online Social and Professional Networking?	C314453.5	5	

Unit VI- FUTURE OF CLOUD COMPUTING

Sr. No.	Question	CO No.	Marks	University Year
1	Explain the future of cloud computing with example.	C314453.6	5	
2	Explain architecture of Mobile cloud computing with diagram.	C314453.6	10	2018
3	Summarize Home based cloud computing in detail.	C314453.6	5	
4	Explain Autonomic Cloud Engine in details.	C314453.6	5	
5	Draw and explain Docker deployment workflow.	C314453.6	8	2018

Unit Wise Question Bank

Unit I- FUNDAMENTALS OF CLOUD COMPUTING

Sr. No.	Question	CO No.	Marks	University Year
1.	Explain Cloud Characteristics.	C314453.1	6	2018
2.	Explain any two cloud delivery models. Explain cloud delivery models with example.	C314453.1	4 6	2018 2019
3.	Draw and explain relation of first generation Web service technologies.	C314453.1	6	2018
4.	Explain advantages and limitations of cloud computing in brief.	C314453.1	6	2018
5.	Compare Private cloud versus Public cloud.	C314453.1	4	2018
6.	Define cloud computing. Explain different types of cloud computing.	C314453.1	8	2018
7.	Explain benefits of IaaS.	C314453.1	6	2018
8.	Explain different types of cloud deployment models.	C314453.1	8	2018
9.	State and describe any four cloud enabling technologies.	C314453.1	8	2018
10	Enlist and explain in brief any 6 characteristics of Cloud Computing.	C314453.1	6	2019
11	What are the fundamental components to construct Inter Connecting Architecture? Describe.	C314453.1	4	2019
12	Enlist and explain technologies used in Storage Systems.	C314453.1	4	2019
13	List cloud enabling technologies. Explain any two in detail.	C314453.1	4	2019
14	Compare and contrast IaaS, SaaS, PaaS related to consumer activities and provider activities.	C314453.1	6	2019
15	Explain advantages and disadvantages of cloud computing.	C314453.1	5	2019
16	Compare private cloud verses public cloud	C314453.1	5	2019
17	Write short note on Multitenant Technology.	C314453.1	4	2019
18	Compare different Cloud Delivery models.	C314453.1	5	2019

Unit II- VIRTUALIZATION AND COMMON STANDARDS IN CLOUD COMPUTING

Sr. No.	Question	CO No.	Marks	University Year
1.	Explain different types of hypervisors with example.	C314453.3	6	2018, 2019
2.	Explain in brief about para virtualization.	C314453.3	4	2018
3.	Explain different abstraction levels of virtualization.	C314453.3	6	2018
4.	Write a short note on LAPP solution stack.	C314453.3	4	2018
5.	What is Live VM migration? Write down the steps required for Live VM Migration.	C314453.3	6	2018
6.	Write a short note on virtualization attack.	C314453.3	4	2018
7.	Compare KVM, Xen and Vmware workstation.	C314453.3	6	2018, 2019
8.	Write a short note on Open Virtualization Format.	C314453.3	4	2018
9.	Write a short note on following standards of application		8	2018

	developer. i)Solution stack (LAMP and LAPP) ii)Syndication (Atom and RSS)	C314453.3		
10.	Explain levels of Virtualization	C314453.3	4	2019
11.	Draw the diagram of Xen Architecture.	C314453.3	3	2019
12.	Define following standards of Application Development. AJAX XML JSON	C314453.3	3	2019
13.	Explain Binary Translation with Full Virtualization.	C314453.3	4	2019
14.	Draw the diagram of 'Two level memory mapping' with reference to memory virtualization.	C314453.3	3	2019
15.	What are Solution Stacks? Explain in brief.	C314453.3	3	2019
16.	What is the difference between horizontal scaling and vertical scaling?	C314453.3	4	2019
17.	Explain and differentiate types of Hypervisor.	C314453.3	5	2019
18.	Explain the concept of syndication and RSS.	C314453.3	6	2019

Unit III- CLOUDPROGRAMMING, ENVIRONMENTS AND APPLICATIONS

Sr. No.	Question	CO No.	Marks	University Year
1.	Draw and explain programming environment for Google App Engine. Draw and explain programming environment for Google App Engine. Explain programming in Google Application Engine with the help of diagram	C314453.4	6 4 6	2018 2019 2019
2.	Write a short note on Windows Azure Platform.	C314453.4	4	2018
3.	Draw and explain Amazon EC2 execution environment.	C314453.4	6	2018, 2019
4.	Write short note on OpenStack Compute.	C314453.4	4	2018, 2019
5.	Draw and explain architecture of Google File System.	C314453.4	8	2018
6.	Explain architecture of Map Reduce in Hadoop.	C314453.4	8	2018
7.	Write short note on Amazon S3 execution environment.	C314453.4	8	2018
8.	Write short note on Cloud implementation and application.	C314453.4	6	2018
9.	Describe any six important Cloud Platform Capabilities.	C314453.4	6	2019
10.	Define any four IaaS instances of Amazon EC2 cloud.	C314453.4	4	2019
11.	Define the following terms: Eucalyptus Nimbus Open Nebula Open Stack	C314453.4		
12.	Draw and explain architecture of NASA's Nebula Cloud.	C314453.4	8	2019
13.	Explain the concept of cloudlet. Differentiate between cloud and cloudlet.	C314453.4	8	2019

14.	Write short note on : Microsoft Azure	C314453.4	5	2019
15.	Explain different Google Cloud Applications.	C314453.4	5	2019

Unit IV- CLOUD SECURITY AND ISSUES

Sr. No.	Question	CO No.	Marks	University Year
1.	Explain Hardened Virtual Server image.	C314453.2	6	2018
2.	Write short note on Overlapping Trust Boundaries.	C314453.2	4	2018
3.	What is the role of threat agent? Enlist and describe three different threat agents.	C314453.2	8	2018, 2019
4.	Explain various threat agents in cloud computing domain with suitable examples and diagrams.	C314453.2	8	2018
5.	Write short note on IAM: Identity and Access Management in cloud computing.	C314453.2	2	2018
6.	Write short note on Non repudiation and DOS attacks.	C314453.2	2	2018
7.	How are security policies and security mechanisms used to counter threats by threat agents?	C314453.2	8	2019
8.	Explain in Virtualization attack in detail with suitable diagrams.	C314453.2	8	2019
9.	What is hardened virtual server image? How is it used as a cloud server mechanism? Explain hardened virtual server images.	C314453.2	8 8	2019 2019
10.	What is threat agent? Explain any four threat agents.	C314453.2	8	2019
11.	Explain with suitable example i) Encryption ii) Hashing	C314453.2	8	2019
12.	Explain any four types of threats and attacks on cloud specifying which security goal it affects.	C314453.2	8	2019

Unit V- UBIQUITOUS CLOUDS AND THE INTERNET OF THINGS

Sr. No.	Question	CO No.	Marks	University Year
1.	Draw and explain the architecture of the Internet of Things.	C314453.5	8	2018
2.	What is RFID? How RFID works?	C314453.5	8	2018
3.	Availability is one of the most important security measure in IoT and cloud computing. Explain in detail.	C314453.5	8	2018
4.	Smart buildings is one of the major application of IoT and cloud computing. Elaborate with suitable diagram and examples.	C314453.5	8	2018
5.	Explain significance of RFID in IoT with suitable system architecture features and advantages in detail.	C314453.5	8	2018
6.	ZigBEE technology is one of the enabling technologies for IoT. Explain in detail with suitable diagram.	C314453.5	6	2018
7.	Write short note on WSN: a driving force of IoT and cloud computing.	C314453.5	2	2018
8.	Enlist and explain benefits of using wireless network for Ubicom.	C314453.5	10	2018
9.	Write short note on Ubiquitous System Challenge and	C314453.5	10	2018

	Outlook			
10.	Explain the concept of cloud mashup. Draw and explain architecture of IoT.	C314453.5	8	2019
11.	Draw and explain architecture of Facebook platform.	C314453.5	8	2019
12.	Explain Cloudlet. Differentiate between Cloud and Cloudlet.	C314453.5	8	2019
13.	Draw and explain architecture of IoT.	C314453.5	8	2019
14.	Elaborate the idea of Cloud Mashups and explain its advantages.	C314453.5	8	2019
15.	Draw and explain working of GPS.	C314453.5	8	2019

Unit VI- FUTURE OF CLOUD COMPUTING

Sr. No.	Question	CO No.	Marks	University Year
1.	What is Docker? Draw and explain Docker deployment workflow. What is Docker? Explain its workflow in detail. What is Docker? Draw and explain Docker deployment workflow.	C314453.6	8 8 10	2018 2018 2019
2.	Explain architecture of Mobile cloud computing with diagram.	C314453.6	10	2018
3.	What is Jungle Computing? Explain why there is need of Jungle Computing?	C314453.6	8	2018
4.	Draw architecture for Docker and explain its components.	C314453.6	8	2018
5.	Explain key issues related to energy efficiency in cloud computing.	C314453.6	8	2019
6.	Explain following concepts with diagrams. Autonomic cloud engine. Multimedia cloud. Jungle computing.	C314453.6	18	2019
7.	Write short note on: Mobile Cloud Computing. Jungle Computing.	C314453.6	10	2019
8.	Write a short note on: Location aware applications. Energy aware cloud computing. Intelligent fabrics and paints.	C314453.6		
9.	Explain the future of cloud computing with example.	C314453.6	5	
10.	What is Home based cloud computing? Explain.	C314453.6	5	
11.	Explain Future of Cloud-Based Smart Devices.	C314453.6	5	

ADDITIONAL RESOURCES

Site References:

1. https://www.makeuseof.com/tag/virtual-machine-makeuseof-explains/
2. https://internetofthingsagenda.techtarget.com/definition/pervasive-computing-ubiquitous-computing
3. The Benefits of Cloud Storage https://www.cloudoye.com/blog
4. Different Cloud Vendors https://www.edureka.co/blog/aws
5. Videos of cloud computing https://cloudacademy.com/

314454

Data Science &Big Data Analytics

SYLLABUS

314454:Data Science and Big data analytics

TeachingScheme:	**Credits:**	**ExaminationScheme:**
Lectures:4Hours/Week	04	In-Semester:30Marks End-Semester:70Marks

Pre-requisites:

4. Engineering and discretemathematics.
5. Database Management Systems, Data warehousing, Datamining.
6. Programmingskill.

Course Objectives:

1. TointroducebasicneedofBigDataandDatasciencetohandlehugeamountofdata.
2. To understand the basic mathematics behind the Bigdata.
3. To understand the different Big data processingtechnologies.
4. To understand and apply the Analytical concept of Big data using R and Python.
5. To visualize the Big Data using differenttools.
6. To understand the application and impact of BigData.

Course Outcomes:

1. To understand Big Dataprimitives.
2. To learn and apply different mathematical models for BigData.
3. TodemonstratetheirBigDatalearningskillsbydevelopingindustryorresearchapplications.
4. To analyze each learning model come from a differentalgorithmic approach and it will perform differently under differentdatasets.
5. To understand needs challenges and techniques for big datavisualization.
6. To learn different programming platforms for big dataanalytics.

UNIT – I INTRODUCTION: DATA SCIENCE ANDBIGDATA 08 hours

Introduction to Data science and Big Data, Defining Data science and Big Data, Big Data examples, Data explosion, Data volume, Data Velocity, Big data infrastructure and challenges, Big Data Processing Architectures, Data Warehouse, Re-Engineering the Data Warehouse, Shared everything and shared nothing architecture, Big data learning approaches.

UNIT – II MATHEMATICAL FOUNDATION OFBIGDATA 08 Hours

Probability theory, Tail bounds with applications, Markov chains and random walks, Pair wise independence and universal hashing, Approximate counting, Approximate median, The streaming models, Flajolet Martin Distance sampling, Bloom filters, Local search and testing connectivity, Enforce test techniques, Random walks and testing, Boolean functions, BLR test for linearity.

UNIT - III BIGDATA PROCESSING 08 Hours

Big Data technologies, Introduction to Google file system, Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration, **Introduction to:** NOSQL, Textual ETL processing.

UNIT – IV BIGDATAANALYTICS 08 Hours

Data analytics life cycle, Data cleaning , Data transformation, Comparing reporting and analysis, Types of analysis, Analytical approaches, Data analytics using R, Exploring basic features of R, Exploring R GUI, Reading data sets, Manipulating and processing data in R, Functions and packages in R, Performing graphical analysis in R, Integrating R and Hadoop, Hive, Data analytics.

