G.T.N. ARTS COLLEGE, (Autonomous)
DINDIGUL
DEPARTMENT OF M.Sc COMPUTER SCIENCE
SYLLABUS CBCS

(With effect from the academic year 2020-2021)

About the Department

The department of M.Sc (CS & IT) was started in 2006.In 2016, the course was renamed as M.Sc(CS). We are proud to have experienced and erudite faculty members aims to develop core competence in Computer Science and prepare the students to take up a career in the highly competitive IT industry as well as carry out research and development. The curriculum is prepared to suite the requirements of industry and research organizations and is continuously upgraded. Seminar and workshops are organized on a regular basis to keep up with latest trends and technologies. The department consistently maintains good academic records and produced graduates with university rank. The department was awarded with one lakh cash prize for achieving 100% result in the year 2016.The department is committed to its endeavor to deliver the best and groom men and women in future, keeps on shining in the academic and industrial world. We strive to produce computer professionals who would contributed to the building of our nation.

PRINCIPAL

Dr. P. Balagurusamy,M.A., M.Phil., M.Ed., P.G.D.C.A., Ph.D.,

STAFF

1. Dr.K.Boopathi, M.C.A., M.Phil., Ph.D., - Assistant Professor and Head
2. Mrs. R. Santhini Rajeswari, M.C.A., M.Phil., - Assistant Professor
3. Mrs.Sruthi Mohan, M.C.A., M.Phil., - Assistant Professor
4. Dr.C.Kirubakaran, M.C.A., M.Phil., Ph.D., - Assistant Professor

Program Outcomes

On successful completion of the M.Sc. programme, the graduates will be able to,

PO1	Apply knowledge of Computer Science to identify, analyze problems and to provide effective solution in the area of Computing
PO2	Able to identify the customer requirements in multidisciplinary domains, create high level design and implement robust software applications using latest technological skills
PO3	Provide framework for Information Technology users with tools that will assist them in their decision-making when faced with Information Technology ethical dilemmas
PO4	Able to apply design and development principles in the construction of software systems of varying complexity
PO5	Enables students to facilitate effective Data-Information-Knowledge transfer, utilizing appropriate technology-based solutions to accomplish the organization, storage and retrieval of data and information in the creation of knowledge
PO6	Recognize the concept of information as a commodity and how value affects perceptions of information resources
PO7	Able to function effectively on teams to accomplish a common goal

Programme Specific Outcomes (POs)

On successful completion of the M.Sc. Computer Science programme, the graduate will be able to

PSO1	Employ Multi Disciplinary knowledge among subsystems of computing and other domain.
PSO2	Think Critically in analyzing complex problems relevant to the field of study to obtain the required knowledge and information.
PSO3	Solve Problem by Formulate algorithms for real world computational problems and analyze their complexities.
PSO4	Work and play a leading role in team and research processes.
PSO5	Engage in lifelong learning through independent study of new techniques and tools.

Under Choice Based Credit System (CBCS)
Course Pattern for M.Sc. Computer Science

The Post Graduate degree course consists of five vital components. They are as follows:
Part III Core Courses (Theory, Practical, Electives, NME, Project and Internship).

Objectives

The Syllabus for M.Sc. Computer Science Programme under semester system has been designed on the basis of Choice Based Credit System (CBCS), which would focus on job oriented programmes and value added education. It will come into effect from June 2020 onwards.

Eligibility

Candidate for admission to the M.Sc. Computer Science course (Full Time) should posses a B.Sc, (CS), BCA and B.Sc (IT) of this University or as an Examination Accepted as equivalent thereto, with a minimum aggregate of 55% marks in Part III subjects other than Languages and mathematics subject as Ancillary and +2 level mathematics.

Duration of the Course

The students who join the M.Sc. Computer Science - Programme shall undergo a study period of two academic years – Four semesters.

Summary of Hours and Credits - M.Sc Computer Science

Part	Semester	Specification	No. of Courses	Hrs	Credit	Total credits
III	I - VI	**Core Courses**				95
		Theory	13	65	52	
		Practicals	7	35	21	
		Electives	2	8	8	
		Mini Project	1	-	4	
		Internship	1	-	4	
		Project	1	6	6	
	III	**Non Major Elective Course**	1	6	5	5
	Overall Total for all Semesters		26	120	100	100

Course Pattern of M.Sc CS – from 2020-2021 Batch

Sem	Part	Study Component	Course Code	Course Title	Hrs	Credit
I	III	Core Course I	20PCSC11	Mathematical Foundation	5	4
		Core Course II	20PCSC12	Advanced Computer Architecture	5	4
		Core Course III	20PCSC13	Advanced Data Structures	5	4
		Core Course IV	20PCSC14	Distributed Database Systems	5	4
		Core Practical I	20PCSC1P	Lab 1 : Data Structures using C++	5	3
		Core Practical II	20PCSC1Q	Lab 2 : Client Server	5	3
				Total	**30**	**22**
II	III	Core Course V	20PCSC21	Advanced Java Programming	5	4
		Core Course VI	20PCSC22	Object Oriented Analysis and Design	5	4
		Core Course VII	20PCSC23	Distributed Operating System	5	4
		Core Course VIII	20PCSC24	Information Security	5	4
		Core Practical III	20PCSC2P	Lab 3 : Advanced Java Programming	5	3
		Core Practical IV	20PCSC2Q	Lab 4 : UNIX Programming	5	3
		Core Mini Project I	20PCSC2R	Mini Project	-	4
				Total	**30**	**26**
III	III	Core Course IX	20PCSC31	Digital Image Processing	5	4
		Core Course X	20PCSC32	Web Technology	5	4
		Core Practical Course V	20PCSC3P	Lab 5 : Image Processing	5	3
		Core Practical VI	20PCSC3Q	Lab 6 : Web Designing	5	3
		Core Internship I	20PCSC3R	Internship	-	4
		Core Elective Course I	20PCSE31 20PCSE32	Advanced Data Mining Cyber Security	4	4
		Non Major Elective Course I	20PCSN31	Internet and Web Designing	6	5
				Total	**30**	**27**
IV	III	Core Course XI	20PCSC41	Advanced Software Engineering	5	4
		Core Course XII	20PCSC42	Compiler Design	5	4
		Core Course XIII	20PCSC43	Big Data Analytics	5	4
		Core Practical VII	20PCSC4Q	Lab 7: Python Programming	5	3
		Core Elective Course II	20PCSE41 20PCSE42	Artificial Intelligence Internet of Things	4	4
		Core Project I	20PCSC4P	Project	6	6
				Total	**30**	**25**
				Total for all IV Semesters	**120**	**100**

Programme	M.Sc. CS	Programme Code	PCS
Course Code	20PCSC11	Number of Hours/Cycle	5
Semester	I	Max. Marks	100
Part	III	Credit	4
Core Course I			
Course Title	Mathematical Foundation		
Cognitive level Up to K3			

Preamble

The course prepares the student in the area of tautologies, normal form, and properties of algebraic structures, lattices and about Boolean algebra.

Unit I Tautologies **13 Hours**

Introduction - Statements and notation - connectives - Statement Formulas and Truth Tables - Tautologies - Equivalence of Formulas - Duality Law - Tautological implications - Normal Forms.

Unit II Graphs **15 Hours**

Basic Definitions - Paths - Reachability - connectedness - Matrix Representation of graphs.

Unit III Semigroups **18 Hours**

Introduction - Definition and Examples - Some simple Algebraic Systems and General Properties - Semigroups and Monoids - Definition and Examples - Homomorphism of Semigroups and Monoids - Sub semigroups and Submonoids

Unit IV Lattices **16 Hours**

Definition and Examples - Some Properties of Lattices - Lattices as Algebraic Systems - Sublattices - Direct Product - Homomorphism.

Unit V Boolean Algebra **13 Hours**

Some Special Lattices - Definition and Examples in Boolean Algebra -Subalgebra - Direct Product - Homomorphism - Atoms - Antiatoms.

Pedagogy

Class Room Lectures, Seminar, Quiz and Assignments, Home Work Practices.

Text Book

1. Tremblay J.P. (1997), *Discrete Mathematical Structures with Applications to Computer Science.* McGraw Hill Education (India) Private Limited.

Reference Books

1 RudolfLidl& Gunter Pilz. (2006), *Applied Abstract Algebra* , Second Indian Reprint, Springer Verlag, NewYork.

2 A.Gill , (2007) *Applied Algebra for Computer Science*, Prentice Hall Inc, New Jersey.

3 3. Gersting. J.L., (2007) *Mathematical Structures for Computer Science*, Computer Science Press, New York, 3rd Edition .

4 S.Wiitala, *Discrete Mathematics- A Unified Approach*, McGraw Hill Book Co.

E-Resources

- https://www.tutorialspoint.com
- https://www.math.wisc.edu
- https://mathworld.wolfram.com/Tautology.html
- https://projecteuclid.org/euclid.dmj/1077491234
- https://www.khanacademy.org/math/algebra-home/

Course Outcomes

At the end of the course students would be able to:

CO1	Identify mathematical logic to solve problems
CO2	Describe knowledge on the basic concepts of Graph Theory.
CO3	Study in detail the concept of groups
CO4	Solve problems in lattices
CO5	Use the properties of special lattices and Boolean Algebra

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**2**	**2**	**1**	**0**	**1**
CO2	**1**	**1**	**2**	**1**	**2**
CO3	**3**	**2**	**2**	**1**	**1**
CO4	**2**	**0**	**2**	**1**	**1**
CO5	**1**	**0**	**2**	**1**	**1**

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K – Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	**CO1**	Up to K1	2	K1&K1	2(K1&K1)	1(K1)
2	**CO2**	Up to K2	2	K1&K2	2(K2&K2)	1(K2)
3	**CO3**	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
4	**CO4**	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
5	**CO5**	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or Choice)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without choice**	**Consolidated (Rounded off)**
K1	6	8	10	24	24%	24%
K2	4	16	10	30	30%	30%
K3	-	16	30	46	46%	46%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit	Description	Hours	Mode
I Tautologies	a. Introduction ,Statements and notation b. Connectives , Statement Formulas and Truth Tables c. Tautologies, Equivalence of Formula, d. Duality Law e. Tautological implications, Normal Forms.	2 3 2 3 3	Lectures Notes Seminars
II Graphs	a. Basic Definitions b. Paths c. Reachability d. connectedness e. Matrix Representation of graphs.	3 3 3 3 3	Lectures YouTube video
III Semigroups	a. Introduction - Definition and Examples b. Some simple Algebraic Systems and General Properties c. Semigroups and Monoids d. Definition and Examples , Homomorphism of Semigroups and Monoids e. Sub semigroups and Submonoids	3 4 4 3 4	Lectures Notes Seminars
IV Lattices	a. Definition and Examples b. Some Properties of Lattices c. Lattices as Algebraic Systems d. Sublattices , Direct Product e. Homomorphism.	3 4 3 3 3	Notes Assignments Learn through Website
V Boolean Algebra	a. Some Special Lattices b. Definition and Examples in Boolean Algebra c. Subalgebra, Direct Product d. Homomorphism e. Atoms , Antiatoms.	2 3 3 2 3	Lectures Quiz

Course Designed by: Mrs.K.Sujatha,

Programme	M.Sc. CS	Programme Code	PCS
Course Code	20PCSC12	Number of Hours/Cycle	5
Semester	I	Max. Marks	100
Part	III	Credit	4
Core Course II			
Course Title	Advanced Computer Architecture		
Cognitive level Up to K4			

Preamble

The student will learn about the flynn's taxonomy interconnection networks, shared memory and message passing architecture.

Unit I Interconnection Networks 15 Hours

Four Decades of Computing - Flynn's Taxonomy of Computer Architecture- SIMD Architecture - MIMD Architecture- Interconnection Networks - Interconnection Networks Taxonomy - Bus-Based Dynamic Interconnection Networks - Switch-Based Interconnection Networks - Static Interconnection Networks - Analysis and Performance Metrics

Unit II Shared Memory Architecture 15 Hours

Classification of Shared Memory Systems- Bus-Based Symmetric Multiprocessors - Basic Cache Coherency Methods - Snooping Protocols - Directory Based Protocols - Shared Memory Programming - Introduction to Message Passing - Routing in Message Passing Networks - Switching Mechanisms in Message Passing - Message Passing Programming Models Processor Support for Message Passing.

Unit III Abstract Models 18 Hours

The PRAM Model and Its Variations- Simulating Multiple Accesses on an EREW PRAM- Analysis of Parallel Algorithms - Computing Sum and All Sums - Matrix Multiplication - Sorting - Message Passing Model - Leader Election Problem - Leader Election in Synchronous Rings - Computer Networks Basics- Client/Server Systems.

Unit IV Parallel Programming in the Parallel Virtual Machine 14 Hours

Clusters - Interconnection Networks -PVM Environment and Application Structure- Task Creation - Task Groups - Communication Among Tasks - Task Synchronization - Reduction Operations - Work Assignment.

Unit V Message Passing Interface 13 Hours

Communicators- Virtual Topologies - Task Communication - Synchronization - Collective Operations - Task Creation - One-Sided Communication

Pedagogy

Class Room Lectures, Power Point presentation, Seminar, Quiz, Assignments, Discussion.

Text Book

1. Hesham El-Rewini.,Mostafa Abd-El-Barr., 2005, *Advanced Computer Architecture and Parrallel Processing*, Wiley-Interscience, 3rd Edition.

Reference Books

1. Er.Rajiv Chopra., (2013), *Advanced Computer Architecture*, S.Chand Pvt. Ltd.
2. S.S. Jadhav., (2008), *Advanced Computer Architecture and Computing*, Technical Publications.
3. Kai Hwang., Naresh Jotwani.,(2016), *Digital Logic and Computer Organization*, McGraw Hill Education,3rd Edition.

E-Resources

- https://www.tutorialspoint.com/parallel_computer_architecture/parallel_computer_architecture_models.htm
- https://www.studytonight.com/computer-architecture/parallel-processing-and-data-transfer/
- https://www.geeksforgeeks.org/introduction-to-parallel-computing/

- http://www.ddegjust.ac.in/studymaterial/mca-3/ms-33.pdf
- https://www.mcs.anl.gov/~itf/dbpp/text/node7.html

Course Outcomes

At the end of the course students would be able to:

CO1	Identify architecture types
CO2	Review Shared Memory architecture
CO3	Demonstrate abstract models
CO4	Categorize parallel programming
CO5	Illustrate Message passing Interface.

