

DEPARTMENT OF COMPUTER SCIENCE

COURSE STRUCTURE & SYLLABI

(For the students admitted from year 2023-2024 onwards)

Programme : M.Sc. Information Technology



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. INFORMATION TECHNOLOGY

Sem	Course Code	Course Category	Course Title	Ins. Hrs/ Week	Credit	Marks		Total
						CIA	ESE	
I	23PIT1CC1	Core - I	.NET Technologies	6	5	25	75	100
	23PIT1CC2	Core - II	Data Structures and Algorithms	6	5	25	75	100
	23PIT1CC3	Core - III	Database Systems	6	5	25	75	100
	23PIT1CC4P1	Core - IV (a)	.NET Lab - Practical	3	2	10	40	50
	23PIT1CC4P2	Core - IV (b)	RDBMS Lab - Practical	3	2	10	40	50
	23PIT1DE1A/B	Discipline Specific Elective - I		6	4	25	75	100
Total				30	23			500
II	23PIT2CC5	Core - V	Java Programming	6	6	25	75	100
	23PIT2CC6	Core - VI	Mobile Communication	6	5	25	75	100
	23PIT2CC7	Core - VII	Data Science and R Programming	6	5	25	75	100
	23PIT2CC8P1	Core - VIII (a)	Java Programming Lab - Practical	3	2	10	40	50
	23PIT2CC8P2	Core - VIII (b)	R Programming Lab - Practical	3	2	10	40	50
	23PIT2DE2A/B	Discipline Specific Elective - II		6	4	25	75	100
	23PCN2CO	Community Outreach	JAMCROP	-	@	-	-	@
Total				30	24			500
* Only grades will be given								
III	23PIT3CC9	Core - IX	Software Quality Engineering	6	6	25	75	100
	23PIT3CC10	Core - X	XML and Web Services	6	5	25	75	100
	23PIT3CC11	Core - XI	Internet of Things	6	5	25	75	100
	23PIT3CC12P1	Core - XII (a)	Software Testing Lab - Practical	3	2	10	40	50
	23PIT3CC12P2	Core - XII (b)	XML and Web Services Lab - Practical	3	2	10	40	50
	23PIT3DE3A/B	Discipline Specific Elective - III		6	4	25	75	100
	23PIT3EC1	Extra Credit Course - I*	Online Course	-	*	-	-	-
Total				30	24			500
IV	23PIT4CC13	Core - XIII	Open Source Technology	6	6	25	75	100
	23PIT4CC14P1	Core - XIV (a)	Open Source Technology Lab - Practical	3	3	10	40	50
	23PIT4CC14P2	Core - XIV (b)	Web Framework Lab - Practical	3	2	10	40	50
	23PIT4PW	Project Work	Project Work	18	13	-	300	300
	23PIT4EC2	Extra Credit Course - II*	Online Course	-	*	-	-	-
	23PCNOC	Mandatory Online Course**	Online Course	-	1	-	100	100
	23PCN4EC3	Extra Credit Course - III*	Innovation and Intellectual Property Rights	-	+	-	-	-
Total				30	25			600
* Programme Specific Online Course for Advanced Learners								
** Any Online Course for Enhancing Additional Skills								
+ Course for Enhancing IPR Skills								
Grand Total					96			2100

DISCIPLINE SPECIFIC ELECTIVES

Semester	Course Code	Course Title
I	23PIT1DE1A	Artificial Intelligence and Machine Learning
	23PIT1DE1B	Data Communication Networks
II	23PIT2DE2A	Semantic Web
	23PIT2DE2B	Cryptography and Network Security
III	23PIT3DE3A	Blockchain Technology
	23PIT3DE3B	Big Data Analytics

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23PIT1CC1	Core – I	6	5	25	75	100
Course Title		.Net Technologies					

SYLLABUS		
Unit	Contents	Hours
I	Introducing C# and .NET Platform: The Philosophy of .NET: Benefits and Building Blocks of .NET Platform – Overview of .NET Assemblies – Understanding CTS, CLS and CLR – Namespace. Building C# Applications: Building .NET Applications on Windows and Non-Windows OS. C# Programming: The System.Console class- Data Types and Keywords – Working with String Data – Data type Conversion – C# Iteration – *Decision Construct and the Relational/ Equality Operators.*	18
II	C# Programming Construct: Understanding C# Arrays – Method and Parameter Modifier – Understanding the enum, Structure and Nullable Type – Tuples. Encapsulation: C# Class Type – Constructors – Role of this and static Keyword. Inheritance: Mechanism of Inheritance – VS Class Diagrams. Structured Exception Handling: Ode to Errors, Bugs and Exceptions – The role of .NET Exception Handling – System Level and Application Level Exceptions – Multiple Exceptions – Debugging Unhandled Exception using VS. *Delegates, Events and Lambda Expressions*	18
III	Getting Started with ASP.Net 6.0: An Introduction to ASP.Net vNext. Building an initial ASP.Net Application: Creating a New Site – Working with Files in your Application – MVC and Web Form file difference. Designing your Web Pages: HTML and CSS –* More CSS* – Style Sheet – Applying and Managing Style Sheet. ASP.Net Web Form Server Controls: Types – State Engine.	18
IV	ASP.Net MVC Helper and Extensions: Different Approach – Form- Building Helper. Creating Consistent –Looking Website: Consistent Page layout with Master Pages. Navigation: Different way to move around your site –* Web form Navigation Controls.* Validating User Input: Gathering data from the user – Validating user input in web form – Validating user input in MVC.	18
V	Displaying and Updating Data: Working with SQL Server Express – Entity Framework approach to Data Access – Data Control in Web From- Data Display in MVC. Working with Data: Sorting and Pagination – Updating or Inserting Data – A Non- Code first approach to Data Access – *Caching.*	18
VI	Current Trends (For CIA Only) : Serverless computing, Azure Cloud, Xamarin Development.	

** Self Study

Text Book(s):
1. Andrew Troelsen, Pro C# 7 with .NET and .NET Core, Apress, Eighth Edition, 2017 2. William Penberthy, Beginning ASP.NET for Visual Studio 2015, 2016
Reference Book(s):
1. Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Apress, Sixth Edition, 2017 2. Bill Evjen , Devin Rader , Farhan Muhammad , Scott Hanselman, Srivakumar Wrox , Professional ASP.NET 1.1
Web Resource(s):
1. https://dotnettutorials.net/course/csharp-dot-net-tutorials/

2.<https://www.homeandlearn.co.uk/csharp/csharp.html>
 3.<https://www.w3schools.com/asp/>

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Understand code solutions and compile C# projects within the .NET framework.	K1, K2
CO2	Design and develop professional console and window based .NET applications	K3
CO3	Validate and Utilize user inputs in web forms of applications.	K4
CO4	Explain the procedure of database connectivity using ADO.NET in web based application	K5
CO5	Create an attractive webpage using Master Page in ASP.NET	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	2	3	1	1	1	3	2	3	2.2
CO2	3	3	3	2	1	1	3	3	2	3	2.4
CO3	3	3	3	2	2	2	1	3	3	2	2.4
CO4	3	2	2	3	1	3	2	2	2	1	2.1
CO5	3	3	3	3	1	1	2	3	3	1	2.3
Mean Overall Score											2.28
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 Coordinators:

1. Dr. K. Nafees Ahmed
2. B. Benazir Butto

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23PIT1CC2	Core – II	6	5	25	75	100
Course Title		Data Structures and Algorithms					