UNIT – V BigData Visualization 08 Hours

Introduction to Data visualization, Challenges to Big data visualization, Conventional data visualization tools, Techniques for visual data representations, Types of data visualization, Visualizing Big Data, Tools used in data visualization, Propriety Data Visualization tools, Open –source data visualization tools, Analytical techniques used in Big data visualization,Data visualization with Tableau, **Introduction to:** Pentaho, Flare, Jasper Reports, Dygraphs, Datameer Analytics Solution and Cloudera, Platfora, NodeBox, Gephi, Google Chart API, Flot, D3, andVisually.

UNIT – VI BIG DATA TECHNOLOGIES APPLICATION AND IMPACT 08 Hours

Social media analytics, Text mining, Mogile analytics , Roles and responsibilities of Big data person, Organizational impact, Data analytics life cycle, Data Scientist roles and responsibility, Understanding decision theory, creating big data strategy, big data value creation drivers, Michael Porter's valuation creation models, Big data user experience ramifications, Identifying big data usecases.

Text Books

1. Krish Krishnan, Data warehousing in the age of Big Data, Elsevier, ISBN: 9780124058910,1stEdition.
2. DTEditorialServices,BigData,BlackBook,DTEditorialServices,ISBN:9789351 197577,2016 Edition.

Reference Books

1. MitzenmacherandUpfal,ProbabilityandComputing:RandomizedAlgorithmsand ProbabilisticAnalysis,CambridgeUniversitypress,ISBN:521835402hardback.
2. DanaRon,AlgorithmicandAnalysisTechniquesinPropertyTesting,SchoolofEE.
3. GrahamCormode,MinosGarofalakis,PeterJ.HaasandChrisJermaine,SynopsesforMassive Data:Samples,Histograms,Wavelets,Sketches,Foundationandtrendsindatabases,ISBN :10.1561/1900000004.
4. A.Ohri,RforBusinessAnalytics,Springer,ISBN:978-1-4614-4343-8.
5. AlexHolmes,Hadoopinpractice,Dreamtechpress,ISBN:9781617292224.
6. AmbigaDhiraj,BigData,BigAnalytics:EmergingBusinessIntelligenceandAnalyticTrendsforToday’sBusiness,WielyCIOSeries.
7. Arvind Sathi, Big Data Analytics: Disruptive Technologies for Changing the Game, IBM Corporation,ISBN:978-1-58347-380-1.
8. EMC Education Services, Data Science and Big Data Analytics- Discovering, analyzing Visualizing andPresentingData.
9. LiChen,ZhixunSu,BoJiang,MathematicalProblemsinDataScience,Springer,ISBN:978-3-319-25127-1.
10. PhilipKromerandRussellJurney,BigDataforchips,O’Reilly,ISBN:9789352132447.
11. EMCEducationservices,DataScienceandBigDataAnalytics,EMC2Wiley,ISBN: 978812655653-3.
12. MuellerMassaron,PythonforDatascience,Wiley,ISBN:9788126557394.
13. EMCEducationServices,DataScienceandBigDataAnalytics,WileyIndia,ISBN: 9788126556533
14. Benoy Antony, Konstantin Boudnik, Cheryl Adams,,Professional Hadoop, Wiley India,ISBN:9788126563029
15. MarkGardener,BeginningR:TheStatisticalProgrammingLanguage,WileyIndia,ISBN :9788126541201
16. MarkGardener,TheEssentialRReference,WileyIndia,ISBN:9788126546015

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Unit	Assessment Technique	Blooms Taxonomy Category
CO314454.1	To understand Big Data primitives.	I	Pre In sem Theory Test	L2-Understanding
CO314454.2	To learn and apply different mathematical models for Big Data.	II		L3-Applying
CO314454.3	To demonstrate their Big Data learning skills by developing industry or research applications.	III		L2-Understanding
CO314454.4	To analyze each learning model come from a different algorithmic approach and it will perform differently under different datasets.	IV	Pre end sem Theory Test	L4-Analyzing
CO314454.5	To understand needs challenges and techniques for big data visualization.	V		L2-Understanding
CO314454.6	To learn different programming platforms for big data analytics.	VI		L2-Understanding

PREREQUISITES

Sr. No.	Unit Number	Prerequisite subject name
1.	I	Database Management system (Data warehousing)
2.	II	Discrete Mathematics
3.	III	Database Management system (Data Warehousing)
4.	IV	Database Management system (Data Mining)
5.	V	Discrete Mathematics Database Management system
6.	VI	Discrete Mathematics Database Management system (Data Mining)

TEACHING PLAN

Teaching Plan Short

AcademicYear:-2020-21 Semester: - II w. e. f.:- 16/12/2019

Class:-TE Division: A &B

Subject: - DATA SCIENCE AND BIGDATAANALYTICS Subject Code: -314454

Faculty In charge: - **Mrs**. Yogita Fatangare/ Anita Devkar No. of Lectures/ weeks:4

- **Lecture Plan**

Sr. No.	Unit No.	Unit/ Topic Name	Start week	End week
1.	I	INTRODUCTION: DATA SCIENCE AND BIG DATA	Dec week3	Jan week 1
2.	II	MATHEMATICAL FOUNDATION OF BIG DATA	Jan week 2	Jan week 3
3.	III	BIG DATA PROCESSING	Jan week 4	Jan week 5
4.	IV	BIG DATA ANALYTICS	Feb week 1	Feb week 3
5.	V	BIG DATA VISUALIZATION	Feb week 3	Mar week 2
6.	VI	BIG DATA TECHNOLOGIES APPLICATION AND IMPACT	Mar week 2	Mar week 3

Detail Teaching Plan

Lect. No	Unit No.	Main Topic to be Covered	Sub Topics to be Covered	Chap. No. & Reference Books	CO to Attain	Measurable to attain CO	Mode of Delivery
1	I	Introduction to big data and datascience	Definition and Need of Big data and data Science, examples, real time scenario	Krish Krishnan, Data warehousing in the age of Big Data, Elsevier, ISBN: 9780124058910, 1st Edition. (Chapter 1,2,3,4)	CO314454.1	Pre In Sem Exam	Chalk and Talk PPT
2	I	BigData examples	Case Study				
3	I	Data explosion	4 V's of Big data, Why data Explosion, Rate of data volume				
4	I	Big data infrastructure and challenges	Need of infrastructure, how to choose, parameters for choosing, challenges faced.				
5	I	Big Data Processing Architectures	Types, Advantages, Disadvantages				
6	I	Data Warehouse, Re-Engineering the Data Warehouse.	Steps, Cycle, need				

7	I	Shared everything and shared nothing architecture	Comparison and which one is suitable for big data				
8	I	Big data learning approaches	Various approaches with examples.				
9	II	Probability theory	Examples and Problem Solving	Mitzenmacher and Upfal, Probability and Computing: Randomized Algorithms and Probabilistic Analysis, Cambridge University press, ISBN :521835402 hardback.	CO314454.2	Pre In Sem Exam	Example solving, Chalk and Talk
10	II	Tail bounds with applications					
11	II	Markov chains and random walks					
12	II	Pair wise independence and universal hashing,					
3	II	Approximatecounting, Approximatemedian, The streaming models					
14	II	Flajolet Martin Distance sampling, Bloom filters					
15	II	Local search and testing connectivity, Enforce test techniques					

16	II	Random walks and testing, Boolean functions, BLR test for linearity					
17	III	Big Data technologies		Krish Krishnan, Data warehousing in the age of Big Data, Elsevier, ISBN: 9780124058910, 1st Edition DT Editorial Services, Big Data, Black Book, DT Editorial Services, ISBN: 9789351197577, 2016 Edition (Chapter 8,9,10)	CO314454.3	Pre In Sem Exam	PPT
18	III	Introduction to Google file system	GFS, Details and architecture				
19	III	Hadoop Architecture	Components and connections				
20	III	Hadoop Storage	HDFS, Common Hadoop Shell commands				
21	III	Anatomy of File Write and Read	NameNode, Secondary NameNode, and DataNode				
22	III	Hadoop MapReduce paradigm	Mapper and reducer examplesand implementation				
23	III	Map Reduce task,	Job,Task trackers-				

			Cluster Setup – SSH &Hadoop Configuration				
24	III	NOSQL,ETL	Introduction to:NOSQL, Textual ETL processing				
25	IV	Data analytics life cycle	Phases and how it works	Krish Krishnan, Data warehousing in the age of Big Data, Elsevier, ISBN: 9780124058910, 1st Edition (Chapter 13) DT Editorial Services, Big Data, Black Book, DT Editorial Services, ISBN: 9789351197577, 2016 Edition (Chapter 19,20,21,26)			
26	IV	Datacleaning , Data transformation	NA		CO314454.4	Pre End Sem Exam	Chalk and Talk
27	IV	Comparing reporting and analysis, Types of analysis	Examples and case studies				
28	IV	Analytical approaches, Data analytics using R	NA				
29	IV	Exploring basic features of R, Exploring R GUI	NA				
30	IV	Reading data sets, Manipulating and processing data in R	NA				

31	IV	Functionsand packages inR	NA				
32	IV	Performing graphical analysis	NA				
33	V	Introduction to Data visualization	NA	DTEditorial Services, Big Data, Black Book, DT Editorial Services, ISBN: 9789351197577, 2016 Edition (chapter 26,27) Arvind Sathi, Big Data Analytics: Disruptive Technologies for Changing the Game, IBM Corporation, ISBN:978-1-58347-380-1	CO314454.5	Pre End Sem Exam	
34	V	Challenges to Big data visualization	Examples				
35	V	Conventional data visualization tools	Techniques for visual data representations				
36	V	Types of data visualization	Visualizing Big Data, Tools used in data visualization				
37	V	Propriety Data Visualization tools	Open –source data visualization tools				
38	V	Analytical techniques used inBig data visualization	Data visualization with Tableau				
39	V	Introduction	Pentaho, Flare, Jasper Reports, Dygraphs, Datameer				

			Analytics Solution and Cloudera				
40	V	Introduction to analytical tools	Platfora, NodeBox, Gephi, Google Chart API, Flot, D3, and Visually				
41	VI	Social media analytics	Examples and advantages	DTEditorial Services, Big Data, Black Book, DT Editorial Services, ISBN: 9789351197577, 2016 Edition (Chapter 28,29,30)	CO314454.6	Pre End Sem Exam	PPT
42	VI	Text mining,	Mogile analytics , Roles and responsibilities of Big data person				
43	VI	Organizational impact of big data	Data analytics life cycle				
44	VI	Data Scientist roles and responsibility,	Understanding decision theory, Roles and responsibilities of working				
45	VI	creating big data strategy	big data value creation drivers, Michael Porter’s valuation creation				

			models				
46	VI	Big data user experience ramifications	Survey				
47	VI	Identifying big data use cases	NA				

HOME ASSIGNMENT

UNIT I

Sr. No.	Question	CO No.
1.	Explain and justify your answer with example "Data Science and Big data are same or different".	C314454.1
2.	Explain various data processing infrastructure challenges in big data.	C314454.1
3.	Explain with example Big Data and 5 V's.	C314454.1
4.	Explain role of Shared Everything and Shared Nothing architecture in big data.	C314454.1

UNIT II

Sr. No.	Question	CO No.
1.	Identify distinct elements in below input stream of integers using Flajolet Martin Algorithm. Consider Hash function h(X)=6x+1, X=1,3,2,1,2,3,4,3,1,2,3,1.	C314454.2
2.	What example can you find to explain Bloom filter.	C314454.2
3.	Solve: Given that a person's last purchase was Coke there is 90% chance that his next purchase will also be Coke. If a person's last purchase was Pepsi, there is 80% chance that his next purchase will also be Pepsi. Given that a person is currently a Pepsi purchaser What is the probability that he will purchase Coke two purchases from now?	C314454.2
4.	How would you show your understanding to choose applications of tail and bound in big data ?	C314454.2

UNIT III

Sr. No.	Question	CO No.
1.	Explain the term Mapreduce? Explain the working of mapper and reducer with example .	C314454.3
2.	Explain how Google file system solves big data processing challenges.	C314454.3
3.	Explain HDFS read and write operations	C314454.3
4.	Compare SQL and NoSQL Databases with example. What is the	C314454.3

	need to develop big data applications using NoSQL databases?	