Mapping of Course Outcomes with Program Specific Outcomes:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**1**	**2**	**2**	**2**	**2**
CO2	**2**	**2**	**1**	**2**	**2**
CO3	**1**	**3**	**3**	**1**	**3**
CO4	**1**	**3**	**3**	**2**	**3**
CO5	**1**	**1**	**1**	**2**	**1**

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**Cos**	**K – Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	**CO1**	UptoK1	2	K1&K1	2(K1&K1)	1(K1)
2	**CO2**	UptoK2	2	K1&K2	2(K2&K2)	1(K2)
3	**CO3**	UptoK3	2	K1&K2	2(K3&K3)	1(K3)
4	**CO4**	UptoK3	2	K1&K2	2(K3&K3)	1(K3)
5	**CO5**	UptoK4	2	K1&K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or Choice)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without choice**	**Consolidated (Rounded off)**
K1	6	8	10	24	24%	24%
K2	4	8	10	22	22%	22%
K3	-	16	20	36	36%	36%
K4	-	8	10	18	18%	18%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit	Description	Hours	Mode
I Interconnection Networks	a. Four Decades of Computing ,Flynn's Taxonomy of Computer Architecture. b. SIMD Architecture, MIMD Architecture- Interconnection Networks. c. Interconnection Networks Taxonomy, Bus-Based Dynamic Interconnection Networks. d. Switch-Based Interconnection Networks - Static Interconnection Networks . e. Analysis and Performance Metrics.	3 3 4 3 2	Lectures Notes Seminars
II Shared Memory Architecture	a. Classification of Shared Memory Systems, Bus. b. Based Symmetric Multiprocessors, Basic Cache Coherency Methods. c. Snooping Protocols , Directory Based Protocols , Shared Memory Programming . d. Introduction to Message Passing, Routing in Message Passing Networks, e. Switching Mechanisms in Message Passing. Message Passing Programming Models Processor Support for Message Passing.	2 3 3 3 4	Lectures YouTube video
III Abstract Models	**a.** The PRAM Model and Its Variations**.** b. Simulating Multiple Accesses on an EREW PRAM, Analysis of Parallel Algorithms. c. Computing Sum and All Sums, Matrix Multiplication, Sorting. d. Message Passing Model - Leader Election Problem. e. Leader Election in Synchronous Rings - Computer Networks Basics. f. Client/Server Systems.	3 3 4 4 2 2	Lectures Notes Seminars
IV Parallel Programming in the Parallel Virtual Machine	a. Clusters, Interconnection Networks. b. PVM Environment and Application Structure Task Creation. c. Task Groups, Communication Among Tasks. d. Task Synchronization,Reduction Operations. e. Work Assignment.	3 3 4 2 2	Notes Assignments Learn through Website
V Message Passing Interface	a. Communicators,Virtual Topologies. b. Task Communication , Synchronization . c. Collective Operations ,Task Creation . d. One-Sided Communication	3 4 4 2	Lectures Quiz

Course Designed by: Mrs.R.Santhini Rajeswari

Programme	**M.Sc. CS**	**Programme Code**	**PCS**
Course Code	**20PCSC13**	**Number of Hours/Cycle**	**5**
Semester	**I**	**Max. Marks**	**100**
Part	**III**	**Credit**	**4**
Core Course III			
Course	**Advanced Data Structures**		
Cognitive level Up to K4			

Preamble

The course provides the student a systematic way of solving problems and efficiently implement different data structure. It also deals with organizing a large amount of data.

Unit I Trees and Hashing **15 Hours**

Trees - The Search Tree ADT - AVL Trees, B –Trees - Hashing - Hash function - Separate chaining - Hash table without Linked list - Linear probing - Quadratic probing - Double Hashing, Rehashing - Extendible Hashing.

Unit II Sorting **16 Hours**

Priority Queues - Simple Implementations - Binary Heap - Applications of Priority Queues - Sorting - Insertion sort - The algorithm - STL Implementation of Insertion sort - Analysis of Insertion sort - Shell sort - Heap sort - Merge sort - Quick sort - External sorting.

Unit III Graph Algorithms **17 Hours**

Definitions - Topological sort - Shortest path algorithms - Minimum Spanning Tree - Applications of Depth First Search – undirected graphs – Biconnectivity – Euler circuits - Introduction to NP- Completeness – Easy vs. Hard- The Class NP - NP-complete problems.

Unit IV Algorithm Design Techniques **14 Hours**

Algorithm Design Techniques – Greedy Algorithms- Huffman Codes- Approximate Bin Packing - Divide and Conquer - Selection Problem - Backtracking Algorithms Turnpike reconstruction problem.

Unit V Amortized Analysis **13 Hours**

Binomial queues - skew heaps - Fibonacci Heaps - Cutting Nodes in Leftist Heaps - Lazy Merging for binomial queues - The Fibonacci Heap Operations - Splay tree – Top Down splay trees.

Pedagogy

Class Room Lectures, Seminar, Videos.

Text Book

1. Mark Allen Weiss, (2014), *Data structures and Algorithm analysis in C++*, Pearson Publications, 4th edition.

Reference Books

1. Ellis Horowitz, Sartaj Sahni, (1999), *Fundamentals of Data Structures*, Galgotia publications.

2. Ellis Horowitz, sartaj Sahni, (1998), *Fundamentals of Computer algorithms*, Galgotia publications.

3. Sartaj Sahni, (2005), *Data structures, Algorithms and Applications in C++*, 2nd edition

E-Resources

- https://www.tutorialspoint.com/advanced_data_structures/index.asp
- https://www.udemy.com/course/introduction-to-data-structures/
- https://www.coursera.org/learn/advanced-data-structures
- https://www.geeksforgeeks.org/advanced-data-structures/
- https://en.wikibooks.org/wiki/Advanced_Data_Structures_and_Algorithms

Course Outcomes

At the end of the course students would be able to:

CO1	Compare hashing methods
CO2	Illustrate algorithms for sorting techniques.
CO3	Interpret NP Completeness
CO4	Apply algorithm analysis technique
CO5	Demonstrate splay trees.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**2**	**1**	**2**	**2**	**1**
CO2	**2**	**1**	**2**	**2**	**1**
CO3	**1**	**3**	**3**	**1**	**1**
CO4	**1**	**1**	**1**	**2**	**2**
CO5	**1**	**1**	**1**	**1**	**1**

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**Cos**	**K – Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K2	2	K1 & K1	2(KI&K1)	1(K2)
2	CO2	Up to K2	2	K1 & K2	2(K2&K2)	1(K2)
3	CO3	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
4	CO4	Up to K4	2	K1 & K2	2(K3&K3)	1(K4)
5	CO5	Up to K4	2	K1 & K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without choice**	**Consolidated (Rounded off)**
K1	6	8	-	14	14%	14%
K2	4	16	20	40	40%	40%
K3	-	8	10	18	18%	18%
K4	-	8	20	28	28%	28%
Total Marks	10	40	50	100	100	100

Lesson Plan

Unit	Description	Hours	Mode
I Trees And Hashing	a. Trees, The search Tree ADT b. Avl Trees c. B-Trees d. Hashing, Hash Function, Separate Chaining e. Hash table without Linked List f. Linear probing, Quadratic probing g. Double Hashing, Rehashing h. Extendible Hashing	2 1 1 3 1 3 2 2	Lectures Notes Seminars
II Sorting	a. Priority Queue-Simple implementations b. Binary Heap-Application of Priority Queue c. Sorting-Insertion Sort d. The Algorithm - STL Implementation of Insertion Sort - Analysis of Insertion sort e. Shell sort - Heap sort f. Merge sort - Quick sort - External sorting	2 2 2 5 2 3	Lectures YouTube video
III Graph Algorithms	a. Definition-Topological sort b. Sortest path Algorithms c. Minimum spanning Tree d. Application of Depth First Search -Undirected Graphs e. Biconnectivity - Euler Circuit f. Introduction to NP - Completeness - Easy vs Hard g. The class NP - NP Complete problems	2 2 2 3 3 3 2	Lectures Notes Seminars
IV Algorithm Design Techniques	a. Algorithm Design Techniques b. Greedy Algorithms c. Huffman Codes - Approximate Bin Packing d. Divide and Conquer e. Selection problem f. Backtracking Algorithms Turnpike Reconstruction Problem	2 2 3 2 2 3	Notes Assignments Learn through Website
V Amortized Analysis	a. Binomial Queues b. Skew Heaps - Fibonacci Heaps - Cutting Notes In Leftiest Heaps c. Lazy Merging For Binomial Queues d. The Fibonacci Heap Operations e. Splay Tree - Top Down Splay Tree	2 4 2 2 3	Lectures Quiz

Course Designed by: Dr.K.Boopathi

Programme	M.Sc. CS	Programme Code	PCS
Course Code	20PCSC14	Number of Hours/Cycle	5
Semester	I	Max. Marks	100
Part	III	Credit	4
Core Course IV			
Course Title	Distributed Database Systems		
Cognitive level Up to K3			

Preamble

The Main objective is to course is to understand the foundations of distributed databases. This course design issues, top down and bottom up design methodology, query processing and transactions, and concurrency control & distributed transaction reliability.

Unit I Distributed Database Architecture **15 Hours**

Distributed Data Processing - What is a Distributed Database System? - Promises of DDBSs -Complications Introduced by Distribution - Design Issues - Distributed DBMS Architecture.

Unit II Distributed Database Design **15 Hours**

Top Down Design Process - Distribution Design Issues - Fragmentation- Allocation - Data Directory - Bottom-Up Design Methodology - Schema Matching - Schema Integration - Schema Mapping.

Unit III Data and Access Control **17 Hours**

View Management - Data Security - Semantic Integrity Control - Query Processing Problem - Objectives of Query Processing - Characterization of Query processors - Layers of Query Processing

Unit IV Query Decomposition and Data Localization **13 Hours**

Query Decomposition - Localization of Distributed Data - Query Optimization - Centralized Query Optimization - Join Ordering in Distributed Queries - Distributed Query Optimization.

Unit V Multidatabase Query Processing **15 Hours**

Issues in Multidatabase Query Processing - Multidatabase Query Processing Architecture - Definition of a Transaction - Properties of Transactions - Types of Transactions.

Pedagogy

Class Room Lectures, Seminar, Quiz, Assignments

Text Book

1. Tamer Ozsu, Patrick Valduriez, (2011), *Principles of Distributed Database Systems*, Springer, 3th Edition.

Reference Books

1. Saeed Rahimi, K., Frank Haug, S., (2010), *Distributed Database Management Systems: A Practical Approach*,Wiley Publication.
2. Chhanda Ray, (2009), *Distributed Database Management Systems*, Pearson Education India.
3. Brendan Burns, (2018), *Designing Distributed Systems: Patterns and Paradigms for Scalable, Reliable Services*, O'Reilly Media, Inc,

E-Resources

- https://www.geeksforgeeks.org/distributed-database-system/
- https://link.springer.com/referenceworkentry/10.1007%2F978-0-387-39940-9_701
- https://www.tutorialride.com/distributed-databases/distributed-databases-tutorial.htm
- https://docs.oracle.com/cd/B10501_01/server.920/a96521/ds_concepts.htm
- https://www.mcobject.com/what-is-a-distributed-database-system/

Course Outcomes

At the end of the course students would be able to:

CO1	Outline distributed database architecture and issues
CO2	Summarize schema techniques
CO3	Demonstrate query processing
CO4	Practice query optimization
CO5	Make use of multi database query

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**2**	**1**	**1**	**2**	**1**
CO2	**3**	**1**	**1**	**2**	**1**
CO3	**2**	**2**	**2**	**1**	**2**
CO4	**1**	**2**	**3**	**2**	**1**
CO5	**1**	**2**	**2**	**2**	**1**

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K – Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	**CO1**	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
2	**CO2**	Up to K2	2	K1&K2	2(K1&K1)	1(K2)
3	**CO3**	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
4	**CO4**	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
5	**CO5**	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or Choice)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without choice**	**Consolidated (Rounded off)**
K1	6	16		22	22	22%
K2	4	8	20	32	32	32%
K3		16	30	46	46	46%
Total Marks	10	40	50	100	100	100

Lesson plan

Unit	Description	Hours	Mode
I Distributed Database Architecture	a. Distributed database system b. Promises of distributed database system c. Complications d. Design issues e. DBMS architecture	3 3 2 4 3	Lectures Notes Seminars
II Distributed Database Design	a. Top down design process b. Distribution design process c. Data directory d. Bottom-up-design methodology e. Schema matching f. Schema mapping and integration	2 2 3 3 2 3	Lectures YouTube video
III Data And Access Control	a. View management b. Data security c. Semantic integrity control d. Query Processing Problem e. Characterization of Query process f. Layers of Query Process	2 3 4 3 2 3	Lectures Notes Seminars
IV Query Decomposition And Data Localization	a. Query decomposition b. Localization of distributed data c. Query optimization d. Centralized query optimization e. Join ordering in distributed queries f. Distributed query optimizations	2 3 2 2 2 2	Notes Assignments Learn through Website
V Multi Database Query Processing	a. Issues in multi database query processing b. Multi database query processing architecture c. Transactions d. Properties of transactions e. Types of transactions	4 3 2 3 3	Lectures Quiz

Course Designed by :Mrs. R.Priyadharshini

Programme	M.Sc. CS	Programme Code	PCS
Course Code	20PCSC1P	Number of Hours/Cycle	5
Semester	I	Max. Marks	100
Part	III	Credit	3
Core Practical I			
Course	Lab 1 : Data Structures Using C++		

Preamble

The course provides the student to implement data structure and trace the difference of static and dynamic memory allocation methods. They can able to identify various problem solving methods.

PROGRAMS

1. Implementation of Stack
   a) Using Array b)Using Linked List
2. Implementation of Queue
   a) Using Array b)Using Linked List
3. Implementation of Heap Tree.
4. Implementation of Tree Traversal.
5. Implementation of BFS.
6. Implementation of DFS.
7. Implementation of Merge Sort using Divide and Conquer.
8. Implementation of quick sort, insertion sort.
9. Implementation of Knapsack Problem using Dynamic Programming.
10. Implementation of Warshall's Algorithm using Dynamic Programming.
11. Implementation of Floyd's Algorithm using Dynamic Programming.
12. Implementation of Dijkstra's Algorithm using Greedy Technique.
13. Implementation of Prim's Algorithm using Greedy Technique.
14. Implementation of n-queens Problem using Backtracking.

Note: The above are sample problems; Instructor can add more exercises on their requirements and to the technology.

Pedagogy

Working in Lab, Videos, demos.

Programme	M.Sc. CS	Programme Code	PCS
Course Code	20PCSC1Q	Number of Hours/Cycle	5
Semester	I	Max. Marks	100
Part	III	Credit	3
Core Practical II			
Course Title	Lab 2: Client Server		

Preamble

The course offers the student to learn all kinds of query interaction they make with the database. They can differentiate the SQL with PL/SQL and to develop stored procedure, triggers and packages.

PL/SQL

1. Program using conditional control, iterative controls and sequential controls.
2. Programs using exception handling.
3. Programs using explicit cursors and implicit cursors.
4. Programs using PL/SQL tables and record.
5. Programs using database triggers.
6. Programs to design procedures using in, out, inout parameter.
7. Programs to design procedures using functions.
8. Programs to design procedures using packages.

Database Connection

1. Inventory Control.
2. Banking
3. Students mark list
4. Library Maintenance.
5. Payroll.
6. Invoice
7. Railway Reservation
8. College Admission

Note: The above are sample problems; Instructor can add more exercises on their requirements and to the technology.

Pedagogy

Working in Lab, Videos, Demos.

Programme	M.Sc. CS	Programme Code	PCS
Course Code	20PCSC21	Number of Hours/Cycle	5
Semester	II	Max. Marks	100
Part	III	Credit	4
Core Course V			
Course Title	Advanced Java Programming		
Cognitive level Up to K4			

Preamble

The course provides the student to learn interfaces, Collection classes and to learn about threading concept. It also makes them to learn applet and GUI components, bean and servelet.

Unit I Java Utility Classes **15 Hours**

JavaUtilConcepts - The Collection Interfaces -The Collection Classes - Accessing A collection via an interface - More Utility Classes – Serialization – Serialzable – Externalizable –ObjectOutput – ObjectOutputStream – ObjectInput – ObjectInputStream - stream Benefits - Exploring Java - Java I/O classes and interfaces - File-Dierctories - Using Filename Filter - Creating Directories

Unit II Java thread model **13 Hours**

Java thread model - Main thread - creating a thread - Multiple threads – Priorities –Synchronization - I/O basics - reading and writing console - Print writer class - reading and writing files - Applet Display methods – Networking Basics - socket overview - client/server - reserved sockets - proxy serves - internet addressing - java and the Net - INET address -TCP/IP Client Sockets –Datagram.

Unit III Applets **17 Hours**

Applets - applet basics - methods of building an applet - some General methods of applet- displaying text in status bar - Embedding applet information - The html applet tag - reading parameters into applets - Status window - HTML APPLET Tag - Passing parameter to applet. The Audio Clip Interface -The Applet Stub Interface - Outputting to the Console.

Unit IV AWT controls **14 Hours**

Using AWT controls - Layout managers and Menus - Control fundamentals – Labels buttons - check boxes - Choice controls lists- scroll bar - text field - text area - layout manager- menu bars and menus, Dialog boxes - Handling event using AWT components - Applet - Icons and Labels-Buttons - Combo boxes - Tables - Exploring swing.