SYLLABUS		
Unit	Contents	Hours
I	Lists, Stacks and Queues: Abstract Data Types (ADTs) - The Stack ADT - *The Queue ADT*	18
II	Trees: Introduction - Binary Trees - Representing Binary Trees in Memory - Traversing Binary Trees - Traversal Algorithms using Stacks - Header Nodes: Threads. Binary Search Trees - Searching and Inserting in Binary Search Trees - Deleting in a Binary Search Tree - AVL Search Trees - Insertion in an AVL Search Tree - Deletion in an Search Tree - m-way Search Trees - Searching Insertion and Deletion in an m-way Search Tree - B Trees - Searching Insertion and Deletion in B Trees - Heap: Heapsort. *Path Lengths: Huffman's Algorithm - General Trees*.	18
III	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
IV	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
V	DYNAMIC PROGRAMMING: The General Method – Multistage Graphs – All-Pairs Shortest Paths – Single-Source Shortest Paths - Optimal Binary Search Trees - String Editing - 0/1 Knapsack - Reliability Design - The Traveling Salesperson Problem - *Flow Shop Scheduling*. BACKTRACKING: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Knapsack Problem	18
VI	Current Trends (For CIA only) – Breadth-first search(BFS), Depth-first search.(DFS)	

** Self Study

Text Book(s):
1.Mark Allen Weiss, Data Structures an Algorithm Analysis in C, Pearson publishing Company Limited, Second Edition, Reprint, Eleventh Impression 2009
2.Seymour Lipschutz, Data Structures (Schaum's Outlines), Tata McGraw-Hill Publishing Company Limited, Fourth Reprint, 2006
3. Ellis Horowitz, SatrajSahni and SanguthevarRajasekaran, Fundamentals of Computer Algorithms, Universities Press, Second Edition, Reprint 2009
Reference Book(s):
1. Charles E. Leiserson, Ronald L. Rivest. Clifford Stein ,Introduction to Algorithms, 3 rd Edition, 2010
Web Resource(s):
1. https://www.tutorialride.com/data-structures/trees-in-data-structure.htm
2. https://www.javatpoint.com/daa-algorithm-design-techniques .
3. https://onlinecourses.nptel.ac.in/noc22_cs92/preview
4. https://onlinecourses.nptel.ac.in/noc20_cs85/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	Understand the Traverse, Search, Insert and Delete operations	K2
CO3	Apply the proper algorithm design method for problem solving.	K3
CO4	Learn mathematical background for analysing algorithm	K4
CO5	Evaluating the algorithms and data structures used in the problem to determine the time and memory consumption.	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	0	3	3	2	3	3	3	0	2.3
CO2	3	3	0	3	3	3	3	3	0	3	2.4
CO3	3	2	3	1	3	3	3	2	3	3	2.6
CO4	3	2	3	2	3	2	3	2	3	2	2.5
CO5	3	2	3	2	3	3	3	2	3	3	2.7
Mean Overall Score											2.5
Correlation											High

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

Course Coordinators:

1. O.S. Abdul Qadir
2. J. Fathima Fouzia

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23PIT1CC3	Core – III	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 Architecture – Database Users and Administrator – Structure of Relational Database – Keys – *Schema Diagrams *– Formal Relational Query Languages: Relational Algebra	18
II	Introduction to SQL: Over View 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. Entity-Relationship Model – Constraints – Removing Redundant Attributes in Entity Sets – * 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	Storage and File Structure: RAID - File Organization – Organization of Records in Files – Data Dictionary storage. Indexing and Hashing: Basic Concepts – Ordered Indices – B + -Tree Index Files – Static Hashing – * Dynamic Hashing *.	18
V	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
VI	Current Trends (For CIA only) – File System, representing data in document form.	

** Self Study

Text Book(s):
1. Abraham Silberschatz, Hendry F. Korth and S. Sudarshan, Database System Concepts, 6th Edition, Mcgraw- Hill International Edition
2. Database Systems A Practical Approach to Design, Implementation, and Management, 4th Edition by Thomas M.Connolly, Carolyn E.Begg, Pearson Education, Fifth Impression, 2012.
Reference Book(s):
1. Fundamentals of Database Systems, 5th Edition by RamezElmasri, Shamkant B. Navathe, Pearson Education Ltd.
2. C.J Date, A. Kannan and S.Swaminathan, An Introduction to Database Systems, 8th Edition, PearsonEducation Asia

Web Resource(s):
1. https://www.db-book.com/db6/slide-dir/
2. https://onlinecourses.nptel.ac.in/noc22_cs91/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 advanced features of DBMS & RDBMS	K1,K2
CO2	Apply SQL queries on created tables in Relational Databases	K3
CO3	Examine techniques pertaining to Database design practices	K4
CO4	Determine set operations, nested subqueries and aggregate functions	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	0	3	3	3	3	3	3	3	0	2.4
CO2	3	2	1	3	3	2	1	3	3	1	2.2
CO3	2	3	2	3	3	3	3	3	2	3	2.7
CO4	3	3	3	3	2	3	2	2	2	3	2.6
CO5	2	3	2	3	2	3	3	3	2	3	2.6
Mean Overall Score											2.5
Correlation											High

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
I	23PIT1CC4P1	Core - IV (a)	3	2	10	40	50
Course Title		.NET Lab - Practical					

1. Program to display mathematical operations using console application.
2. Program to read the 10 characters long. If not then display an error message using IF and ELSE
3. Program that places double quotation marks around each word in a string.
4. Program to display first 10 natural numbers and their sum using console application.
5. Program to implement the concept of Array.
6. Program to implement Single Inheritance.
7. Program to implement Exception Handling
8. Program to implement the concept of Delegates and Events
9. Change the font family and color of all headings in a webpage using CSS.
10. Program to implement the concept of Master Page.
11. Create a web site for a bank and include types of navigation.
12. Program to implement validating data entered in controls using Web based application
13. Program to insert the data from the UI to the server
14. Program to access data sources through ADO.NET
15. Program to display the data using Detail View and Grid View Control.

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Demonstrate code solutions and compile C# projects within the .NET framework.	K2
CO2	Design and develop professional console and window based .NET applications	K3
CO3	Validate and Utilize user inputs in web forms of applications.	K4
CO4	Compare the Detail View and Grid View Controls for displaying data	K5
CO5	Create an attractive webpage using Master Page in ASP.NET	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	2	3	1	1	1	3	2	3	2.2
CO2	3	3	3	2	1	1	3	3	2	3	2.4
CO3	3	3	3	2	2	2	1	3	3	2	2.4
CO4	3	2	2	3	1	3	2	2	2	1	2.1
CO5	3	3	3	3	1	1	2	3	3	1	2.3
Mean Overall Score											2.28
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 Coordinators:

1. Dr. K. Nafees Ahmed
2. B. Benazir Butto

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23PIT1CC4P2	Core – IV (b)	3	2	10	40	50
Course Title		RDBMS Lab – Practical					

I. Data Definition Language Commands

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

- Insertion
- Arithmetic, Logical, Comparison operations
- 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.
- 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)
- 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.
- 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.
- 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.
- 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 notin)

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	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23PIT1DE1A	Discipline Specific Elective-I	6	4	25	75	100
Course Title Artificial Intelligence and Machine Learning							