UNIT IV

Sr. No.	Question	CO No.
1.	Can you list major stages of data analysis life cycle in big data.	C314454.4
2.	Categorize different modes of data transformation in big data and explain.	C314454.4
3.	How would you explain need of big data analysis? Explain different types of analysis techniques.	C314454.4
4.	How can you compare reporting and analysis? Explain in brief	C314454.4

UNIT V

Sr. No.	Question	CO No.
1.	Explain the term Mapreduce? Explain the working of mapper and reducer with example .	C314454.5
2.	Explain how Google file system solves big data processing challenges.	C314454.5
3.	How can you describe visualization with tableau.	C314454.5
4.	Explain advanced analytics methods used in big data visualization	C314454.5

UNIT VI

Sr. No.	Question	CO No.
1.	What is mean by social media analytics? Explain its need with sample case study.	C314454.6
2.	What is the main ideaof Text Mining? Draw and explain text mining architecture	C314454.6
3.	How would you express roles and responsibilities of big data analyst and data scientist.	C314454.6

UNIT WISE QUESTION BANK

UNIT-I

Sr. No.	Question	CO No.	Marks	Universi ty Year
1.	Define data Science and big data.	CO314454.1	4	
2.	Explain big data with examples.	CO314454.1	8	
3.	What is data explosion, explain the root cause.	CO314454.1	8	
4.	Explain 4 V's of big data.	CO314454.1	8	
5.	What are big data processing infrastructure challenges?	CO314454.1	8	
6.	What are two popular data processing architectures?	CO314454.1	8	
7.	Write short notes on Following: a)Re-Engineering the data Warehouse. b)Data Processing Techniques	CO314454.1	8	
8.	What are big data learning approaches? Explain with example.	CO314454.1	8	
9.	What is Shared nothing and shared everything architecture, explain with the help of diagrams.	CO314454.1	8	
10.	Which architecture is used for big data? Explain Why?	CO314454.1	8	
11.	What is the need of data warehouse?	CO314454.1	8	
12	What is data warehouse? Explain design and architecture of data warehouse.	CO314454.1	6	May 2018
13	List and explain data processing infrastructure challenges in Big Data.	CO314454.1	6	May 2018
14	Explain big data along with 5 V's.	CO314454.1	6	Nov 2019
15	Explain Machine learning Approaches in Big Data	CO314454.1	6	Nov 2019
16	Explain shared-everything and shared nothing architectures in detail with respect to Big data	CO314454.1	5	March 2019

17	Explain 5V's for defining Big Data along with the factors responsible for data exlosion?	CO314454.1	5	March 2019
18	List and explain choices for reengineering the data warehouse.	CO314454.1	5	March 2019
19	Discuss the processing complexities associated with the big data	CO314454.1	5	March 2019
20	Define big data. Enlist the differences and similarity in Big Data and Data science with example.	CO314454.1	6	May 2019

UNIT-II

Sr. No.	Question	CO No.	Marks	University Year
1.	Write a note on Bloom Filter.	CO314454.2	4	
2.	Explain Markov chains and random walks.	CO314454.2	4	
3.	What is an Enforce test technique?	CO314454.2	4	
4.	What is the application of tail and bound in big data.	CO314454.2	4	May 2018
5.	Which Boolean functions used for mathematical modelling.	CO314454.2	4	
6.	Explain BLR test for linearity.	CO314454.2	4	
7.	Write a note on Enforce test techniques.	CO314454.2	4	
8.	Write a note on Flajolet Martin Distance sampling.	CO314454.2	4	
9.	Write a note on universal hashing.	CO314454.2	4	
10.	Explain Importance of probability theory in mathematical foundation of big data.	CO314454.2	8	
11.	Given that a person's last purchase was pepsi, there is a 90% chance that his next purchase will also be pepsi. If a person's last purchase was coke, there is an 80% chance that his next purchases will also coke. What is the probability that he will purchase pepsi three purchases from new?	CO314454.2	6	May 2018
12.	Explain the Flajolet Martin Distance sampling. Find the distinct element from the element stream 1,4,2,1,2,4,4,4,1,2,4,1,7. Assume suitable hash function.	CO314454.2	6	May 2018
13.	Prove the principle of linearity of expectation.	CO314454.2	4	May 2018
14	Explain pairwise independent hashing	CO314454.2	4	Nov 2019
15	A petrol station owner is considering the effect on his business (Superpet) of a new petrol station (Global) which has opened just down the road. Currently (of the total market shared between Superpet and Global) Superpet has 80% of the market	CO314454.2	6	Nov 2019

	and Global has 20%. Analysis over the last week has indicated the following probabilities for customers switching the station they stop at each week: To Superpet Global From Superpet 0.75 0.25 Global 0.55 0.45 What will be the expected market share for Superpet and Global after another two weeks have past?			
16	Explain the Flajolet Martin Distance Sampling.Find the distinct element from the element stream 4,2,5,9,1,6,3,7.Consider the Hash function h(x)=(x+6)mod 32.	CO314454.2	4	Nov 2019
17	Determine the distinct elements in the following stream using Flajolet martin algorithm. Also design a suitable hash function which will give accurate result. Input stream 1, 3,2,1,2,3,4,3,1,2,3,1	CO314454.2	6	May 2019
18	Explain the big data infrastructure for mobile computing.	CO314454.2	4	May 2019
19	Prove that principle of linearity of Expectation along with the usage related to Big data	CO314454.2	4	May 2019
20	Suppose that an orange juice company controls 20% of the orange juice market. Suppose they hire a market research company to predict the effects of an aggressive ad campaign. Suppose they include- • Someone using Brand A will stay with Brand A with probability 90% • Someone not using Brand A will switch to brand A with 70% probability i. What is the initial state matrix ii. Write down transition probability matrix iii. Calculate the probability that someone uses Brand A after 1 week	CO314454.2	6	May 2019
21	Explain Flajolet martin Algorithm .List the limitations of algorithm and how will you overcome these limitations?	CO314454.2	4	March 2019
22	A computer system can operate in two different modes.Every hour it remains in the same mode or switches to a different mode according mode according to the transition probability matrix. P=[0.4,0.6 0.6 0.4] i) Compute the 2-step transition probability matrix ii) If the system is in mode I at 5.30 pm what is the probability that it will be in mode I at 8.30 pm on the same day?	CO314454.2	6	March 2019
23	Explain the following terms. i) Expectation ii) Pair wise independence	CO314454.2	4	March 2019
24	Assume that a man's profession can be classified as professional, skilled labourer, or unskilled labourer. Assume that, of the sons of professional men, 80 percent are professional, 10 percent are skilled labourers, and 10 percent are unskilled labourers. In the case of sons of skilled labourers, 60 percent are skilled labourers, 20 percent are professional,	CO314454.2	6	March 2019

	and 20 percent are unskilled. Finally, in the case of unskilled labourers, 50 percent of the sons are unskilled labourers, and 25 percent each are in the other two categories. Assume that every man has at least one son, and form a Markov chain by following the profession of a randomly chosen son of a given family through several generations. Set up the matrix of transition probabilities. Find the probability that a randomly chosen grandson of an unskilled labourer is a professional man.		TE (Semester II)	

UNIT-III

Sr. No.	Question	CO No.	Marks	University Year
1.	Write Short noteson: 1) GFS2)HDFS	CO314454.3	8	
2.	What is Hadoop architecture? Explain each component with the help of diagram	CO314454.3	8	
3.	What is Mapreduce? Explain the working of mapper and reducer with example.	CO314454.3	8	
4.	What are task tracker and job tracker?	CO314454.3	4	
5.	Write short note on: a)NO SQL 2)Textual ETL processing	CO314454.3	8	
6.	What are hadoop core components?	CO314454.3	8	
7.	Explain MapReduce implementation with the help of example.	CO314454.3	8	
8.	How write and read operations are managed in HDFS.	CO314454.3	8	
9.	Whatis the use of Namenode and secondary namenode?	CO314454.3	4	
10.	Explain Jo Tracker Architecture with the help of diagram.	CO314454.3	8	
11.	Explain any 5 hadoop shell commands.	CO314454.3	10	
12.	Explain how Google file system solves big data processing challenges.	CO314454.3	4	May 2018
13.	Explain job execution in Hadoop with example.	CO314454.3	4	May 2018
14	Write two Hadoop shell file management command.	CO314454.3	4	Nov 2019
15	Explain Mapreduce with proper diagram for word count example.	CO314454.3	4	Nov 2019
16	Explain anatomy of file read and write in HDFS.	CO314454.3	6	Nov 2019

17	Draw and explain architecture of Hive	CO314454.3	8	Nov 2019
18	Explain the following terms: i) Google file system ii) Heartbeat mechanism in HDFS	CO314454.3	6	March 2019
19	Differentiate between SQL and NoSQL databases with example. What is the need to develop Big data applications using NoSQL databases?	CO314454.3	4	March 2019
20	Explain HDFS Read & write operations in detail	CO314454.3	6	March 2019
21	What is the role of sorter,shuffler and combiner in Map reduces Paradigm?	CO314454.3	4	March 2019
22	Write a short note on Textual ETL	CO314454.3	4	May 2019
23	Explain the role of following components in Hadoop system • Name node • Secondary name node • Data node	CO314454.3	6	May 2019
24	Discuss advantages and disadvantages of distributed processing	CO314454.3	4	May 2019

UNIT -IV

Sr. No.	Question	CO No.	Marks	University Year
1.	Explain data analytics life cycle.	CO314454.4	8	
2.	Explain process of cleaning and transformation.	CO314454.4	8	
3.	Compare Reporting and analysis.	CO314454.4	8	
4.	Why R is used?	CO314454.4	4	
5.	Why is the need of graphical analysis for data? What is the procedure using R GUI?	CO314454.4	8	
6.	Write Short note on Hive.	CO314454.4	4	
7.	What are the types of analysis in big data?	CO314454.4	8	
8.	How to integrate R and Hadoop?	CO314454.4	8	
9.	Write Short note on a) R b)Hive	CO314454.4	8	
10.	What are the analytical approaches in Big data.	CO314454.4	8	
	What is data preparation? Explain its types with suitable example.	CO314454.4	8	May 2018
11	Explain the different modes of data transformation in big data.	CO314454.4	8	May 2018
12.	What is the need of big data analysis? Explain the different types of analysis techniques.	CO314454.4	8	May 2018

13.	Explain the data analysis life cycle in big data.	CO314454.4	8	May 2018
14	Explain different steps in Data Analytics Project Lifecycle	CO314454.4	8	Nov 2019
15	Explain different kinds of Data Analysis.	CO314454.4	8	Nov 2019
16	Write a user defined function to calculate a cube of a given number in R	CO314454.4	8	Nov 2019
17	List and explain the different kind of roles for an analytics project	CO314454.4	8	May 2019
18	List and explain the steps in discovery phase of data analytics life cycle	CO314454.4	8	May 2019
19	Explain the data analytics life cycle in big data	CO314454.4	8	May 2019
20	Explain the terms data cleaning and data transformation with the help of example	CO314454.4	8	May 2019

UNIT-V

Sr. No.	Question	CO No.	Marks	University Year
1.	Explain techniques used in visual data representation.	CO314454.5	8	
2.	Explain in short data visualization.	CO314454.5	4	
3.	What are the types of data visualization?	CO314454.5	8	
4.	Explain applications of data visualization.	CO314454.5	8	
5.	Write short notes on a)Visualizing big data b)Tableau	CO314454.5	8	
6.	Explain any 4 tools used in data visualization.	CO314454.5	8	
7.	What is data visualization in Tableau?	CO314454.5	8	
8.	Write short notes on:	CO314454.5	6	
	a)Pentaho b)Flare c)Jasperreports			
9.	Write short notes on: a)Dygraph b)Datameer analytic solution and clouderac)Platfora d)Visually	CO314454.5	8	

10.	Write short notes on: a)NodeBox b)Gephi c)Google chart API d)Flot e)D3	CO314454.5	10	
11	What are the major challenges in visualizing the big data and how to overcome these challenges.	CO314454.5	8	May 2018
12.	Explain i) Google chat API ii) Cloudera	CO314454.5	8	May 2018
13.	Explain any two visual data representation techniques with sample data set.	CO314454.5	8	May 2018
14	Explain i) Data visualization with Tableau ii) Jasper reports	CO314454.5	8	May 2018
15	List the conventional Data Visualization Tools. Explain any two.	CO314454.5	8	Nov 2019
16	Explain pie chart and scatter plot.	CO314454.5	8	Nov 2019
17	Describe different types of data visualization.	CO314454.5	8	Nov 2019
18	Explain different data visualization tools	CO314454.5	8	Nov 2019
19	Discuss different types of data visualization techniques ?why visualization is more important	CO314454.5	8	May 2019
20	What are the challenges in visualizing big data and how to overcome them?	CO314454.5	8	May 2019
21	What are the advanteges of data visualization?write a short note on any three tools used for data visualization	CO314454.5	8	May 2019
22	Write a short note on: i) Google chart API ii) Scatter plot iii) Gephi iv) cloudera	CO314454.5	8	May 2019

