DEPARTMENT OF COMPUTER SCIENCE

COURSE STRUCTURE & SYLLABI
(For the students admitted from year 2023-2024 onwards)

Programme : M.Sc. Computer Science

Since 1951

JAMAL MOHAMED COLLEGE (AUTONOMOUS)
Accredited with A++ Grade by NAAC (4th Cycle) with CGPA 3.69 out of 4.0
(Affiliated to Bharathidasan University)
TIRUCHIRAPPALLI – 620 020

M.SC. COMPUTER SCIENCE

Sem	Course Code	Course Category	Course Title	Ins. Hrs/ Week	Credit	Marks		Total
						CIA	ESE	
I	23PCS1CC1	Core - I	Mathematics for Computer Science	6	5	25	75	100
	23PCS1CC2	Core - II	Advanced Java Programming	6	5	25	75	100
	23PCS1CC3	Core - III	Web Development Tools	6	5	25	75	100
	23PCS1CC4P1	Core - IV (a)	Advanced Java Programming Lab - Practical	3	2	10	40	50
	23PCS1CC4P2	Core - IV (b)	Web Development Tools Lab - Practical	3	2	10	40	50
	23PCS1DE1A/B	Discipline Specific Electives - I		6	4	25	75	100
			Total	**30**	**23**			**500**
II	23PCS2CC5	Core - V	Database Systems	6	5	25	75	100
	23PCS2CC6	Core - VI	Python for Data Science	6	5	25	75	100
	23PCS2CC7	Core - VII	Design and Analysis of Algorithms	6	5	25	75	100
	23PCS2CC8P1	Core -VIII (a)	RDBMS Lab - Practical	3	2	10	40	50
	23PCS2CC8P2	Core - VIII (b)	Data Science Lab - Practical	3	2	10	40	50
	23PCS2DE2A/B	Discipline Specific Electives - II		6	4	25	75	100
	23PCN2CO	Community Outreach	JAMCROP	-	@	-	-	@
	@Only grades will be given		**Total**	**30**	**23**			**500**
III	23PCS3CC9	Core - IX	Principles of Compiler Design	6	6	25	75	100
	23PCS3CC10	Core - X	Machine Learning and R Programming	6	5	25	75	100
	23PCS3CC11	Core - XI	Digital Image Processing	6	5	25	75	100
	23PCS3CC12P1	Core - XII (a)	Machine Learning Lab - Practical	3	2	10	40	50
	23PCS3CC12P2	Core - XII (b)	Image Processing Lab - Practical	3	2	10	40	50
	23PCS3DE3A/B	Discipline Specific Electives - III		6	4	25	75	100
	23PCS3EC1	Extra Credit Course - I*	Online Course	-	*	-	-	-
			Total	**30**	**24**			**500**
IV	23PCS4CC13	Core - XIII	Middleware Technologies	6	6	25	75	100
	23PCS4CC14P1	Core - XIV (a)	Web Framework Lab - Practical	3	3	10	40	50
	23PCS4CC14P2	Core - XIV (b)	Middleware Technology Lab - Practical	3	3	10	40	50
	23PCS4PW	Project Work	Industrial Experience and Project Work	18	13	-	300	300
	23PCNOC	Mandatory online course**	Online Course	-	1	-	100	100
	23PCS4EC2	Extra Credit Course - II*	Online Course	-	*	-	-	-
	23PCN4EC3	Extra Credit Course – III+	Innovation and Intellectual Property Rights	-	+	-	-	-
	*** Programme Specific Online Course for Advanced Learners** **** Any Online Course for Enhancing Additional Skills** **Total** **+ Course for Enhancing IPR Skills**			**30**	**26**			**600**
			Grand Total		**96**			**2100**

DISCIPLINE SPECIFIC ELECTIVES

Semester	Course Code	Course Title
I	23PCS1DE1A	Advanced Computer Architecture
	23PCS1DE1B	Object Oriented Analysis and Design
II	23PCS2DE2A	Cloud Computing
	23PCS2DE2B	Distributed Operating System
III	23PCS3DE3A	Cryptography and Network Security
	23PCS3DE3B	Software Project Management

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23PCS1CC1	Core - I	6	5	25	75	100

Course Title	Mathematics for Computer Science

SYLLABUS		
Unit	**Contents**	**Hours**
I	Mathematical Logic: Introduction – Statements and Notation – Connectives – (AND, OR, NOT) Negation, Conjunction, Disjunction, *Statement formulas and truth tables* - Conditional and Biconditional – Tautologies, Related Problems – *Equivalence of formulas* - Tautological Implications.	18
II	Normal forms – Disjunctive Normal forms- Conjunctive Normal forms - Principal Disjunctive Normal forms - Principal Conjunctive Normal forms – Ordering and Uniqueness of Normal forms –Lattices and Boolean Algebra: *Lattices as Partially ordered sets- Definitions and examples- Some Properties of Lattices.*	18
III	Basic Concept of Set Theory: Notation-Inclusion and Equality of sets- The Power set-some operations on sets- *Venn diagrams* - Some basic set identities- Cartesian products.	18
IV	Graph – *Applications of Graphs* – Finite and Infinite graphs – Incidence and Degree – Isolated vertex, pendant vertex and Null graphs. Paths and Circuits: Isomorphism – Sub-graphs – Walks, Paths and Circuits – Connected and disconnected graphs – Euler graphs- Operations on Graphs	18
V	Trees and fundamental circuits: Trees – Properties of Trees – Pendant vertices in a Tree – Distance and centers in a Tree- Spanning Trees – Fundamental circuits – *Finding all spanning trees of graph* – Spanning trees in a weighted graph.	18
VI	**Current Trends (For CIA only):** Cryptography –Symmetric and Asymmetric Ciphers – Complexity –Public Key Ciphers – Discrete Logarithm Ciphers –Signatures –Bit Commitment –Quantum Cryptography	

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Text Book(s):

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill Education Private Limited, 38th reprint 2010.
2. Narsingh Deo, Graph theory with application to Engineering and Computer Science, Prentice Hall of India Pvt. Ltd. (2005).
3. T.K. Carne,"Codes & Cryptography", Applications & Algorithms, Department of Mathematics, University of Cambridge**,** Notes Michaelmas (2007).

Reference Book(s):

1. G. Shanker Rao, Discrete Mathematical Structures, New Age International (P) Limited, Second Edition.
2. Edgar G. Goodaire and Michael M. Paramenter, Discrete Mathematics with Graph Theory,Prentice Hall, Second Edition.

Web Resource(s):

1. https://onlinecourses.nptel.ac.in/noc20cs82
2. https://youtu.be/UwYJUKVc-Hs
3. https://youtu.be/tyDKR4FG3Yw
4. https://youtu.be/yC1wXymtBoI

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Apply domain knowledge of mathematical logic	K2
CO2	Explain the Concept of Set theory and operations.	K3
CO3	Estimate the recurrence relation and recursive algorithms	K4
CO4	Determine the walks, paths and circuits of a graph	K5
CO5	Discuss the trees and fundamental circuits of a graph	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	2	3	3	2	3	2	2.7
CO2	3	3	3	3	1	2	2	3	2	3	2.5
CO3	3	3	3	3	2	3	2	2	3	3	2.7
CO4	3	3	3	3	2	3	2	3	3	2	2.7
CO5	2	3	2	3	2	2	3	3	3	3	2.6
Mean Overall Score											2.64
Correlation											High

Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. H. Sheik Mujibur Rahman

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23PCS1CC2	Core - II	6	5	25	75	100

Course Title	Advanced Java Programming

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introducing Classes: Class Fundamentals – Declaring Objects – Introducing Methods – Constructors – The *this* keyword – Garbage Collection – Overloading Methods – Call by value, Call by reference – Recursion – Understanding static and final. Inheritance: Inheritance Basics – Using super – Method overriding – *Dynamic Method Dispatch*- Using Abstract Classes.	18
II	Packages and Interfaces: Defining a Package – Access Protection – Importing Packages – Defining, Implementing, Applying Interfaces - Exception Handling: Exception Types – try, catch – throw – throws – finally – Creating User-defined Exceptions. Multithreaded Programming: The Java Thread Model – Creating a Thread – Thread Priorities – *Synchronization* – String Handling	18
III	The Collection Interfaces and Utility Classes: ArrayList, LinkedList, Vector, Stack, StringTokenizer, and Date classes. Files and IO Streams: File – The Byte Streams: DataInputStream – DataOutputStream-FileInputStream – FileOutputStream – SequenceInputStream – PrintStream. The Character Streams: *FileReader – FileWriter*– Serialization	18
IV	Networking: Networking Basics-The Networking classes and Interfaces – InetAddress-URL-URLConnection-TCP/IP Server Sockets-Datagrams– Remote Method Invocation(RMI)-Architature-Simple Client-Server Application using RMI- Advantages and Disadvantages. Java Database Connectivity: Establishing a connection – Creation of data tables – Entering data into table – Table Updating – Use of PreparedStatement –*Obtaining metadata*.	18
V	Event Handling: The Delegation Event Model – Event Classes – Sources of Events - Event Listeners and Interfaces-Adapter classes. Introducing Swing: Features of Swing – Components and Containers – JLabel and ImageIcons - JText Fields – The Swing Buttons –JCheckBoxes – JRadioButtons – *JComboBoxes -JList*.	18
VI	**Current Trends (For CIA only):** Net Beans IDE, Spring-MVC, Spring Boot and Hybernate	

* ……..* Self Study

Text Book(s):

Herbert Schildt, Java The Complete Reference Eleventh Edition, McGraw-Hill Education Pvt. Ltd., 2019

Reference Book(s):

1. Sachin Malhotra and SaurabhChoudhary, Programming in Java,2nd Edition, Oxford University Press,2018.
2. C. Muthu, Programming with Java, Vijay Nicole imprints private Limited, 2004.