Unit V Java Servlet **16 Hours**

Introducing Swing - Exploring Swing - Background-Lifecycle of servlet-Simple servlet-The servlet API-Javax.servlet package-Reading servlet parameters-javax.servlet.http.package-Handling HTTP requests and responses-Cookies-session tracking-security issues.

Pedagogy

Class Room Lectures, Seminar, PowerPoint.

Text Book

1. Herbert Schildt,(2006), *Java-The Complete Reference*, TMH,

Reference Books

1. Balagurusamy.E (2007), *Programming with Java*, TMH ,Third Edition**.**
2. Programming in Java2, K.Somasundaram, Jaico Publishing House, New Delhi, 2009.
3. Mathew T.Nelson (1998), *Foundation Classes*, McGraw-Hill.
4. K.Somasundaram (2013), *Do 'n' Learn JAVA - A Practical Approach*, Anuradha Publications, Chennai.

E-Resources

- https://www.udemy.com/course/advanced-java-programming/

- https://enos.itcollege.ee/~jpoial/allalaadimised/reading/Advanced-java.pdf
- https://lecturenotes.in/subject/368/advanced-java-programming-ajp
- https://pdf.wecabrio.com/advance-java-notes.pdf
- https://www.tutorialspoint.com/java/java_tutorial.pdf
- https://beginnersbook.com/2017/09/java-examples/

Course Outcomes

At the end of the course students would be able to:

CO1	Illustrate utility classes
CO2	Infer multiple thread
CO3	Construct applet programs
CO4	Apply awt classes
CO5	Practice Servlet concepts

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**2**	**2**	**2**	**2**	**2**
CO2	**2**	**2**	**1**	**1**	**1**
CO3	**2**	**3**	**3**	**1**	**1**
CO4	**1**	**1**	**1**	**1**	**3**
CO5	**1**	**1**	**1**	**2**	**3**

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K – Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
2	CO2	Up to K2	2	K1&K2	2(K2&K2)	1(K2)
3	CO3	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
4	CO4	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
5	CO5	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without choice**	**Consolidated (Rounded off)**
K1	6	8	-	14	14	14%
K2	4	8	20	32	32	32%
K3	-	8	10	18	18	18%
K4	-	16	20	36	36	36%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit	Description	Hours	Mode
I Java Utility Classes	**a.** JavaUtilConcepts - The Collection Interfaces	**3**	**Descriptive Method, PPT presentation**
	b. The Collection Classes - Accessing A collection via an interface - More Utility Classes	**3**	
	c. Serialization – Serialzable – Externalizable	**2**	
	d. ObjectOutput – ObjectOutputStream – ObjectInput – ObjectInputStream - stream Benefits	**3**	
	e. Exploring Java - Java I/O classes and interfaces	**2**	
	f. File-Dierctories - Using Filename Filter - Creating Directories	**2**	
II - Java thread model	**a.** Java thread model - Main thread - creating a thread - Multiple threads	**2**	**Descriptive Method, Code Developing**
	b. Priorities –Synchronization	**2**	
	c. I/O basics - reading and writing console - Print writer class - reading and writing files	**2**	
	d. Applet Display methods	**2**	
	e. Networking Basics - socket overview - client/server - reserved sockets - proxy serves - internet addressing	**3**	
	f. java and the Net - INET address -TCP/IP Client Sockets –Datagram.	**2**	
III – Applets	**a.** Applets - applet basics - methods of building an applet - some General methods of applet	**3**	**Descriptive Method, PPT presentation, Assignment**
	b. Displaying text in status bar - Embedding applet information	**3**	
	c. The html applet tag - reading parameters into applets - Status window	**3**	
	d. HTML APPLET Tag - Passing parameter to applet.	**3**	
	e. The Audio Clip Interface	**2**	
	f. The Applet Stub Interface - Outputting to the Console.	**3**	
IV - AWT controls	**a.** Using AWT controls - Layout managers and Menus	**3**	**PPT presentation, Assignment**
	b. Control fundamentals – Labels buttons - check boxes - Choice controls lists- scroll bar - text field - text area	**4**	
	c. Layout manager- menu bars and menus, Dialog boxes	**3**	
	d. Handling event using AWT components - Applet - Icons and Labels-Buttons - Combo boxes - Tables - Exploring swing.	**4**	

V - Java Servlet	**a.** Introducing Swing - Exploring Swing **b.** Background-Lifecycle of servlet-Simple servlet-The servlet API-Javax.servlet **c.** package-Reading servlet parameters-javax.servlet.http.package **d.** Handling HTTP requests and responses **e.** Cookies-session tracking-security issues.	**3** **4** **3** **3** **3**	**Assignment, Seminars**

Course Designed by : Dr.C.Kirubakaran

Programme	M.Sc. CS	Programme Code	PCS
Course Code	20PCSC22	Number of Hours/Cycle	5
Semester	II	Max. Marks	100
Part	III	Credit	4
Core Course VI			
Course Title	Object Oriented Analysis and Design		
Cognitive level up to K4			

Preamble

The student will realize and understand the concept objects with its attributes, life cycle along with UML.

Unit I Object Oriented basics **15 Hours**

An Overview of object oriented systems development – Object basics: An Object Oriented philosophy-Objects –Objects are grouped in classes – Attributes: Object State and properties –Object behavior and methods-Object respond to messages-Encapsulation and Information Hiding- Class Hierarchy-Polymorphism-Object relationships and associations-Case Study.

Unit II Object Oriented Life Cycle **14 Hours**

The software development process- Building High Quality Software- Object Oriented Systems Development –Reusability –Object Oriented Methodologies- Toward Unification- Patterns- The Unified Approach.

Unit III Unified Modeling Language **17 Hours**

Static and Dynamic Models- Why Modeling- UML Diagrams –UML Class Diagram- Use –Case Diagram- UML Dynamic Modeling- UML Extensibility

Unit IV Designing Classes **15 Hours**

The Object-Oriented Design philosophy –UML Objet Constraint Language-Design classes-Class Visibility -Designing classes- Designing Methods and Protocols - Access Layer : Object store and Persistence- Logical and Physical Data Organization

Unit V View Layer **14 Hours**

User Interface Design as a Creative process- Designing view layer Classes-Macro-level Process –Micro Level Process –The purpose of a view layer Interface –Prototyping the user interface –Case Study ViaNet Bank ATM.

Pedagogy:

Class Room Lectures , video, Discussion.

Text Book

1. Ali Bahrami, (2008), *Object Oriented Systems Development*, Irwin McGraw-Hill.

Reference Books

1. Andrew Haigh, (2001), *Object Oriented Analysis and Design*, McGraw Hill
2. Atul Kahate, (2007), *Object Oriented Analysis and Design*, McGraw Hill
3. Mike O'Docherty, (2005), *Object Oriented Analysis and Design-Understanding System Development with UML 2.0*, Wiley India
4. Grady Booch., Robert A.Maksimuchuk., Michael W.Engle., (2007), *Object Oriented Analysis and Design with Application*, Wiley India, 3rd Edition

E-Resources

- https://www.geeksforgeeks.org/object-oriented-analysis-and-design/
- https://medium.com/omarelgabrys-blog/object-oriented-analysis-and-design-introduction-part-1-a93b0ca69d36
- https://www.umsl.edu/~sauterv/analysis/488_f01_papers/quillin.htm
- https://www.coursera.org/learn/object-oriented-design
- https://study.com/academy/lesson/what-is-object-oriented-analysis-design.html

Course Outcomes

At the end of this course, students should be able to:

CO1	Identify object basics
CO2	Review object oriented development process
CO3	Practice UML diagrams
CO4	Categorize designing classes
CO5	Interpret view layer concepts

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**1**	**1**	**1**	**1**	**1**
CO2	**3**	**2**	**1**	**2**	**1**
CO3	**1**	**3**	**3**	**1**	**2**
CO4	**1**	**1**	**2**	**2**	**3**
CO5	**1**	**1**	**1**	**2**	**3**

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K – Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	**CO1**	Up to K1	2	K1&K1	2(K1&K1)	1(K1)
2	**CO2**	Up to K2	2	K1&K2	2(K2&K2)	1(K2)
3	**CO3**	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
4	**CO4**	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
5	**CO5**	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without choice**	**Consolidated (Rounded off)**
K1	6	8	10	24	24	24%
K2	4	8	10	22	22	22%
K3		8	10	18	18	18%
K4		16	20	36	36	36%
Total Marks	10	40	50	100	100	100%

Lesson plan

Unit	Description	Hours	Mode
I Object Oriented Basics	a) Object oriented philosophy b) Attributes c) Object behaviors and methods d) Encapsulation and information hiding e) Class hierarchy f) Polymorphism g) Object relationships and associations	3 2 2 3 1 2 2	Lectures Notes
II Object Oriented Life Cycle	a) Software Design Process b) Building high quality software c) Object oriented development d) Object oriented methodologies e) Unified approach	3 3 3 3 2	Lectures YouTube video
III Unified Modelling Language	a) Static and dynamic models b) UML diagrams c) UML class diagrams d) UML dynamic model e) UML Extensibility	3 3 4 4 3	Lectures Notes Seminars
IV Designing Classes	a) Object oriented philosophy b) UML object Constraints c) Design Class and Class Visibility d) Design methods and Protocols e) Access Layer	3 2 3 3 4	Notes Assignments Websites
V View Layer	a) User interface Design b) Designing View Layer Classes c) Purpose of view layer interface d) Prototyping of User interface	3 4 4 3	Lectures Quiz

Course Designed by : Mrs. R.Priyadharshini

Programme	M.Sc. CS	Programme Code	PCS
Course Code	20PCSC23	Number of Hours/Cycle	5
Semester	II	Max. Marks	100
Part	III	Credit	4
Core Course VII			
Course Title	Distributed Operating System		
Cognitive level Up to K4			

Preamble

The student will learn the concept of distributed systems, its states and events in a distributed system, election algorithms and unix system V message queue, mutex and shared memory concept.

Unit I Distributed Operating systems **15 Hours**

Features of Distributed systems - Network Operating systems - Distributed Operating systems - Reliable inter process communication - IPC Semantics - Distributed computation paradigms –Networking - Model of a distributed system.

Unit II States and Events in a distributed system **15 Hours**

States and Events in a distributed system -Time, clocks and event precedence Recording the state of a distributed system - Operation of distributed control algorithms - Correctness of distributed control algorithms.

Unit III Distributed mutual exclusion **18 Hours**

Distributed mutual exclusion - Distributed deadlock handling - Distributed scheduling algorithms - Distributed termination detection - Election algorithms.

Unit IV System V Message queues **13 Hours**

System V Message queues - msgget, msgsnd, msgrcv, and msgctl function - Mutexes: Locking and unlocking - Producer - consumer problem - Condition variables: Timed waits and Broadcasts - Obtaining and releasing Read -Write Locks - fcntl record locking.

Unit V System V Semaphores **14 Hours**

System V Semaphores - semget,semop,semctl functions - semphore limits - Shared Memory -System V shared memory introduction - shmget, shmat,shmdt,shmctl function - shared memory limits.

Pedagogy

Class Room Lectures, Seminar, Quiz, Assignments, Discussion.

Text Book

1. Dhamdhere D.M (2006), *Operating System a Concept based approach*, TMH publishing company, New Delhi, 2nd Edition,
2. Richard Stevens.W(1999),"*UNIX Network Programming-Interprocess Communications",* Volume 2, PHI Private Limited, New Delhi, 2nd Edition.

Reference Books

1. Andrew S.Tanenbaum, (2008), Distributed *Operating Systems*, Pearson Education.
2. Pradeep K.Sinha , (2012), *Distributed to operating Systems Concepts and Practice*, PHI.
3. Doreen Galli, (2000) , Distributed *Operating Systems Concepts and Practice*, Prentice Hall

E-Resources

- https://ecomputernotes.com/fundamental/disk-operating-system/distributed-operating-system
- http://digitalthinkerhelp.com/distributed-operating-system-tutorial-with-their-types-examples/
- https://www.inf.ed.ac.uk/teaching/courses/ds/slides1516/OS.pdf
- https://www.quora.com/What-is-distributed-operating-system
- http://www.tutorialsspace.com/Operating-System/04-Distributed-operating-system.aspx

Course Outcomes

At the end of the course students would be able to:

CO1	Summarize distributed operating system
CO2	Construct operation on distributed operating system
CO3	Make use of mutual exclusion
CO4	Illustrate System V message queues
CO5	Sketch System V message queues

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**1**	**2**	**2**	**1**
CO2	**1**	**3**	**3**	**1**	**2**
CO3	**1**	**3**	**3**	**1**	**1**
CO4	**1**	**1**	**1**	**3**	**3**
CO5	**1**	**1**	**1**	**2**	**3**

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K – Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	**CO1**	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
2	**CO2**	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
3	**CO3**	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
4	**CO4**	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
5	**CO5**	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without choice**	**Consolidated (Rounded off)**
K1	6	8	-	14	14	14%
K2	4	8	10	22	22	22%
K3	-	8	20	28	28	28%
K4	-	16	20	36	36	36%
Total Marks	10	40	50	100	100	100%

Lesson plan

Unit	Description	Hours	Mode
I Distributed Operating systems	a. Features of Distributed systems b. Network Operating systems c. Distributed Operating systems d. Reliable inter process communication e. IPC Semantics, Distributed computation paradigms . f. Networking - Model of a distributed system.	2 3 2 2 3 3	Lectures Notes
II States and Events in a distributed system	a. States and Events in a distributed system. b. Time, clocks and event precedence Recording the state of a distributed system. c. Operation of distributed control algorithms. d. Correctness of distributed control algorithms.	3 4 4 4	Lectures YouTube video
III Distributed mutual exclusion	a. Distributed mutual exclusion . b. Distributed deadlock handling . c. Distributed scheduling algorithms . d. Distributed termination detection . e. Election algorithms.	3 4 4 3 4	Lectures Notes Seminars
IV System V Message queues	a. System V Message queues - msgget, msgsnd, msgrcv, and msgctl function. b. Mutexes: Locking and unlocking . c. Producer - consumer problem . d. Condition variables: Timed waits and Broadcasts Obtaining and releasing Read - Write Locks. e. fcntl record locking.	3 2 2 3 3	Notes Assignments Websites
V System V Semaphores	a. System V Semaphores - semget, semop, semctl functions. b. semphore limits. c. Shared Memory -System V shared memory introduction. d. shmget, shmat,shmdt,shmctl function - shared memory limits.	4 2 4 4	Lectures Quiz

Course Designed by : Mrs. R.Santhini Rajeswari

Programme	M.Sc. CS	Programme Code	PCS
Course Code	20PCSC24	Number of Hours/Cycle	5
Semester	II	Max. Marks	100
Part	III	Credit	4
Core Course VIII			
Course Title	Information Security		
Cognitive level Up to K3			

Preamble

The student will know the security concepts with its characteristics, business needs, risk identification with its strategies. They understand the information security policy with intrusion detection system.

Unit I Information Security Introduction **14 Hours**

What is security - Key Information Security Concepts - Critical Characteristics of Information - Components of an Information System - Balancing Security and Access - The System Development Life cycle-Security System Development Life cycle.

Unit II The Need for Security **14 Hours**

Business Needs - Protecting the functionality of an organization - Enabling the safe operation of Applications - Attack- Malicious code – hoaxes - password crack - brute force - Risk Identification - Risk Assessing - Risk Control strategies - Defend – Transfer – Mitigate –Accept -Terminate.

Unit III Information security planning **18 Hours**

Information security planning and Governance - Planning levels - Planning and the CISO -Information security policy, standards and practices - Enterprise Information security policy-Issue specific security policy-policy management - Access Control – Firewalls - Firewall processing modes -Categorized by Generation -Firewall architecture - Content Filters.

Unit IV Intrusion detection systems **15 Hours**

Intrusion detection and prevention systems -Trap and Trace Systems -Active Intrusion prevention -Scanning and analysis tools - Port scanners - Firewall analysis tools - Operating System detection tools - Wireless security tools.