UNIT-VI

Sr. No.	Question	CO No.	Marks	University Year
1.	What are the key elements of social media?	CO314454.6	8	
2.	What is the need of text mining in social data?	CO314454.6	4	
3.	Explain text mining process with example.	CO314454.6	8	
4.	Explain mobile analytics.	CO314454.6	8	
5.	Explain roles and responsibilities of big data analyst.	CO314454.6	8	
6.	Explain data analytics life cycle.	CO314454.6	8	
7.	Explain roles and responsibilities of data scientist.	CO314454.6	8	
8.	Explain decision theory.	CO314454.6	6	
9.	How to create big	CO314454.6	8	

10.	What is Michael Porter's valuation creation model?	CO314454.6	8	
11.	Explain Big data user experience ramifications.	CO314454.6	8	
12.	Explain and Identify big data use cases.	CO314454.6	8	
13.	What is social media analytics? Explain it's need with sample case study.	CO314454.6	9	May 2018
14	What is text mining? Draw and explain text mining architecture and explain its need.	CO314454.6	9	May 2018
15	How mobile analytics is different than social media analytics. Explain with suitable example.	CO314454.6	9	May 2018
16	Explain roles and responsibilities of big data analyst and data scientist.	CO314454.6	9	May 2018
17	Explain Data Scientist role and responsibilities with suitable diagram.	CO314454.6	9	Nov 2019
18	How social media Analytics helps in value creation? Explain with suitable example.	CO314454.6	9	Nov 2019
19	What is text mining? Draw and explain text mining architecture and its use.	CO314454.6	9	Nov 2019
20	Explain four Big Data Use cases.	CO314454.6	9	Nov 2019
21	Write a short note on : 1. Social media analytics 2. Roles and responsibilities of big data person 3. Mobile analytics	CO314454.6	9	May 2019
22	Write a short note on: 1. Difference between mobile analytics and social media analytics 2. Text mining 3. Role of Data scientist	CO314454.6	9	May 2019

ADDITIONAL RESOURCES

1. Online course

   NPTEL:https://onlinecourses.nptel.ac.in/noc17_mg24/course

2. Rprogramming

   https://onlinecourses.nptel.ac.in/noc17_ma17/

314455
Software Laboratory-IV

SYLLABUS

TeachingScheme:	**Credits**	**Examination Scheme**:
Practical:2Hours/Week	01	Term Work: 25Marks
		Oral: 25 Marks

Prerequisites:

1. Fundamentals of computer Networks.

Course Objectives:

1. To design and implement small size network and to understand various networkingcommands
2. To provide the knowledge of various networking tools and their relatedconcepts
3. To understand various application layer protocols for its implementation in client/serverenvironment
4. To understand network layer protocols and itsimplementations.
5. To explore and understand various simulations tools for networkapplications.
6. To understand the fundamentals of wireless networks andstandards.

Guidelines for Instructor's Manual

1. The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratoryinstructor/Assistant

Guidelines for Student's Lab Journal

1. Student should submit term work in the form of handwritten journal based on specified list of assignments.
2. Practical Examination will be based on the termwork.
3. Candidate is expected to know the theory involved in theexperiment.
4. The practical examination should be conducted if and only if the journal of the candidate is complete in allrespects.

Guidelines for Lab /TW Assessment

1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendanceetc.
2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carriedout.
3. Appropriate knowledge of usage of software and hardware related to respective laboratory should be checked by the concerned faculty member. As a conscious effort and little contribution

towards Green IT and environment awareness, attaching printed papers of the program in journal may be avoided. There mustbehand-writtenwrite-upsforeveryassignmentinthejournal.TheDVD/CDcontainingstudentsprograms should be attached to the journal by every student and same to be maintained by department/lab In-charge is highly encouraged. For referenceone or two journals may be maintained with program prints at Laboratory.

Suggested List of Laboratory Assignments

AssignmentNo.1

Explore and Study of TCP/IP utilities and Network Commands on Linux.

a) Ping
b) ipconfig /ifconfig
c) Hostname
d) Whois
e) Netstat
f) Route
g) Tracert/Traceroute/Tracepath
h) NSlookup
i) Arp
j) Finger
k) Port Scan /nmap

Assignment No.2: Using a Network Simulator (e.g. packet tracer) Super-netting of a given networks.

Assignment No.3:

Using a Network Simulator (e.g. packet tracer)
Configure A router using router commands,
Access Control lists – Standard & Extended.

Assignment No.4:

Using a Network Simulator (e.g. packet tracer) Configure
EIGRP – Explore Neighbor-ship Requirements and Conditions, its K Values Metrics Assignment and Calculation, RIPv2 and EIGRP on same network.
WLAN with static IP addressing and DHCP with MAC security and filters

Assignment No.5:

Using a Network Simulator (e.g. packet tracer)Configure VLAN, Dynamic trunk protocol and spanning tree protocol OSPF – Explore Neighbor-ship

Condition and Requirement, Neighbor-ship states,

OSPF Metric Cost Calculation.

Network Address Translation : Static, Dynamic & PAT (Port Address Translation)

Assignment No.6:

Socket Programming in C/C++ on

Linux. TCP Client , TCP Server

UDP Client , UDP Server

Assignment No.7:

Introduction to server administration (server administration commands and their applications) and configuration any three of below Server : (Study/Demonstration Only)

FTP, Web Server, DHCP, Telnet, Mail, DNS

Assignment No.8:

Using any open source Network Simulator,

Implement MANET / Wireless Sensor Network

Assignment No.9:

Write a program using Arduino / Rasberry Pi Kit for Demonstration of IOT Application on any one of the following Topics.

Appliance Remote Control

Time Lapse Camera

Controller Security /

Automation Sensors The

Traffic Light Controller

Temperature Controller

References

1. Andrew S. Tanenbaum, David J. Wethrall, Computer Network, Pearson Education, ISBN : 978-0- 13- 212695-3.

2. Kurose Ross, Computer Networking: A Top Down Approach Featuring the Internet, Pearson Education, ISBN:978-81-7758-878-1.

3. Charles E. Perkins, Adhoc Networking, Pearson Education,978-81-317-2096-7.

4. Andrea Goldsmith, Wireless Communication, Cambridge University Press, ISBN:978-0-521-83716-3.

5. Mayank Dave, Computer Network, Cengage Learning, ISBN:978-81-315-0986-9.

6. C. K. Toh, Ad Hoc Mobile Wireless Networks Protocols and Systems, Prentice Hall, ISBN:978-01- 324-42046.

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Assignment	Assessment Technique	Blooms Taxonomy Category
C314455.1	To implement small size network and its use of various networking commands.	1	CONTINOUS ASSESSMENT &MOCK TEST	Creating
C314455.2	To understand and use various networking and simulations tools.	2,3,4,5		Understanding
C314455.3	To configure various client/server environments to use application layer protocols	6		Creating
C314455.4	To understand the protocol design at various layers.	7		Understanding
C314455.5	To explore use of protocols in various wired and wireless applications.	8		Understanding
C314455.6	To develop applications on emerging trends.	9		Applying

PREREQUISITES

Sr No	Title of assignment	Prerequisites
1	Networking commands	Data communication and Network layer, transport layer
2	Using a Network Simulator (e.g. packet tracer) Configure Sub-netting of a given network Super-netting of a given networks.	Data communication and Network layer
3	Using a Network Simulator (e.g. packet tracer) Configure A router using router commands, Access Control lists – Standard & Extended.	Data communication and Network layer
4	Using a Network Simulator (e.g. packet tracer) Configure EIGRP,RIPv2 and EIGRP on same network,WLAN	Data communication and Network layer
5	Using a Network Simulator (e.g. packet tracer)Configure VLAN, DTP,STP, OSPF,NAT	Data communication and Network layer
6	Socket Programming in C/C++ on Linux. TCP Client , TCP Server UDP Client , UDP Server	Data communication and Transport layer
7	Server administration on FTP, Web Server, DHCP, Telnet, Mail, DNS	Data communication and application layer
8	Using any open source Network Simulator,Implement MANET / Wireless Sensor Network	Data communication and Network layer, Transport layer
9	IOT application using Rasberrypai/Arduino	Data communication and IOT

TEACHING PLAN

Teaching Plan Short

AcademicYear:-2020-21 Semester:-II w. e. f.:- 16/12/2019

Class:-TE Division: A &B

Subject: - SOFTWARE LABORATORY–IV Subject Code:- 314455

Faculty In charge: -Prof.S.D.Deshpande/MrDeepak Tamhane No. of Practical/ weeks:2h

- **PracticalPlan**

Sr. No.	Assignm entNo.	Assignment Name	Start week	End week
1.	I	Explore and Study of TCP/IP utilities and Network Commands on Linux. a) Ping b) ipconfig / ifconfig c) Hostname d) Whois e) Netstatf) Route g) Tracert/Traceroute/Tracepath h) NSlookupi)Arp j) Fingerk) Port Scan / nmap	3rd Week Dec	3rd Week Dec
2.	II	Using a Network Simulator (e.g. packet tracer) Configure Sub-netting of a given network Super-netting of a givennetworks.	4th Week Dec	1st Week Jan
3.	III	Using a Network Simulator (e.g. packet tracer) Configure A router using router commands, Access Control lists – Standard & Extended.	2nd Week Jan	2nd Week Jan
4.	IV	Using a Network Simulator (e.g. packet tracer) Configure EIGRP – Explore Neighbor-ship Requirements and Conditions, its K Values Metrics Assignment and Calculation, RIPv2 and EIGRP on same network. WLAN with static IP addressing and DHCP with MAC security and filters	3rd week Jan	1st Week Feb
5.	V	Using a Network Simulator (e.g. packet tracer) Configure VLAN, Dynamic trunk protocol and spanning tree protocol OSPF – Explore Neighbor-ship Condition and Requirement, Neighbor-ship states, OSPF Metric Cost Calculation. Network Address Translation : Static,	2nd Week Feb	3rd Week Feb

		Dynamic & PAT (Port Address Translation)		
6.	VI	Socket Programming in C/C++ on Linux. TCP Client , TCP Server UDP Client , UDP Server	4th Week Feb	1st week March
7	VII	Introduction to server administration (server administration commands and their applications) and configuration any three of below Server : Study/Demonstration Only) FTP, Web Server, DHCP,Telnet, Mail, DNS	2nd Week March	2nd Week March
8	VIII	Using any open source Network Simulator, Implement MANET / Wireless Sensor Network	3rd week march	3rd week march
9	IX	Write a program using Arduino / Rasberry Pi Kit for Demonstration of IOT Application on any one of the following Topics. Appliance Remote Control Time Lapse Camera Controller Security / Automation Sensors The Traffic Light Controller Temperature Controller	4th week march	4th week march

PRACTICAL PRACTICE QUESTIONS

Assignment No.1:

Explore and Study of TCP/IP utilities and Network Commands on Linux.

a) Ping
b) ipconfig /ifconfig
c) Hostname
d) Whois
e) Netstat
f) Route
g) Tracert/Traceroute/Tracepath
h) NSlookup
i) Arp
j) Finger
k) Port Scan /nmap

Assignment No.2:

Using a Network Simulator (e.g. packet tracer) Configure

Sub-netting of a given network

Super-netting of a given networks.

Assignment No.3:

Using a Network Simulator (e.g. packet tracer) Configure

A router using router commands,

Access Control lists – Standard & Extended.

Assignment No.4:

Using a Network Simulator (e.g. packet tracer) Configure

EIGRP – Explore Neighbor-ship Requirements and Conditions, its K Values Metrics Assignment and Calculation,

RIPv2 and EIGRP on same network.

WLAN with static IP addressing and DHCP with MAC security and filters

Assignment No.5:

Using a Network Simulator (e.g. packet tracer) Configure

VLAN, Dynamic trunk protocol and spanning tree protocol

OSPF – Explore Neighbor-ship Condition and Requirement, Neighbor-ship states, OSPF Metric Cost Calculation.

Network Address Translation : Static, Dynamic & PAT (Port Address Translation)

Assignment No.6:

Socket Programming in C/C++ on Linux.