Web Resource(s):

1. https://www.tutorialspoint.com/java/index.htm
2. https://www.javatpoint.com/programming-in-Java
3. https://www.programiz.com/java-programming
4. https://onlinecourses.nptel.ac.in/noc22_cs102/preview

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the concepts of class & objects, inheritance, interfaces, overloading and overriding methods	K1,K2
CO2	Utilize Stream classes and interfaces for data processing on Files, databases& I/O operations	K3
CO3	Examine TCP/IP, UDP and RMI techniques between client and server programs.	K4
CO4	Evaluate event handling techniques on Swing components.	K5
CO5	Create and manipulate packages and threads with the power of exception handling technique	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	3	3	3	3	3	1	2.8
CO2	3	3	2	3	3	3	2	3	2	1	2.5
CO3	3	2	3	2	3	3	3	2	3	3	2.7
CO4	2	3	2	2	3	3	3	3	2	3	2.6
CO5	3	2	1	3	3	3	2	3	3	3	2.6
Mean Overall Score											2.64
Correlation											High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr.S. Abdul Saleem

Semester	Course Code	CourseCategory	Hours/ Week	Credits	MarksforEvaluation		
					CIA	ESE	Total
I	23PCS1CC3	Core - III	6	5	25	75	100

Course Title	Web Development Tools

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Introduction to CSS**: Importing a style sheet – CSS rules – Style Types – Selectors – Fonts and Typography – Managing Text Styles – CSS Colors - Positioning Elements. The HTML5 Canvas: Creating and Accessing a Canvas – Writing Text to the Canvas – Drawing Lines – Working with Curves – Manipulating Images. HTML5 Audio and Video: The <audio> and <video> Element. *Other HTML5 Features: Geolocation and the GPS Service*.	18
II	**Exploring JavaScript**: JavaScript and HTML Text – Using Comments – Semicolons – Variables – Operators – The Document Object Model – About document write. Expressions and Control Flow in JavaScript: Expressions – Literals and Variables – Operators – with Statement – Using try….catch – Conditionals – Looping – Explicit Casting – JavaScript Functions – *JavaScript Objects* – JavaScript Arrays.	18
III	**Exploring PHP**: PHP Functions and Objects: PHP Functions- Including and requiring Files-PHP Objects. PHP Arrays: Basic Access-Multidimensional Arrays- Using Array Functions. Accessing MYSQL using PHP: Querying a MYSQL Database with PHP-A Practical Example. Cookies,Sessions And Authentication: Using Cookies in PHP-*HTTP Authentication*-Using Sessions.	18
IV	**Introduction to jQuery**: What jQuery can do for you -Installing jQuery. Selecting and Filtering: Using Selector API- *Filtering a Selection*-Slicing and Adding. Events. Manipulating Content.	18
V	**Introduction to JSON**: JSON Grammar -JSON Tokens.Creating JSON: The Serialization Process-Demystified- JSON Object. Parsing JSON: JSON.parse. Data Interchange:Hyper Text Transfer Protocol-*Ajax-XMLHTTPrequest Interface*.	18
VI	**CurrentTrends(ForCIAonly):** Progressive Web Apps, AI Chartbots, Singl Page Application and MotionUI	

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TextBook(s):

1. Robin Nixon , Learning PHP, MySQL &JavaScript with JQuery, CSS &HTML 5, O'Reilly, 5th Edition, 2018.
2. Richard York, Web Development with jQuery , John Wiley & Sons, Inc.2015
3. Ben Smith, Beginning JSON , Apress Publisher, 2015

ReferenceBook(s):

1. Laura Lemay, Rafe Colburn and Jennifer Kyrnin, Mastering HTML, CSS & Java Script Web Publishing, BPB Publications, 2016
2. John Pollock, JQAuery: A Beginner's Guide, McGraw Hill Publisher, 2014
3. Ben Smith, Beginning JSON, Apress Publisher, 2015

Web Resource(s):

1. https://www.w3schools.com/js/js_json_intro.asp
2. https://www.javatpoint.com/json-tutorial
3. https://www.geeksforgeeks.org/json-introduction/

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the concepts of CSS, JavaScript, PHP, jQuery, AJAX and JSON	K1, K2
CO2	Utilize JavaScript with HTML and CSS to create interactive web applications.	K3
CO3	Inspect JavaScript frameworks and light weight format which facilitate the developers to focus on core features.	K4
CO4	Explain the importance of PHP, jQuery and JSON for web application development	K5
CO5	Develop object orientedServer-Side Scripts using PHP to generate anddisplay the contents dynamically.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	3	3	3	2	3	1	2.7
CO2	3	3	2	3	2	3	2	3	2	1	2.4
CO3	3	2	3	3	3	3	3	2	3	2	2.7
CO4	2	3	2	2	3	3	3	1	2	2	2.3
CO5	3	2	1	3	3	3	2	2	3	2	2.4
Mean Overall Score											2.5
Correlation											High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:
Ms. J. Sahitha Banu
Ms. S. Benazir Butto

Semester	Course Code	CourseCategory	Hours/ Week	Credits	MarksforEvaluation		
					CIA	ESE	Total
I	23PCS1CC4P1	Core - IV (a)	3	2	10	40	50
Course Title	Advanced Java Programming Lab - Practical						

Develop the Java application using NetBeans IDE to:

1. Prepare a student report using class and objects.
2. Implement single inheritance to find area & perimeter of a Rectangle.
3. Create an abstract class named as Department with abstract method calcBonus() and normal method displaySalary(String name). Define an Account class which extends Department class and implements calcBonus() with its own.
4. Demonstrate for handling any three types of Runtime Exceptions.
5. Create two threads using Runnable interface to compute and display factorials of first five natural numbers.
6. Arrange the given set of names in alphabetical order using String handling method.
7. Demonstrate various operations on Vector and ArrayList classes.
8. Display the file properties of a given file or directory.
9. Merge the given two files using SequenceInputStream class.
10. Send a text message from one system to another using TCP/IP Sockets.
11. Send and receive value between client and server using RMI technique.
12. Prepare an invoice using Swing controls and to store the details in a database using JDBC.
13. Create three buttons with caption Red, Green and Blue using Swing and set the background color by clicking the relevant buttons.
14. Design a simple calculator and implement the basic arithmetic operations.

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CONo.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Demonstrate the concepts of Class, Inheritance, multithreading and message passing	K2
CO2	Utilize Stream classes and interfaces for data processing on Files, databases & I/O operations	K3
CO3	Examine event handling techniques on Swing components	K4
CO4	Prove the message passing using TCP/IP,UDP and RMI techniques between client and server programs	K5
CO5	Create and manipulate packages and threads with the power of exception handling technique	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	3	3	3	3	3	1	2.8
CO2	3	3	2	3	3	3	2	3	2	1	2.5
CO3	3	2	3	2	3	3	3	2	3	3	2.7
CO4	2	3	2	2	3	3	3	3	2	3	2.6
CO5	3	2	1	3	3	3	2	3	3	3	2.6
									Mean Overall Score		2.64
									Correlation		High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Abdul Saleem

Semester	Course Code	CourseCategory	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23PCS1CC4P2	Core - IV (b)	3	2	10	40	50
Course Title	Web Development Tools Lab – Practical						

1. Create a HTML form for building your resume. Apply inline, internal, and external CSS in the form.
2. Design a web site using HTML and DHTML. Use Basic text Formatting&Images.
3. Write a JavaScript program to list the properties of a JavaScript object.
4. Write a JavaScript program to create a registration form and validate the username and password fields.
5. Write a HTML program to draw graphics on webpage using <canvas> element.
6. Write a simple PHP program for database connectivity.
7. Write a program to display session id, creation time and last access time of the web page using PHP.
8. Write a jQuery program to get a single element from a selection of elements of a HTML page.
9. Write a jQuery program to attach a click and double-click events to all elements.
10. Write a jQuery program to get the value of a textbox.
11. Write a program to convert PHP object in to JSON.
12. Write a program to extract data from MySQL table and display as JSON.