SYLLABUS		
Unit	Contents	Hours
I	PROBLEM SOLVING: Introduction to AI - AI Applications - Problem solving agents – search algorithms – uninformed search strategies – Heuristic search strategies – Local search and optimization problems – *adversarial search* – constraint satisfaction problems (CSP).	18
II	PROBABILISTIC REASONING: Acting under uncertainty – Bayesian inference – naïve bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – *causal networks.*	18
III	SUPERVISED LEARNING: Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, *Decision Tree, Random forests.*	18
IV	ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING: Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, *Gaussian mixture models and Expectation maximization.*	18
V	NEURAL NETWORKS: Perceptron - Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks – Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, *batch normalization, regularization, dropout.*	18
VI	Current Trends (For CIA only) – Innovative machine Learning techniques- Deep Learning	

** Self Study

Text Book(s):
1. Stuart Russell and Peter Norvig, <i>Artificial Intelligence – A Modern Approach</i> , Pearson Education, Fourth Edition, 2021.
2. Ethem Alpaydin, <i>Introduction to Machine Learning</i> , MIT Press, Fourth Edition, 2020.
Reference Book(s):
1. Dan W. Patterson, <i>Introduction to Artificial Intelligence and Expert Systems</i> , Pearson Education, 2007
2. Kevin Night, Elaine Rich, and Nair B., <i>Artificial Intelligence</i> , McGraw Hill, 2008
Web Resource(s)
1. https://onlinecourses.nptel.ac.in/noc22_cs24/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
3. https://onlinecourses.nptel.ac.in/noc22_ge29/preview

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Classify uninformed and heuristic search techniques	K1, K2
CO2	Identify techniques for reasoning under uncertainty	K3
CO3	Compare Machine Learning and supervised learning algorithms	K4
CO4	Explain the Ensembling and unsupervised learning algorithms	K5
CO5	Imagine basics of deep learning using neural networks	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	2	3	2	3	2	1	1	3	2.3
CO2	3	3	3	2	3	3	3	2	2	1	2.5
CO3	2	3	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	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Mr. A. Basheer Ahamed

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23PIT1DE1B	Discipline Specific Elective-I	6	4	25	75	100
Course Title		Data Communication Networks					

SYLLABUS		
Unit	Contents	Hours
I	Introduction: Data Communications – Networks. Network Models: The OSI Model – Layers in the OSI Model – TCP/IP Protocol suite – Physical Layer: *Multiplexing*– Transmission Media: Guided Media- Telephone Network.	18
II	Data Link Layer: Error Detection and Correction: Introduction – Block coding – Cyclic Codes – Checksum. Data Link Control: Framing – *Flow and Error Control* – Protocols – Noiseless Channels – Noisy Channel – HDLC-PPP.	18
III	Network Layer Design Issues – Routing Algorithms: The Optimality Principle – Shortest Path Algorithm – Flooding – Distance Vector Routing – Link State Routing – Hierarchical Routing – Broadcasting Routing – Congestion Control Algorithms – Network Layer in the Internet: IP Addresses- *The IP Version 6 Protocol.*	18
IV	Transport Layer: Process to Process Delivery – User Datagram Protocol (UDP) – *Transmission Control Protocol (TCP)*- Stream Control Transport Protocol (SCTP).	18
V	Application Layer: Name Space – Domain Name Space (DNS) – Distribution of Name Space – DNS in the Internet – Remote Logging – E-Mail – File Transfer- Network Management System (NMS) –* Simple Network Management Protocol (SNMP)*.	18

** Self Study

Text Book(s):
1. Behrouz A Forouzan, Data Communications and Networking, Fourth Edition, Tata McGraw-Hill, Special Indian Edition 2006 2. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Fifth Edition, Pearson Education, Inc., Publishing as Prentice Hall, 2011
Reference Book(s):
William Stallings, Data and Computer Communication, PHI, Eighth Edition, 2009
Web Resource(s):
1. https://www.javatpoint.com/computer-network-tutorial 2. https://www.geeksforgeeks.org/computer-network-tutorials/ 3. https://www.computernetworkingnotes.com/networking-tutorials/ 4. https://onlinecourses.nptel.ac.in/noc22_ee61/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 of Computer networks, OSI Reference Model, TCP Reference Model and Routing algorithms.	K2
CO2	Apply security principles and investigate network security threat to system design.	K3
CO3	Categorize the CSMA/CD, internetworking technologies and routing and addressing procedures	K4
CO4	Explain the protocols and services in the seven layers of OSL model	K5
CO5	Discuss the current research problems and research methods in advanced computer networks.	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	2	3	1	1	1	3	2	3	2.2
CO2	3	3	3	2	1	1	3	3	2	3	2.4
CO3	3	3	3	2	2	2	1	3	3	2	2.4
CO4	3	2	2	3	1	3	2	2	2	1	2.1
CO5	3	3	3	3	1	1	2	3	3	1	2.3
Mean Overall Score											2.28
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 Coordinators

1. Mr. S. Syed Ibrahim
2. Mr. P. Sheik Abdulla

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23PIT2CC5	Core – V	6	6	25	75	100
Course Title 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 – final. Inheritance: Inheritance Basics – Using super – Method overriding – *Dynamic Method Dispatch *- Using Abstract Classes.	18
II	Packages and Interfaces: Declaring Packages – Access Protection – Importing Packages – Defining, Implementing, Applying Interfaces - Exception Handling: Exception Types – try, catch – throw – throws – finally – Creating Userdefined Exceptions. Multithreaded Programming: The Java Thread Model – Creating a Thread – Thread Priorities -*String Handling.*	18
III	The Collection Interfaces and Utility Classes: ArrayList, LinkedList, Vector, Stack, 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: Introduction-Networks Domain Names and Protocols - Ports-Transmission Control Protocol-UDP Approach. 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: Event Model – Event Classes – Event Listeners and Interfaces. Swing Component classes: Icons and JLabels - JText Fields – JButtons - JCheckBoxes – JRadioButtons - *JComboBoxes.*	18
VI	Current Trends (For CIA only) – NetBeans IDE, Layout Managers, MVC architecture, Hibernate and Struts frameworks	

** Self Study

Text Book(s):
1. Herbert Schildt, The Complete Reference Java 2, TMH Education Pvt. Ltd, Fifth Edition 2. C. Muthu, Programming with Java, Vijay Nicole imprints Private Limited, 2004.
Reference Book(s):
1. Herbert Schildt with Joe O’ Neil, Java –Programmer’s Reference, TMH.
Web Resource(s):
1. https://www.programiz.com/java-programming 2. https://www.javatpoint.com/java-tutorial 3. 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	Knowledge of the structure and model of the Java programming language.	K1
CO2	Use the Java programming language for various programming technologies.	K2
CO3	Develop software in the Java programming language.	K3
CO4	Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.	K4
CO5	Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem.	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	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	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. S. Abdul Saleem
2. M. Kamal

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23PIT2CC6	Core – VI	6	5	25	75	100
Course Title		Mobile Communication					

SYLLABUS		
Unit	Contents	Hours
I	Introduction: Applications – History of wireless communication – Market for mobile communications – * Open research topics *- Simplified reference model. Wireless Transmission : Frequencies for radio transmission – Signals – Antennas – Signal Propagation.	18
II	Telecommunication Systems : GSM. Satellite Systems: History - * Applications * - Basics – Routing – Broadcast Systems : Digital Audio Broadcasting – Digital Video Broadcasting.	18
III	Wireless LAN : Infra red vs Radio transmission – Infrastructure and ad-hoc network – System architecture – Protocol architecture – Historical HIPERLAN – Bluetooth User Scenarios - * Architecture *.	18
IV	GPRS:GPRS and Packet Data Network – GPRS Network Architecture – Data Services in GPRS – Billing and Charging inGPRS.WAP: Evolution of Wireless Data and WAP –*GPRS Applications *.	18
V	Security Issues in Mobile Computing : Introduction – Information Security – Security Techniques and Algorithms –* Security Protocols *.	18
VI	Current Trends (For CIA only) – Contemporary developments related to the course during the semester concerned.	

