

M.Sc.(Computer Science) PROGRAMME CREDIT DISTRIBUTION PATTERN (108)

Class	Sem	Core Course	Elective Course			Ability Enhancement Compulsory Courses (AECC)		Total Credit
			Discipline Specific Elective	Dissertation Project	Generic Elective Course	Ability Enhancement Compulsory Courses	Skill Enhancement Courses	
M.Sc. I	I	5 papers 5 x 4= 20 Credits	-	-	HR – I 2 Credit CS – I 2 Credit	Communication Skill 2 Credit	1 Practical = 4 Credits	30
	II	4 papers 4 x 4= 16 Credits	Paper (A) 4 Credit <u>OR</u> Paper (B) 4 Credits	1 Project = 4 Credits	CS – II 2 Credit	-	1 Practical = 4 Credits	30
M.Sc. II	III	4 papers 4 x 4= 16 Credits	Paper (A) 4 Credit <u>OR</u> Paper (B) 4 Credits	1 Project = 4 Credits	-	-	1 Practical = 4 Credits Subject Related Skill Dev. Course 2 Credit	30
	IV	--	--	1 Industrial Training / Institutional Project (IT) = 16 Credits	-	-	Subject Related Skill Dev. Course 2 Credit	18
Total Credits		52	8	24	6	2	16	108

Mandatory 12 additional/ add-on credits for Post Graduate Programmes

Note:

- 1. 6 credits from Group - 1 are compulsory**
- 2. Choose minimum 6 credits from Group - 2 to Group - 7**

Group-1	Human Rights Awareness Course (Semester-I):		02 credit
	Cyber Security Awareness Course (Semester-I)		02 credit
	Cyber Security Awareness Course (Semester-II)		02 credit
Group-2 Skill Component Courses	1. Subject Related Certificate Course (Sem. II)		02 credits
	2. Subject Related skill development course (Sem. III)		02 credits
	3. Subject Related skill development course (Sem. IV)		02 credits
Group-3	(a)	Representation in Sports at University Level	02 credits
	(b)	Representation in Sports at State Level / National level	02 credits
	(c)	Representation in Sports at International (overseas) Level	02 credits
Group-4	(a)	Selection in AVISHKAR at University Level	02 credits
Group-5	(a)	Research paper publication at National level	02 credits
	(b)	Research paper publication at International (overseas) level	02 credits
Group-6	(a)	Participation in Summer School/ Internship programme / Short term course (not less than 2 weeks duration)	02 credits
Group-7	(a)	Participation in cultural and co-curricular activities/ extracurricular activities/competitions at University level / State Level	02 credit
	(b)	Participation in cultural and co-curricular activities / extracurricular activities/ competitions at International (overseas) level	02 credits

Note : 1) One Credit = 15 Lectures.

- 2) The separate Project should be initiated and submitted on the II Semester and III Semester.
- 3) All semester --> 4 Lectures per week / paper.
- 4) The last semester contains full Internship i.e. Industrial Training (IT) Project and reporting Weekly to the institute/department.
- 4) Theory paper be covered with 70% actual teaching (3 actual lectures per week) and 30% component (1 lecture per week) of self-study should be further evaluated through Group discussion / Seminar / Open Book Test / MCQ / Essay writing / Assignment etc.

M.Sc. (Computer Science)-I (Sem. I)

2019 Pattern		2022Pattern	
Subject	Paper Code	Paper Code	Paper Title
Principles of Programming Languages	COMP4101	PSCS111	Principles of Programming Language (C)
Cryptography & Network Security	COMP4102	PSCS112	Cryptography and Cyber Forensics(C)
Database Technologies	COMP4103	PSCS113	Database Technologies (C)
Design and Analysis of Algorithms	COMP4104	PSCS114	Design and Analysis of Algorithms (C)
Programming with DOT NET	COMP4105	PSCS115	Dot Net Framework & C# (C)
Lab Course on DOT NET, PPL and Database Technologies	COMP4106	PSCS116	Lab Course on Dot Net, PPL, DBT & DAA (C)
Human Rights – I	HR-101	HR1	Human Rights – I
Introduction to Cyber Security – I	CYS-101	CYS1	Introduction to Cyber Security – I