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CONo.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Demonstrate the concepts of CSS, JavaScript, PHP, jQuery, AJAX and JSON	K2
CO2	Utilize JavaScript with HTML and CSS to create interactive web applications.	K3
CO3	Inspect JavaScript frameworks and light weight format which facilitate the developers to focus on core features.	K4
CO4	Prove the importance of PHP, jQuery and JSON	K5
CO5	Develop Server-Side Scripts using PHP to generate and display the contents dynamically.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	3	3	3	2	3	1	2.7
CO2	3	3	2	3	2	3	2	3	2	1	2.4
CO3	3	2	3	3	3	3	3	2	3	2	2.7
CO4	2	3	2	2	3	3	3	1	2	2	2.3
CO5	3	2	1	3	3	3	2	2	3	2	2.4
Mean Overall Score											2.5
Correlation											High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:
Ms. J. Sahitha Banu
Ms. S. Benazir Buto

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23PCS1DE1A	DSE – I	6	4	25	75	100
Course Title	Advanced Computer Architecture						

SYLLABUS		
Unit	**Contents**	**Hours**
I	Parallel Computer Models:-The state of computing - Multiprocessors and multi computers – Multi-vector and SIMD computers. Program and Network properties:-Conditions of parallelism–Program partitioning and scheduling– program flow mechanisms–*System interconnect architectures*- Principles of Scalable Performance : Parallel Processing Applications.	18
II	Processors and memory hierarchy: Advanced processor Technology–Super scalar and vector processors–*Memory Hierarchy Technology*. Bus Cache and Shared Memory: Bus Systems – Shared-Memory Organizations. Pipelining and Superscalar Techniques: Linear Pipeline Processors – Nonlinear Pipeline Processors.	18
III	Multiprocessors and Multicomputers: Multiprocessor System Interconnects – *Cache Coherence and Synchronization Mechanisms* - Message Passing Mechanisms. Multivector and SIMD Computers: SIMD Computer Organizations –The Connection Machine CM-5. Scalable, Multithreaded, and Dataflow Architectures : Fine-Grain Multicomputers.	18
IV	Software for Parallel Programming : Parallel Programming Models – Parallel Languages and Compilers – Dependence Analysis of Data Arrays –Parallel Program Development and Environments : Parallel Programming Environments – *Synchornization and Multiprocessing Modes*–Message Passing Program Development.	18
V	**Instruction and System Level Parallelism: Instruction Level Parallelism –** Trends in Parallel Systems: *Brief Overview of Technology* – Forms of Parallelism – Case Studies.	18
VI	**Current Trends(For CIA only):** 32-bit Advanced RISC Machine, 32-bit Intel Architecture, PowerPC Architecture	

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Text Book(s):

1. Kai Hwang, "Advanced Computer Architecture, "Tata McGraw-Hill International Edition Singapore, 2003.

Reference Book(s):

1. Kai Hwang and Faye A. Briggs, "Computer Architecture and Parallel Processing", McGraw-Hill International Edition, Singapore, 1985.
2. 2. Michael J.Quinn, "Parallel Computing, Theory and Practice", McGrawHill, International Edition, Singapore, 1994.

Web Resource(s):

1. https://www.pdfdrive.com/advanced-computer-architecture-e5799174.html
2. https://www.researchgate.net/publication/255178777_UNIT_1_Advanced_Computer_Architecture_Introduction
3. https://onlinecourses.nptel.ac.in/noc23_cs07/preview

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the different parallel computer models and compare the program flow mechanisms with network properties.	K2
CO2	Identify the advanced processor technology like super scalar, vector, pipeline processors and make use of bus, cache and superscalar techniques.	K3
CO3	Analyze multiprocessor system concepts with message passing mechanism and examine the concepts of SIMD computers.	K4
CO4	Evaluate the parallel programming models, languages, compilers and estimate the Parallel Program Development and Environments	K5
CO5	Adapt the Instruction level Parallelism and estimate the recent trends in Parallel System	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	3	1	3	2	3	3	2	2	2.4
CO2	3	3	3	2	1	3	1	1	2	1	2.0
CO3	3	2	2	3	2	3	1	3	3	1	2.3
CO4	2	3	2	2	2	3	2	1	2	2	2.1
CO5	3	2	3	2	3	3	2	3	1	2	2.4
Mean Overall Score											2.24
Correlation											Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr.K. Syed Kousar Niasi

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23PCS1DE1B	DSE - I	6	4	25	75	100
Course Title	Object Oriented Analysis and Design						

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction to OOAD – Unified Process – *UML diagrams* – Use Case – Class Diagrams–Interaction Diagrams–State Diagrams–Activity Diagrams – Package, component and Deployment Diagrams.	18
II	GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller – *Design Patterns* – Creational – factory method – structural – Bridge – Adapter – behavioural – Strategy – Observer.	18
III	Case study – the Next Gen POS system, Inception – Use case Modelling – Relating Use cases – include, extend and generalization – Elaboration – Domain Models – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – *Aggregation and Composition*.	18
IV	System sequence diagrams – Relationship between sequence diagrams and use cases Logical architecture and UML package diagram – Logical architecture refinement – *UML class diagrams* - Applying GoF design patterns.	18
V	Mapping design to code – Testing: Issues in OD Testing – Class Testing – OO Integration Testing – *GUI Testing* – OO System Testing	18
VI	**Current Trends(For CIA only):** UML component diagram, UML interaction diagrams and UML deployment diagrams	

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Text Book(s):

1. Craig Larman, “Applying UML and Patterns: An Introduction to Object – Oriented Analysis and Design and Iterative Development”, Third Edition, Pearson Education, 2005.

Reference Book(s):

1. Simon Bennelt, Steve Mc Robb and Ray Farmer, “Object Oriented Systems Analysis and Design Using UML”, Fourth Edition, Mc-Graw Hill Education, 2010.
2. Erich gamma and Richard Helm, Ralph Johnson, John Vlissides, “Design patterns: Elements of Reusable Object-Oriented Software”, Addison-Wesley, 1995.

Web Resource(s):

1. https://www.tutorialspoint.com/object_oriented_analysis_design/index.htm
2. https://onlinecourses.nptel.ac.in/noc19_cs48/preview

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the concept of OOA and UML diagrams	K1, K2
CO2	Apply the UML diagrams and appropriate design patterns for problem domain.	K3
CO3	Analyze various testing issues and techniques.	K4
CO4	Compare sequence diagrams,Use cases logical architecture and UML package diagram	K5
CO5	Create coding and documentation manual from UML design	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	1	3	1	3	1	3	3	1	2.2
CO2	3	3	3	3	3	3	1	3	1	3	2.6
CO3	3	3	2	3	3	2	3	2	3	3	2.7
CO4	2	3	2	2	3	3	3	3	1	3	2.5
CO5	3	2	2	3	2	3	2	3	3	1	2.4
									Mean Overall Score		2.48
									Correlation		Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr.M.A. Jamal Mohamed Yaseen Zubeir

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23PCS2CC5	Core – V	6	5	25	75	100

Course Title	Database Systems

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction: Database System Applications – Purpose of Database Systems – Views of Data – Database Languages – Data Storage and Querying – Database Users and Administrator – Structure of Relational Database – Keys – *Schema Diagrams * – Formal Relational Query Languages – Relational Algebra – The Tuple Relational Calculus – The Domain Relational Calculus.	18
II	Introduction to SQL: Overview of SQL – SQL Definition – Basic Structure of SQL Queries – Additional Basic Operations – Set Operations – Null Values – *Aggregate Functions* – Nested Sub-queries – Modification of the database - Intermediate SQL: Join Expression – Views. Database Design: Entity-Relationship Model – Constraints – Entity- Relationship Diagram	18
III	Normalization: Purpose of Normalization – How Normalization Support Database Design – Data Redundancy and Update Anomalies – Functional Dependencies – First Normal Form – Second Normal Form – Third Normal Form. Advanced Normalization: More on Functional Dependencies – *BCNF* – 4NF – 5NF.	18
IV	Transaction: Transaction Concept – A simple Transaction Model – Storage Structure – Transaction Atomicity and Durability – Transaction Isolation – Serializability – Concurrency Control: Lock-Based Protocol – Timestamp-Based Protocol – *Validation-Based Protocol* – Recovery Systems: Failure Classification – Recovery and Atomicity.	18
V	Database-System Architectures: Centralized and Client-Server Architectures – Server System Architecture. Distributed Databases: Homogeneous and Heterogeneous Databases – Distributed Data Storage – Distributed Transactions – *Commit Protocols* – Concurrency Control in Distributed Database.	18
VI	**Current Trends(For CIA only):** MongoDB, Parallel Database Systems and Cloud Databases.	

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Text Book(s):

1. Abraham Silberschatz, Hendry F. Korth and S. Sudarshan, Database System Concepts, 7th Edition, McGraw- Hill International Edition, 2019.
2. Thomas M.Connolly, Carolyn E.Begg, Database Systems A Practical Approach to Design, Implementation, and Management, 4th Edition, Pearson Education, Fifth Impression, 2012.

Reference Book(s):

1. C.J. Date, A. Kannan and S. Swaminathan, An Introduction to Database Systems, 8th Edition, Pearson Education Asia, 2000.
2. Fundamentals of Database Systems, 5th Edition by Ramez Elmasri, Shamkant B. Navathe, Pearson Education Ltd, 2016.