Unit V Implementing Information Security **14 Hours**

Information security project management - Developing Security project management-Technical aspects -Conversion strategies -The Bull's Eye Model - Non Technical aspects -Information security maintenance models - Monitoring the external environment - internal environment - planning and risk assessment.

Pedagogy

Class Room Lectures, Seminar, PowerPoint.

Text Book

1. Michael E Whitman and Herbert J Mattord(2010), *Principles of Information Security*, Vikas Publishing House, New Delhi.

Reference Books

1. Micki Krause, Harold Tipton, F., (2009), *Handbook of Information Security Management*, CRC Press LLC.
2. Matt Bishop (2008), Computer Security Art and Science", Pearson/PHI.
3. Umesh Hodeghatta Rao and Umesha Nayak, *The Infosec Handbook-An Introduction to Information security,* Apress.

E-Resources

- https://www.csoonline.com/article/3513899/what-is-information-security-definition-principles-and-jobs.html
- https://searchsecurity.techtarget.com/definition/information-security-infosec

- https://www.infoguardsecurity.com/what-is-information-security-definition-principles-and-policies/
- https://www.cisco.com/c/en_in/products/security/what-is-information-security-infosec.html
- https://www.exabeam.com/information-security/information-security/

Course Outcomes

At the end of the course students would be able to:

CO1	Identify Security Models using SDLC
CO2	Infer risk management
CO3	Choose security planning
CO4	Utilize detection and prevention systems
CO5	Construct security models

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**1**	**2**	**2**	**1**
CO2	**3**	**2**	**1**	**2**	**1**
CO3	**1**	**3**	**3**	**1**	**1**
CO4	**1**	**3**	**2**	**2**	**2**
CO5	**1**	**3**	**2**	**1**	**2**

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**Cos**	**K – Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	**CO1**	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
2	**CO2**	Up to K2	2	K1&K2	2(K2&K2)	1(K2)
3	**CO3**	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
4	**CO4**	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
5	**CO5**	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without choice**	**Consolidated (Rounded off)**
K1	6	8	-	14	14	14%
K2	4	16	20	40	40	40%
K3	-	16	30	46	46	46%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit	Description	Hours	Mode
I Information Security Introduction	a. What is security - Key Information Security Concepts. b. Critical Characteristics of Information . c. Components of an Information System. d. Balancing Security and Access e. The System Development Life cycle f. Security System Development Life cycle.	2 3 3 2 2 2	Lectures Notes Assignments
II The Need for Security	a. Business Needs - Protecting the functionality of an organization. b. Enabling the safe operation of Applications, Attack. c. Malicious code – hoaxes - password crack - brute force d. Risk Identification, Risk Assessing . e. Risk Control strategies - Defend . f. Transfer – Mitigate –Accept -Terminate.	2 2 3 2 2 3	Lectures YouTube video
III Information security planning	a. Information security planning and Governance, Planning levels. b. Planning and the CISO. c. Information security policy, standards and practices. d. Enterprise Information security policy-Issue specific security policy. e. Policy management - Access Control . f. Firewalls - Firewall processing modes. g. Categorized by Generation -Firewall architecture - Content Filters.	2 3 3 2 3 2 3	Lectures Assignments Seminars
IV Intrusion detection systems	a. Intrusion detection and prevention systems. b. Trap and Trace Systems -Active Intrusion prevention . c. Scanning and analysis tools - Port scanners. d. Firewall analysis tools. e. Operating System detection tools. f. Wireless security tools	2 3 3 2 3 2	Lectures Notes
V Implementing Information Security	a. Information security project management . b. Developing Security project management c. Technical aspects -Conversion strategies -The Bull's Eye Model. d. Non Technical aspects -Information security maintenance models. e. Monitoring the external environment . f. internal environment ,planning and risk assessment.	2 3 3 2 2 2	Lectures videos

Course Designed by : Mrs.R.Santhini Rajeswari

Programme	M.Sc. CS	Programme Code	PCS
Course Code	20PCSC2P	Number of Hours/Cycle	5
Semester	II	Max. Marks	100
Part	III	Credit	3
Core Practical III			
Course Title	Lab 3: Advanced Java Programming		

Preamble

The course makes the student to know to implement advanced concepts of Java Multiple thread, database connectivity, java swing and beans concept.

JAVA CONCEPT

1. Using multilevel inheritance process student marks
2. Package illustration
3. To illustrate built-in & user defined exceptions
4. To create multiple threads
5. String manipulation using string methods
6. GUI components, Animation of images
7. Event handling(Focus events, Key events, Paint events, Text events, Mouse events and Window events)
8. File-byte stream. & File - character stream
9. Applet - Graphical method& Threads
10. To implement Single Client-Server Communication.
11. To implement the SQL commands using JDBC.
12. To implement the JTrees and JTable.
13. To create the table using JDBC.

Note: The above are sample problems; Instructor can add more exercises on their requirements and to the technology.

Pedagogy

Working in Lab, Videos.

Programme	M.Sc. CS	Programme Code	PCS
Course Code	20PCSC2Q	Number of Hours/Cycle	5
Semester	II	Max. Marks	100
Part	III	Credit	3
Core Practical IV			
Course Title	Lab 4: Unix Programming		

Preamble

The student will learn to make use of various system calls, understand the basics of interprocess communication. The course allow the student to implement shared memory and message queue.

UNIX PROGRAM LAB

1. Implement system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
2. Implement I/O System calls of UNIX operating system. (open, read, write, etc)
3. Implement to implement fork(), getpid() and wait().
4. Implement to simulate UNIX command: ls.
5. Implement to simulate UNIX command: grep.
6. Given the list of processes, their CPU burst times and arrival times. Display/print the Gantt chart for FCFS. Compute and print the average waiting time and average turnaround time.
7. Given the list of processes, their CPU burst times and arrival times. Display/print the Gantt chart for SJF. Compute and print the average waiting time and average turnaround time.
8. Develop Application using Inter-Process-Communication (Using shared memory, pipes or message queues).
9. Implement the Producer-Consumer problem using semaphores (Using UNIX system calls)
10. Implement some Memory management schemes like Paging and Segmentation.

Note: The above are sample problems; Instructor can add more exercises on their requirements and to the technology.

Pedagogy

Working in Lab, Videos.

Programme	M.Sc CS	Programme Code	PCS		
Course Code	20PCSC2R	Number of Hours/Cycle	-		
Semester	II	Max. Marks	100		
Part	III	Credit	4		
Core Mini Project I					
Course Title	Mini Project		L	T	P
			-	-	-

L-Lecture, T-Tutorial, P-Practical

Preamble

This course practically aims at let the students apply the programming skills to solve real world problems. It encourages the students to understand and develop projects by their own.

Course Requirements and Evaluation:

1. The duration of the study project is for one semester.
2. The students shall submit the report in a prescribed mentioned format on or before a specified date, failing which will warrant disqualification
3. The student shall work under close supervision and consultation with the faculty guide appointed for the purpose at every stage of the research work regularly and get approved falling in which leads to disqualification for appearing in the Viva-Voce examination.
4. The faculty advisor shall be responsible for the continuous assessment of the course and his/her recommendation for final evaluation of the project shall be mandatory.
5. Students have to submit their project report (2 bounded copies) in the prescribed format (70-100) pages in A4 size. The Project work has to be duly recommended by the faculty advisor and the Head of the Department for appearing in the final Viva Voce. The Viva-Voce shall be conducted by an External examiners. The marks will be allotted on the prescribed basis as given below:

A. Internal Assessment

Problem identification	-5marks
Analysis of existing and proposed system	-5 marks
Attending project review meeting	-10 marks
Analysis, Conclusion, and Reporting	-10 marks
Execution of project	-10 marks
Total	-40 marks

B. End Semester Examination (Viva Voce)

Consistency of involvement and meeting deadlines	- 15 marks
Individual Presentations	- 20 marks
The ability for independent work	- 25 marks
Total	- 60 marks

Any proven case of plagiarism or resubmission of project will warrant disqualification

Programme	M.Sc CS	Programme Code		PCS	
Course Code	20PCSC31	Number of Hours/Cycle		5	
Semester	III	Max. Marks		100	
Part	III	Credit		4	
Core Course IX					
Course Title	Digital Image Processing		L	T	P
Cognitive Level		Up to K4	70	5	-

L-Lecture, T-Tutorial, P-Practical

Preamble

The Main objective of this course is to learn the fundamental of digital image processing, transformations, filtering concept and compression.

Unit I	Intensity Transformations	15 Hours
	What is Digital Image Processing? -Fundamental Steps in Digital Image Processing-Components of an Image Processing System-Image Sensing and Acquisition -Image Sampling and Quantization- The Basics of Intensity Transformations and Spatial Filtering-Some Basic Intensity Transformation Functions-Histogram Processing-Histogram Equalization-Histogram Matching (Specification)- Exact Histogram Matching (Specification)- Local Histogram Processing.	
Unit II	**Spatial Filtering**	**15 Hours**
	Fundamentals of Spatial Filtering-The Mechanics of Spatial Filtering-Spatial Correlation and Convolution-Vector representation of linear filtering-generating spatial filter masks-Smoothing spatial filters-Sharpening spatial filters-Image smoothing and sharpening using frequency domain filters.	
Unit III	**Image Restoration and Reconstruction**	**17 Hours**
	A Model of the Image Degradation/Restoration Process - Noise Models- Restoration in the Presence of Noise Only Spatial Filtering- Periodic Noise Reduction Using Frequency Domain Filtering- Estimating the Degradation Function- Image Reconstruction from Projections: Introduction- Principles of X-ray Computed Tomography (CT)- Pseudocolor Image Processing-Color Transform.	
Unit IV	**Image Compression**	**15 Hours**
	Matrix-Image pyramids-subband coding –The Haar transform-. Image Compression Models- Huffman Coding- Golomb Coding-LZW Coding-Bit plane coding-Block Transform Coding-Wavelet Coding.	
Unit V	**Morphological Image Processing**	**13 Hours**
	Preliminaries- Erosion and Dilation- Opening and Closing- The Hit-or-Miss Transform- Some Basic Morphological Algorithms: Boundary Extraction ,Hole Filling,Extraction of Connected Components -Convex Hull -Thinning -Thickening -Skeletons - Pruning - Gray scale Morhphology.	

Pedagogy

Class Room Lectures, Seminar, Quiz, Assignments

Text Book

1. Rafael C. Gonzalez, Richard E. Woods, (2009) *Digital Image Processing*, Pearson Education, 3rd Edition.

Reference Books

1. Chris Solomon, Toby Breckon (2011) *Fundamentals of Digital Image Processing-A practical Approach with examples in MATLAB,* Wiley-Blackwell.
2. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, (2009) *Digital Image Processing,* Pearson Education.
3. Bhabatosh Chanda, Dwijesh Dutta Majumder, (2011), *Digital Image Processing and Analysis,* PHI, 2nd Edition

E-Resources

- https://www.mygreatlearning.com/blog/digital-image-processing-explained/
- https://www.intechopen.com/books/digital-imaging/introductory-chapter-on-digital-image-processing
- https://www.geeksforgeeks.org/digital-image-processing-basics/
- https://www.quora.com/What-are-some-simple-applications-of-digital-image-processing-in-medicine
- https://www.rsipvision.com/image-processing-for-precise-agriculture/

Course Outcomes

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

CO1	Outline the fundamental image processing techniques.
CO2	Illustrate spatial filtering.
CO3	Sketch noise models and restoration methods.
CO4	Categorize the compression techniques.
CO5	Interpret morphological operations.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	1	2	1
CO2	3	2	1	2	2
CO3	1	3	3	1	1
CO4	1	2	2	2	3
CO5	1	2	2	2	3

3. High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No.of Question
1	CO1	Up to K1	2	K1&K1	2(K1&K1)	1(K1)
2	CO2	Up to K2	2	K1&K2	2(K2&K2)	1(K2)
3	CO3	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
4	CO4	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
5	CO5	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or Choice)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	6	8	10	24	24	24%
K2	4	8	10	22	22	22%
K3	-	8	10	18	18	18%
K4	-	16	20	36	36	36%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Intensity Transformations**	**15 Hours**	**Mode**
	a. What is Digital Image Processing? - Fundamental Steps in Digital Image Processing.	**2**	Class Room Lectures
	b. Components of an Image Processing System- Image Sensing and Acquisition	**3**	
	c. Image Sampling and Quantization- The Basics of Intensity Transformations and Spatial Filtering	**3**	
	d. Some Basic Intensity Transformation Functions- Histogram Processing-Histogram Equalization	**3**	
	e. Histogram Matching (Specification)- Exact Histogram Matching (Specification)- Local Histogram Processing.	**4**	
Unit II	**Spatial Filtering**	**15 Hours**	**Mode**
	a.Fundamentals of Spatial Filtering-The Mechanics of Spatial Filtering-	**2**	Class Room Lectures, Group Discussion
	b. Spatial Correlation and Convolution-Vector representation of linear filtering	**3**	
	c. generating spatial filter masks-	**3**	
	d. Smoothing spatial filters	**3**	
	e. Sharpening spatial filters-Image smoothing and sharpening using frequency domain filters.	**4**	
Unit III	**Image Restoration and Reconstruction**	**17 Hours**	**Mode**
	a. A Model of the Image Degradation/ Restoration Process	**3**	Class Room Lectures, Seminar.
	b. Noise Models- Restoration in the Presence of Noise Only Spatial Filtering	**3**	
	c. Periodic Noise Reduction Using Frequency Domain Filtering	**3**	
	d. Estimating the Degradation Function- Image Reconstruction from Projections: Introduction	**4**	
	e. Principles of X-ray Computed Tomography (CT) Pseudocolor Image Processing-Color Transform	**4**	
Unit IV	**Image Compression**	**15 Hours**	**Mode**
	a. Matrix-Image pyramids-subband coding –The Haar transform	**3**	Class Room Lectures,
	b. Image Compression Models- Huffman Coding	**3**	
	c. Golomb Coding- LZW Coding	**3**	
	d. Bit plane coding-Block Transform Coding	**3**	
	e.Wavelet Coding.	**3**	
Unit V	**Morphological Image Processing**	**13 Hours**	**Mode**
	a. Preliminaries- Erosion and Dilation	**2**	Class Room Lectures,
	b.Opening and Closing- The Hit-or-Miss Transform	**2**	
	c.Some Basic Morphological Algorithms: Boundary Extraction, Hole Filling, Extraction of Connected Components	**3**	
	d. Convex Hull –Thinning	**2**	
	e. Thickening -Skeletons -Pruning - Gray scale Morhphology.	**4**	

Course designed by Mrs. R.Santhini Rajeswari

Programme	M.Sc CS	Programme Code		PCS	
Course Code	20PCSC32	Number of Hours/Cycle		5	
Semester	III	Max. Marks		100	
Part	III	Credit		4	
Core Course X					
Course Title	Web Technology		L	T	P
Cognitive Level		Up to K4	70	5	-

L-Lecture, T-Tutorial, P-Practical

Preamble

These courses enable the students to understand the basics of HTML and CSS3 and interface concepts. The students will able to learn about jquery and encoding audio and video.

Unit I	Building blocks of PHP	15 Hours
	The building blocks of PHP- Switching flow – Loops- Code blocks and browser output. Working with functions: Function introduction-Calling functions-Defining a function-Returning values from user-defined functions- Variable scope- Saving state between function calls with static Statement-More about Arguments-Testing for the existence of a function.	
Unit II	**Working with PHP**	**15 Hours**
	Creating a simple input form-Accessing form input with User defined Arrays-Combining HTML and PHP Code on a single page-Using Hidden Fields to save State- Redirecting the User- Sending Mail on Form submission-Working with file uploads. Introducing Cookies- Setting a Cookie with PHP- Deleting a Cookie with PHP-Session Function Overview- Starting a Session –Working with session variable-Passing Session IDs in the Query string – Destroying Sessions and Un Setting Variables-Using Session in an Environment with registered users.	
Unit III	**Working with MySQL**	**18 Hours**
	Learning the MySQL Data types- Learning the Table creation syntax- Using the Insert Command-Using the Select Command-Using Where in Queries- Selecting from Multiple Tables- Using the Update Command to modify the Records- Using t he Replace Command- Using the Delete Command- Frequently used string functions MySQL- Using Date and Time Functions in MySQL with PHP-Working with MySQL Data.	
Unit IV	**Introduction to jQuery**	**14 Hours**
	What jQuery Can Do For You-Obtaining jQuery -Programming Conventions-Selecting And Filtering-The Origin Of The Selectors API -Using The Selectors API-Filtering A Selection-Working With An Element's Relatives-Slicing a Selection-Adding to a selection.	
Unit V	**jQuery -Events**	**13 Hours**
	The Various Event Wrapper Methods- Attaching Other Events-Attaching Persistent Event Handlers- Removing Event Handlers-Creating Custom Events- Setting, Retrieving, and Removing Attributes- Setting Multiple Attributes- Manipulating Class Names-Manipulating HTML and Text Content- Replacing Elements.	