** Self Study

Text Book(s):
1. Jochen Schiller, Mobile Communications, Pearson Education, Second Editon, 2014.
2. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, Mobile Computing, Technology, Applications and Service Creation, Tata M C Graw Hill Publishing, Second Edition, 2010.
Reference Book(s):
T.G. Palanivelu, R.Nakkeeran, Wireless and Mobile Communication, PHI Learning Private Limited, NewDelhi,2009.
Web Resource(s):
1. https://onlinecourses.nptel.ac.in/m
2. https://www.javatpoint.com/mobile-communication-introduction

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Recognise about mobile communications and know about RFID and other signals.	K2
CO2	Apply knowledge of wireless LAN system.	K3
CO3	Impart the knowledge of mobile networks.	K3
CO4	Justify the current requirements for satellite systems and know basics about digital broadcasting.	K4
CO5	Discuss about mobile security issues.	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	1	3	3	1	1	1	3	2.0
CO2	3	3	2	3	2	3	2	3	2	1	2.4
CO3	3	2	3	2	3	2	3	2	3	2	2.5
CO4	2	3	2	2	3	3	3	1	2	2	2.3
CO5	3	2	1	3	1	3	2	1	3	3	2.2
Mean Overall Score											2.28
Correlation											Medium

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

Course Coordinators:

1. Dr. B. Mohamed Faize Basha
2. Ms. B. Diana

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23PIT2CC7	Core – VII	6	5	25	75	100
Course Title		Data Science and R Programming					

SYLLABUS		
Unit	Contents	Hours
I	Introduction to Data Science: Introduction: Big Data and Data Science Hype – Getting past the hype –Datafication – The Current Landscape (Little History): Data Science Jobs - Data Science Profile – What is a Data Scientist, Really – In Academia – In Industry – Statistical Thinking in the age of Big Data – Statistical Inference – New kinds of data - Exploratory Data Analysis (EDA): Basic tools of EDA - Philosophy of exploratory data analysis – Data Science Process: Data Scientist’s Role in this process – Connection to scientific method. Data Science and Risk – About Square – The Risk Challenge (Risk Engine) – *Trouble with Performance Estimation: Define error metric – Defining the labels.*	18
II	Model Building, Evaluation & Data Engineering: Model Building Tips (Good Guidelines): Code readability and reusability – Productionizing Machine Learning models – Data Leakage: Market predictions – How to avoid leakage - Evaluating models: Accuracy – Probabilities matter, Not 0’s and 1’s. – Data Engineering: MapReduce – Enter MapReduce – Other examples of MapReduce – What can’t MapReduce Do? – Pregel – Hadoop: Brief Introduction to Hadoop – Cloudera – How to get started with Hadoop Next-Generation Data Scientists: Data Science Again –Next-Gen Data Scientists: Being a Problem Solvers – Cultivating Soft Skills –* Being Question Askers – Being an Ethical Data Scientist *.	18
III	Introduction to R: Using R – Working with R – Packages – Batch Processing – Using output as input – Working with large datasets – Working through an example – Creating a dataset: Understanding datasets – Data structures in R: Vectors - Matrices – Arrays – Data frames – Factors – Lists – Data Input: Entering data from keyboard – Importing data from delimited text – Importing data from Excel –* Importing data from XML *.	18
IV	: Basic Statistics and Visualizations in R: Discriptive Statistics: Via summary() – sapply() – describe() – stat.desc() – by group using aggregate() – by group using by(). Data Visualization (Plotting): Packages – Scatter plots - Bar Charts & Plots - R Graphics:*Packages - The ggplot2 package – Maps *.	18
V	Data Analysis via R Packages: Regression Analysis: Packages – Simple Regression – Clustering: Packages – k-means clustering – Machine Learning in Action (Classification): Packages – Train methods (Decision Tree – Neural Networks –* Random Forests *)	18
VI	Current Trends (For CIA only) –..Challenges in features and learning	

** Self Study

Text Book(s):
1.Rachel Schutt& Cathy O’Neil, “Doing Data Science – Straight Talk from the Frontline”, O’Reilly Media Inc., 2014.
2.Robert I Kabacoff, “R in Action - Data Analysis and Graphics with R”, Manning Publications Co., 2011.
3. Dan Toomy, “R for Data Science – Learn and Explore the Fundamentals of Data Science with R”, Packt Publishing Ltd., 2014

Reference Book(s):
1. Roger D. Peng, “R Programming for Data Science”, Leanpub, 2014. 2. Richard Cotton, “Learning R—A Step by step Function Guide to Data Analysis”, O’Reilly Media Inc.,2013. 3. NimaZumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014. 4. Avrim Blum, John Hopcraft, RavindranKannan, “Foundations of Data Science”, January 2018.
Web Resource(s):
1. www.r-project.org 2. www.cran.r-project.org 3. https://onlinecourses.nptel.ac.in/noc22_cs72/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 Data Science Process, Statistical Inference, New kinds of Data, Exploratory Data Analysis.	K2
CO2	Gain basic notions of Model building, Evaluation Metrics formulas, concepts of Data Engineering and NextGen Data Scientists	K1,K5
CO3	Fetch insights behind R Programming for Data Science	K2
CO4	Understand basic statistics and execute Data visualization method via R packages	K2
CO5	Implement and apply Data Analysis Techniques (Regression, Clustering, and Classification) via R Packages to build a Machine Learning model.	K3,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	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	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator:

1. Dr. M. Sabibullah
2. Dr. S. VaaheethaKfatheen

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23PIT2CC8P1	Core – VIII (a)	3	2	10	40	50
Course Title		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 display Salary(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. Prepare an invoice using Swing controls and to store the details in a database using JDBC.
12. Create three buttons with caption Red, Green and Blue using Swing and set the background color by clicking the relevant buttons.
13. Design a simple calculator and implement the basic arithmetic operations.