TCP Client , TCP Server

UDP Client , UDP Server

Assignment No.7:

Introduction to server administration (server administration commands and their applications) and configuration any three of below Server : (Study/Demonstration Only)

FTP, Web Server, DHCP, Telnet, Mail, DNS

Assignment No.8:

Using any open source Network Simulator, Implement

MANET / Wireless Sensor Network

Assignment No.9:

Write a program using Arduino / Rasberry Pi Kit for Demonstration of IOT Application on any one of the following Topics.

Appliance Remote Control

Time Lapse Camera Controller

Security / Automation Sensors

The Traffic Light Controller

Temperature Controller

ORAL QUESTION BANK

Assignment No 1

1. Describe steps for designing smallnetwork.
2. Tell OSI layers insequence.
3. What are various networkdevices?
4. Tell layer in which router present.
5. Specify which network devices are present inDLL.
6. Specify which network devices are present inTL,PL
7. Give application where gateways areused.
8. Specify which protocols are present in network layer,DLL,PL,AL.
9. Specify cablingmethods.
10. Which cabling method is used for connecting router toswitch?
11. Which cabling method is used for connecting machine toswitch?
12. Which cabling method is used for connecting switch toswitch?
13. What is LAN, MAN, WAN? Giveexample.
14. What isinternet?
15. What is broadcastnetwork?
16. What is point to pointnetwork?
17. What is difference between computer network & distributedsystem?
18. What is the biggest WAN present onearth?
19. What istopology?
20. CompareOSImodelwithTCP/IPreferencemodel.
21. ExplainallthelayersofISO-OSImodel.
22. ExplainallthelayersofTCP/IPmodel.
23. What isARPANET?
24. What isWWW?
25. AreInternet&WWWaresame?
26. IfnotwhatisdifferencebetweenInternet&WWW?
27. Can Internet workwithout WWW?
28. CanWWWworkwithoutInternet?
29. What is PINGcommand?

30. O/p of Pingcommand?
31. What is ICMP protocol? Explain ICMP with the help of PINGcommand?
32. If PING command gives you output destination host unreachable what does it mean?
33. If PING command gives you output destination host unreachable what does it mean?
34. If PING command gives you output request timed out unreachable what does it mean?
35. What is RJ-45connector?
36. What is RJ-11connector?
37. What type of network cable you use in your collegelab?
38. Which cable is faster as far as data transfer rates areconcerned?
39. What type of network topology is used in your collegelab?
40. Which n/w topology isbest?
41. Which n/w topology is best suitable for research lab where n/w reliability is very important?

Assignment No 2

1. Explain use of networksimulator.
2. Give examples of various network simulators/w.
3. What is packetTracer?
4. What are various features of packetTracer?

Following are some features of packet tracer. Check tutorial for getting more features

Packet Tracer Features

- Logical and PhysicalWorkspaces
- Real-Time and SimulationModes
- User friendlyCLI
- Global event list (packetsniffer)
- LAN, switching, TCP/IP, routing, and WANprotocols
- Activity Wizard, Labgrading
- Multiple platformsupport
- Multiple languagesupport

- Integrated Help and Tutorials

5. What are benefits of Packettracer?

Packet Tracer Benefits

- Makes teaching easier by providing a free, multiuser environment for instructors to easily teach complex technicalconcepts
- Makes learning easier by providing a realistic simulation and visualization environment for exploration, experimentation andexplanation

Instructors and students can create their own virtual “network worlds” for teaching and learning networking concepts and technologies

6. What issupernetting?
7. What issubnet?
8. Can we use VLAN for small networks?Justify.
9. Are VLAN’srequired?
10. There is no need to configure VLAN until your network gets so large & has so much traffic.
11. When I needVLAN?
12. Explain example to design VLAN using CIDR addressingscheme?
13. Explain redistributioncommand
14. Explain use ofDHCP

Assignment No. 3

1. What is function of router? Tell layer in which routerpresent.
2. What isrouting?
3. Define routingalgorithm?
4. Specify types of routingalgorithm?
5. Difference between static & dynamic routingalgorithm?
6. What isAccess-List?
7. What is the Function ofAccess-List?
8. How many Access-List's can be created on therouter?
9. What are the advantages of Standard ACL?
10. What are the advantages of Extended ACL?
11. What is the difference between Standard ACL and ExtendedACL?

12. What is the difference between Numbered ACL and NamedACL?
13. What is the difference between Access-group and Access-classcommand?
14. Access Control Lists are Case-Sensitive orCase-Insensitive?
15. Which Traffic is not filtered byACL?
16. What are the different types ofACL?
17. What is wildcardMask?
18. How to permit or deny specific host inACL?
19. Difference between inbound Access-list and Out-Bound AccessList.

Assignment No. 4

1. What is function of router? Tell layer in which routerpresent.
2. What isrouting?
3. Define routingalgorithm?
4. Specify types of routingalgorithm?
5. Difference between static & dynamic routingalgorithm?
6. List commands for configuringrouter
7. ExplainRIP,OSPF,EIGRP
8. What is administrativedistance?
9. What is autonomoussystem
10. Explain area concept inOSPF
11. Compare between RIP,OSPF &EIGRP
12. Explain output of Show ip protocol & show ip routecommand

Assignment No. 5

1. What is difference between LAN &VLAN
2. DefineVLAN
3. Explain area concept inOSPF
4. Compare between RIP,OSPF &EIGRP
5. ExplainRIP,OSPF,EIGRP
6. State advantages & disadvantages of LAN
7. What are advantages of VLAN overLAN
8. Types ofVLAN
9. How to configureVLAN?

10. List commands for VLAN configuration.

Configuring VLAN and names on a switch:

```
BRANCH1#configure terminal
BRANCH1(config)#vlan 10
BRANCH1(config-vlan)#name IT
BRANCH1(config-vlan)#exit
BRANCH1(config)#vlan 20
BRANCH1(config-vlan)#name Sales
BRANCH1(config-vlan)#exit
BRANCH1(config)#exit
```

11. Which command is used to view your VLAN configurations?
12. How to assign switch port toVLAN?

After creating your vlan you can assign a switch port to the vlan .

VLAN 20, is statically assigned to port F0/8 on switch S1:

```
switch1#config t
BRANCH1(config)#interface fastethernet0/8
BRANCH1(config-if)#switchport mode access
BRANCH1(config-if)#switchport access vlan 20
BRANCH1(config-if)#no shutdown
BRANCH1(config-if)#exit
BRANCH1(config)#exit
BRANCH1#
```

- To assign a switch port use mode**access**

13. What is trunklink?
14. How to configure trunk link?

Example:

```
S1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#interface fastethernet0/1
S1(config-if)#switchport mode trunk
S1(config-if)#end
```

- To assign a switch port use mode**trunk**

15. What is use of VLAN Trunking Protocol(VTP)
16. What is CIDR addressscheme?
17. What are advantages of CIDR over classful addressingscheme
18. What issupernetting?
19. What issubnet?
20. Can we use VLAN for small networks?Justify.
21. Are VLAN'srequired?

    There is no need to configure VLAN until your network gets so large & has so much traffic .

22. When I needVLAN?
23. Explain example to design VLAN using CIDR addressingscheme?
24. Explain redistributioncommand
25. Explain use ofDHCP

Assignment 6

1. Explain steps for implementation of client-server application usingTCP.
2. Explain steps for implementation of client-server usingUDP.
3. What is socket? Explain various socket primitives used in client-serverinteraction?
4. Explain server side socket primitives & client side socketprimitives

   Server side socket functions inTCP:

   1. Socket()
   2. Bind()
   3. Listen()
   4. Accept()
   5. Read()
   6. Write()
   7. Close()

   Client side socket functions in TCP:

   1. Socket()
   2. Connect()
   3. Read()

    4. Write()
    5. Close()

  Server side socket functions in udp:

      1. Socket()
      2. Bind()
      3. recvfrom()
      4. sendto ()
      5. Close()

  Client side socket functions in UDP:

      1. Socket()
      2. recvfrom()
      3. sendto ()
      4. Close()

5. What isTCP?
6. What isUDP?
7. What services Transport layer provides to upper layers.
8. Three way handshake inTCP?
9. Difference between TCP &UDP?
10. What is socket addressstructure
11. What is port no ?specify itssize

Assignment No. 7

1. What is FTP?
2. How to deny specific users access to the FTP server?
3. Can we create logs for ftp authenticated sessions ?
4. Is there any way to monitor clients connected tovsftpd?
5. Important Configuration file for vsftpserver?
6. On which port VSFTP server works?
7. What is DHCPserver?
8. How does itwork?
9. Which port are used byDHCP?
10. What is command used to release IPaddress?

11. What is DHCPscope?
12. How to make client of DHCPserver?
13. What is TELNET?\
14. SSH or Telnet?Why?
15. What is the difference between TELNET orSSH?
16. What Is A Postfix MailServer?
17. What IsMua?
18. What Is The Location Of Postfix Mail ServerQueue?
19. What Is Postfix And Default Port Used ForPostfix?
20. How To Send A Test Mail From CommandLine?
21. What Is An Open MailRelay?
22. which are the important configuration files for DNS server?
23. What is BIND?
24. What is the role of DNS?
25. On which port DNS server works?
26. What is NameServer?
27. What is Primary name server or primary masterserver?
28. what is Root nameserver?
29. Explain"TTL"?
30. What is DynamicDNS?

Assignment No 8

1. What is use ofNS-2
2. What is use of out.nam&out.tracefile
3. What isNAM
4. At what point of program the 'finish' procedure should be called?
5. What is the default packet size of tcp in NS2?
6. What is sink node
7. What is the function of trace-all?
8. What is the code to view the simulation of the network in NAM?
9. What information do you get from the sixth field of atracefile
10. Applications ofWLAN

Assignment No 9

1. What isIoT?
2. Give examples of the Impact of Internet of Things (IoT) on ourlives?
3. How is business IoT (IIoT) exclusive from the internet of things(IoT)?
4. What are the important Components of an Internet ofThings?
5. Difference between ArduinoandRasberry.
6. Different sensors used inIOT.
7. How to connect Rasbarry toIOT.
8. How to take readings from any sensor inIOT.

ADDITIONAL RESOURCES

1. https://www.youtube.com/watch?v=OymtD3A-JbQ&t=16s
2. https://www.youtube.com/watch?v=Rvk_L9vJlWA&list=PLnpwocHJ4uP6cG7UhTCcQbXD99pf993RP
3. https://www.youtube.com/watch?v=B7-7RcZCIbM
4. https://www.youtube.com/watch?v=-JOw6R790gQ
5. https://www.youtube.com/watch?v=PhrP45Vm5Bg
6. https://www.youtube.com/watch?v=WMbXgtxTrBY
7. https://www.youtube.com/watch?v=X0GMtmBAhOk
8. https://www.youtube.com/watch?v=7XJ6j0ZqiJU&t=245s
9. https://www.youtube.com/watch?v=4PPUvRj2PvM

314456
Software Laboratory-V

SYLLABUS

314456: SOFTWARE LABORATORY – V

Teaching Scheme:	**Credits**	**Examination Scheme:**
Practical:4Hours/Week	02	Term Work : 50Marks Practical: 50 Marks

Course Objectives:-

1. To learn the concepts of assembler to design and implement two passassembler.
2. To study use of macros and its expansionprocess.
3. To understand lexical analyzer and parser and its applications in compilerdesign.
4. To learn the various algorithmic designparadigms.
5. To apply appropriate algorithmic strategy in problemsolving.
6. To find the space and running time requirements of thealgorithms.

Course Outcome:-

1. To design and implement two pass assembler for hypothetical machine instructions
2. To design and implement different phases ofcompiler
3. To use the compile generation tools such as “Lex" and"YACC”.
4. To apply algorithmic strategies for solving variousproblems.
5. To compare various algorithmicstrategies.
6. To analyze the solution using recurrencerelation.

Group A: System Programming

1. Write a program to implement Pass-I of Two-pass assembler for Symbols and Literal processing (For hypothetical instruction set from Dhamdhere) considering followingcases

i. Forwardreferences

ii. DS and DCstatement

iii. START, EQU, LTORG, END.

iv. Error handling: symbol used but not defined, invalid instruction/registeretc.

2. Write a program to implement Pass-II of Two-pass assembler for output of Assignment 1(The subject teacher should provide input file for this assignment)
3. Study Assignment for Macro Processor. (Consider all aspects of MacroProcessor)
4. Write a program to implement Lexical Analyzer for subset ofC.
5. Write a program to implement a Recursive Descent Parser.
6. Write a program to implement calculator using LEX andYACC.