Pedagogy

Class Room Lectures, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments

Text Book

1. Julie C.Meloni, (2012), *Sams Teach Yourself PHP, MySQL and Apache ALL in One*, Pearson Education, Fourth Edition and Sixth Impression.
2. Richard York,(2017), *Web development with jQuery*,Wiley

Reference Book

1. Jon Duckett,Gilles Ruppert, Jack Moore, (2014), *Web Design with HTML,CSS,JavaScript and JQuery*, Wiley.
2. Jeffrey C. Jackson,(2007), *WEB TECHNOLOGIES A Computer Science Perspective*, Pearson Education
3. Nitasha Jain,(2011), *Web Technology* ,

E-Resources

- https://www.study.com/academy/web technology/
- https://www.geeksforgeeks.org/web technology/
- http://en.m.wikibooks.org/wiki/introduction to information technology/web technologies /
- https://www.simplilearn.com/web technology/
- https://www.w3schools.com/web technology tutorial/

Course Outcomes

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

CO1	Define the building blocks of PHP
CO2	Demonstrate the concepts of Forms, Session and Cookies
CO3	Make use of the concepts MySQL
CO4	Examine the jQuery
CO5	Interpret the jquery events

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	1	2	2	1
CO2	1	3	3	1	2
CO3	1	3	3	1	1
CO4	1	1	1	3	3
CO5	1	1	1	2	3

3-High: 2- Moderate: 1-low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No. of Question
1	CO1	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
2	CO2	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
3	CO3	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
4	CO4	Up to K4	2	K1&K2	2(K3&K3)	1(K4)
5	CO5	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or Choice)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	6	8	-	14	14%	14%
K2	4	8	10	22	22%	22%
K3	-	16	20	36	36%	36%
K4	-	8	20	28	28%	28%
Total Marks	10	40	50	100	100%	100%

Lesson plan

Unit I	**Building blocks of PHP**	**15 Hours**	**Mode**
	a. The building blocks of PHP- Switching flow – Loops- Code blocks and browser output.	**4**	Lectures Notes Seminars
	b. Working with functions: Function introduction-Calling functions-Defining a function-Returning values from user-defined functions	**4**	
	c. Variable scope- Saving state between function calls with static Statement	**4**	
	d. More about Arguments-Testing for the existence of a function.	**3**	
Unit II	**Working with PHP**	**15 Hours**	**Mode**
	a. Creating a simple input form-Accessing form input with User defined Arrays-Combining HTML and PHP Code on a single page-Using Hidden Fields to save State	**4**	Lectures YouTube video
	b. Redirecting the User- Sending Mail on Form submission-Working with file uploads. Introducing Cookies- Setting a Cookie with PHP- Deleting a Cookie with PHP	**4**	
	c. Session Function Overview- Starting a Session – Working with session variable-Passing Session IDs in the Query string	**4**	
	d. Destroying Sessions and Un Setting Variables-Using Session in an Environment with registered users.	**3**	
Unit III	**Working with MySQL**	**18 Hours**	**Mode**
	a. Learning the MySQL Data types- Learning the Table creation syntax- Using the Insert Command-Using the Select Command.	**4**	Lectures Notes Seminars
	b. Using Where in Queries- Selecting from Multiple Tables- Using the Update Command to modify the Records- Using t he Replace Command	**4**	
	c. Using the Delete Command- Frequently used string functions MySQL	**4**	
	d. Using Date and Time Functions in MySQL with PHP-Working with MySQL Data.	**6**	
Unit IV	**Introduction to jQuery**	**14 Hours**	**Mode**
	a. What jQuery Can Do For You-Obtaining jQuery - Programming Conventions	**4**	Notes Assignments Learn through Website
	b. Selecting And Filtering-The Origin Of The Selectors API	**2**	
	c. Using The Selectors API-Filtering A Selection-Working With An Element's Relatives	**4**	
	d. Slicing a Selection-Adding to a selection.	**4**	
Unit V	**jQuery -Events**	**13 Hours**	**Mode**
	a. The Various Event Wrapper Methods- Attaching Other Events	**4**	Lectures Notes Seminars
	b. Attaching Persistent Event Handlers- Removing Event Handlers-Creating Custom Events	**4**	
	c. Setting, Retrieving, and Removing Attributes-Setting Multiple Attributes-Manipulating Class Names	**3**	
	d. Manipulating HTML and Text Content- Replacing Elements	**2**	

Course designed by Mrs.R.Santhini Rajeswari

Programme	M.Sc CS	Programme Code		PCS	
Course Code	20PCSC3P	Number of Hours/Cycle		5	
Semester	III	Max. Marks		100	
Part	III	Credit		3	
Core Practical V					
Course Title	Lab 5: Image Processing		L	T	P
			-	-	75

L-Lecture, T-Tutorial, P-Practical

Preamble

The course provides the student to implement basic image processing methods, applying various filters and to implement segmentation. The course can be implemented Using Matlab or Scilab(Open source software)

PROGRAMS

1. Implement the spatial image enhancement functions on a bitmap image – Mirroring (Inversion)
2. Implement the spatial image enhancement functions on a bitmap image – Rotation (Clockwise)
3. Implement the spatial image enhancement functions on a bitmap image – Enlargement (Double Size)
4. Implement (a) LowPassFilter(b) HighPass Filter
5. Implement (a) Arithmetic Mean Filter (b) Geometric Mean Filter
6. Implement Smoothing and Sharpening of an eight bit color image
7. Implement (a) Boundary Extraction Algorithm (b) Graham's Scan Algorithm
8. Implement (a) Edge Detection (b) Line Detection
9. Display an image and its histogram
10. Write a Program to perform shrinking, zooming and cropping of an image
11. Write a Program to perform the experiment for histogram equalization.
12. Write a Program to perform blurring and de-blurring on an image.
13. Write a Program to Remove salt and pepper noise in an image.
14. Write a Program to Perform Edge detection using Operators.

Note: The above are sample problems; Instructor can add more exercises on their requirements and to the technology.

Pedagogy

Working in Lab, Videos, and demos.

Programme	**M.Sc CS**	**Programme Code**		**PCS**	
Course Code	**20PCSC3Q**	**Number of Hours/Cycle**		**5**	
Semester	**III**	**Max. Marks**		**100**	
Part	**III**	**Credit**		**3**	
Core Practical VI					
Course Title	**Lab 6: Web Designing**		**L**	**T**	**P**
			-	**-**	**75**

L-Lecture, T-Tutorial, P-Practical

Preamble

The course offers the student to learn web development and web page content management.

PHP:

1. Write a PHP script to Swapping two numbers.
2. Write a PHP script to display filter list.
3. Write a PHP script Email validation.
4. Write a PHP script to create table using MySQL.
5. Write a PHP script to create number guess script.
6. Write a PHP script to upload file.
7. Write a PHP script login validation.
8. Write a PHP script for session.
9. Write a PHP script for cookies.
10. Write a PHP script to perform multiple file tests.
11. Write a PHP script to retrieve data from MySQL (empname and salary).
12. Write a PHP script to upload Image.

JQUERY:

1. Create a simple jQuery enabled page.
2. Retrieving page content using basic jQuery selectors.
3. Retrieving page content using basic jQuery filters.
4. Retrieving page content using basic jQuery Traversing documents.
5. Manipulating page content using jQuery.
6. Manipulating page content using jQuery.
7. Working with jQuery events..

Note: The above are sample problems; Instructor can add more exercises on their requirements and to the technology.

Pedagogy

Working in Lab, Videos, Demos.

Programme	M.Sc CS	Programme Code	PCS		
Course Code	20PCSC3R	Number of Hours/Cycle	-		
Semester	III	Max. Marks	100		
Part	III	Credit	4		
Core Internship I					
Course Title	Internship		L	T	P
			-	-	-

L-Lecture, T-Tutorial, P-Practical

Preamble

The internship experience gives students an opportunity to integrate theory and practice by working in a supervised setting. Consultation and reporting to the faculty advisor guides the student's experience to maximize learning.

Evaluation

- Grading is on a pass/fail basis and based on written and oral reports submitted by the student and with consultation with the on-site supervisor.
- The student will submit 3 written reports and maintain regular contact with the faculty advisor.
- Continuous Internal Assessment – 40 Marks and End Semester Examinations (Viva Voce) - 60 Marks

Outcomes

After completion of the internship experience the student should be able to:

- Integrate and apply theory and understandings from CS courses in a work environment.
- Use common techniques and skills of the computer and information technology field.
- Observe and take part in the management of technology changes within an organization.
- Understand the industry environment of the organization providing the internship.
- Understand the impact and role of computer and information technology on an organization.
- Demonstrate community involvement and reflect on the issues encountered in that involvement.
- Demonstrate the ability to work with supervision and with other employees, and
- Perform various tasks to the satisfaction of the supervisor.

Programme	M.Sc CS	Programme Code			PCS
Course Code	**20PCSE31**	Number of Hours/Cycle			**4**
Semester	**III**	Max. Marks			**100**
Part	**III**	**Credit**			**4**
Core Elective Course I A					
Course Title	**Advanced Data Mining**		**L**	**T**	**P**
Cognitive Level		**Up to K4**	**55**	**5**	**-**

L-Lecture, T-Tutorial, P-Practical

Preamble

This course enables the students to understand the basics of Data Mining and mining Data Streams. Also able to understand the concepts of data mining principles and techniques

Unit I	**Introduction to Data Mining**	**11 Hours**
	Introduction-Data Mining Process-The basic Data Types: non dependency-Oriented Data-Dependency oriented Data-The major Building Blocks	
Unit II	**Data Preparation**	**12 Hours**
	Introduction-Feature Extraction and Portability-Data Cleaning: handling Missing Entries-Handling incorrect and inconsistent entries-scaling and normalization	
Unit III	**Association Pattern Mining**	**14 Hours**
	Introduction- The Frequent Pattern Mining Model- Association Rule Generation Framework- Frequent Itemset Mining Algorithms- Enumeration-Tree Algorithms- Alternative Models: Interesting Patterns- Statistical Coefficient of Correlation- $\chi 2$ Measure- Useful Meta-algorithms- Sampling Methods- Data Partitioned Ensembles.	
Unit IV	**Cluster Analysis**	**12 Hours**
	Introduction- Feature Selection for Clustering- Filter Models- Representative-Based Algorithms- Hierarchical Clustering Algorithms- Probabilistic Model-Based Algorithms	
Unit V	**Cluster Analysis-Advanced Concepts**	**11 Hours**
	Introduction- Clustering Categorical Data- Hierarchical Algorithms- Scalable Data Clustering- High-Dimensional Clustering- Semi supervised Clustering.	

Pedagogy

Class Room Lectures, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments

Text Book

1. Charu c. Aggarwal, (2015),"*Data Mining"*, Springer

Reference Book

1. Jiawei han and Micheline Kambar,(2011) *Data Mining: Concepts and Techniques*, Morgan Kaufmann Publishers,3rd Edition
2. Ian Witten, Eibe Frank,(2011), *Data mining :Practical Machine Learning Tools and Techniques*, Morgan Kaufmann, 3rd edition

E-Resources

- https://www.javapoint.com/data mining tutorial/
- https://www.guru99.com/data mining tutorial/
- http://books.google.co.in/books/about/Data mining /
- https://www.javatpoint/data-mining-cluster-analysis
- https://www.towardsdatascience.com/

Course Outcomes

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

CO1	Relate the Data mining concepts and its process
CO2	Demonstrate the concepts of data types and normalization
CO3	Develop the association pattern mining
CO4	Contrast the cluster analysis
CO5	Explain the advanced cluster analysis concept

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	2	2	1
CO2	2	1	2	2	1
CO3	1	3	3	1	1
CO4	1	1	1	2	2
CO5	1	1	1	1	1

3-High: 2- Moderate: 1-low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K2	2	K1&K2	2(K1&K1)	1(K2)
2	CO2	Up to K2	2	K1&K2	2(K2&K2)	1(K2)
3	CO3	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
4	CO4	Up to K4	2	K1&K2	2(K3&K3)	1(K4)
5	CO5	Up to K4	2	K2& K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or Choice)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	4	8	-	12	12%	12%
K2	6	8	20	34	34%	34%
K3	-	16	10	26	26%	26%
K4	-	8	20	28	28%	28%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Introduction to data mining**	**11 Hours**	**Mode**
	a. Introduction, data mining process, basic data types	**3**	Lectures Notes Seminars
	b. Major building blocks :A bird's eye view	**3**	
	c. Association pattern mining and its features	**3**	
	d. Data clustering, outlier detection- data classification	**2**	
Unit II	**Data Preparation**	**12 Hours**	**Mode**
	a. Introduction , feature extraction and portability	**4**	Lectures YouTube video
	b. Data cleaning, handling missing entries	**4**	
	c. In correct and inconsistent entries, scaling and normalization	**4**	
Unit III	**Association Pattern Mining**	**14 Hours**	**Mode**
	a. Introduction- The Frequent Pattern Mining Model	**3**	Lectures Notes Seminars
	b. Association Rule Generation Framework	**3**	
	c. Frequent Itemset Mining Algorithms- Enumeration-Tree Algorithms	**3**	
	d. Alternative Models: Interesting Patterns- Statistical Coefficient of Correlation	**3**	
	e. $\chi 2$ Measure- Useful Meta-algorithms- Sampling Methods- Data Partitioned Ensembles.	**2**	
Unit IV	**Cluster Analysis**	**12 Hours**	**Mode**
	a. Introduction- Feature Selection for Clustering	**3**	Notes Learn through Website
	b. Filter Models- Representative-Based Algorithms	**3**	
	c. Hierarchical Clustering Algorithms	**3**	
	d. Probabilistic Model-Based Algorithms	**3**	
Unit V	**Cluster Analysis- Advanced Concepts**	**11 Hours**	**Mode**
	a. Introduction- Clustering Categorical Data	**3**	Lectures Group Discussion Seminars
	b. Hierarchical Algorithms	**3**	
	c. Scalable Data Clustering	**2**	
	d. High-Dimensional Clustering- Semisupervised Clustering.	**3**	

Course designed by Mrs.R.Santhini Rajeswari

Programme	M.Sc CS	Programme Code		PCS
Course Code	**20PCSE32**	Number of Hours/Cycle		**4**
Semester	**III**	Max. Marks		**100**
Part	**III**	**Credit**		**4**
Core Elective Course I B				
Course Title	**Cyber Security**	**L**	**T**	**P**
Cognitive Level	**Up to K4**	**55**	**5**	**-**

L-Lecture, T-Tutorial, P-Practical

Preamble

This course enables the students to understand the broad set of technical aspects of cyber security and able to understand the purpose of intrusion detection problem and understand the threat from cyber crime

Unit I	**Introduction to Cyber Crime**	**11 Hours**
	Introduction-Role of Electronic Communication Devices and Information and Communication Technologies in Cybercrime - Types of Cybercrime-Cybercrime against Individuals and property-Classification of Cybercriminals - Execution of Cybercrime -Tools used in Cybercrime - Factors Influencing Cybercrime -Challenges to Cybercrime-Strategies to Prevent Cybercrimes-Extent of Cybercrime.	
Unit II	**Cybercrime—The Present and the Future**	**12 Hours**
	Introduction to Cyber War—The Present and the Future of Cybercrime –Cryptocurrency: Characteristics ,Types - Bitcoin : Bitcoin Cash - Ethereum - Comparison between Bitcoin and Ethereum - Blockchain :Association between bitcoin and blockchains-Ransomware: Evolution, types, entities affected by ransomware and steps-Deep web and Dark Web-Deep Web and its Challenges.	
Unit III	**Introduction to Cyber Forensics**	**14 Hours**
	Interrelation among Cybercrime, Cyber Forensics, and Cyber Security-Cyber Forensics-Disk Forensics-Network Forensics - Wireless Forensics-Database Forensics-Malware Forensics-Mobile Forensics-GPS Forensics-Email Forensics-Memory Forensics.	
Unit IV	**Digital Evidence**	**12 Hours**
	Introduction to Digital Evidence and Evidence Collection Procedure-Sources of Evidence -Digital Evidence from Standalone Computers/Electronic Communication Devices - Operating Systems and their Boot Processes- Storage Medium- File System-Windows Registry-Windows Artifacts-Browser Artifacts-Digital Evidence on the Internet.	
Unit V	**Cyber Forensics—The Present and the Future**	**11 Hours**
	Forensic Tools-Cyber Forensic Suite-Drive Imaging and Validation Tools- Forensic Tool for Integrity Verification and Hashing, Data Recovery, RAM analysis, Analysis of Registry, Encyption/Decryption, Password recovery, Analysing network and Mobile devices-Need for Computer Forensic Investigators	

Pedagogy

Class Room Lectures, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments.