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Demonstrate the concepts of Class, Inheritance, exception handling and multithreading	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 and UDP techniques between client and server programs	K5
CO5	Create and manipulate packages for developing simple applications	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

Mr. M. Kamal

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23PIT2CC8P2	Core – VIII (b)	3	2	10	40	50
Course Title		R Programming Lab - Practical					

1. Installing R and R Studio
2. Applying Simple Commands in R
3. R as a Calculator application
4. Execution of Loops and Functions via R - Control Structures
5. Basic Descriptive Statistics using summary() – sapply() – describe() – stat.desc() – by group using aggregate() in R
6. Reading and writing different types of Datasets in R
7. Visualizations: Visualize various Plotting and Graphics in R
8. Regression: Perform Simple Regression using R Package
9. Clustering: Apply k-means by using R Package
10. Classification: Use Random Forest / Naïve Bayes / NN by using R Package

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Demonstrate for installing R and R Studio	K2
CO2	Apply simple commands in R programming	K3
CO3	Examine the control structures in R	K4
CO4	Manipulate the different types of Datasets in R	K3
CO5	Design and visualize various plotting and Graphics in R	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO1	3	3	3	3	2	3	3	3	3	1	2.7
CO2	3	3	2	3	2	3	2	3	2	1	2.4
CO3	3	2	3	2	2	3	3	2	3	3	2.6
CO4	2	3	2	2	2	3	3	3	2	3	2.5
CO5	3	2	1	3	3	3	2	3	3	3	2.6
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:

1. Dr. M. Sabibullah
2. Dr. S. VaaheethaKfatheen

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23PIT2DE2A	Discipline Specific Elective-II	6	4	25	75	100
Course Title		Semantic Web					

SYLLABUS		
Unit	Contents	Hours
I	Future of internet: Introduction – The syntactic web- The semantic web- Working of semantic web -What the semantic web is not. Ontology in computer science: Defining the term ontology-Classifying the Ontologies-Web Ontology Description Languages * Ontologies, categories and intelligence *.	18
II	Knowledge representation in description logic: Introduction – Informal Examples Inference problems. RDF and RDF schema: introduction – * XML essentials *- RDF- RDF schema	18
III	OWL: Introduction – Requirement for web ontology description Languages-Header information, versioning, annotation Properties-Properties – * Classes- Individuals – Data types *- A summary of OWL vocabulary. Rule languages: introduction – Usage scenarios for rule languages- ruleML- SWRL-TRIPLE.	18
IV	Semantic web services: Introduction –Web service essentials- OWL-S service ontology- An OWL-S example-scenario description – Informal process definition – *OWL-S process definition*. Methods for ontology development: Introduction – Uschold and king ontology development method- Methodology.	18
V	Ontology sources: introduction- Meta data Definition –Dublin core – Warwick framework-Upper ontologies: SUMOKR Ontology-word net. Semantic web software tools: Introduction- *Metadata and ontology editors.*	18
VI	Current Trends (For CIA only) -Current Trends in Datasets, Tools and Technologies: Development for Linked Open Data	

** Self Study

Text Book(s):
Karin K. Breitman, Macro Antonio Casanova,WalterTruszkowski, Semantic Web, Springer International Edition.
Reference Book(s):
Semantic Web Services Processes And Application (Sie) by Cardoso J, Springer Exclusive (Cbs), 2004
Web Resource(s):
1. https://www.techtarget.com/searchcio/definition/Semantic-Web 2. https://www.techopedia.com/definition/27961/semantic-web 3. https://www.analyticssteps.com/blogs/what-semantic-web-working-importance-and-applications

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 basics of semantic web, common data formats and exchange protocols on the Web	K2
CO2	Apply the ontology libraries that is relevant to indexing of resources in the semantic web.	K3
CO3	Use ontology engineering approaches in semantic applications	K3
CO4	Illustrate the logic semantics and inference with OWL.	K4
CO5	Create a common framework that allows data to be shared and reused across various applications.	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	2	3	1	1	1	3	2	3	2.2
CO2	3	3	3	2	1	1	3	3	2	3	2.4
CO3	3	3	3	2	2	2	1	3	3	2	2.4
CO4	3	2	2	3	1	3	2	2	2	1	2.1
CO5	3	3	3	3	1	1	2	3	3	1	2.3
Mean Overall Score											2.28
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 :P Shaik Abdulla

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23PIT2DE2B	Discipline Specific Elective-II	6	4	25	75	100
Course Title		Cryptography and Network Security					

SYLLABUS		
Unit	Contents	Hours
I	Introduction to the Concepts of Security: Introduction – The need for security – Principles of security – Security services and Mechanisms – *Types of Attacks*.	18
II	Cryptography Techniques: Basic Terms – Plain text and Cipher Text – Substitution techniques – Transposition techniques – Encryption and Decryption – Symmetric and Asymmetric key cryptography - *Steganography*.	18
III	Computer-Based Symmetric key Cryptographic Algorithms: Algorithm types and modes - *Algorithm modes* – An overview of Symmetric key Cryptography – Data Encryption Standard (DES).	18
IV	Computer-Based Symmetric key Cryptographic Algorithms: Block cipher design principles – International Data Encryption Algorithm (IDEA) - *Blowfish* – Advanced Encryption Standard (AES).	18
V	Computer-Based Asymmetric key Cryptographic Algorithms: Brief History of Asymmetric key cryptography - An overview of Asymmetric key cryptography – The RSA algorithm – *Digital signatures.*	18

** Self Study

Text Book(s):
1. Atul Kahate, Cryptography and Network Security, McGraw Hill Education (India) Private Limited, Fourth Edition, 2019.
Reference Book(s):
1. 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 .

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Recall the concepts of network Security	K1
CO2	Learn Cryptography techniques.	K2
CO3	Apply Symmetric key algorithm modes	K3
CO4	Explain the knowledge of Symmetric key Cryptography algorithms	K5
CO5	Discuss Asymmetric key cryptography algorithms	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	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	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. VaaheedhaKfatheen

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PIT3CC9	Core – IX	6	6	25	75	100
Course Title		Software Quality Engineering					

SYLLABUS		
Unit	Contents	Hours
I	Software Quality: Quality – Perspectives and Expectations – Quality Frameworks and ISO-9126 – Correctness and Defects – Definitions, Properties and Measurements – Quality Assurance: Classification – QA as dealing with defects – Defect Prevention – Defect Reduction – Defect Containment – Quality Engineering: Activities and Process – Quality Planning – Goal Setting and Strategy Formation – *Quality Assessment and Improvement* - Quality Engineering in Software Processes	18
II	Testing Concepts, Issues and Techniques: Purposes, Activities and Context– Functional Vs. Structural Testing: What to Test? – Coverage based Vs. Usage based Testing: When to stop testing? –Test Activities, Management and Automation: Test Planning and Preparation –Test Execution Result Checking and Measurement – Analysis and Follow up – *Activities, People and Management*– Test Automation.	18
III	Input Domain Partitioning and Boundary Testing: Input Domain Partitioning and Testing – Simple Domain Analysis and the Extreme Point Combination Strategy – Testing Strategies based on Boundary Analysis – Finite State Machines and Testing – FSM State and Transition Coverage – *Markov chains and Unifies Markov models*.	18
IV	Control Flow, Data Dependency and Interaction Testing: Basic Control Flow testing – Loop testing, CFT Usage, and Other Issues – Data Dependency and Data Flow Testing - *DFT Coverage and Applications* - Testing Techniques: Testing Sub-Phases and Applicable Testing Techniques – Specialized Test Tasks and Techniques – Test Integration.	18
V	Quality Assurance Beyond Testing: Defect Prevention and Process Improvement – Basic concepts and Generic Approaches – Root Cause Analysis for Defect Prevention - *Education and Training for Defect Prevention* – Software Inspection: Basic Concepts and Generic Process – Fagan Inspection – Formal Verification and Formal Specification – Formal Verification – Axiomatic Approach – Fault Tolerance and Failure Containment: Basic Ideas and Concepts – Fault Tolerance with Recovery Blocks.	18
VI	Current Trends(For CIA only): SDLC, Agile software development and DevOps	

** Self Study

Text Book(s):
1. Jeff Tian, “Software Quality Engineering – Testing, Quality Assurance & Quantifiable Improvement”, Wiley India Edition, New Delhi, 2005. UNIT I : Chapter 2: 2.1 – 2.3, Chapter 3: 3.1 – 3.4 & Chapter 5: 5.1 – 5.4 UNIT II: Chapter 6: 6.1, 6.3 – 6.4 & Chapter 7: 7.1 – 7.5 UNIT III: Chapter 9: 9.1 – 9.3 & Chapter 10: 10.1 – 10.2, 10.4 UNIT IV: Chapter 11: 11.1 – 11.4 & Chapter 12: 12.1 – 12.3 UNIT V: Chapter 13: 13.1 – 13.3, Chapter 14: 14.1 – 14.2, Chapter 15: 15.1 – 15.2 & Chapter 16: 16.1 – 16.2
Reference Book(s):
1. Ron Patton, “Software Testing”, 2nd Edition, Pearson Education, New Delhi, 2006. 2. Paul C. Jorgensen, “Software Testing”, Fourth Edition, a craftsman’s approach, 2014 3. Renu Rajani, Pradeep Oak, “Software Testing – Effective Methods, Tools and Techniques”, TMH Publishing Company Limited, New Delhi, 2004.