Web Resource(s):

1. https://www.db-book.com/db6/slide-dir/
2. https://www.geeksforgeeks.org/basic-database-concepts/
3. https://onlinecourses.nptel.ac.in/noc23_cs29/preview

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the features of RDBMS and compare it with file system.	K1, K2
CO2	Apply SQL queries on created tables in Relational Databases	K3
CO3	Examine techniques pertaining to Database design practices	K4
CO4	Explain the working principle of commit protocols and concurrency control.	K5
CO5	Create various advanced SQL queries related to Transaction Processing & Locking.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	1	3	3	3	1	3	3	1	2.2
CO2	3	3	1	3	2	3	2	3	2	1	2.3
CO3	3	3	1	3	3	2	3	2	3	1	2.4
CO4	2	3	2	2	3	3	3	3	2	2	2.5
CO5	3	2	2	3	2	3	2	3	3	3	2.6
Mean Overall Score											2.4
Correlation											Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Mr. S. Syed Ibrahim

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23PCS2CC6	Core - VI	6	5	25	75	100

Course Title	Python for Data Science

SYLLABUS

Unit	Contents	Hours
I	Introduction: Using Python - Displaying Output with the print Function – Variables - Reading Input from the Keyboard - Simple Functions: Introduction to Functions - Defining and Calling a Function - Decision Structures and Boolean Logic: The if Statement - The if-else Statement - Comparing Strings – Nested Decision Structures and the if-elif-else Statement - *Logical Operators* - Boolean Variables - Repetition Structures: The while Loop: a Condition-Controlled Loop - The for Loop: a Count-Controlled Loop - Sentinels - Input Validation Loops - Nested Loops.	18
II	Lists and Tuples: Sequences - Introduction to Lists - List Slicing - Finding Items in Lists with the in Operator - List Methods and Useful Built-in Functions - Copying Lists - Processing Lists - Two-Dimensional Lists - Tuples - More About Strings: Basic String Operations - String Slicing - Testing, Searching and Manipulating Strings - Dictionaries and Sets: Dictionaries - Sets - Serializing Objects - Classes and Object-Oriented Programming: - Classes - Inheritance: Introduction to Inheritance - Polymorphism - Getting MySQL for Python - *import MySQL for Python* - MySQLDb - Connecting with a Database.	18
III	Making Sense of Data through Advanced Visualization: Controlling the line properties of a chart – Creating multiple plots – Playing with text – Styling your plots – Box plots – Heatmaps – Scatter plots with histograms – A scatter plot matrix – Area plots – Bubble charts – Hexagon bin plots – Trellis plots – *A 3D plot of a surface.*	18
IV	Introduction: Getting Started with Raw Data – The world of arrays with NumPy – Creating an array – Mathematical Operations – Squaring an array – Indexing and Slicing – Shape manipulation – Empowering data analysis with Pandas – The data structure of pandas – *Inserting and Exporting data* – Data cleansing – Data Operations – Joins..	18
V	Inferential Statistics: Various forms of distribution – A normal distribution – A Poisson distribution – A Bernoulli distribution – A z-score – A p-value – One-tailed and two-tailed tests – Type 1 and Type 2 errors – A confidence interval – Correlation – Z-test vs T-test – The F distribution – *The chi-square distribution* – The chi-square test of independence.	18
VI	**Current Trends(For CIA only):**AI**,** Web Development andAnalysis of Variance (ANOVA)	

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Text Book(s):

1. Tony Gaddis, Starting Out with Python, Addison-Wesley Pearson Education, 2nd Edition, 2012
2. Albert Lukaszewski, MySQL for Python, [PACKT] Publishing, 1st Edition, 2010
3. Samir Madhavan, Mastering Python for Data Science, PACKT Publishing, 2015

Reference Book(s):

1. Jake VanderPlas, Python data Science Hand book, O'Reilly Publications, 2016
2. Samuel Burns , Fundamentals of Data Science, Independently Published, 2019

Web Resource(s):

1. https://www.geeksforgeeks.org/data-science-tutorial/
2. https://www.w3schools.com/datascience/
3. https://onlinecourses.nptel.ac.in/noc23_cs21/preview
4. https://www.youtube.com/watch?v=LHBE6Q9XlzI

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CONo.	**COStatement**	**Cognitive Level (K-Level)**
CO1	Interpret the fundamental concepts of Python Programming	K1, K2
CO2	Apply inferential statistical methods for distribution of data and decision making	K3
CO3	Analyze the sense of data through data visualization techniques	K4
CO4	Influence Python library for working with data sets.	K5
CO5	Develop database application in Python for solving real-time problems	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	1	3	3	3	3	1	2.6
CO2	3	3	1	3	3	3	3	3	2	3	2.7
CO3	3	1	3	1	3	1	3	1	3	3	2.2
CO4	3	3	2	3	3	3	3	3	3	3	2.9
CO5	3	3	3	3	2	3	3	3	3	2	2.8
										Mean Overall Score	2.64
										Correlation	High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

CourseCoordinator: Dr. S. Peerbasha

Semester	Course Code	CourseCategory	Hours/ Week	Credits	MarksforEvaluation		
					CIA	ESE	Total
II	23PCS2CC7	CORE – VII	6	5	25	75	100
Course Title	Design and Analysis of Algorithms						

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction: Algorithm Definition – Algorithm Specification – PerformanceAnalysis Elementary Data Structures: Stacks and Queues – Trees – Dictionaries – *Priority Queues – Sets and Disjoint Set Union* – Graphs.	18
II	Divide and Conquer: The General Method – Defective Chessboard – Binary Search – Finding the Maximum and Minimum – *Merge Sort* – Quick Sort – Selection - Strassen's Matrix Multiplication.	18
III	The Greedy Method: General Method - Container Loading - Knapsack Problem - Tree Vertex Splitting – Job Sequencing with Deadlines - Minimum Cost Spanning Trees - Optimal Storage On Tapes – * Optimal Merge Patterns * - Single Source Shortest Paths.	18
IV	Dynamic Programming: The General Method – Multistage Graphs – All-Pairs Shortest Paths – Single-Source Shortest Paths - Optimal Binary Search Trees - String Editing - 0/1Knapsack - Reliability Design - The Traveling Salesperson Problem - * Flow Shop Scheduling *. Basic Traversal And Search Techniques: Techniques for Binary Trees – Techniques for Graphs – Connected Components and Spanning Trees – BiconnectedComponents and DFS.	18
V	Backtracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Knapsack Problem- Branch and Bound: The Method - * 0/1 Knapsack Problem *.	18
VI	Current Trends (For CIA only): Randomization, Incremental improvement	

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Text Book(s):

Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Universities Press, Second Edition, Reprint 2009

Reference Book(s):

Narasimha Karumanchi, Data Structures and Algorithms Made Easy, Second Edition, 2011.

Web Resource(s):

1.https://www.javatpoint.com/daa-algorithm-design-techniques/
2.https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_tutorial.pdf
3. https://onlinecourses.nptel.ac.in/noc22_cs92/preview

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Select appropriate data structures for any specified problem	K1
CO2	Implement the various operations such as Traverse, Search, Insert and Delete	K2
CO3	Apply the proper algorithm design method for problem solving	K3
CO4	learn mathematical background for analyzing algorithm	K4
CO5	Evaluate the algorithms and data structures used in the problem to determine the time and memory consumption	K5& K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	1	3	3	3	2	3	3	1	2.5
CO2	3	3	1	3	1	3	3	2	1	3	2.3
CO3	3	3	3	3	2	3	3	3	2	2	2.7
CO4	3	3	3	3	2	3	2	3	3	2	2.7
CO5	3	3	3	2	3	3	3	3	3	2	2.8
										Mean Overall Score	2.6
										Correlation	High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. O. S. Abdul Qadir

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23PCS2CC8P1	Core – VIII (a)	3	2	10	40	50
Course Title	RDBMS Lab – Practical						

I. **Data Definition Language Commands**

1. Create the following relations
   Customer (customer-Id (Primary key), customer-name, address)
   Account (account-number (Primary key), branch-name, and balance)
   Loan (loan-number (Primary key), branch-name, and amount)
   Branch (branch-name, branch-city, assets)
   Depositor (customer-name, account-number)
   Borrower (customer-name, loan-number)
   Supplier (supplier-number, part-number, color, quantity) use candidate key

2. Write DDL query to perform foreign key with on delete cascade - A foreign keywith cascade delete means that if a record in the parent table is deleted, thenthe corresponding records in the child table will automatically be deleted.

3. Alter with three options
   Add – add columns in the existing table
   Add – constraints
   Modify – modify the data type and size in the existing table
   Drop – delete column from existing table

II Data Manipulation Language Commands

1. Insertion

2. Arithmetic, Logical, Comparison operations

3. **String Operations**
   Find the customer names whose names start with T.
   Find the customer names whose names end with V.
   Find the customer name whose names contain ― ‘an’‖ as a substring
   Find the customer name whose names exactly six character.
   Find the customer name whose names at least five character.

4. **Tuple Variables**
   Using branch relation, Find the names of all branches that have assets greater than at least one branch located in a city (any city)

5. **Ordering of Tuples**
   To list in alphabetic order all customers who have loan at a branch (ex: cantonment) To list customer names in descending order.

6. **Set Operation** – (union, Intersect, minus)
   Find all customers having a loan, an account or both at the bank.
   Find all customers who have both a loan and account at the bank.
   Find all customers who have an account but no loan at the bank.
   Find all customers who have a loan but not an account at the bank.

7. **Aggregate functions** – (average, minimum, maximum, total, and count)
   Find average account balance at a branch. (any branch name like cantonment branch)
   Find the minimum balance at a branch. Find the maximum balance at a branch.
   Find the total balance at a branch Find the number of accounts in a branch.