7. Write a program for Intermediate code generation using LEX &YACC for ControlFlow statement (Either While loop or Switchcase)

Group B: Design & Analysis of Algorithms

1. Write a program to find Maximum and Minimum element in an array using Divideand Conquer strategy and verify the timecomplexity.
2. Write a program to solve optimal storage on tapes problem using Greedyapproach.
3. Write a program to implement Bellman-Ford Algorithm using Dynamic Programmingand verify the timecomplexity.
4. Write a program to solve the travelling salesman problem and to print the path and thecost using DynamicProgramming.
5. Write a recursive program to find the solution of placing n queens on chessboard so thatno two queens attack each other usingBacktracking.
6. Write a program to solve the travelling salesman problem and to print the path and thecost using Branch andBound.

Note: All the assignments should be conducted on Latest version of Open Source/Proprietary Operating Systems, tools and Multi-core CPU supporting Virtualization and Multi-Threading.

References :

1. D. M. Dhamdhere, Systems Programming and Operating Systems, Tata McGraw-Hill,ISBN 13: 978-0-07-463579-7, Second Revised Edition.
2. Horowitz and Sahani, Fundamentals of computer Algorithms, Galgotia.,ISBN : 81-7371-612-9.

COURSE OUTCOMES

System Programming

CO No.	Course Outcome	Mapping With Unit/ Assignment	Assessment Technique	Blooms Taxonomy Category
314456.1	To design and implement two pass assembler for hypothetical machine instructions	1,2	Continuous Assessment and Mock Practical Exam	L3 - Applying
314456.2	To design and implement different phases of compiler	4,5		L3 - Applying
314456.3	To use the compile generation tools such as “Lex" and "YACC”.	6,7		L3 - Applying

Design and analysis of algorithm

CO No.	Course Outcome	Mapping With Assignment	Assessment Technique	Blooms Taxonomy Category
314456.4	To apply algorithmic strategies for solving various problems.	1,2,3,4,5,6	Continuous Assessment and Mock Practical Exam	L3- Applying
314456.5	To compare various algorithmic strategies.	4,6		L2- Understanding
314456.6	To analyze the solution using recurrence relation.	1		L4- Analyzing

PREREQUISITES

System Programming

1. Computer Organization and architecture.
2. Processor Architecture andInterfacing.
3. Fundamentals of Data Structures, Data Structures andFiles.
4. Theory of Computation: DFA, NFA, Regular expressions,Grammars.
6. C/ C++ Programming.

Design and analysis of algorithm

1. DiscreteStructure.
2. C/ C++Programming.
3. Fundamentals of Data Structure andFiles.

TEACHING PLAN

Teaching Plan Short

Academic Year:-2020-21 Semester: - II w. e. f. :- 16/12/2019

Class:-TE Division: A &B

Subject:-DAA Subject Code: -314456

Faculty In charge: - Mrs. Mukta Jamage & Asmita PAwar No. of Pract / weeks:2hr

- **Practical Plan**

Sr. No.	Ass. No.	Unit/ Topic Name	Start Date	End Date
1.	I	Write a program to find Maximum and Minimum element in an array using Divide and Conquer strategy and verify the time complexity.	Dec. Week3	Jan. week2
2.	II	Write a program to solve optimal storage on tapes problem using Greedy approach.	Jan. week2	Jan. week4
3.	III	Write a program to implement Bellman-Ford Algorithm using Dynamic Programming and verify the time complexity.	Jan. week4	Feb. Week2
4.	IV	Write a program to solve the travelling salesman problem and to print the path and the cost using Dynamic Programming.	Feb. Week3	Mar. Week1
5.	V	Write a recursive program to find the solution of placing n queens on chessboard so that no two queens attack each other using Backtracking.	Mar. week2	Mar. week3
6.	VI	Write a program to solve the travelling salesman problem and to print the path and the cost using Branch and Bound.	Mar. Week3	Mar. End

Teaching Plan Short

Academic Year:-2020-21 Semester: - II w. e. f. :- 17/12/2018

Class:-TE Division: A &B

Subject:-SP Subject Code: -314456

Faculty In charge: - Mrs. R.S. Sadafule & Mr. C.A. Ghuge No. of Pract / weeks:2hr

Sr. No.	Ass. No.	Assignment Title	Start Week	End Week
1.	I	Write a program to implement Pass-I of Two-pass assembler for Symbols and Literal processing considering following cases i. Forwardreferences ii. DS and DCstatement iii. START, EQU, LTORG, END. iv. Error handling: symbol used but not defined, invalid instruction/registeretc.	Dec Week4	Jan week2
2.	II	Write a program to implement Pass-II of Two-pass assembler for output of Assignment 1	Jan week2	Jan week4
3.	III	Write a program to implement Lexical Analyzer for subset of C.	Jan week4	Feb Week2
4.	IV	Write a program to implement a Recursive Descent Parser .	Feb Week3	Mar Week1
5.	V	Write a program to implement calculator using LEX and YACC.	Mar week2	Mar week3
6.	VI	Write a program for Intermediate code generation using LEX &YACC for Control Flow statement (Either While loop or Switch case)	Mar Week3	Mar End

PRACTICAL PRACTICE QUESTIONS

System Programming

1. Write C/C++ program for separating token fromfile.
2. C/C++ program Create different tables and add data intoit.
3. Write C/C++ program for Single passAssembler.
4. LEX/YACC program for counting space, tab, newline, words and letters fromfile.
5. Categorizes a number of words as verbs andnonverbs.
6. Basic calculator usingLEX/YACC
7. Write a program for Intermediate code generation using LEX &YACC for ControlFlow statement for FOR and WHILE statements

Design and analysis of algorithm

1. Write a program to sort elements in an array using Divide and Conquer strategy and verify the time complexity.
2. Write a program to solve Knapsack Problem using Greedy approach.
3. Write a program to solve 0/1 Knapsack problem using Dynamic Programming.
4. Write a recursive backtracking program to solve sum of subset problem.
5. Write a Program to implement MST using Prims Algorithm.

ORAL QUESTION BANK

System Programming

1. Is macro processing a phase in compilation? Justify youranswer
2. List the properties of an operatorgrammar
3. Define finiteautomata.
4. What is LL(1) grammar?
5. What isYACC?
6. State different storage-allocationstrategies.
7. What are the two classes of parsingmethods?
8. DefineLexeme.
9. Write any two algebraic properties of regularexpression.
10. What do you mean byambiguous?
11. Define Annotated parsetree.
12. Define optimizingcompiler.
13. What is the purpose of semantic analysis in acompiler?
14. Draw NFA for regular expression(s/t).
15. What is meant byLexeme?
16. List out bottom upparsing.
17. List the functions of apreprocessor.
18. Define operatorgrammar.
19. What is meant byquadruple?
20. What is called annotated parsetree?
21. List two compiler constructiontools.
22. Define optimizingcompilers.
23. Define ambiguity of agrammar.
24. What is synthesizedattribute?
25. What is three addresscode?
26. Define annotated parsetree.
27. Define symboltable.
28. What is aninterpreter?

29. List the various error recovery strategies for a lexicalanalysis.
30. Define a context freegrammar.
31. What are the various types of intermediate coderepresentation?
32. List the common syntacticerrors.
33. What is the use of a dependencygraph?
34. Write the purpose of minimizing the states of the DFA in a lexicalanalyzer.
35. List the properties of operator precedence grammar.
36. Mention the components of context free grammar.
37. What are the two phases of lexicalanalyzer?
38. Write the regular expression for the language, the set of strings over {a,b,c} thatcontain exactly oneb.
39. What isMicroprocessor
40. DefineIntrepreter
41. What is acompiler?
42. List the subparts or phases of analysispart.
43. List the various phases of acompiler.
44. What are the classifications of acompiler?
45. What is a symboltable?
46. List the various compiler constructiontools.
47. Differentiate tokens, patterns,lexeme.
48. Write a regular expression for anidentifier.
49. Mention the various notational shorthands for representing regularexpressions.
50. What does a semantic analysisdo?
51. List the various error recovery strategies for a lexicalanalysis.
52. Mention the basic issues inparsing.
53. Define a context freegrammar.
54. List the properties of LRparser.
55. Mention the types of LR parser.
56. What are the problems with top downparsing?
57. Definehandle.
58. What is a DAG? Mention itsapplications.

Design and analysis of algorithm

1. Why balancing is necessary in divide and conquer?
2. What are the Applications of Divide and Conquer Approach?
3. What is the relationship between divide and conquer and recursion?
4. Is divide and conquer always recursive?
5. Suppose you have an array of 1000 records in which only a few are of order and they are not very far from their positions which sorting algorithm would you use to put the whole array in order? Justify your answer with time complexity of your algorithm
6. What is the greedy algorithm approach? How is it used to address Optimal storage tape.
7. Verify Implicit Or Explicit Constraint in n Queen Problem.
8. Analyze n Queen Problem Using Backtracking.
9. What is significance of Dynamic Programming in problem solving.
10. What is Algorithm and what are its properties?
11. Discuss Divide and Conquer Approach.
12. What are the benefits of Divide and Conquer Approach?
13. Explain the difference between Divide & Conquer Approach and Greedy Method.
14. Explain recurrence equation for the running time of finding maximum and minimum element in an array.
15. What is the worst case, best case and average case complexity?
16. Discuss Greedy Method in detail.
17. Explain recursive and iterative process with example?
18. What is Dynamic Programming?
19. What are the principles of optimality?
20. What are the steps of Dynamic Programming?
21. Explain Floyd Warshall Algorithm with its time complexity.
22. What is backtracking?
23. Explain implicit and explicit constraints of backtracking.
24. Discuss Branch and Bound Strategy. How it is different from Backtracking?
25. What is Pointer and Structure?
26. Differentiate Backtracking and Branch and Bound.

27. If the n queen’s problem is being solved by Branch and Bound Approach as well as Backtracking, then discuss which approach is more efficient and why?
28. What is the difference between Least Cost (LC) Search and First In First Out(FIFO) Search? Which data structures are used for the same?
29. Justify the time complexity of all the 6 programs of lab assignment.
30. What is backtracking?
31. Explain Hamiltonian path. Which method is used for it?
32. What is knapsack problem?
33. Write 2 equations related to knapsack problem What is time complexity for it?
34. Explain graph coloring problem
35. What is Time Complexity.
36. What is Complete Binary Tree.
37. What is Backtracking.
38. What is LCBB.
39. Explain the problem statement Strassen’s matrix multiplication?
40. Which method we can use for Strassen’s matrix multiplication?
41. What is time complexity of Strassen’s matrix multiplication?
42. What is mean by graph coloring?
43. Enlist and explain application of graph coloring?
44. Explain the TSP Problem.
45. Difference between LIFO branch n bound and FIFO branch n bound method.
46. What is knapsack problem.
47. What is principle of optimality.
48. Which different methods are used to solve the TSP problem.
49. What is travelling salesman problem? Explain it.
50. What is minimum spanning tree?
51. Which methods you have used to find MST? Which is better?
52. What is time complexity of Huffman code?
53. What is recurrence relation? What are the uses of it?
54. What is analysis of algorithm?
55. What is amortized analysis? Explain using binary counter.

56. What is feasible solution and what is optimal solution?
57. Explain n queen method
58. Time Complexity of nqueens
59. Explain Floyd n Warshall method
60. Time Complexity of floyd n warshall
61. Explain job sequencing
62. Explain knapsack problem
63. What is accounting method of amortised analysis?
64. What is NP hard problem?
65. Difference between 01 knapsack and fractional knapsack
66. Knapsack problem can be solved by how many methods
67. Explain Huffman problem.
68. Which method is used to extract minimum value for constructing Huffman code
69. Why Huffman coding is used?
70. Explain TSP.
71. Difference between dynamic and greedy method.
72. What is graph colouring problem?
73. Time complexity of Huffman.
74. Explain knapsack problem.
75. Different techniques used for knapsack problem.
76. What is state space tree.
77. What is min heap.
78. What is asymptotic notation.
79. What is amortized analysis.
80. What is p class? NP class? NP hard problem? NP complete problem?