Text Book

1. Dejey, S.Murugan (2018)*"Computer Forensics "*, Oxford University press ,

Reference Book

1. W.A. Conklin , G. White,(2016),*Principles of Computer Security*, Mc Graw Hill, fourth edition
2. William stalling, (2013), *Cryptography and Network Security Principles and Practices*, Tata McGraw-Hill , 7th edition
3. Bernadette H Schell, Clemens Martin,(2004),*Cybercrime*, ABC-CLIO Inc., California.

E-Resources

- https://www.newhorizons.com/promotions/cybersecurity-ebooks/
- http://books.google.co.in/books/about/cybercrime_and_Digital_Forensics/
- https://www.javapoint.com/cyber security tutorial/
- https://www.simplilearn.com/cyber security tutorial/
- https://www.w3schools.com/cyber security tutorial/

Course Outcomes

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

CO1	Define the Cyber crime
CO2	Explain the concepts of Cyber crime
CO3	Identify the Cyber Forensics
CO4	Examine the Digital Evidence
CO5	Discover the Cyber Forensics tools

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	1	1
CO2	2	2	3	2	2
CO3	2	2	3	2	2
CO4	2	2	3	2	2
CO5	2	3	3	2	2

3-High: 2- Moderate: 1-low

Articulation Mapping - K Levels with Course Outcomes

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No. of Question
1	CO1	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
2	CO2	Up to K2	2	K1&K2	2(K2&K2)	1(K2)
3	CO3	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
4	CO4	Up to K4	2	K1&K2	2(K3&K3)	1(K4)
5	CO5	Up to K4	2	K1&K2	2(K3&K3)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or Choice)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	6	8	-	14	14	14%
K2	4	16	20	40	40	40%
K3	-	16	10	26	26	26%
K4	-	-	20	20	20	20%
Total Marks	10	40	50	100	100	100%

.

Lesson Plan

Unit I	**Introduction to Cyber Crime**	**11 Hours**	**Mode**
	a. Introduction-Role of Electronic Communication Devices and Information and Communication Technologies in Cybercrime -Types of Cybercrime	**3**	Lectures Notes Seminars
	b. Cybercrime against Individuals and property-Classification of Cybercriminals	**3**	
	c. Execution of Cybercrime -Tools used in Cybercrime- Factors Influencing Cybercrime	**3**	
	d. Challenges to Cybercrime-Strategies to Prevent Cybercrimes-Extent of Cybercrime.	**2**	
Unit II	**Cybercrime—The Present and the Future**	**12 Hours**	**Mode**
	a. Introduction to Cyber War—The Present and the Future of Cybercrime –Cryptocurrency: Characteristics ,Types.	**4**	Lectures YouTube video
	b. Bitcoin :Bitcoin Cash - Ethereum - Comparison between Bitcoin and Ethereum	**3**	
	c. Blockchain :Association between bitcoin and blockchains-Ransomware: Evolution, types, entities affected by ransomware and steps	**3**	
	d. Deep web and Dark Web-Deep Web and its Challenges.	**2**	
Unit III	**Introduction to Cyber Forensics**	**14 Hours**	**Mode**
	a. Interrelation among Cybercrime, Cyber Forensics, and Cyber Security-Cyber Forensics	**3**	Lectures Notes Seminars
	b. Disk Forensics-Network Forensics -Wireless Forensics-Database Forensics	**4**	
	c. Malware Forensics-Mobile Forensics-	**4**	
	d. GPS Forensics-Email Forensics-Memory Forensics	**3**	
Unit IV	**Digital Evidence**	**12 Hours**	**Mode**
	a. Introduction to Digital Evidence and Evidence Collection Procedure-Sources of Evidence	**3**	Notes Assignments Learn through Website
	b. Digital Evidence from Standalone Computers/Electronic Communication Devices - Operating Systems and their Boot Processes	**3**	
	c. Storage Medium- File System- Windows Registry	**3**	
	d. Windows Artifacts-Browser Artifacts-Digital Evidence on the Internet.	**3**	
Unit V	**Cyber Forensics—The Present and the Future**	**11 Hours**	**Mode**
	a. Forensic Tools-Cyber Forensic Suite-Drive Imaging and Validation Tools	**3**	Lectures Notes Seminars
	b. Forensic Tool for Integrity Verification and Hashing, Data Recovery	**3**	
	c. RAM analysis, Analysis of Registry, Encyption/Decryption, Password recovery	**3**	
	d. Analysing network and Mobile devices-Need for Computer Forensic Investigators	**2**	

Course designed by Dr.K.Boopathi

Programme	M.Sc CS	Programme Code			PCS
Course Code	**20PCSN31**	Number of Hours/Cycle			**6**
Semester	**III**	Max. Marks			**100**
Part	**III**	**Credit**			**5**
Non Major Elective Course I					
Course Title	**Internet and Web Designing**		**L**	**T**	**P**
Cognitive Level		**Up to K4**	**85**	**5**	**-**

L-Lecture, T-Tutorial, P-Practical

Preamble

To learn introduction to Internet programming and Web application development. Subjects covered include basic web page development and an introduction to dynamic web page development using client-side scripting. To be aware of Hyper Text Markup Language, Dynamic HTML, PHP, java scripts, VB Script.

Unit I	**Introduction to Internet**	**14 Hours**
	History of the Internet: Basic concepts – Communicating on the internet – Internet domains – Internet server identities – Establishing connectivity on the internet – Client IP address – How IP addressing case into existence? A brief overview of TCP/IP and its services - How does the Internet Work?; Routers;	
Unit II	**HTML**	**18 Hours**
	Information files creation – Web server and client / Browser – HTML – Commonly used HTML commands – Titles and footers – Text Formatting – Emphasizing material in a web page – Text styles – Other text effects. Types of Lists. Using the BORDER Attribute – Using the WIDTH and HEIGHT Attribute – Using the ALIGN Attribute – Using the ALT Attribute. Using the CELLPADDING Attribute – Using the CELLSPACING Attribute – Using the BGCOLOR Attribute – Using the COLSPAN and ROWSPAN Attributes. Links: Images as Hyperlinks. Introduction to Frames.	
Unit III	**CSS**	**18 Hours**
	Basics of CSS: Applying CSS Code - Syntax of a CSS rule - Selecting an Element - Selecting Classes and IDs - More Selectors - Case Insensitivity - Order of Precedence - Display Inconsistency - Comments - CSS Box Model: Width and Height Properties - Overflow Property - Padding and Margin Properties - Border Properties	
Unit IV	**PHP and Javascripts**	**20 Hours**
	Basic Development Concepts - Writing and Running the Script - Handling Script Errors - Mixing PHP with HTML - Storing Data in Variables - Understanding PHP's Data Types - Manipulating Variables with Operators - Handling Form Input - Conditional Statements – loops – Javascripts: Writing Java Script into HTML – Basic Programming Techniques – Operators and Expressions in Java Script – JavaScript Programming Constructs Conditional Checking – Super Controlled-Endless Loops – User Defined Functions – Placing Text in a Browser – Dialog Boxes. The Form Object – Other Built-in Objects in JavaScript – User Defined Objects. What are Cookies – Setting a Cookie.	

Unit V	VB Script & Server Page	20 Hours
	Introduction – Embedding VBScript Code in an HTML Document – Comments – Variables – Operators – Procedures – Conditional Statements – Looping Constructs – Objects and VBScript – Cookies. Introduction – Advantages of JSP – Developing First JSP – Components of JSP – Reading Requests Information – ASP Introduction – Advantages of Using ASP – First ASP Script – Processing of ASP Scripts with forms – Variables and Constructs – Subroutines – Include/Virtual	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, YouTube, Group Discussion, Seminar, Quiz, Assignments, Brainstorming, Activity

Text Book

1. Ivan Bayross , *Web Enabled Commercial Application Development Using HTML*, DHTML, JavaScript, Perl CGI, BPB Publications, 3rd Revised Edition,

Reference Books

1. Learn CSS in One Day and Learn It Well (Includes HTML5): CSS for Beginners with Hands-on Project.
2. Achyut Godbole., and Atul Kahate., (2013), 3rd Edition, Web technologies , MCgraw hill Education publishers.
3. A Lexis Leon., and Mathews Leon., (2012), Internet for everyone, Leon vikas publishers, 15th anniversary edition.

E-Resources

- http://www.learncodingfast.com/css
- www.tutorialspoint.com › internet_technologies
- www.geeksforgeeks.org › internet-and-web-programming
- www.edureka.co › blog › web-development-tutorial
- www.crectirupati.com › default › files › lecture_notes

Course Outcomes

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

CO1	Analyze the requirements for and create and implement the principles of web page development.
CO2	Manipulate knowledge of objects that interacts with server-based programs
CO3	Experiment the simple features of HTML.
CO4	be able to create and use cascading style sheets (CSS)
CO5	Create and use JavaScript programs.
CO6	Demonstrate the ability to communicate effectively.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	1	3
CO2	2	2	3	2	3
CO3	2	2	3	2	3
CO4	2	2	3	2	3
CO5	2	3	3	2	3
CO6	2	3	3	2	3

3. High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	Up to K1	2	K1&K1	2(K1&K1)	1(K1)
2	CO2	Up to K2	2	K1&K2	2(K2&K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2(K2&K2)	1(K2)
4	CO4	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
5	CO5 &CO6	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or Choice)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	6	8	10	24	24%	24%
K2	4	16	20	40	40%	40%
K3	-	8	10	18	18%	18%
K4	-	8	10	18	18%	18%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Introduction to Internet**	**14 Hours**	**Mode**
	Basic concepts – Communicating on the internet	**1**	Descriptive method, PPT Presentation
	Internet domains – Internet server identities	**2**	
	Establishing connectivity on the internet	**3**	
	Client IP address – How IP addressing case into existence?	**3**	
	A brief overview of TCP/IP and its services	**3**	
	How does the Internet Work?; Routers;	**2**	
Unit II	**HTML**	**18 Hours**	**Mode**
	Information files creation – Web server and client / Browser	**2**	PPT Presentation, Assignments
	HTML – Commonly used HTML commands	**2**	
	Titles and footers – Text Formatting – Emphasizing material in a web page – Text styles – Other text effects	**3**	
	Types of Lists. Using the BORDER Attribute – Using the WIDTH and HEIGHT Attribute – Using the ALIGN Attribute – Using the ALT Attribute.	**3**	
	Using the CELLPADDING Attribute – Using the CELLSPACING Attribute	**3**	
	Using the BGCOLOR Attribute – Using the COLSPAN and ROWSPAN Attributes.	**3**	
	Links: Images as Hyperlinks. Introduction to Frames.	**2**	
Unit III	**CSS**	**18 Hours**	**Mode**
	Basics of CSS: Applying CSS Code - Syntax of a CSS rule	**3**	Descriptive method
	Selecting an Element - Selecting Classes and IDs - More Selectors	**4**	
	Case Insensitivity - Order of Precedence - Display Inconsistency	**3**	
	CSS Box Model: Width and Height Properties - Overflow Property	**4**	
	Padding and Margin Properties - Border Properties	**4**	
Unit IV	**PHP and Javascripts**	**20 Hours**	**Mode**
	Basic Development Concepts - Writing and Running the Script - Handling Script Errors	**2**	Descriptive method, PPT Presentation
	Mixing PHP with HTML - Storing Data in Variables - Understanding PHP's Data Types	**3**	
	Manipulating Variables with Operators - Handling Form Input - Conditional Statements – loops	**3**	
	Javascripts: Writing Java Script into HTML – Basic Programming Techniques – Operators and Expressions in Java Script	**3**	

	JavaScript Programming Constructs Conditional Checking – Super Controlled-Endless Loops	**3**	
	User Defined Functions – Placing Text in a Browser – Dialog Boxes.	**3**	
	The Form Object – Other Built-in Objects in JavaScript – User Defined Objects. What are Cookies – Setting a Cookie.	**3**	
Unit V	**VB Script & Server Page**	**20 Hours**	**Mode**
	Introduction – Embedding VBScript Code in an HTML Document – Comments	**4**	Assignment, PPT Presentation, Group discussions.
	Variables – Operators – Procedures – Conditional Statements – Looping Constructs	**4**	
	Objects and VBScript – Cookies. Introduction	**3**	
	Advantages of JSP – Developing First JSP – Components of JSP – Reading Requests Information – ASP Introduction	**4**	
	Advantages of Using ASP – First ASP Script – Processing of ASP Scripts with forms – Variables and Constructs – Subroutines – Include/Virtual	**5**	

Course designed by Dr. C. Kirubakaran.

Programme	M.Sc CS	Programme Code			PCS
Course Code	20PCSC41	Number of Hours/Cycle			5
Semester	IV	Max. Marks			100
Part	III	Credit			4
Core Course XI					
Course Title	Advanced Software Engineering		L	T	P
Cognitive Level		Up to K4	70	5	-

L-Lecture, T-Tutorial, P-Practical

Preamble

The Main objective of this course is to understand the software engineering concepts used to develop software project .

Unit I	Project Management Concepts	15 Hours
	Project Management Concepts- The management spectrum- People, The product, The process-The project. Process And Project Metrices- Metrices in the Process and Project Domains, Software Measurement-Metrices for Software Quality, Integrating Metrices within the Software Process-Metrices for Small Organizations, Establishing a Software Metrices Program.	
Unit II	**Estimation For Software Projects**	**14 Hours**
	Observation on Estimation-The project Planning Process-Software Scope and Feasibility, Resources-Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Estimation for Object-Oriented Projects, Specialized Estimation Techniques.	
Unit III	**Project Scheduling and Risk Management**	**17 Hours**
	Project Scheduling-Basic Concepts, Project Scheduling, Defining a Task Set for the Software Project- Defining a Task Network- Scheduling. Risk Management- Reactive versus Practice Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation , Monitoring, and Management.	
Unit IV	**Maintenance and Reengineering**	**15 Hours**
	Maintenance and Reengineering- Software Maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering, The Economics of Reengineering.	
Unit V	**Software Process Improvement**	**14 Hours**
	Software Process Improvement-What is SPI?- The SPI Process, The CMMI, The People CMM, Other SPI Frameworks, SPI Return on Investment, SPI Trends Emerging Trends In Software Engineering- Technology Evolution, Observing Software Engineering Trends, Identifying ‘’Soft Trends’’	

Pedagogy

Class Room Lectures, Videos, Seminar, Quiz, Assignments

Text Book

1. Roger S Pressman, (2014), *Software Engineering - A Practitioners Approach, McGraw Hill, 7th Edition.*

Reference Books

1. Ian Sommerville, (2015), *Software Engineering*, Pearson Publishers, 10th edition.

2. Rod Stephens, (2015), *Beginning software Engineering*, Wiley publishers,1st edition.
3. R.A.Khan A.Agarwal, (2014), *Software Engineering - A Practitioners Approach* , Narosa Publishing house.