8. **Aggregate functions with group by and having clause)**

Find the average account balance at each branch.

Find branch names those branches where the total balance is more than Rs. 1, 00,000.

Find the branches those branches where the total accounts are more than 3.

9. **Nested sub-queries**. **Membership (in and not in)**

Find all customers who have both a loan and account at the bank.

Find all customers who have an account but no loan at the bank.

Set Comparison (some, all)

Using branch relation, Find the names of all branches that have asset value greater than at least one branch located in a city (any city)

10. Views

Create the view consisting of customer-names and branch-names who have either loan or an account at the branch.

11. Deletion

Delete the tuples of all accounts with balances below the average at the bank (sub-query).

Delete all accounts tuples at every branch located in a city(any city)

12. Updates

All balances are to be increased by 5 percent.

Update with case statements All accounts with balances over 10000 receives 10 percent interest where as others receive 5 percent

13. Join Operations

Inner join – Find the customer-names who have loan from a branch (KKNagar)

Left outer join – Show the relation, which loan not buy a single customer.

Right outer join – Show the relation, which customers bought loan, that loan details not in the loan relation

Full outer join

III. PL/SQL Procedure

1. Reverse the string.
2. Student Mark Sheet Preparation
3. Pay Roll preparation
4. Find factorial number using recursive function.
5. Program using Exception Handling.

IV. SQL FORMS

1. Student Mark System
2. Pay Roll Preparation
3. Income Tax Calculation

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Learn how to retrieve and manipulate data from one or more tables	K1
CO2	Understand how the relationship between tables with affect the SQL	K2
CO3	Apply the PL/SQL procedures for implementing tasks	K3
CO4	Compare the various join operations	K5
CO5	Develop simple applications using SQL Forms	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	1	3	3	3	3	1	2.6
CO2	3	3	1	3	3	3	3	3	2	3	2.7
CO3	3	1	3	1	3	1	3	1	3	3	2.2
CO4	3	3	2	3	3	3	3	3	3	3	2.9
CO5	3	3	3	3	2	3	3	3	3	2	2.8
										Mean Overall Score	2.64
										Correlation	High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Mr. S. Syed Ibrahim

Semester	Course Code	CourseCategory	Hours/ Week	Credits	MarksforEvaluation		
					CIA	ESE	Total
II	23PCS2CC8P2	Core - VIII (b)	3	2	10	40	50
Course Title	Data Science Lab – Practical						

1. a) Program to create an numpy array, rank1 array, rank2 array and create an array from tuple.
   b) Program to demonstrate indexing in numpy array.

2. a) Program to demonstrate basic operations, unary and binary operations in numpy array.
   b) Program to demonstrate vertical and horizontal (stacking and splitting)

3. Program to create a date, array of dates in a month, arithmetic operations on dates and sorting on dates.

4. a) Program that uses various methods to apply linear algebra on any numpy array.
   b) Program to create array with all zeroes and ones.

5. a) Python program to create pandas series with scalar values, default index values and predefined index values.
   b) Python program to create Dictionary series, ndarray series.
   c) Program to create data frame with two dictionaries
   d) Program to create data frame of three series and from 2D array.

6. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.

7. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
   a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation
   b. Bivariate analysis: Linear and logistic regression modeling
   c. Multiple Regression analysis
   d. Also compare the results of the above analysis for the two data sets.

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Demonstrate operations on Numpy array in Python Programming	K1
CO2	Apply inferential statistical methods for distribution of data and decision making	K3
CO3	Create data frames for using Dictionaries and 2D Arrays	K4
CO4	Influence Python library for working with data sets.	K5
CO5	Develop database application in Python for solving real-time problems	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	1	3	3	3	3	1	2.6
CO2	3	3	1	3	3	3	3	3	2	3	2.7
CO3	3	1	3	1	3	1	3	1	3	3	2.2
CO4	3	3	2	3	3	3	3	3	3	3	2.9
CO5	3	3	3	3	2	3	3	3	3	2	2.8
Mean Overall Score											2.64
Correlation											High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Peerbasha

Semester	Course Code	CourseCategory	Hours/ Week	Credits	MarksforEvaluation		
					CIA	ESE	Total
II	23PCS2DE2A	DSE – II	6	4	25	75	100
Course Title	Cloud Computing						

SYLLABUS		
Unit	**Contents**	**Hours**
I	Principles of Parallel and Distributed Computing: Eras of Computing – Parallel vs. Distributed Computing – Elements of Parallel Computing – What is parallel processing? – Hardware architectures for parallel processing – Approaches to parallel processing – Levels of parallelism – Elements if Distributed Computing – *Technologies for Distributed Computing *	18
II	Introduction: Cloud Computing at a Glance – The vision of cloud computing – Defining a cloud – Cloud computing reference model – Characteristics and benefits – *Historical Developments* – Distributed computing – Virtualization – Service-oriented computing – Utility-oriented computing – Building Cloud Computing Environments	18
III	Cloud Computing Architecture: Introduction – Cloud Reference model – Architecture – Infrastructure/Hardware as a Service – Platform as a Service – Software as a Service – Types of Clouds – *Economics of cloud* - Open challenges – Cloud interoperability and standards – Scalability and Fault tolerance.	18
IV	Resource Virtualization: What is virtualization? – Virtualizing physical computing resources – Understanding abstraction – Business benefits of virtualization – Machines or server level virtualization – Exploring Hypervisor or Virtual Machine monitor – Operating system level virtualization: Removal of the Hypervisor – Major server virtualization products and vendors – High-level language virtual machine – *Emulation – Advantages of Virtualization – Downsides of Virtualization* Virtualization and cloud computing.	18
V	Cloud Platforms in Industry – Amazon Web Services – Computer services – Storage services – Communication services - Google AppEngine – Architecture and core concepts – Application life cycle – Microsoft Azure – Azure core concepts – *SQL Azure*.	18
VI	**Current Trends(ForCIA only):**Multi and Hybrid cloud computing, Evolution of cloud gaming and Blockchain	

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Text Book(s):

1. Sandeep Bhowmik, *Cloud Computing*, Cambridge University Press 2017.
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing Principles and Paradigms, Wiley Publications, 2011

Reference Book(s):

1. George Reese, Cloud Application Architectures, O'Reilly Media, Inc, First Edition,2009.
2. Michael Miller, Cloud Computing: Web based Applications That Change the Way You work and Collaborate Online, QUE Publishing,2009.

Web Resource(s):

1. https://www.tutorialspoint.com/cloud_computing/cloud_computing_tutorial.pdf
2. https://www.geeksforgeeks.org/cloud-computing/
3. https://onlinecourses.nptel.ac.in/noc23_cs42/preview
4. https://onlinecourses.nptel.ac.in/noc23_cs27/preview

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CONo.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Define the basics concepts of cloud computing	K1
CO2	Illustrate the cloud computing models	K2
CO3	Explain the Cloud computing services and Security reference model	K4
CO4	Apply the knowledge of virtualization	K3
CO5	Evaluate and Propose the capacity planning and load balancing	K5 & K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	1	1	2	3	3	3	1	3	3	2.1
CO2	3	3	1	2	2	3	3	1	3	3	2.4
CO3	3	1	2	3	3	2	3	2	3	1	2.3
CO4	3	2	1	3	3	3	3	2	3	3	2.5
CO5	3	1	3	3	3	3	3	3	3	3	2.8
									Mean Overall Score		2.42
									Correlation		Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Vaaheedha Kfatheen

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23PCS2DE2B	DSE – II	6	4	25	75	100

Course Title	Distributed Operating System

SYLLABUS		
Unit	**Contents**	**Hours**
I	Fundamentals: What is a Distributed Computing System – Evolution of Distributed Computing Systems –Distributed Computing System Models – Why are Distributed Computing Systems gaining popularity – What is a Distributed Operating System – Issues in Designing Distributed Operating System – Introduction to Distributed Computing Environment. Computer Networks: *Protocols for Distributed Systems*.	18
II	**Message Passing:** Desirable Features – Synchronization – Buffering – *****Process Addressing*****. **Remote Procedure Call:** RPC Model – Implementing RPC Mechanism –RPC Messages – Communication Protocols for RPC – Special Types of RPCs.	18
III	**Distributed Shared Memory:** General Architecture of DSM Systems – Design and Implementation Issues of DSM –Structure of Shared Memory Space – Replacement Strategy - *Advantages of DSM*. **Synchronization:**Mutual Exclusion – Deadlock.	18
IV	**Process Management:** Process Migration – **Distributed File Systems:***Desirable Features* – File Models – File Accessing Models – File Sharing Semantics – File Caching Schemes – File Replication.	18
V	Security : Potential Attacks to Computer Systems – *Cryptography* – Authentication – Access Control – Digital Signatures –Design Principles-Naming: desirable features of good naming system-fundamental technologies-system oriented names-object – locating mechanism.	18
VI	**Current Trends(For CIA only):** Peer-to-Peer Computing – Service-Oriented Computing – Cloud Computing-Distributed Systems	