Web Resource(s):

1. https://www.tutorialspoint.com/software_testing
2. https://onlinecourses.nptel.ac.in/noc23_cs122/preview
3. https://onlinecourses.nptel.ac.in/noc23_cs38/preview

Relationship Matrix:

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Remember the fundamental concepts in software Quality and software testing	K1, K2
CO2	Understand various quality measurements and software testing methodologies to improve software quality	K3
CO3	Apply the advanced software testing techniques such as adaptation, specialization and integration	K4
CO4	Analyze the concept of quality assurance	K5
CO5	Create the various processes of quality assurance beyond testing	K6

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	3	2	3	2	1	1	3	2.3
CO2	3	3	3	2	3	3	3	2	2	1	2.5
CO3	2	3	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
≥1.5and<2.5	Medium
≥2.5	High

Course Coordinator: Ms. J. Fathima Fouzia

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PIT3CC10	Core - X	6	5	25	75	100
Course Title XML and Web Services							

SYLLABUS		
Unit	Contents	Hours
I	XML: Extending the Enterprise: Extending the enterprise – The role of XML – XML Just Tags? – XML and the Web – SOAP - * Web Services *- XML: The Three Revolutions.	18
II	The XML Technology Family: XML Technologies – Leveraging the XML Technology Family – Structuring with Schemas – Presentation Technologies - *Transformations*.	18
III	Evolution and Emergence of web services: What is distributed computing? – Importance of distributed computing – Client-Server applications – Introduction to web services: What are web services? – *Motivation and Characteristics* – Why use web services? – Basic Operational model of web services – CORE Web services standards.	18
IV	Web services architecture and technologies: Web services architecture and its CORE building blocks –Tools of the Trade: SOAP – WSDL – UDDI – Implementing web services – Developing web services enabled applications – Developing Web services using SOAP – XML based protocols and SOAP – Anatomy of a SOAP message – SOAP encoding – *Building SOAP web services*	18
V	Security in Web Services: Web Services Security – Challenges of securing web services– *XML encryption*– XML signatures – Security Assertions Markup Language – XML access control markup language.	18
VI	Current Trends(For CIA only): XML-RDF, XML-RSS, Web Services Projects	

* * Self Study

Text Book(s):
1. Frank P. Coyle, “XML, Web Services and the Data Revolution”, Pearson Education Inc. , 2011. UNIT I: Chapter 1 UNIT II: Chapter2.
2. Ramesh Nagappan, Robert Skoczylas, Rima Patel Sriganesh, “Developing Java Web Services”, Wiley Publication, 2006. UNIT III: Chapter1, 2 UNIT IV: Chapter3, 4 UNIT V: Chapter13.
Reference Book(s):
Sandeep Chatterjee, JamesWebber, “Developing Enterprise Web Services”, AnArchitect’s Guide, Pearson Education, Second Indian Reprint 2005
Web Resource(s):
https://www.e-booksdirectory.com/details.php?ebook=1847 http://ommolketab.ir/aaf-lib/ooz6p9fd46m2w11y90n5jhuhp1s98f.pdf https://www.nptelvideos.com/video.php?id=723

Course Outcomes		
Upon successful completion of this course, the students will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Defining and Exploring the basic ideas of XML programming	K1,K2
CO2	Describe the key idea about XML family	K3
CO3	Apply the difference between a web service and web application	K4
CO4	Analyze the basic flow of data and the responsibilities for web service consumption	K5
CO5	Create the security levels of web services.	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	2	2.7
CO2	3	3	2	3	2	3	2	3	2	1	2.4
CO3	2	3	3	3	3	3	3	2	3	1	2.7
CO4	3	2	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. B. Diana

Semester	Course Code	Course Category	Hours/Week	Credit	Mark for Evaluation		
					CIA	ESE	Total
III	23PIT3CC11	Core-XI	6	5	25	75	100
Course Title		Internet of Things					

SYLLABUS		
Unit	Contents	Hours
I	Introduction to Internet of Things: Introduction – Physical Design of IoT – Logical Design of IoT –IoT Enabling Technologies – *IoT Levels & Deployment Templates.*	18
II	Domain Specific IoTs: –Introduction – Home automation –Cities – Environment – Energy – Agriculture – Industry – Health & Lifestyle – IoT and M2M: Introduction – M2M – Difference between IoT and M2M – SDN and NFV for IoT –*Software Defined Networking* – Network Function Virtualization.	18
III	IoT System Management: Need for IoT Systems Management –Simple Network Management Protocol (SNMP) – *Network Operator Requirements*–NETCONF. IoT Platforms Design Methodology: Introduction – IoT Design Methodology.	18
IV	IoT Physical Devices and Endpoints: – What is an IoT device – Exemplary Device: Raspberry Pi – About the Board – *Linux on Raspberry Pi* – Raspberry Pi Interfaces – Programming Raspberry Pi with Python.	18
V	Case Studies Illustrating IoT Design: Introduction – Home Automation – Environment. Data Analytics for IoT: Introduction – Apache Hadoop – Using Hadoop MapReduce for Batch Data Analysis.	18
VI	Current Trends(For CIA only): Home Automation System, Face Recognition Bot, Air Pollution Monitoring System, Smart Parking System	

*.....*Self Study

Text Book(s):
Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A Hands-on Approach”, Universities Press (India) Private Limited, 2016.
Books for Reference
Cuno Pfister, “Getting started with the internet of things”, O’Rielly Publication, 2011
Web References:
1. http://www.internet-of-things-book.com
2. https://www.tutorialspoint.com/internet_of_things/index.htm
3. https://data-flair.training/blogs/iot-tu
4. https://onlinecourses.nptel.ac.in/noc22_cs53/preview

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Define the designs and levels of IoT	K1, K2
CO2	Understand the Domain Specific IoTs	K3
CO3	Apply both IoT and M2M	K4
CO4	Analyze the need of IoT Systems Management	K5
CO5	Create Devices and Endpoints. Programming Raspberry Pi with Python.	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	2	2.7
CO2	3	3	2	3	2	3	2	3	2	1	2.4
CO3	2	3	3	3	3	3	3	2	3	1	2.7
CO4	3	2	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. Zunitha Sulthana

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PIT3CC12P1	Core – XII (a)	3	2	10	40	50
Course Title		Software Testing Lab - Practical					

1. Installation of Automation testing tools.
2. Using Selenium IDE, write a test suite containing minimum three test cases.
3. Conduct a test suite for any two web sites.
4. Install Selenium server and demonstrate it using a script in Java / PHP.
5. Write and test a program to login a specific web page.
6. Write and test a program to update 10 student records in a table into Excel file.
7. Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects).
8. Write and test a program to provide total number of objects present / available on the page.
9. Write and test a program to get the number of list items in a list / combo box.
10. Write and test a program to count the number of check boxes on the page checked and unchecked Count.