E-Resources

- https://www.pjsrivastava.com/a-short-guide-to-estimating-software-projects
- https://www.slideshare.net/adeelr456/maintenance-reengineering-of-software
- https://www.slideshare.net/bilalhashmishah/software-process-improvement-12777417
- https://www.exceeders.com/blog/introduction-to-project-management-key-concepts
- https://www.simplilearn.com/project-estimation-techniques-article

Course Outcomes

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

CO1	Define project management concept.
CO2	Outline the project process concept.
CO3	Develop the software project using project scheduling techniques.
CO4	Test for software project using business process reengineering.
CO5	Support the software process improvement.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	1	1	2	1
CO2	3	2	1	2	2
CO3	1	3	3	1	1
CO4	2	3	3	2	1
CO5	1	2	2	2	3

3. High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No. of Question**
1	CO1	Up to K1	2	K1&K1	2(K1&K1)	1(K1)
2	CO2	Up to K2	2	K1&K2	2(K1&K1)	1(K2)
3	CO3	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
5	CO5	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or Choice)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	6	16	10	32	32%	32%
K2	4	8	10	22	22%	22%
K3	-	8	20	28	28%	28%
K4	-	8	10	18	18%	18%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Project Management Concepts**	**15 Hours**	**Mode**
	a. Project Management Concepts- The management spectrum-People, The product, The process-The project.	**4**	Notes Assignments Learn through Website
	b. Process And Project Metrices- Metrices in the Process and Project Domains, Software Measurement	**3**	
	c. Metrices for Software Quality, Integrating Metrices within the Software Process	**3**	
	d. Metrices for Small Organizations,	**2**	
	e. Establishing a Software Metrices Program.	**3**	
Unit II	**Estimation For Software Projects**	**14 Hours**	**Mode**
	a.Observation on Estimation-The project Planning Process-,	**3**	Descriptive method, PPT Presentation
	b. Software Scope and Feasibility, Resources-Software Project Estimation, Decomposition Techniques,	**4**	
	c. Empirical Estimation Models, Estimation for Object-Oriented Projects	**4**	
	d. Specialized Estimation Techniques.	**3**	
Unit III	**Project Scheduling and Risk Management**	**17 Hours**	**Mode**
	a.Project Scheduling-Basic Concepts, Project Scheduling,	**3**	Notes Assignments Learn through Website
	b. Defining a Task Set for the Software Project.	**3**	
	c. Defining a Task Network- Scheduling.	**3**	
	d. Risk Management- Reactive versus Practive Risk Strategies, Software Risks, Risk Identification,	**4**	
	e. Risk Projection, Risk Refinement, Risk Mitigation , Monitoring, and Management.	**4**	
Unit IV	**Maintenance and Reengineering**	**15 Hours**	**Mode**
	a. Maintanance and Reengineering.	**3**	PPT Presentation
	b. Software Maintenance, Software Supportability,	**3**	
	c. Reengineering, Business Process Reengineering,	**3**	
	d. Software Reengineering, Reverse Engineering,	**3**	
	e. Restructuring, Forward Engineering, The Economics of Reengineering.	**3**	
Unit V	**Software Process Improvement**	**14 Hours**	**Mode**
	a.Software Process Improvement-What is SPI?- The SPI Process,	**3**	Descriptive method, PPT Presentation
	b. The CMMI, The People CMM, Other SPI Frameworks, SPI Return on Investment, SPI Trends	**3**	
	c. Emerging Trends In Software Engineering-Technology Evolution,	**3**	
	d. Observing Software Engineering Trends	**3**	
	e. Identifying ‘’Soft Trends’’	**2**	

Course designed by Dr.K.Boopathi

Programme	**M.Sc CS**	**Programme Code**			**PCS**
Course Code	**20PCSC42**	Number of Hours/Cycle			**5**
Semester	**IV**	Max. Marks			**100**
Part	**III**	**Credit**			**4**
Core Course XII					
Course Title	**Compiler Design**		**L**	**T**	**P**
Cognitive Level		**Up to K4**	**70**	**5**	**-**

L-Lecture, T-Tutorial, P-Practical

Preamble

The Main objective of the course is to understand the structure of compiler, learn syntax directed translator, grammars, lexical analyzer and regular expression of automata.

Unit I	**Structure of compiler**	**15 Hours**
	Language Processors-The structure of a compiler-Lexical Analysis-Syntax Analysis- Semantic Analysis –Intermediate code generation-Code optimization-Code Generation-Symbol-Table Management-The Grouping of Phases into Passes-Compiler-Construction Tools-The Evolution of Programming Languages-The Move to Higher-level Languages-Impacts on Compilers.	
Unit II	**Syntax directed translator**	**14 Hours**
	The Science of Building a Compiler-Applications of Compiler Technology-Programming Language Basics-A Simple Syntax-Directed Translator-Syntax Definition - Definition of Grammars- Derivations- Parse Trees-Ambiguity-Associativity of Operators-Precedence of Operators.	
Unit III	**Parsing**	**17 Hours**
	Syntax-Directed Translation-Postx Notation-Synthesized Attributes-Simple Syntax-Directed Definitions-Tree Traversals-Translation Schemes-Parsing-A Translator for Simple Expressions-Lexical Analysis- Symbol Tables.	
Unit IV	**Lexical analysis**	**14 Hours**
	The Role of the Lexical Analyzer - Input Buffering - Specifiication of Tokens- Recognition of Tokens- The Lexical-Analyzer Generator Lex- Finite Automata.	
Unit V	**Design of lexical analyzer**	**15 Hours**
	From Regular Expressions to Automata- Design of a Lexical-Analyzer Generator- Optimization of DFA-Based Pattern Matchers- Syntax Analysis- Introduction- Context-Free Grammars- Writing a Grammar: Lexical Versus Syntactic Analysis- Eliminating Ambiguity.	

Pedagogy

Class Room Lectures, Videos, Seminar, Quiz, Assignments

Text Book

2. Alfred V.Aho, Monica S.Lam Ravi sethi, Jeffrey D. Ullman,(2007) *Compilers – Principles, Techniques & Tools*, Pearson Education, 2nd Edition

Reference Books

1. Douglas Thain, (2019) *Introduction to Compilers and Language Design*, Pearson Education, 2nd Edition

2. Dick Grune, Kees van Reeuwijk, Henri E.Bal, Cariel J.H,(2012) *Modern Compiler Design*, Pearson Education,Springer,2nd Edition
3. Torben Egidius Mogensen,(2017) *Introduction to Compiler design*, Spring,2nd Edition

E-Resources

- https://www.tutorialspoint.com/compiler_design/index.htm
- https://www.geeksforgeeks.org/phases-of-a-compiler/
- https://ecomputernotes.com/compiler-design/phases-of-compiler
- https://www.javatpoint.com/compiler-phases
- https://www.csestack.org/phases-of-compiler-with-example/

Course Outcomes

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

CO1	Recall the structure of the compiler
CO2	Paraphrase the syntax directed translator
CO3	Illustrate tree traversal with simple expression translator
CO4	Sketch lexical analysis
CO5	Demonstrate the design of lexical analyzer.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	1	1	2	1
CO2	3	2	1	2	2
CO3	1	3	3	1	1
CO4	2	3	3	2	1
CO5	1	2	2	2	3

3. High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K1	2	K1&K1	2(K1&K1)	1(K1)
2	CO2	Up to K2	2	K1&K2	2(K1&K1)	1(K2)
3	CO3	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
5	CO5	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or Choice)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	6	16	10	32	32%	32%
K2	4	8	10	22	22%	22%
K3		8	20	28	28%	28%
K4		8	10	18	18%	18%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Structure of compiler**	**15 Hours**	**Mode**
	a. Language Processors-The structure of a compiler	**2**	Notes, Assignment
	b. Lexical Analysis, Syntax Analysis, Semantic Analysis	**3**	
	c. Intermediate code generation, Code optimization-Code Generation, Symbol-Table Management	**4**	
	d., The Grouping of Phases into Passes, Compiler-Construction Tools.	**3**	
	e. -The Evolution of Programming Languages,The Move to Higher-level Languages-Impacts on Compilers	**3**	
Unit II	**Syntax directed translator**	**14 Hours**	**Mode**
	a. The Science of Building a Compiler-Applications of Compiler Technology	**4**	Descriptive learning
	b. Programming Language Basics-A Simple Syntax-Directed Translator	**4**	
	c. Syntax Defnition -Definition of Grammars-Derivations	**3**	
	d. Parse Trees- Ambiguity-Associativity of Operators	**2**	
	e. Precedence of Operators	**1**	
Unit III	**Parsing**	**17 Hours**	**Mode**
	a.Syntax-Directed Translation	**3**	Assignment, Group Discussion
	b. Postx Notation-Synthesized Attributes	**3**	
	c. Simple Syntax-Directed Definitions-Tree Traversals	**4**	
	d. Translation Schemes-Parsing	**3**	
	e. A Translator for Simple Expressions-Lexical Analysis- Symbol Tables.	**4**	
Unit IV	**Lexical analysis**	**14 Hours**	**Mode**
	a. The Role of the Lexical Analyzer	**4**	PPT Presentation, Notes
	b. Input Buffering - Specifiication of Tokens	**3**	
	c. Recognition of Tokens	**2**	
	d. The Lexical-Analyzer Generator Lex	**3**	
	e. Finite Automata.	**2**	
Unit V	**Design of lexical analyzer**	**15 Hours**	**Mode**
	a. From Regular Expressions to Automata-Design of a Lexical	**3**	Descriptive method
	b. Analyzer Generator- Optimization of DFA-Based Pattern Matchers	**3**	
	c. Syntax Analysis- Introduction- Context-Free Grammars	**4**	
	d. Writing a Grammar: Lexical Versus Syntactic Analysis	**3**	
	e. Eliminating Ambiguity	**2**	

Course designed by R.Santhini Rajeswari

Programme	M.Sc CS	Programme Code			PCS
Course Code	**20PCSC43**	Number of Hours/Cycle			**5**
Semester	**IV**	Max. Marks			**100**
Part	**III**	**Credit**			**4**
Core Course XIII					
Course Title	**Big Data Analytics**		**L**	**T**	**P**
Cognitive Level		**Up to K4**	**70**	**5**	**-**

L-Lecture, T-Tutorial, P-Practical

Preamble

To Understand Data Warehouse Environment, Terminologies used in Big Data Environments and Hadoop environment. It helps us to understand challenges in big data and technologies in big data.

Unit I	**Types of Digital Data**	**14 Hours**
	Types of Digital Data: Classification of Digital Data, Introduction to Big Data: Characteristics of data-Evolution of Big data-Challenges of Big data-Other Characteristics of Data Which are not Definitional Traits of Big Data-Why Big Data?-Are we Just an Information Consumer or Do we also produce Information?-Traditional Business Intelligence (BI) versus Big Data – A Typical Data Warehouse Environment – A Typical Hadoop Environment – What is New Today? – What is changing in the Realms of Big Data?	
Unit II	**Big Data Analytics**	**15 Hours**
	Where do we Begin? – What is Big Data Analytics? – What Big Data Analytics Isn't? – Why this Sudden Hype Around Big Data Analytics? – Classification of Analytics – Greatest Challenges that Prevent Business from capitalizing on Big Data – Top Challenges Facing Big Data – why is Big Data Analytics Important? – What kind of Technologies are we looking Toward to Help Meet the Challenges Posed by Big Data? – Data Science – Data Scientist… Your New Best Friend – Terminologies Used in Big Data Environments – Basically Available Soft State Eventual Consistency (BASE) – Few Top Analytics Tools.	
Unit III	**The Big Data Technology Landscape**	**17 Hours**
	The Big Data Technology Landscape: NoSQL (Not Only SQL) – Hadoop, Introduction to Hadoop: Introducing Hadoop – Why Hadoop? – Why not RDBMS? – RDBMS versus Hadoop – Distributed Computing Challenges – History of Hadoop – Hadoop Overview – Use Case of Hadoop – Hadoop Distributors – HDFS(Hadoop Distributed File System) – Processing Data with Hadoop – Managing Resources and Applications with Hadoop YARN(Yet another Resource Negotiator) – Interacting with Hadoop Ecosystem.	
Unit IV	**Introduction to MongoDB**	**14 Hours**
	What's is MongoDB? -Why MongoDB? - Terms Used in RDBMS and MongoDB - Data Types in MongoDB - MongoDB Query language.	
Unit V	**Introduction to MAPREDUCE Programming & Hive**	**15 Hours**
	Introduction to MAPREDUCE Programming: Introduction – Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression, Introduction to Hive: What is Hive? – Hive Architecture – Hive Data Types – Hive File Format – Hive Query Language (HQL) – RCFile Implementation – SerDe – User – Defined Function (UDF).	

Pedagogy

Class Room Lectures, Videos, Seminar, Quiz, Assignments

Text Book

1.Seeme Acharya, Subhashini Chellappan, (2015), *Big Data and Analytics*, Wiley India Pvt.Ltd, 1st Edition.

Reference Books

1. Nathan Marz, James Warren, (2015), *Big Data – Principles and best practices of scalable real-time data systems*, Manning Publication, USA.
2. Bart Baesens , (2015), *Analytics in a Big Data World: The Essential Guide to Data Science and its Applications*, Wiley India Pvt.Ltd.
3. Jared Deamn, (2015), *Big Data, Data Mining and Machine Learning*, Willey India Pvt.Ltd.