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Text Book(s):
1. Pradeep K Sinha, "Distributed Operating Systems – Concepts and Design", PHI, 2013.
Reference Book(s):
1. Andrew S. Tanenbaum, "Distributed Operating Systems", Pearson Education India, 2001
Web Resource(s):
1. https://www.javatpoint.com/distributed-operating-system 2. https://www.tutorialspoint.com/Distributed-Systems 3. https://onlinecourses.nptel.ac.in/noc22_cs18/preview

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Find and characterize the fundamental principles of distributed system design	K1, K2
CO2	Recognize message passing techniques in distributed environments	K3
CO3	Examine the concept of distributed shared memory and acquire knowledge in synchronization.	K4
CO4	Explain how to store data in distributed file systems	K5
CO5	Discuss the concept of security in distributed systems	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	3	3	1	3	1	3	2.6
CO2	1	3	2	3	1	1	3	3	3	3	2.3
CO3	3	3	1	3	3	3	1	1	3	3	2.4
CO4	3	1	3	3	3	1	3	3	3	3	2.6
CO5	1	3	3	3	3	1	3	1	1	3	2.2
										Mean Overall Score	2.42
										Correlation	Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr.K. Nafees Ahamed

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PCS3CC9	Core - IX	6	6	25	75	100

Course Title	Principles of Compiler Design

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction to Compilers: Compilers and Translators – The Structure of a Compiler – Lexical Analysis – Syntax Analysis – Intermediate Code Generation – Optimization – Code Generation. Finite Automata and Lexical Analysis: *****The Role of Lexical analyzer Regular Expressions***** – Finite Automata – From a regular expression to Finite Automata – Minimizing the Number of States of a DFA.	18
II	The Syntactic Specification of Programming Languages: Context-free grammars – Derivations and parse trees. Basic Parsing Techniques: Parsers – Shift-reduce Parsing -Operator precedence parsing – Top-down Parsing – Predictive Parsers. Automatic Construction of Efficient Parsers: LR Parsers – The Canonical Collection of LR(0) items – Constructing SLR Parsing Tables - *****Constructing canonical LR Parsing Tables***** - Constructing LALR Parsing Tables	18
III	Syntax Directed Translation: Syntax Directed Translation schemes: Implementation of Syntax Directed Translation - Intermediate code – Postfix Notation – Parse Trees and Syntax Trees – Three-address Code, Quadruples and Triples – Boolean Expressions	18
IV	Symbol Tables: The Contents of Symbol table – Data Structures for Symbol tables – Representing scope information - Runtime storage Administration: Implementation of a Simple Stack allocation scheme - Implementation of a Block Structured Languages. Error Detection and Recovery: Errors – Lexical-phase Errors - *Syntactic-phase Errors* – Semantic Errors	18
V	Introduction to Code Optimization: The Principal Sources of Optimization – Loop Optimization – The DAG Representation of Basic Blocks. Code Generation: Problems in Code Generation – A Machine Model – *****A Simple Code Generator***** – Register allocation and Assignment – Peephole optimization	18
VI	**Current Trends (For CIA only):** Optimization for Parallelism	

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Text Book(s):

Alfred V. Aho and Jeffrey D. Ullman, "Principles of Compiler Design", Twenty fifth Reprint, Narosa Publishing House, New Delhi, 2002

UNIT I: Chapter1(1.1,1.3–1.8) Chapter3(3.1,3.3–3.6)\

UNIT II: Chapter4(4.1–4.2) Chapter5 (5.1 – 5.5) and Chapter6 (6.1–6.5)

UNIT III: Chapter 7(7.1–7.6 and 7.8)

UNIT IV: Chapter9(9.1–9.3) Chapter10(101–10.2) and Chapter 11 (11.1-11.4)

UNIT V :Chapter12(12.1–12.3) Chapter15(15.2–15.5 and 15.7)

Reference Book(s):

Dr. M. Joseph, "Elements of Complier Design", University Science Press, 2011.

Web Resource(s):

1. https://www.tutorialspoint.com/compiler_design/index.htm
2. https://onlinecourses.nptel.ac.in/noc21_cs07/preview
3. https://www.geeksforgeeks.org/compiler-design-tutorials/
4. https://karkare.github.io/cs738/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the lexical, syntactic and semantic structures of advanced language features	K1, K2
CO2	Apply the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation	K3
CO3	Analyze the scanner, parser, and semantic analyzer without the aid of automatic generators	K4
CO4	Choose the techniques for intermediate code and machine code optimization	K5
CO5	Design the structures and support required for compiling advanced language features.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	1	3	3	2	3	3	2.7
CO2	3	3	1	1	2	3	3	1	3	1	2.1
CO3	3	3	3	3	1	3	3	2	3	1	2.5
CO4	3	3	1	3	3	3	3	3	3	3	2.8
CO5	3	3	3	3	3	3	3	3	3	3	3.0
Mean Overall Score											2.62
Correlation											High

Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S.A. Jameel

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PCS3CC10	Core - X	6	5	25	75	100

Course Title	Machine Learning and R Programming

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introducing Machine Learning: What is ML? – Varieties of ML – Types of Learning – Sample Applications – Introducing ML: Origins of Machine Learning (ML) – Uses and Abuses of ML – How do Machines Learn? – Steps to apply ML to your data choosing a ML algorithm–Using R for Machine Learning: *****Installing and Loading R Packages*****	18
II	Lazy Learning – Classification Using Nearest Neighbors: Understanding Classification using Nearest Neighbours (NN):KNN Algorithm – Calculating Distance – Choosing an appropriate K – Preparing data for use with KNN – Why is the KNN algorithm lazy? - Probabilistic Learning - Classification using Naïve Bayes : Understanding Naïve Bayes - Basic concepts of Bayesian Methods – The Naïve Bayes Algorithm - Naïve Bayes classification – *****Laplace Estimator***** – using Numeric features with Naïve Bayes.	18
III	Divide and Conquer – Classification using Decision Trees and Rules: Understanding Decision Trees - Divide and Conquer – C5.0 decision Tree algorithm – Understanding Classification Rules – Separate and Conquer – The One Rule algorithm –The RIPPER algorithm – Rules for Decision Trees – Forecasting Numeric Data – Regression Methods : Understanding Regression– Simple Linear Regression– *****Ordinary Least Squares Estimation*****– Correlations –Multiple Linear Regression– Understanding Regression Trees and model trees.	18
IV	Black Box Methods: Neural Networks and Support Vector Machines (SVM) :Understanding Neural Networks: From biological to Artificial Neurons– Activation Functions–Network Topology–Training Neural Networks with Back propagation – Modelling the strength of concrete with ANNs: Collecting Data – Exploring and Preparing the data –Training a model on the data – Evaluating model performance – improving model performance – *****Understanding SVM: Classification with hyper planes***** – Finding the maximum margin – Using Kernels for Non-Linear Spaces – Clustering with K-Means: Understanding Clustering–K-Means algorithm for Clustering.	18
V	Using R for Machine Learning: Managing and Understanding Data: R Data Structures – Vectors – Factors: Lists – Data Frames–Managing Data with R: Saving and Loading R Data structures–Importing and Saving data from CSV files – Importing Data from SQL databases – Exploring and Understanding.	18
VI	**Current Trends (For CIA only):** Robotics, IoT, NLP and other AI related topics	

…… Self Study

Text Book(s):

Brett Lantz, Machine Learning with R, PACKT Publishing, Open Source, 2013.

Reference Book(s):

1. Shai Shalev - Shwartz, "*Understanding Machine Learning: From Theory t to Algorithms",* Cambridge University Press, 2014.
2. Alex Smola and SVN Vishwanathan, "*Introduction to Machine Learning",* Cambridge University Press.- ISBN:0521825830, 2010.
3. Jason Bell, "*Machine Learning– Hands-on for Developers and Technical Professionals",* Wiley Publications.

Web Resource(s):
1. https://www.datacamp.com/community/tutorials/machine-learning-in-r 2. https://www.kaggle.com/code/camnugent/introduction-to-machine-learning-in-r-tutorial 3. https://www.edureka.co/blog/machine-learning-with-r/ 4. https://lgatto.github.io/IntroMachineLearningWithR/an-introduction-to-machine-learning-with-r.html 5. https://onlinecourses.nptel.ac.in/noc23_cs18/preview

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Understand the types of learning and gain ideas on methods and types in machine learning	K1,K2
CO2	Apply the different categories of machine learning algorithms	K3
CO3	Analyze insight on R Package	K4
CO4	Decide the power of black box methods for machine learning	K5
CO5	Develop application in R for illustrating the machine learning concepts	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	1	3	3	3	3	2	2.7
CO2	3	3	2	2	3	3	2	1	2	1	2.2
CO3	3	3	3	3	1	3	3	2	3	1	2.5
CO4	3	3	1	3	3	1	3	3	3	2	2.5
CO5	3	3	2	3	3	1	3	3	3	3	2.7
Mean Overall Score											2.52
Correlation											High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Mr. A. Basheer Ahamed
Dr. M. Sabibuallah

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PCS3CC11	Core - XI	6	5	25	75	100