ADDITIONAL RESOURCES

1. Online course

NPTEL:

Course Name: System programming

Weblink: https://www.youtube.com/channel/UCDKSDtvKoOpKF78KL7wn5lA

https://www.tutorialspoint.com/compiler_design/compiler_design_overview.htm

https://www.tutorialspoint.com/compiler_design/compiler_design_overview.htm

Course Name: Introduction to Algorithms and Analysis

Weblink: https://nptel.ac.in/courses/106/105/106105164/

Course Name: Fundamental Algorithms:Design and Analysis

Weblink: https://nptel.ac.in/courses/106/105/106105157/

Course Name: Design and Analysis of Algorithms

weblink: https://nptel.ac.in/courses/106/106/106106131/

314457
Software Laboratory-VI

SYLLABUS

314457: SOFTWARE LABORATORY – VI

TeachingScheme:	**Credits**	**ExaminationScheme:**
Lectures:2Hours/Week	01	Term Work: 25Marks Practical: 25 Marks

Prerequisites:

1. Engineering and discretemathematics.
2. Database Management Systems, Data warehousing, Datamining.
3. Programmingskill.

Course Objectives:

1. To understand Big data primitives andfundamentals.
2. To understand the different Big data processingtechniques.
3. To understand and apply the Analytical concept of Big data usingR/Python.
4. To understand different data visualization techniques for BigData.
5. To understand the application and impact of BigData
6. To understand emerging trends in Big dataanalytics

Course Outcomes:

1. To apply Big data primitives and fundamentals for applicationdevelopment.
2. To explore different Big data processing techniques with usecases.
3. To apply the Analytical concept of Big data usingR/Python.
4. To visualize the Big Data usingTableau.
5. To design algorithms and techniques for Big dataanalytics.
6. To design Big data analytic application for emergingtrends.

Guidelines for Instructor's Manual

1. The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant.

Guidelines for Student's Lab Journal

1. Student should submit term work in the form of handwritten journal based on specified listof assignments.
2. Practical Examination will be based on the termwork.
3. Candidate is expected to know the theory involved in theexperiment

4. The practical examination should be conducted if and only if the journal of the candidateis complete in all respects.

Guidelines for Lab /TW Assessment

1. Examiners will assess the term work based on performance of students consideringthe parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendanceetc.
2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carriedout.
3. Appropriate knowledge of usage of software and hardware related to respectivelaboratory should be checked by the concerned facultymember.

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing students programs should be attached to the journal by every student and same to be maintained by department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Suggested List of Laboratory Assignments

Part A: Assignments based on the Hadoop

1. Hadoop Installation on a)Single Node b)MultipleNode
2. Design a distributed application using MapReduce which processes a log file of a system.List out the users who have logged for maximum period on the system. Use simple log file from the Internet and process it using a pseudo distribution mode on Hadoopplatform.
3. Design and develop a distributed application to find the coolest/hottest year from theavailable weather data. Use weather data from the Internet and process it usingMapReduce.
4. Write an application using HBase and HiveQL for flight information system whichwill include

1) Creating, Dropping, and altering Databasetables

2) Creating an external Hive table to connect to the HBase for Customer InformationTable

3) Load table with data, insert new values and field in the table, Join tables withHive

4) Create index on Flight informationTable

5) Find the average departure delay per day in2008.

Part B: Assignments based on R and Python

1. Perform the following operations using R/Python on the Amazon book review andfacebook metrics datasets

5) Create datasubsets
6) Merge Data
7) SortData
8) TransposingData
9) Melting Data to longformat
10) Casting data to wideformat

2. Perform the following operations using R/Python on the Air quality and Heart Diseasesdata sets

1) Datacleaning
2) Dataintegration
3) Datatransformation
4) Error correcting
5) Data modelbuilding

3. Integrate R/Python and Hadoop and perform the following operations on forest firedataset

1) Text mining inRHadoop
2) Data analysis using the Map Reduce inRhadoop
3) Data mining in Hive 4. Visualize the data using R/Python by plotting the graphsfor assignment no. 2 and3

5. Perform the following data visualization operations using Tableau on Adult and Iris datasets

1) 1D (Linear) Datavisualization
2) 2D (Planar) DataVisualization
3) 3D (Volumetric) DataVisualization
4) Temporal DataVisualization
5) Multidimensional DataVisualization
6) Tree/ Hierarchical Datavisualization
7) Network Datavisualization

Part C : Case Study Assignment

1) Social MediaAnalytics

2) Text Mining/ TextAnalytics

3) MobileAnalytics

References :

1. Big Data, Black Book, DT Editorial services, 2015edition.
2. A.Ohri, “R for Business Analytics”, Springer,2012.
3. Robert I.Kbacoff , R in Action, Dreamtech press, Secondedition
4. Alex Holmes, Hadoop in practice, Dreamtechpress.
5. Online References for data set 1)http://archive.ics.uci.edu/ml/

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Assignment	Assessment Technique	Blooms Taxonomy Category
CO314457.1	To apply Big data primitives and fundamentals for application development.	PART-A(1,2,3,4)	Continuous Assessment and Mock Practical Exam	L3-Applying
CO314457.2	To explore different Big data processing techniques with use cases.			L4-Analyzing
CO314457.3	To apply the Analytical concept of Big data using R/Python.	PART-B (1,2,3,4,5)		L3-Applying
CO314457.4	To visualize the Big Data using Tableau.			L5-Creating
CO314457.5	To design algorithms and techniques for Big data analytics.			L1&5-Remembering, Creating
CO314457.6	To design Big data analytic application for emerging trends.	PART-C		L4-Analyzing

PREREQUISITES

Sr. No.	Assignment No.	Assignment Title	Pre-requisites
1.	1 (B)	Perform the following operations using R/Python on the Amazon book review and facebook metrics data sets 1) Create datasubsets 2) Merge Data 3) SortData 4) TransposingData 5) Melting Data to longformat 6) Casting data to wideformat	R programming Databases
2.	2 (B)	Perform the following operations using R/Python on the Air quality and Heart Diseases data sets 1) Datacleaning 2) Dataintegration 3) Datatransformation 4) Error correcting 5) Data modelbuilding	R programming Databases
3.	1(A)	1. Hadoop Installation on a)Single Node b)Multiple Node	Hadoop Databases
4.	2(A)	Design a distributed application using MapReduce which processes a log file of a system. List out the users who have logged for maximum period on the system. Use simple log file from the Internet and process it using a pseudo distribution mode on Hadoop platform.	Hadoop Distributed Databases
5.	3(A)	Design and develop a distributed application to find the coolest/hottest year from the available weather data. Use weather data from the Internet and process it using MapReduce.	Hadoop Distributed Databases
6.	4(A)	Write an application using HBase and HiveQL for flight information system which will include 1) Creating, Dropping, and altering Database tables 2) Creating an external Hive table to connect to the HBase for Customer InformationTable 3) Load table with data, insert new values and field in the table, Join tables with Hive 4) Create index on Flight informationTable 5) Find the average departure delay per day in	Hadoop Databases Hive

		2008.	
7.	3(B)	Integrate R/Python and Hadoop and perform the following operations on forest fire dataset 1) Text mining inRHadoop 2) Data analysis using the Map Reduce in Rhadoop 3) Data mining inHive	Hadoop Distributed Databases
8.	4(B)	Visualize the data using R/Python by plotting the graphs for assignment no. 2 (B) and 3(B)	Python
9.	5(B)	Perform the following data visualization operations using Tableau on Adult and Iris datasets 1) 1D (Linear) Datavisualization 2) 2D (Planar) DataVisualization 3) 3D (Volumetric) DataVisualization 4) Temporal DataVisualization 5) Multidimensional DataVisualization 6) Tree/ Hierarchical Datavisualization 7) Network Datavisualization	Tableau
10.	1(C)	Case Study Assignment 1) Social MediaAnalytics 2) Text Mining/ TextAnalytics 3) MobileAnalytics	Big data analytics

TEACHING PLAN

Teaching Plan Short

Academic Year:-2020-21 Semester:-II w. e. f. :-16/12/2019

Class :-TE Division: A &B

Subject :-SL-VI Subject Code :-314457

Faculty In charge: - Mrs. Y.D.Fatangare/ Mrs. Anita Devkar No. of Pract/ weeks: 4hr

- **PracticalPlan**

Sr. No.	Assignment No.	Assignment Title	Start Date	End Date
1.	1 (B)	Perform the following operations using R/Python on the Amazon book review and facebook metrics data sets 1) Create datasubsets 2) Merge Data 3) SortData 4) TransposingData 5) Melting Data to longformat 6) Casting data to wideformat	Dec week 3	Dec Week 4
2.	2 (B)	Perform the following operations using R/Python on the Air quality and Heart Diseases data sets 1) Datacleaning 2) Dataintegration 3) Datatransformation 4) Error correcting 5) Data modelbuilding	Jan week 1	Jan week 2
3.	1(A)	1. Hadoop Installation on a)Single Node b)Multiple Node	Jan week 3	Jan week 4

4.	2(A)	Design a distributed application using MapReduce which processes a log file of a system. List out the users who have logged for maximum period on the system. Use simple log file from the Internet and process it using a pseudo distribution mode on Hadoop platform.	Jan week 5	Feb week 1
5.	3(A)	Design and develop a distributed application to find the coolest/hottest year from the available weather data. Use weather data from the Internet and process it using MapReduce.	Feb week 2	Feb week 3
6.	4(A)	Write an application using HBase and HiveQL for flight information system which will include 1) Creating, Dropping, and altering Databasetables 2) Creating an external Hive table to connect to the HBase for Customer InformationTable 3) Load table with data, insert new values and field in the table, Join tables with Hive 4) Create index on Flight informationTable 5) Find the average departure delay per day in 2008.	Feb week 5	Mar week2
7.	3(B)	Integrate R/Python and Hadoop and perform the following operations on forest fire dataset 1) Text mining inRHadoop 2) Data analysis using the Map Reduce inRhadoop 3) Data mining inHive	Mar week 4	Mar week 4
8.	4(B)	Visualize the data using R/Python by plotting the graphs for assignment no. 2 (B) and 3(B)	Mar week 3	Mar week 3
9.	5(B)	Perform the following data visualization operations using Tableau on Adult and Iris datasets 1) 1D (Linear) Datavisualization 2) 2D (Planar) DataVisualization 3) 3D (Volumetric) DataVisualization	Apr week 1	Apr week 1

		4) Temporal DataVisualization 5) Multidimensional DataVisualization 6) Tree/ Hierarchical Datavisualization 7) Network Datavisualization		
10.	1(C)	Case Study Assignment 1) Social MediaAnalytics 2) Text Mining/ TextAnalytics 3) MobileAnalytics	Apr week 1	Apr week 1

PRACTICAL PRACTICE QUESTIONS

1. Loan Prediction Dataset

Among all industries, the insurance domain has one of the largest uses of analytics & data science methods. This dataset provides you a taste of working on data sets from insurance companies – what challenges are faced there, whatstrategies are used, which variables influence the outcome, etc. This is a classification problem. The data has 615 rows and 13 columns.

Problem: Predict if a loan will get approved or not.

2. Heights and Weights Dataset

This is a fairly straightforward problem and is ideal for people starting off with data science. It is a regression problem. The dataset has 25,000 rows and 3 columns (index, height and weight).

Problem: Predict the height or weight of a person.

ORAL QUESTION BANK

Part-I

1. What does ‘jps’ commanddo?
2. How to restartNamenode?
3. Which are the three modes in which Hadoop can berun?
4. What does /etc /init.ddo?
5. What if a Namenode has nodata?
6. What happens to job tracker when Namenode isdown?
7. What is BigData?
8. What are the four characteristics of BigData?
9. How is analysis of Big Data useful fororganizations?
10. Why do we needHadoop?
11. What is the basic difference between traditional RDBMS andHadoop?
12. What is FaultTolerance?
13. What is aNamenode?
14. Is Namenode also a commodityhardware?
15. What is aDatanode?
16. Why do we use HDFS for applications having large data sets and not when there are lot of smallfiles?
17. What is a jobtracker?
18. What is a tasktracker?
19. What is a heartbeat inHDFS?
20. What is a ‘block’ inHDFS?
21. What are the benefits of blocktransfer?
22. How indexing is done inHDFS?
23. Are job tracker and task trackers present in separatemachines?
24. What is the communication channel between client and namenode/datanode?
25. What is arack?
26. What is a SecondaryNamenode?
27. Is it a substitute to theNamenode?
28. Explain how do ‘map’ and ‘reduce’works.
29. Why ‘Reading‘ is done in parallel and ‘Writing‘ is not inHDFS?
30. What isHDFS?
31. What are the key features ofHDFS?
32. What is the difference between traditional RDBMS andHadoop?
33. How would you check whether your NameNode is working or not?
34. Can you change the block size of HDFSfiles?
35. Can we have different replication factor of the existing files inHDFS?
36. What do you mean by the High Availability of a NameNode? How is itachieved?
37. What kind of applications is supported by ApacheHive?