E-Resources

- https://www.tutorialspoint.com/mongodb/index.htm
- https://www.oreilly.com/library/view/programming-hive/9781449326944/ch01.html
- https://www.sas.com/en_in/insights/analytics/big-data-analytics.html
- https://searchbusinessanalytics.techtarget.com/definition/big-data-analytics
- https://www.simplilearn.com/what-is-big-data-analytics-article

Course Outcomes

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

CO1	Define the digital data.
CO2	Explain the big data.
CO3	Make use NoSQL and Hadoop
CO4	Analize the MongoDB
CO5	Explain the Mapreduce &Hive.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	1	1	2	1
CO2	3	2	1	2	2
CO3	1	3	3	1	1
CO4	1	2	2	2	3
CO5	1	2	2	2	3

3. High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No.of Question
1	CO1	Up to K1	2	K1&K1	2(K1&K1)	1(K1)
2	CO2	Up to K2	2	K1&K2	2(K2&K2)	1(K2)
3	CO3	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
4	CO4	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
5	CO5	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or Choice)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	6	8	10	24	24%	24%
K2	4	8	10	22	22%	22%
K3	-	8	10	18	18%	18%
K4	-	16	20	36	36%	36%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit	Types of Digital Data	14 Hours	Mode
I	**a.** Types of Digital Data: Classification of Digital Data, Introduction to Big Data: Characteristics of data	**3**	Notes Assignments Learn through Website
	b. Evolution of Big data-Challenges of Big data-Other Characteristics of Data Which are not Definitional Traits of Big Data.	**3**	
	c. Why Big Data?-Are we Just an Information Consumer or Do we also produce Information?	**2**	
	d. Traditional Business Intelligence (BI) versus Big Data – A Typical Data Warehouse Environment	**3**	
	e. A Typical Hadoop Environment – What is New Today? – What is changing in the Realms of Big Data?	**3**	

Unit	Big Data Analytics	15 Hours	Mode
II	**a.** Where do we Begin? – What is Big Data Analytics? – What Big Data Analytics Isn't?	**3**	Descriptive method, PPT Presentation
	b. Why this Sudden Hype Around Big Data Analytics? – Classification of Analytics – Greatest Challenges that Prevent Business from capitalizing on Big Data.	**3**	
	c. Top Challenges Facing Big Data – why is Big Data Analytics Important?	**3**	
	d. What kind of Technologies are we looking Toward to Help Meet the Challenges Posed by Big Data? – Data Science – Data Scientist… Your New Best Friend – Terminologies Used in Big Data Environments	**3**	
	e. Basically Available Soft State Eventual Consistency (BASE) – Few Top Analytics Tools.	**3**	
Unit	**The Big Data Technology Landscape**	**17 Hours**	**Mode**
III	**a.** The Big Data Technology Landscape: NoSQL	**3**	Notes Assignments Learn through Website
	b. Hadoop, Introduction to Hadoop: Introducing Hadoop – Why Hadoop?	**3**	
	c. Why not RDBMS? – RDBMS versus Hadoop – Distributed Computing Challenges – History of Hadoop – Hadoop Overview – Use Case of Hadoop	**4**	
	d. Hadoop Distributors – HDFS(Hadoop Distributed File System) – Processing Data with Hadoop	**3**	
	e. Managing Resources and Applications with Hadoop YARN(Yet another Resource Negotiator) – Interacting with Hadoop Ecosystem.	**4**	
Unit	**MongoDB**	**14 Hours**	**Mode**
IV	**a.** What's is MongoDB?	**3**	Descriptive method, PPT Presentation
	b. Why MongoDB?	**2**	
	c. Terms Used in RDBMS and MongoDB	**3**	
	d. Data Types in MongoDB	**3**	
	e. MongoDB Query language.	**3**	
Unit	**MAPREDUCE &Hive**	**15 Hours**	**Mode**
V	**a.** Introduction to MAPREDUCE Programming Introduction – Mapper – Reducer – Combiner .	**3**	Notes Assignments Learn through Website
	b. Partitioner – Searching – Sorting – Compression	**3**	
	c. Introduction to Hive: What is Hive? – Hive Architecture	**3**	
	d. Hive Data Types – Hive File Format – Hive Query Language (HQL)	**3**	
	e. RCFile Implementation – SerDe – User – Defined Function (UDF).	**3**	

Course designed by Dr.K.Boopathi

Programme	M.Sc CS	Programme Code	PCS		
Course Code	20PCSC4Q	Number of Hours/Cycle	5		
Semester	IV	Max. Marks	100		
Part	III	Credit	3		
Core Practical VII					
Course Title	Lab 7: Python Programming Lab		L	T	P
			-	-	75

L-Lecture, T-Tutorial, P-Practical

Preamble

The course makes the student to know about menu, using of arrays

Python Programming

Section: A (Simple Program)

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. WAP to calculate total marks, percentage and grade of a student, Marks obtained in each of the three subjects are to be input by the user.
3. Write a menu driven program, using user defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. WAP to display the first 'n' terms of Fibonacci series.
5. WAP to find factorial of the given number.
6. WAP to calculate the sum and product of two compatible matrices.

Section: B (Visual Python)

All the programs should be written using user defined functions, wherever possible.

1. Write a menu-driven program to create mathematical 3D objects (Curve, Sphere, Cone, Arrow).
2. WAP to read n integers and display them as a histogram.
3. WAP to display sine, cosine, polynomial and exponential curves.
4. WAP to plot a graph of people with pulse rate p vs height h. The values of p and h are to be entered by the user.

Note: The above are sample problems; Instructor can add more exercises on their requirements and to the technology.

Pedagogy

Working in Lab, Videos.

Programme	M.Sc CS	Programme Code			PCS
Course Code	20PCSE41	Number of Hours/Cycle			4
Semester	IV	Max. Marks			100
Part	III	Credit			4
Core Elective Course II A					
Course Title	Artificial Intelligence		L	T	P
Cognitive Level		Up to K3	55	5	-

L-Lecture, T-Tutorial, P-Practical

Preamble

This course is primarily aimed at students with technical backgrounds who wish to design and develop products and services using AI. A background in basic statistics is required for the course.

Unit I	AI – Introduction	11 Hours
	What IsAI? - The Foundations of Artificial Intelligence - The History of Artificial Intelligence - The State of the Art - **Intelligent Agents:** Agents and Environments – The Nature of Environments	
Unit II	**Problem-solving – Phase I**	**12 Hours**
	Solving Problems by Searching : Problem-Solving Agents - Uninformed Search Strategies - Informed (Heuristic) Search Strategies - Heuristic Functions - **Beyond Classical Search:** Local Search Algorithms and Optimization Problems - Local Search in Continuous Spaces	
Unit III	**Problem-solving – Phase II**	**14 Hours**
	Adversarial Search: Games – Optimal Decisions in Games - Alpha–Beta Pruning – Imperfect Real-Time Decisions – Stochastic Games - **Constraint Satisfaction Problems :** Defining Constraint Satisfaction Problems - Constraint Propagation: Inference inCSPs - Backtracking Search forCSPs - LocalSearch forCSPs	
Unit IV	**Knowledge, reasoning, and planning**	**12 Hours**
	Logical Agents : Knowledge-Based Agents – TheWumpusWorld – Logic - **First-Order Logic:** Representation Revisited - Syntax and Semantics of First-Order Logic – Using First-Order Logic - **Inference in First-Order Logic -** Propositional vs. First-Order Inference	
Unit V	**Learning**	**11 Hours**
	FormsofLearning - Supervised Learning – Learning Decision Trees- **Knowledge in Learning:** ALogical Formulation of Learning - Knowledge in Learning - **Learning Probabilistic Models –** StatisticalLearning	

Pedagogy

Class Room Lectures, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming

Text Book

1. Stuart J. Russell and Peter Norvig, (2010), *Artificial Intelligence - A Modern Approach*, Prentice Hall, ISBN-13: 978-0-13-604259-4, 3rd Edition

Reference Books

1. Avron Ban and Edward A. Feigenbaum, (1979), *Handbook of Artificial Intelligence*, Stanford, California
2. Ela Kumar, (2020), *Artificial Intelligence*, Dreamtech Press
3. Dr. Nilakshi Jain (2019), Artificial Intelligence, As per AICTE: Making a System Intelligent, Wiley

E-Resources

- https://orbograph.com
- https://www.upgrad.com
- https://www.udemy.com
- https://search.visymo.com
- https://jobs.mitula.in

Course Outcomes

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

CO1	Demonstrate fundamental understanding of AI
CO2	Investigate applications of AI techniques in intelligent agents
CO3	Demonstrate awareness and a fundamental understanding of various learning of AI
CO4	Apply basic principles of AI in solutions that require problem solving
CO5	Explore the current learning, scope and potential of intelligent

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	1	1	3	3
CO2	2	2	2	2	3
CO3	2	2	2	3	3
CO4	2	2	2	2	3
CO5	3	2	2	3	3

3. High; 2. Moderate; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No.of Question
1	CO1	Up to K1	2	K1&K1	2(K1&K1)	1(K1)
2	CO2	Up to K2	2	K1&K2	2(K2&K2)	1(K2)
3	CO3	Up toK2	2	K1&K2	2(K2&K2)	1(K2)
4	CO4	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
5	CO5	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or Choice)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	6	8	10	24	24%	24%
K2	4	16	20	40	40%	40%
K3	-	16	20	36	36%	36%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**AI - Introduction**	**11 Hours**	**Mode**
	a. What IsAI? - The Foundations of Artificial Intelligence	**3**	Descriptive method, PPT Presentation
	b. The History of Artificial Intelligence	**2**	
	c. The State of the Art	**2**	
	d. Agents and Environments	**2**	
	e. The Nature of Environments	**2**	
Unit II	**Problem-solving – Phase I**	**12 Hours**	**Mode**
	a. Problem-Solving Agents - Uninformed Search Strategies	**3**	PPT Presentation, Assignments
	b. Informed (Heuristic) Search Strategies - Heuristic Functions'	**3**	
	c. Local Search Algorithms and Optimization Problems	**3**	
	d. Local Search in Continuous Spaces	**3**	
Unit III	**Problem-solving – Phase II**	**14 Hours**	**Mode**
	a. Games – Optimal Decisions in Games	**3**	Descriptive method
	b. Alpha–Beta Pruning – Imperfect Real-Time Decisions	**4**	
	c. Stochastic Games	**2**	
	d. Defining Constraint Satisfaction Problems	**2**	
	e. Inference inCSPs - Backtracking Search forCSPs - LocalSearch forCSPs	**3**	
Unit IV	**Knowledge, reasoning, and planning**	**12 Hours**	**Mode**
	a. Knowledge-Based Agents – TheWumpusWorld	**3**	Descriptive method, PPT Presentation
	b. Representation Revisited - Syntax and Semantics of First-Order Logic	**3**	
	c. Using First-Order Logic	**2**	
	d. Inference in First-Order Logic	**2**	
	e. Propositional vs. First-Order Inference	**2**	
Unit V	**Learning**	**11 Hours**	**Mode**
	a. FormsofLearning - Supervised Learning	**2**	Assignment, PPT Presentation, Group discussions.
	b. Learning Decision Trees	**2**	
	c. A Logical Formulation of Learning - Knowledge in Learning	**3**	
	d. Learning Probabilistic Models	**2**	
	e. Statistical Learning	**2**	

Course designed by Dr.C. Kirubakaran

Programme	M.Sc CS	Programme Code			UCO
Course Code	20PCSE42	Number of Hours/Cycle			4
Semester	IV	Max. Marks			100
Part	III	Credit			4
Core Elective Course II B					
Course Title	Internet of Things		L	T	P
Cognitive Level		Up to K4	55	5	-

L-Lecture, T-Tutorial, P-Practical

Preamble

The Main objective of this course is to enable the students to understand the interconnection via the internet of computing devices embedded in everyday objects, enabling them to send and receive data. This makes them to create real time applications in all domains.

Unit I	**Introduction to IoT**	**11 Hours**
	The Internet of Things: Today – Tomorrow- Vision - Strategic Research and Innovation Directions - Smart-X Applications	
Unit II	**Basic Technologies in IoT**	**12 Hours**
	Internet of Things and Related Future Internet Technologies - Networks and Communication – Processes - Data Management - Security, Privacy & Trust - Device Level Energy Issues - IoT Related Standardization	
Unit III	**Global Standardisation**	**14 Hours**
	IoT Vision: IoT Drivers - IoT Definition - Standardisation Landscape: ETSI – IEEE – IETF - ITU-T - oneM2M - Research Projects Positions: BETaaS Advisory Board Experts Position - IoT6 Position	
Unit IV	**Security, Privacy Framework**	**12 Hours**
	BackgroundWork - Main Concepts and Motivation - A Policy-based Framework for Security and Privacy – Scalable Integration Framework for Heterogeneous Smart Objects, Applications and Services	
Unit V	**IoT Applications**	**11 Hours**
	OpenIoT – iCORE – Compose – SmartSantander – Fitman - OSMOSE	

Pedagogy

Class Room Lectures, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming

Text Book

1. OvidiuVermesan Peter Friess (2014), 'Internet of Things – From Research andInnovation to Market', River Publishers

Reference Books

1. B.K. Tripathy, J. Anuradha (2018), 'INTERNET OF THINGS (IoT) - Technologies, Applications, Challenges, and Solutions', CRC Press (Taylor & Francis Group)
2. David Hanes, Gonzalo Salgueiro (2017), 'IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things' , Cisco Press
3. Andrew Minteer (2017), 'Analytics for the Internet of Things (IoT): Intelligent analytics for your intelligent devices', Packt, ISBN-978-1-78712-073-054499

E-Resources

- https://www.the-reference.com
- https://www.zdnet.com
- https://www.forbes.com
- https://internetofthingsagenda.techtarget.com
- https://www.wired.co.uk

Course Outcomes

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

CO1	Describe what IoT is and how it works today
CO2	Design and program IoT devices
CO3	Use real IoT protocols for communication
CO4	Secure the elements of an IoT device
CO5	Design an IoT application to work with a standard model

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	1	3
CO2	2	3	2	2	3
CO3	2	3	2	2	3
CO4	2	3	2	2	3
CO5	3	3	2	2	3

3. High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K1	2	K1&K1	2(K1&K1)	1(K1)
2	CO2	Up to K2	2	K1&K2	2(K2&K2)	1(K2)
3	CO3	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
5	CO5	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	6	8	10	24	24%	24%
K2	4	16	10	30	30%	30%
K3		8	20	28	28%	28%
K4		8	10	18	18%	18%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Introduction to IoT**	**11 Hours**	**Mode**
	a. The Internet of Things: Today	**2**	Descriptive method, PPT Presentation
	b. The Internet of Things Tomorrow	**2**	
	c. Vision	**2**	
	d. Strategic Research and Innovation Directions	**2**	
	e. Smart-X Applications	**3**	
Unit II	**Basic Technologies in IoT**	**12 Hours**	**Mode**
	a. Internet of Things and Related Future Internet Technologies	**3**	PPT Presentation , Assignments
	b. Networks and Communication – Processes	**2**	
	c. Data Management - Security, Privacy & Trust	**3**	
	d. Device Level Energy Issues	**2**	
	e. IoT Related Standardization	**2**	
Unit III	**Global Standardisation**	**14 Hours**	**Mode**
	a. IoT Vision: IoT Drivers - IoT Definition	**2**	Descriptive method
	b. Standardisation Landscape: ETSI – IEEE	**3**	
	c. IETF - ITU-T - oneM2M	**4**	
	d. Research Projects Positions: BETaaS Advisory Board Experts Position	**3**	
	e. IoT6 Position	**2**	
Unit IV	**Security, Privacy Framework**	**12 Hours**	**Mode**
	a. BackgroundWork	**2**	Descriptive method, PPT Presentation
	b. Main Concepts and Motivation	**2**	
	c. A Policy-based Framework for Security and Privacy	**3**	
	d. Scalable Integration Framework for Heterogeneous Smart Objects	**3**	
	e. Applications and Services	**2**	
Unit V	**IoT Applications**	**11 Hours**	**Mode**
	a. OpenIoT – iCORE	**3**	Assignment ,PPT Presentation , Group discussions.
	b. Compose	**2**	
	c. SmartSantander	**2**	
	d. Fitman	**2**	
	e. OSMOSE	**2**	

Course designed by Dr.C.Kirubakaran

Programme	M.Sc CS	Programme Code	PCS		
Course Code	20PCSC4P	Number of Hours/Cycle	6		
Semester	IV	Max. Marks	100		
Part	III	Credit	6		
Core Project I					
Course Title	Project		L	T	P
			-	-	

L-Lecture, T-Tutorial, P-Practical

Preamble

This course practically aims at acquiring the application of research methods, tools, and techniques and to develop skills of analysis and reporting among the students. This is done by encouraging students to identify researchable problems in their areas of specialization and do independent projects.

Course Requirements and Evaluation:

1. The duration of the study project is for one semester.
2. The students shall submit the report in a prescribed mentioned format on or before a specified date, failing which will warrant disqualification.
3. The student shall work under close supervision and consultation with the faculty guide appointed for the purpose at every stage of the research work regularly and get approved falling in which leads to disqualification for appearing in the Viva-Voce examination.
4. The faculty advisor shall be responsible for the continuous assessment of the course and his/her recommendation for final evaluation of the project shall be mandatory.
5. Students have to submit their project report (2 bounded copies) in the prescribed format (70-100) pages in A4 size. The Project work has to be duly recommended by the faculty advisor and the Head of the Department for appearing in the final Viva Voce. The Viva-Voce shall be conducted by an External examiners. The marks will be allotted on the prescribed basis as given below:

A. Internal Assessment

Problem identification	5marks
Analysis of existing and proposed system	5 marks
Attending project review meeting	10 marks
Analysis, Conclusion, and Reporting	10 marks
Execution of project	10 marks
Total	40 marks

B. End Semester Examination (Viva Voce)

Consistency of involvement and meeting deadlines	- 15 marks
Individual Presentations	- 20 marks
The ability for independent work	- 25 marks
Total	- 60 marks

Any proven case of plagiarism or resubmission of project will warrant disqualification