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Identify the fundamental concepts in software testing	K1,K2
CO2	Apply the principles of system and component testing	K3
CO3	Analyze the distinction between validation testing and defect testing	K4
CO4	Evaluate the strategies for generating system test cases	K5
CO5	Develop the tools used for test automation	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	2.7
CO4	3	3	2	2	3	3	3	1	2	2	2.3
CO5	2	2	2	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
≥1.5and<2.5	Medium
≥2.5	High

Course Coordinator: Ms. J. Fathima Fouzia

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PIT3CC12P2	Core – XII (b)	3	2	10	40	50
Course Title		XML and Web Services Lab - Practical					

1. Develop an XML program to display a string.
2. Develop an XML program for birthday party invitation using various images.
3. Develop an XML program to send greeting cards using colorful borders.
4. Develop an XML program for listing of job details of various employees using the following Fields (emp-id, designation, company name, salary)
5. Develop a JAX-WS web service and client for displaying a welcome message.
6. Develop a JAX-WS web service for currency conversion/temperature conversion
7. Develop a JAX-WS web service Fibonacci application
8. Develop a JAX-WS web service for printing the contents of ArrayList an order
9. Develop a JAX-WS web service for checking whether the input is palindrome or not
10. Develop a JAX-WS web service with database connectivity

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 client-server architecture in web services using JS-WS	K1, K2
CO2	Identify the numeric part of web services	K3
CO3	Examine the logical part of web services programming	K4
CO4	Prove the importance of designing in web services	K5
CO5	Develop the database connectivity in web services	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	2	3	2	1	2.6
CO2	3	3	3	2	2	3	3	2	2	2	2.5
CO3	3	3	3	3	3	3	3	2	2	2	2.7
CO4	3	3	2	2	3	3	3	2	1	3	2.5
CO5	3	3	3	2	1	3	3	3	2	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
≥1.5and<2.5	Medium
≥2.5	High

Course Coordinator: Ms. B. Diana

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PIT3DE3A	Discipline Specific Elective-III	6	4	25	75	100
Course Title		Blockchain Technology					

SYLLABUS		
Unit	Contents	Hours
I	Basics of Blockchain Introduction-Concept of Blockchain-History-Definition of Blockchain-Fundamentals of Blockchain-Characteristics of Blockchain-Consensus in Trust-Building Exercise-Public, Private, and Hybrid Blockchains-Distributed Ledger Technologies-DLT Decentralized Applications and Databases-MArchitecture of Blockchain-Transactions-Chaining Blocks-Value Proposition of Blockchain Technology-Decentralized System-Introduction- Distributed Decentralized Databases- Decentralized- Enterprises-Decentralization-Disintermediation- *Decentralized Enterprise Regulation*	18
II	Hash Functions Introduction-Hashing-Message Authentication Code-Secure Hash Algorithms(SHA-1)-Secure Hash Algorithm Version-Distributed Hash Tables-Hashing and Data Structures-Hashing in Blockchain Mining-Consensus introduction-Approach-Consensus-Consensus Algorithms-Byzantine Agreement Methods-Blockchain Components Introduction-Ethereum-History-Ethereum Virtual Machine-Working of Ethereum-Ethereum Clients-Ethereum Key Pairs-Ethereum Addresses-EthereumWallets-Ethereum Transactions-Ethereum Languages-Ethereum Development Tools-Cryptography-Introduction Cryptography-Cryptography Primitives-*Symmetric Cryptography-Asymmetric Cryptography*	18
III	Smart Contracts-Introduction-Smart Contracts-Absolute and Immutable-Contractual Confidentiality-Law Implementation and Settlement-Characteristics-Internet of Things-Utilities: Smart Grid-Proofs of Origin-Supply Chain Management-Medical Sciences-Finance-Media and Entertainment-Public Services-*Legal Services-Darknet*-The Future	18
IV	Bitcoins-Introduction Working of Bitcoin-Merkle Trees-Bitcoin Block Structure-Bitcoin Address-Bitcoin Transactions-Bitcoin Network-Bitcoin Wallets-Bitcoin Payments-Bitcoin Clients-Bitcoin Supply-Decentralized Applications Introduction-Today's Web Applications Requirement-*Mining in Blockchain Bitcoin*-Blocks Validation and Identification-Bitcoins Creation-Mining Hardware-Mining Software-Running Miner Software-Executing Several Miners-Bitcoins Management-Reasons for Bitcoin Mining-Swarm-Robotic Possibilities-Sidechain Hopping-Blockchain Forks	18
V	Blockchain-Blockchain in Insurance-Life Insurance and Claim Processing in Case of Death-Healthcare-Assets Management-Financial Institutional Assets-Smart Assets-Electronic Currency-Manufacturing-Blockchain and Allied Technologies-Blockchain and Cloud Computing-Characteristics of Blockchain Cloud-Blockchain and Artificial Intelligence-Blockchain and IoT-Blockchain and Machine Learning-*Blockchain and Robotic Process Automation*	18
VI	Current Trends (For CIA only): Cryptography, Cryptography Primitives, Symmetric Cryptography and Asymmetric Cryptography.	

..... Self Study

Text Book(s):
1. Kumar Saurbh, Ashutosh Saxena, "Blockchain Technology – Concept and Applications", Wiley Publication 2020

Reference Book(s):
1. Peter Gaffney, Kyle Sonlin, Herwig Konings , “Blockchain Explained: Your Ultimate Guide to the Tokenization of Finance” Kindle Edition2 2. Daniel Drescher, “Blockchain Basics: A Non-Technical Introduction in 25 Steps” First Edition 3. Samanyu Chopra, Paul Valencourt, “Blockchain Quick Referenceby Brenn Hill”, Packt Publishing , 2018
Web Resource(s):
1. https://www.geeksforgeeks.org/how-does-the-blockchain-work/ 2. https://onlinecourses.nptel.ac.in/noc22_cs44/preview

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Remember the basics of Blockchain and Decentralized system.	K1,K2
CO2	Understand the Hash functions and Blockchain components.	K3
CO3	Apply and estimate the Smart contracts.	K4
CO4	Analyze the Bitcoins and Decentralized Applications.	K5
CO5	Evaluate the Blockchain vertical solution and allied Technology.	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	1	3	3	3	3	3	2	3	2.7
CO3	3	3	1	3	3	2	3	2	3	1	2.4
CO4	3	3	1	3	2	3	2	3	2	1	2.3
CO5	2	3	2	2	3	3	3	3	1	3	2.5
Mean Overall Score											2.42
Correlation											Medium

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

Course Coordinator: Mr. P. Shaik Abdulla

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23PIT3DE3B	Discipline Specific Elective - III	6	4	25	75	100
Course Title		Big Data Analytics					