38. Define the difference between Hive andHBase?
39. Where does the data of a Hive table getsstored?
40. What is a metastore inHive?
41. What is the difference between local and remotemetastore?
42. Why Hive does not store metadata information inHDFS?
43. What is the default database provided by Apache Hive formetastore?
44. What is the difference between external table and managedtable?
45. Is it possible to change the default location of a managedtable?
46. What is a partition inHive?
47. When should we use SORT BY instead of ORDERBY?
48. Why do we perform partitioning inHive?
49. What is dynamic partitioning and when is itused?
50. How can you add a new partition for the month December in the above partitionedtable?
51. What are the key components ofHBase?
52. When would you use HBase?
53. What is the use of get()method?
54. Define the difference between Hive andHBase?
55. Explain the data model ofHBase.
56. Define standalone mode inHBase?
57. Define columnfamilies?
58. What are the data manipulation commands ofHBase?
59. What is the use of truncatecommand?
60. HBase blocksize is configured on whichlevel?
61. Which command is used to run HBaseShell?
62. Which command is used to show the current HBaseuser?

Part-B

1. Compare R &Python
2. Explain the data import in Rlanguage.
3. Difference between library () and require () functions in Rlanguage.
4. What isR?
5. How R commands arewritten?
6. What are the disadvantages of RProgramming?
7. What is the use of subset() and sample() function inR?
8. What are the advantages of R?
9. What is the function used for adding datasets inR?
10. What is difference between matrix and dataframes?

11. What is the memory limit ofR?
12. How many data structures Rhas?
13. Explain how data is aggregated inR.
14. How to create new variable in Rprogramming?
15. What are Rpackages?
16. What is the workspace in R?
17. What is the function which is used for merging of data frames horizontally inR?
18. what is the function which is used for merging of data frames vertically inR?
19. Which function is used for sorting inR?
20. How can you load and use csv file inR?
21. What is R Basepackage?
22. How to create scatterplotmatrices?
23. Why we use melt() andcast()?
24. How to sort and order data inR.
25. What is Data Cleaning inR.
26. What is aDimension?
27. What is aMeasure?
28. What does the extension .twbx represent inTableau?
29. What is a Tableauworkbook?
30. In Tableau what is a worksheet?
31. what isTableau?
32. What is TableauReader?
33. What is DataVisualization?
34. What are the differences between Tableau desktop and TableauServer?
35. What are fact table and Dimension table inTableau?
36. What is aggregation and disaggregation of data inTableau?
37. Name the file extensions inTableau.
38. Explain the difference between .twb and .twbx
39. Name the components of aDashboard
40. What different products Tableau provide?
41. What is the difference between Tableau and Traditional BITools?

42. How many maximum tables can you join inTableau?
43. What areshelves?
44. What are the visualization types inTableau
45. Tell me examples and which tools support for followingtypes

    1D (Linear) Datavisualization
    2) 2D (Planar) DataVisualization
    3) 3D (Volumetric) DataVisualization
    4) Temporal DataVisualization
    5) Multidimensional DataVisualization
    6) Tree/ Hierarchical Datavisualization
    7) Network Datavisualization

ADDITIONAL RESOURCES

2. Online course

NPTEL:https://onlinecourses.nptel.ac.in/noc17_mg24/course

3. Rpogramminghttps://onlinecourses.nptel.ac.in
/noc17_ma17/

314458

Project Based Seminar

SYLLABUS

314458: PROJECT BASED SEMINAR		
Teaching Scheme: **01 Oral: 50 Marks**	**Tutorial : 1 Hour/Week**	**Credits Examination Scheme:**
		Oral: 50 Marks

Introduction:

Graduates of final year IT program are supposed to design and implement projects through knowledge and skills acquired in previous semesters. Students should identify complex engineering problems and find effective, efficient and innovative ways of solving them through their projects.

In a technical seminar, students should aim to review literature in a focused way for identifying a complex problem to be attempted in their final year project. Seminar should make the student attain skills like (a) gathering of literature in specific area in a focused manner (b) effectively summarizing the literature to find state-of-the-art in proposed area (c) identifying scope for futurework(d)presenting(arguing)thecasefortheintendedworktobedoneasproject(e)
reporting literature review and proposed work in scientific way using good English.

Prerequisites:

1. Basic Communication, reading and writing skills.

Course Objectives:

1. To perform focused study of technical and research literature relevant to a specific topic.
2. To study, interpret and summarize literature scientifically.
3. To build independent thinking on complex problems.
4. To build collaborative work practices.
5. To communicate scientific information to a larger audience in oral and written form.
6. 6. To use presentation standards and guidelines effectively.

Course Outcomes:

By the end of the course, students should be able to

1. To gather, organize, summarize and interpret technical literature with the purpose of formulating a project proposal.
2. To write a technical report summarizing state-of-the-art on an identified topic.
3. Present the study using graphics and multimedia presentations.
4. Define intended future work based on the technical review.

5. To explore and enhance the use of various presentation tools and techniques.
6. To understand scientific approach for literature survey and paper writing.

Guidelines for Project Based Seminars

1. A project group consisting of 3 to 4 students shall identify problem(s) in Computer Engineering / Information Technology referring to recent trends and developments in consultation with institute guide.
2. The group must review sufficient literature (reference books, journal articles, conference papers, white papers, magazines, web resources etc.) in relevant area on their project topic as decided by the guide.
3. Internal guide shall define a project statement based on the study by student group.
4. Students should identify individual seminar topic based on the project undertaken in consultation with guide.
5. Seminar topics should be based on project undertaken. Guide should thoughtfully allocate seminar topics on different techniques to solve the given problem (project statement), comparative analysis of the earlier algorithms used or specific tools used by various researchers.
6. Research articles could be referred from IEEE, ACM, Science direct, Springer, Elsevier, IETE,CSI or from freely available digital libraries like Digital Library of India (dli.ernet.in), National Science Digital Library, JRD Tata Memorial Library, citeseerx.ist.psu.edu, getcited.org, arizona.openrepository.com, Open J-Gate, Research Gate, worldwide science. Org etc.
7. The group shall present the study as individual seminars in 20 – 25minutes.

Guidelines for Seminar Report

1. Each student shall submit two copies of the seminar report in a prescribed format duly signed by the guide and Head of the department/Principal.
2. First chapter of a project group may talk about the project topic. At the end of the first chapter individual students should begin with introduction of seminar topic and its objectives.
3. Broad contents of review report (20-25 pages) shall be
    i. Introduction of Project Topic
    ii. Motivation, purpose and scope of project and seminar

   iii. Related work (of the seminar title) with citations
   iv. Discussion (your own reflections and analysis)
   v. Conclusions
   vi. Project definition. (Short version of RUP's vision document if possible).
   vii. References in IEEE Format

4. Students are expected to use open source tools for writing seminar report, citing the references and plagiarism detection. (Latex, Lex for report writing ; Mendeley, Zatero for collecting, organizing and citing the resources; DupliChecker , PaperRater, Plagiarism Checker and Viper for plagiarism detection)

Guidelines for Seminar Evaluation

1. A panel of examiners appointed by University will assess the seminar externally during the presentation.
2. Attendance for all seminars for all students is compulsory.
3. Criteria for evaluation
   i. Relevance of topic - 05Marks
   ii. Relevance + depth of literature reviewed- 10Marks
   iii. Seminar report (Technical Content) - 10Marks
   iv. Seminar report (Language) - 05Marks
   v. Presentation Slides - 05Marks
   vi. Communication Skills - 05 Marks
   vii. Question and Answers - 10Marks

Guidelines for Seminar Presentation

1. A panel of examiner will evaluate the viability of project scope and seminar delivery.
2. Oral examination in the form of presentation will be based on the project and seminar work completed by the candidates.
3. Seminar report must be presented during the oral examination.

Reference Books

1. Sharon J. Gerson, Steven M. Gerson, Technical Writing: Process and Product, Pearson Education Asia, ISBN :130981745, 4th Edition.
2. Andrea J. Rutherfoord, Basic Communication Skills for Technology, PearsonEducation Asia, 2nd Edition.
3. Lesikar, Lesikar's Basic Business Communication, Tata McGraw, ISBN :256083274,1st Edition.

PREREQUISITES

Sr. No.	Activity Number	Prerequisite subject name
1.	I: Orientation Session for all TE students on PBS	Basic Communication, Team Building
2.	II: Abstract Submission	Basic Communication, reading and writing skills, Searching skill (Research paper and topic related document.).
3.	III: Review 1 (for Project Approval)	Basic Communication, reading and writing skills, Presentation skill (Vocal and Technical)
4.	IV: Review 2 (for Seminar Approval)	Basic Communication, reading and writing skills, Presentation skill (Vocal and Technical), Technical knowledge related to topic.
5.	V:Session on Plagiarism detection tools and Citation	Knowledge about internet.
6.	VI: Review 3 (Final Report Submission)	Basic Communication, reading and writing skills, Presentation skill (Vocal and Technical), Technical knowledge related totopic.

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Activities	Assessment Technique	Blooms Taxonomy Category
314458.1	To Gather, organize, summarize and interpret technical literature with the purpose of formulating a project proposal.	Orientation Session, Discussion on project statements selection and guidelines, Session on How to readand summarizeliterature	Project Topic Selection	Applying
314458.2	To write a technical report summarizing state-of-the-art on an identified topic.	"How to write Abstract/ Synopsis"	Abstract Writing, Seminar Report	Creating
314458.3	Present the study using graphics and multimedia presentations.	Review I, II,III	Presentations	Creating
314458.4	Define intended future work based on the technical review.	How to read and summarize literatur	Seminar Report and Presentation	Applying
314458.5	To explore and enhance the use of various presentation tools and techniques.	writing report writing using Lyx, Plagiarism detection tools,Session on CitationManagers		Understanding
314458.6	To understand scientific approach for literature survey and paper writing.	How to read and summarize literature		Understanding

TEACHING PLAN

Teaching Plan Short

AcademicYear:-2020-21 Semester:-II w. e. f. :-16/12/2019

Class :-TE Division: A & B

Subject :-Project Based Seminar Subject Code :- 314458

Faculty In charge :- MS. Deepali Bhanage & Asmita Pawar

Mrs. V. G. Dixit & Ms. Anita Devkar No. of Tutorial/ weeks:1hr

- **Practical Plan**

Sr. No.	Activity No.	Assignment Title	Start & End Date
1.	1.	Orientation Session for all TE students on PBS	December third week
2.	2.	Discussion on project statements selection and guidelines	December last week
3.	3.	Session – "How to write Abstract/ Synopsis"	January first Week
4.	4.	**Review 1** (for Project Approval)	January second & Third Week
5.	5.	Abstract Submission	January Forth Week
6.	6.	Guide Allocation	February First Week
7.	7.	Project Synopsis Submission	
8.	8.	Session on How to read and summarize literature	February second Week
9.	9.	Session of Effective presentation and guidelines	February Third Week
10.	10.	**Review 2** (for Seminar Approval)	February Fourth Week
11.	11.	Session on writing report writing using Lyx	March Third week
12.	12.	Session on Plagiarism detection tools	March Fourth week
13.	13.	Session on Citation Managers	
14.	14.	**Review 3** (Final Report Submission)	March Last week

ORAL QUESTION BANK

1. Brief about your topic.
2. Why you choose this topic?
3. What market survey you have done? Proof of the survey.
4. Show the questioner for survey.
5. How you maintain the record?
6. What will be the cost of your project? How you decide the cost?
7. Show your work flow.
8. Show the block diagram of your project.
9. What are the minimum H/W and S/W requirement of your project.
10. Explain the practical implementation of your project.
11. Where you can apply/use your product.
12. How many paper you search? What are the latest papers you search?
13. How you relate your project w.r.to smart India.(If applicable)
14. What is the applicable area of your project?
15. What are the risk factors of your project?
16. How you handle that risk factor?
17. How can you say that you are a good team.

ADDITIONAL RESOURCES

1. file:///C:/Users/DAB/Downloads/lyxguide.pdf
2. http://www.almack.ch/upload/Doc/LyX/en/Tutorial.pdf
3. https://www.lyx.org/Download
4. https://www.duplichecker.com/
5. https://smallseotools.com/plagiarism-checker/
6. https://www.toptal.com/designers/product-design/design-problem-statement
7. https://robots.thoughtbot.com/writing-effective-problem-statements