Course Title	Digital Image Processing

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction: What is Digital Image Processing?-Fundamental Steps in Image processing-Component of an Image Processing System-Digital Image Fundamentals: Image Sensing and Acquisition-Image Sampling and Quantization-Relationship between Pixels - Linear and Non-linear Operations. Color Models: Color Fundamentals, Color Models, *****Pseudo-color Image Processing*****, Noise in Color Images.	18
II	Intensity Transformation and Spatial Filtering: Basic Intensity Transformation Functions-Histogram Processing – Histogram Equalization – Fundamentals of Spatial Filtering-Smoothing and Sharpening Spatial Filters-Filtering in the Frequency Domain: Fast Fourier Transform, Discrete Fourier Transform(DFT) and Discrete Cosine Transforms(DCT) and their properties - *****Image filtering in frequency domain*****.	18
III	Image Restoration and Reconstruction: Image Degradation Model- Noise Model-Spatial Restoration Filters-Adaptive Filters-Edge Detection: Types of edges; threshold; zero-crossing; Gradient operators: Roberts, Prewitt, and Sobel operators; Canny edge detection. Edge features and their applications.	18
IV	Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory. Error Free Compression: Huff-man coding - *****Arithmetic coding***** Wavelet transform based coding- Lossy Compression: FFT; DCT; KLT; DPCM; MRFM based compression.	18
V	Image Segmentation: Detection and Discontinuities: Edge Linking and Boundary Deduction; Threshold; Region-Based Segmentation. Segmentation by Morphological watersheds. The use of motion in segmentation, Image Segmentation based on Color. Morphological Image Processing: Erosion and Dilation, *****Opening and Closing, Hit-Or-Miss Transformation*****.	18
VI	**Current Trends (For CIA only):** Scilab general environment and console – numerical computation and implementation of some basic image processing algorithms	

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Text Book(s):

Rafael Gonzalez, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2014.

Reference Book(s):

1. S. Jayaraman. S. Esakkirajan, T. Veerakumar, “Digital Image Processing”, Mc Graw Hill Education, Twelfth Reprint, 2014
2. Anil K. Jain, “Fundamentals of Image Processing”, PHI, New Delhi, 2011.
3. Kenneth R. Castleman, “Digital Image Processing”, Pearson, 2007

Web Resource(s):

1. https://www.tutorialspoint.com/dip/index.htm
2. https://www.javatpoint.com/digital-image-processing-tutorial
3. https://www.mygreatlearning.com/blog/digital-image-processing-explained/
4. https://onlinecourses.nptel.ac.in/noc19_ee55/preview

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the basic concepts and components in Digital Image Processing	K1, K2
CO2	Interpret Image compression standards, and Interpret image segmentation and representation techniques	K2
CO3	Analyze images in the frequency domain using various transforms and categories various filtering and compression techniques	K4
CO4	Evaluate the techniques for image enhancement and image restoration	K5
CO5	Develop idea to process images used in various fields such as weather forecasting, Diagnosis of various diseases like tumer, cancer etc. using images	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	3	3	3	2	3	1	2.7
CO2	3	3	2	3	2	3	2	3	2	1	2.4
CO3	3	2	3	3	3	3	3	2	3	2	2.7
CO4	2	3	2	2	3	3	3	1	2	2	2.3
CO5	3	2	1	3	3	3	2	2	3	2	2.4
Mean Overall Score											2.5
Correlation											High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: Dr. S. Abdul Saleem

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PCS3CC12P1	Core - XII (a)	3	2	10	40	50
Course Title	Machine Learning Lab - Practical						

1. Installing R and R Studio
2. Applying simple commands in R
3. R as a Calculator application
4. Execution of Loops via R-control structures
5. Execution of functions using R
6. Reading and writing different types of datasets in R
7. Visualize various plotting and graphics in R
8. Perform simple regression using R package
9. Apply k-means by using R package
10. Use decision Tree/Random Forest/Naïve Bayes / NN by using R package

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the installation and working with R programming	K1, K2
CO2	Apply the commands in R Programming	K3
CO3	Examine the Loops via R-Control Structures	K4
CO4	Test Simple Regression using R Package	K5
CO5	Develop R program for Reading and Writing different types of Datasets	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	3	3	3	3	3	1	2.8
CO2	3	3	2	3	3	3	2	3	2	1	2.5
CO3	3	2	3	2	3	3	3	2	3	3	2.7
CO4	2	3	2	2	3	3	3	3	2	3	2.6
CO5	3	2	1	3	3	3	2	3	3	3	2.6
Mean Overall Score											2.64
Correlation											High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Mr. A. Basheer Ahamed
Dr. M. Sabibullah

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PCS3CC12P2	Core - XII (b)	3	2	10	40	50
Course Title	Image Processing Lab - Practical						

Develop the coding to

1. Perform the basic operations on a matrix (Identity, Transpose, Zeros, Ones and Random matrices)
2. Perform the fundamental operations on an image (Read, write, negative of an image)
3. Implement a) Relationships between pixels in an image b) Transformations of an image
4. Perform contrast stretching of a low contrast image, Histogram and Histogram Equalization of an image
5. Display of bit planes and FFT (1-D & 2-D) of an image
6. Compare the Discrete Fourier Transform and Discrete Cosine Transforms of an image
7. Compute the mean, standard deviation, correlation coefficient of the given Image
8. Implement the image smoothening filters (Mean and Median filtering of an Image)
9. Implement the image sharpening filters
10. Implementation of image restoring techniques
11. Implementation of image intensity slicing technique for image enhancement
12. Image compression by DCT, DPCM, Huffman coding
13. Perform edge detection using different operators and compare the results

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Illustrate the basic operations on Images and interpret the relationships between pixels in an image	K2
CO2	Demonstrate the transformation, histogram equalization, pit planes of an image.	K3
CO3	Apply DCT, DPCM, Huffman coding for image compression.	K4
CO4	Compare DFT & DCT of an image and image restoration and image enhancement techniques	K5
CO5	Generate new filters for image smoothing and image sharpening	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	2	3	3	2	3	3	2.8
CO2	3	3	2	3	2	3	2	3	2	1	2.4
CO3	3	2	3	3	3	2	3	2	3	3	2.7
CO4	2	3	2	2	3	3	3	2	3	3	2.6
CO5	3	2	1	3	3	3	2	2	3	2	2.4
Mean Overall Score											2.58
Correlation											High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: Dr. S. Abdul Saleem

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PCS3DE3A	DSE – III	6	4	25	75	100
Course Title	Cryptography and Network Security						

SYLLABUS		
Unit	**Contents**	**Hours**
I	Attacks on Computers and Computer Security: Introduction: The Need for security – Security Approaches – Principles of Security – Types of Attacks – Cryptography: Concepts and Techniques: Introduction – Plain Text and cipher Text – Substitution techniques – Transposition techniques – Encryption and Decryption – *****Symmetric and Asymmetric cryptography*****.	18
II	Symmetric Key Algorithms and AES: Introduction –Overview of symmetric key cryptography – Data Encryption standard (DES) – Advanced Encryption Standard (AES).	18
III	Asymmetric Key Algorithms, Digital Signatures and RSA.: Introduction – Brief History of Asymmetric Key Cryptography - The RSA Algorithm – *****Digital Signatures*****.	18
IV	Internet Security Protocols: Basic concepts – SECURE SOCKETS LAYER (SSL) – Secure Hyper Text Transfer protocol (SHTTP) – Secure Electronic Transaction (SET) – SSL Vs SET– email security – WAP security – *****Security in GSM*****.	18
V	User Authentication and Kerberos: Introduction – Authentication Basics – Password – Authentication Tokens – Certificate Based Authentication – Biometric Authentication – Kerberos – *****Single sign–on Approaches*****.	18
VI	**Current Trends (For CIA only):** Different types of Cryptography, Public key cryptography, Network intrusion detection system, Security and privacy problems	

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Text Book(s):

Atul Kahate, "Cryptography and Network Security", McGraw Hill Education(India) Private Ltd., Fourth Edition, 2019.

Reference Book(s):

William Stallings, Cryptography and Network Security principles and Practice, Pearson, Fifth Edition, 2011.