SYLLABUS		
Unit	Contents	Hours
I	Introduction to Big Data: Characteristics and Types of Digital Data: Unstructured, Semi-Structured and Structured – Introduction to Big Data – Sources of Big Data – Characteristics and Necessity of Big Data – Big Data Terminologies – Big Data Architecture – Challenges with Big Data – Data Environment Vs Big Data Environment – Big Data Analytics: What is Big Data Analytics – Classification of Analytics – * Data Analytics Life Cycle * – Data Scientists: Skills and Responsibilities.	18
II	Big Data Technology: The BigData Technology Landscape: NoSQL- Introduction to Hadoop: Why Hadoop? -RDBMS Vs Hadoop – Distributed Computing Challenges – History of Hadoop – History of Hadoop – Hadoop Overview – Use case of Hadoop – Hadoop Distributors – HDFS – Processing Data with Hadoop – *Managing Resources and Applications with Hadoop YARN* – Interacting with Hadoop Ecosystem.	18
III	Introduction to MongoDB : What is MongoDB? – Why MongoDB? – Terms Used in RDBMS and MongoDB – Data Types in MongoDB – MongoDB Query Language. Big Data Management: Introduction to NoSQL Database – Features – Types of NoSQL Databases – Merits and Demerits of NoSQL – Applications – Introduction to New SQL – *SQL Vs NoSQL Vs NewSQL*.	18
IV	Introduction to Cassandra: Introduction to Apache Cassandra - Features of Cassandra – CQL Data Types – CQLSH – CRUD – Collections – Using a Counter – Time to Live (TTL) – Alter Commands. Introduction to MAPREDUCE Programming: Introduction – *Mapper – Reducer *– Combiner – Partitioner – Searching – Sorting – Compression.	18
V	Introduction to HIVE: What is Hive? – Hive Architecture – Hive Data Types – Hive File Format – Hive Query Languages – * RCFile Implementation* – SerDe – User-Defined Function (UDF) - Machine Learning definitions- Machine Learning Algorithm.	18
VI	Current Trends (For CIA Only): Clustering, Collaborative Filtering.	

* * Self Study

Text Book(s):
1. Seema Acharya, Subhashini Chellappan, “ Big Data Analytics”, Wiley Publications, 2016.
Reference Book(s):
1. Andrew Troelsen, “ProC#5.0 and the .NET4.5 Framework”, Apress, SixthEdition, 2017
2. Bill Evjen, DevinRader, Farhan Muhammad, Scott Hanselman, Srivakumar, “Professional ASP.NET 1.1”, Wily Publishing, 2004
Web Resource(s):
1. https://dotnettutorials.net/course/csharp-dot-net-tutorials/
2. https://www.homeandlearn.co.uk/csharp/csharp.html
3. https://www.w3schools.com/asp/
4. https://onlinecourses.nptel.ac.in/noc20_cs92/preview

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Remember Big Data and Big Data Analytics	K1, K2
CO2	Understand about Hadoop &HDFS	K3
CO3	Apply and discuss about MongoDB & NoSQL	K4
CO4	Analyze on Partitioner, Summarize the concept of Sorting, Recall on the concept of compression	K5
CO5	Create Hive and its architecture	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	2	3	1	1	1	3	2	3	2.2
CO2	3	3	3	2	1	1	3	3	2	3	2.4
CO3	3	3	3	2	2	2	1	3	3	2	2.4
CO4	3	2	2	3	1	3	2	2	2	1	2.1
CO5	3	3	3	3	1	1	2	3	3	1	2.3
Mean Overall Score											2.28
Correlation											Medium

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

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

Course Coordinator: Mr. M. Riyaz Mohammed

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23PIT4CC13	Core - XIII	6	6	25	75	100
Course Title		Open Source Technology					

SYLLABUS		
Unit	Contents	Hours
I	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
II	Introducing AngularJS: Introduction: What is MVC? - Benefits - Philosophy – Starting out with Angular JS: 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
III	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 AngularJS Filters? – Creating AngularJS Filters.	18
IV	Perl Programming Language: Introduction – Environment- Syntax Overview – Data Types- Variables- Scalar – Array – Hashes – Control Statements – Looping Statements – Operators	18
V	Perl Advanced Topics: Socket Programming – OOP in Perl – Database Access – CGI Programming- Packages and Modules.	18
VI	Current Trends(For CIA Only) : Comparing Perl to other languages	

* * Self Study

Text Book(s):
1. Robin Nixon , Learning PHP, “MySQL &JavaScript with JQuery, CSS &HTML 5”, O’Reilly, 5th Edition, 2018. 2. Shyam Seshadri and Brad Green, “AngularJS: Up and Running”, First Edition, Published by O’Reilly Media, Inc., 2014
Reference Book(s):
1. M.N. Rao, Fundamentals of Open Source Software, PHI Learning Private Ltd., Delhi, 2015 2. Tom Christiansen, Brian D Foy, Larry Wall, Jon Orwant, “Programming Perl”, O’Reilly, 3 rd Edition, 2017.
Web Resource(s):
1. https://www.tutorialspoint.com/angularjs/index.html 2. https://www.tutorialspoint.com/perl/perl_tutorial.pdf 3. https://www.upgrad.com/blog/node-js-free-online-course/ 4. https://www.mygreatlearning.com/angular-js/free-courses

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Explain the importance of PHP MYSQL for web application development	K1
CO2	Gain the knowledge of the basic principles of AngularJS	K2
CO3	Understand the design of single-page applications and how AngularJS facilitates their development	K3
CO4	To identify basic Perl constructs and to outline Perl debugging commands.	K4
CO5	To implement the concept of CGI and Database Connectivity	K5

Relationship Matirix:

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	Correlation
< 1.5	Low
>= 1.5 and < 2.5	Medium
>= 2.5	High

Course Coordinator: Ms. S. Benazir Butto

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23PIT4CC14P1	Core – XIV (a)	3	3	10	40	50
Course Title		Open Source Technology Lab - Practical					

1. Write a PHP program to print the given number is Armstrong number or not.
2. Write a PHP program to display session id, creation time and last access time of the web page.
3. Write a simple PHP program for database connectivity
4. To change the date format using ng-model
5. Design Login form and validate the username and password
6. To illustrate the use of Filter
7. To demonstrate a shopping list using various built-in functions in Array
8. Develop a simple text fade application
9. Using Keyboard and Mouse events
10. Write a Perl program using Numerical variables and operators
11. Write a Perl Program using Looping Statement (for, foreach Loop)
12. Write a Perl program for database connectivity

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Understand and explain the concepts of PHP	K1,K2
CO2	Apply Angular JS form Control and filters	K2
CO3	Apply components to create simple web applications	K3
CO4	Understand and explain the concept of Perl	K4
CO5	Apply Perl for simple database connectivity	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	3	3	3	3	3	2	3	1	2.7
CO2	3	3	2	3	3	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	2	3	3	1	2	2	2.3
CO5	3	2	2	3	3	3	2	2	3	2	2.4
Mean Overall Score											2.52
Correlation											High

Mean Overall Score	Correlation
< 1.5	Low
>= 1.5 and < 2.5	Medium
>= 2.5	High

Course Coordinator: Ms. S. Benazir Butto

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23PIT4CC14P2	Core – XIV (b)	3	2	10	40	50
Course Title		Web Framework Lab - Practical					

Develop the programs 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 Log in form and validate the username and password

Develop application based on Node.js:

9. Create students 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 student 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	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	2.7	3	3	3	3	3	3	2	3	1	2.7
CO2	2.6	3	2	3	2	3	2	3	2	3	2.6
CO3	2.6	2	3	3	3	3	2	1	3	3	2.7
CO4	2.3	3	2	2	3	3	3	1	2	2	2.3
CO5	2.4	2	2	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
≥1.5and<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	23PIT4PW	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