Web Resource(s):

1. https://www.cs.vsb.cz/ochodkova/courses/kpb/cryptography-and-network-security_-principles-and-practice-7th-global-edition.pdf.
2. https://onlinecourses.nptel.ac.in/noc22_cs90/preview

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall and explain the concepts of Network Security	K1, K2
CO2	Apply Asymmetric key algorithms and Digital Signatures	K3
CO3	Analyze Symmetric key algorithms	K4
CO4	Explain the knowledge of Internet Security Protocols	K5
CO5	Integrate the various user authentications appraches	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	3	3	2	1	1	3	2.3
CO2	3	3	3	3	2	3	2	3	2	1	2.5
CO3	3	2	3	2	3	2	3	2	3	2	2.5
CO4	3	3	2	3	3	3	3	3	2	2	2.7
CO5	3	2	2	3	2	3	2	2	3	3	2.5
Mean Overall Score											2.5
Correlation											High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Vaaheedha Kfatheen

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PCS3DE3B	DSE - III	6	4	25	75	100
Course Title	Software Project Management						

SYLLABUS		
Unit	**Contents**	**Hours**
I	Conventional Software Management: The waterfall model, conventional software Management performance. Evolution of Software Economics: Software Economics, pragmatic software cost estimation. Improving Software Economics : Reducing Software product size, improving software processes, improving team effectiveness, improving automation, *****achieving required quality, peer inspections***.**	18
II	The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process. Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. Artifacts of the process : The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts .Model based software architectures : A Management perspective and technical perspective.	18
III	Work Flows of the process: Software process workflows, Iteration workflows. Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments. Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, *****Iteration planning process, Pragmatic planning*****.	18
IV	Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations. Process Automation: Automation Building blocks, The Project Environment. Project Control and Process instrumentation : The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, *Metrics automation***.**	18
V	Tailoring the Process: Process discriminants, Small-scale project Vs Large scale project**.** Looking Forward: Modern Project Profiles, Next generation Software economics, *modern process transitions*****.	18
VI	**Current Trends(For CIA only):** The COCOMO cost estimation model, Change metrics, Risk management, People factors	

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Text Book(s):
Walker Royce, Software Project Management- A Unified Framework, Pearson Education, 2012.
Reference Book(s):
Joel Henry, Software Project Management-A Real-World Gudie to Success, Pearson Education, 2009.
Web Resource(s):
1. https://www.javatpoint.com/software-project-management 2. https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/ 3. https://www.tutorialspoint.com/software_engineering/software_project_management.htm 4. https://onlinecourses.nptel.ac.in/noc19_cs70/preview

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the fundamental principles of software project management.	K1, K2
CO2	Apply the principles of modern software management and life cycle phases.	K3
CO3	Examine the work flows of the software process.	K4
CO4	Explain the responsibilities of project manager and project organizations.	K5
CO5	Develop small scale and large-scale software products.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	3	3	3	2	3	1	2.7
CO2	3	3	2	3	2	3	2	3	2	1	2.4
CO3	3	2	3	3	3	3	3	2	3	2	2.7
CO4	2	3	2	2	3	3	3	1	2	2	2.3
CO5	3	2	1	3	3	3	2	2	3	2	2.4
Mean Overall Score											2.5
Correlation											High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Ms. A. Roghya Parveen

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23PCS4CC13	Core – XIII	6	6	25	75	100
Course Title	Middleware Technologies						

SYLLABUS		
Unit	**Contents**	**Hours**
I	Java RMI: Introduction–Architecture of RMI –The RMI Package-Creation of RMI applications-Advantages and Disadvantages of RMI. CORBA: Object Management Architecture-*****CORBA Architecture*****- OMG,CORBA,IDL-CORBA Object Life Cycle-CORBA Services: Object Location Service, Messaging Service, Security Service, Transaction Service and Persistency Services	18
II	Introduction – Advantages of Servlets over CGI – The Servlet Life Cycle – Server API – Handling HTTPGET Requests – Handling HTTP POST Requests – Cookies – Session Tracking – Multi-tier Applications using Database Connectivity- Introduction to Node.js- Features of Node.js – Environment Setup – REPL – NPM- Callback Concepts-Event Driven Programming-*****Streams-File System***** – Utility Modules	18
III	JSP: Introduction – Advantages of JSP – Developing first JSP – Components of JSP – Reading request information –Retrieving the data posted from a HTML file to a JSP file– JSP Sessions– Cookies– Disabling sessions	18
IV	Introducing AngularJS: Introduction: What is MVC? – Benefits - Philosophy-Starting out with AngularJS: A Basic AngularJS Application - AngularJS Hello World - Basic Angular JS Directives and Controllers: AngularJS Modules – Working with and Displaying arrays - Working with ng-repeat: ng-repeat Over an Object - Helper Variables in ng-repeat- *****Track by ID*****- ng-repeat Across Multiple HTML Elements.	18
V	Forms, Inputs and Services: Working with ng-model – Working with Forms – *****Leverage Data Binding and Models***** -Form Validation and States–Error Handling with Forms– Other Forms Controls: Textareas– Checkboxes – Radio Buttons–Combo Boxes/Drop-Downs– Working with Filters: What are Angular JSFilters? – Creating AngularJS Filters.	18
VI	**Current Trends(For CIA only):** Database Middleware, Message Oriented Middleware	

*** ……*** Self Study

Text Book(s):

1. G.Sudha Sadasivam, "Distributed Component Architecture",WileyIndiaPvt.Ltd,2008.
2. N.P.Gopalan& J.Akilandeswary, "WebTechnology A Developer Perspective", PHI Learning Private Limited, 2009.
3. Shyam Seshadri & BradGreen, "Angular JS: Up and Running", Published by O'Reilly Media, Inc., First Edition, 2014

Reference Book(s):

1. James McGovern and Rahim Adatia, J2EE1.4 Bible, Willey India Pvt. Ltd, NewDelhi,2012.
2. Richard Monson Haefel, Enterprise JavaBeans,O'Reilly, Fourth Edition, 2004
3. M.N.Rao, Fundamentals of Open Source Software, PHI Learning Private Ltd., Delhi, 2015

Web Resource(s):

1. https://www.tutorialspoint.com/nodejs/nodejsquickguide.htm
2. https://www.w3schools.com/angular/
3. https://www.tutorialspoint.com/angularjs/index.htm

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand and explain the concepts of RMI, CORBA, JSP, NodeJs, and AngularJS	K1, K2
CO2	Use AngularJS form controls and filters which helps to develop web applications.	K3
CO3	Identify the components to create web applications for real time problems	K4
CO4	Explain the importance of middleware which facilitates the development of distributed applications	K5
CO5	Design and develop distributed applications using RMI, JSP, Servlet with Scripting Languages	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	3	3	3	2	3	1	2.7
CO2	3	3	2	3	2	3	2	3	2	3	2.6
CO3	3	2	3	3	3	3	3	1	3	3	2.7
CO4	2	3	2	2	3	3	3	1	2	2	2.3
CO5	3	2	1	3	2	3	2	2	3	2	2.3
Mean Overall Score											2.52
Correlation											High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Ms**.** J. Sahitha Banu

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23PCS4CC14P1	Core – XIV (a)	3	3	10	40	50
Course Title	Web Framework Lab - Practical						

Develop a program using AngularJS:

1. Simple application to
   a) Display the values for different data types
   b) Perform basic arithmetic operations
2. Demonstrate a shopping list using various built-in functions in Array
3. Change the date format using ng-model
4. Illustrate the use of Filter
5. Apply Keyboard and Mouse events
6. Use slide Toggle animation
7. Design a simple calculator
8. Design Login form and validate the username and password

Develop an application based on Node.js:

9. Create student profile
10. Demonstrate Lookup () functions on DNS
11. Display OS details using utility module
12. Demonstrate file operations

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand and explain the concepts of AngularJS and NodeJS	K1,K2
CO2	Apply AngularJS form controls and filters which helps to develop web applications.	K3
CO3	Inspect components to create web applications for real time problems	K4
CO4	Explain functions and modules in NodeJS	K5
CO5	Develop and Design dynamic applications using AngularJS and NodeJS	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	3	3	3	2	3	1	2.7
CO2	3	3	2	3	2	3	2	3	2	3	2.6
CO3	3	2	3	3	3	3	2	1	3	3	2.6
CO4	2	3	2	2	3	3	3	1	2	2	2.3
CO5	3	2	2	3	2	3	2	2	3	2	2.4
Mean Overall Score											2.52
Correlation											High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Ms. A. Sumaiya

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23PCS4CC14P2	Core – XIV (b)	3	3	10	40	50
Course Title	Middleware Technology Lab - Practical						

Using NetBeans Integrated Development Environment (IDE)

1. Develop a simple RMI application for client server communication.
2. Develop a Servlet application to display a welcome message on the browser window.
3. Develop a Servlet program for calculating the factorial of a given number that has been submitted through the form.
4. Develop a Servlet program to send username and password using HTML forms and authenticate the user.
5. Develop a Servlet program to create a cookie that counts the number of accesses to a Webpage.
6. Write a Servlet program that accepts the age and name and displays if the user is eligible for voting or not.
7. Write a program to display the system date and time.
8. Write a JSP application to validate the username and password from the database.
9. Write a JSP program to view the student mark sheet from information stored in MySQL database using action tags.
10. Write a JSP program to connect to the database and display all the records.

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand and explain the concepts of RMI, CORBA, JSP & Servlets	K1, K2
CO2	Apply the power of Java Technologies to solve real-time problems	K3
CO3	Inspect the problems in the middleware technologies	K4
CO4	Prove the importance of various controls in developing GUI	K5
CO5	Design and develop simple applications using MYSQL	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	3	3	3	2	3	1	2.7
CO2	3	3	2	3	2	3	2	3	2	3	2.6
CO3	3	2	3	3	3	3	3	1	3	3	2.7
CO4	2	3	2	2	3	3	3	1	2	2	2.3
CO5	3	2	3	3	2	3	2	2	3	2	2.5
										Mean Overall Score	2.56
										Correlation	High

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Ms. J. Sahitha Banu

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23PCS4PW	Project Work	18	13	-	300	300
Course Title	Industrial Experience and Project Work						

Students should carry out a project nearly two months in Software Development Companies

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23PCNOC	Mandatory Online Course	-	1	-	100	100
Course Title	Online Course						

- Students should undergo an online course for a minimum of 30 days during the course of study
- The course certificate is to be submitted to the department before the end of IV Semester
- The course certificate is compulsory for completing the degree