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
Autonomous

M.Sc. (Computer Science) Academic Year 2022-2023

M.Sc. (Computer Science) I-Credit Structure

Subject	Semester I	Semester II	Total
Paper-I	4	4	8
Paper-II	4	4	8
Paper-III	4	4	8
Paper-IV	4	4	8
Paper-V	4	4	8
Practical	4	4	8
Practical(Project)	---	4	4
Intro. To Cyber Security-I&II	2	2	4
Human Rights	2	--	2
Certificate Course- I	2	--	2
Total =	30	30	60

M.Sc.(Computer Science)II-Credit Structure

Subject	Semester III	Semester IV	Total
Paper-I	4	Industrial Training Project / Internship (IT) 16	4
Paper-II	4		4
Paper-III	4		4
Paper-IV	4		8
Paper-V	4		8
Practical/ Paper VI (Sem IV)	4		8
Practical(Project)	4		8
Skill Development I & II	2	2	4
			2
Total =	30	18	48

Extra Credits:

1	Human Rights	2 Credits
2	Cyber Security Module I & II	4 Credits
3	Certificate Courses I (communication skill)	2 Credits
4	Skill Development I & II	4 Credits
Total Extra Credits=		12 Credits

Total Credits: Academic Credits (24+28+28+16=96) + Extra Credits(12) =108

Paper wise Course Structure For M.Sc. (Computer Science)-I Semester –I

No	Class	Sem	Code	Paper	Paper Title	Credit	Exam	Marks
1	M.Sc. -I	I	PSCS111	Theory	Principles of Programming Language (C)	4	I / E	60 + 40
2			PSCS112	Theory	Cryptography and Cyber Forensics(C)	4	I / E	60 + 40
3			PSCS113	Theory	Database Technologies (C)	4	I / E	60 + 40
4			PSCS114	Theory	Design and Analysis of Algorithms (C)	4	I / E	60 + 40
5			PSCS115	Theory	Dot Net Framework & C# (C)	4	I / E	60 + 40
6			PSCS116	Pract.	Lab Course on Dot Net, PPL,DBT& DAA (C)	4	I / E	60 + 40
7			HR1	----	Human Rights – I	2	----	----
8			CYS1	----	Introduction to Cyber Security – I	2	----	----
Note: Credit: 24. Core subjects are compulsory and Extra credits (2+2=4) is also compulsory.								

M.Sc.(Computer Science)-I

Semester-I

Syllabus

A.Y.2022-23

SYLLABUS (CBCS) FOR M.Sc. (Computer Science)-I Sem-I

(With effect from June 2022) Academic Year 2022-2023

Class: M. Sc. (Computer Science) (Semester-I)
Title of paper: Principles of Programming Language
Credit - 4

Paper Code: PSCS111
Paper: I
No. of Lectures - 60

Prerequisites:

It is assumed that student learning this course have the following background:

- Experience with an OOP language (such as Java or C++)
- Experience with a procedural language (such as C)
- Working knowledge of C, C++, and Java programming.
- Basic algorithms and data structure concepts.

Objectives:

- This course will prepare you to think about programming languages analytically:
 - Separate syntax from semantics
 - Compare programming language designs
 - Learn new languages more quickly
 - Use standard vocabulary when discussing languages
 - Understand basic language implementation techniques
- **This course focuses on both:**
 - Theory is covered by the textbook readings, lectures and on the tests
 - Implementation is covered by the homework assignments

Unit	Title and Contents	No. of lectures
Unit-I	Programming Domains ✓ The Art of Language Design - The Programming Language Spectrum, Why Study Programming Languages? ✓ Types of Programming Language Domains # Scientific Applications – Large Number of Floating Point Computations – FORTRAN # Business Applications – Produce Reports, Use decimal numbers and characters – COBOL # Artificial Intelligence – Symbols rather than numbers manipulated – LISP # Systems Programming – Need Efficiency because of continuous use – C # Web Software – Eclectic Collection of Languages: Markup (e.g., XHTML), Scripting (e.g., PHP), General-Purpose (e.g., Java) # Data Analytics Applications – R Programming, Python Programming	8

Unit-II	Names, Scopes and Bindings ✓ Meaning of Names in Scope-Aliases, Object Lifetime and Storage Management: Static Allocation, Stack-based Allocation, Heap-Based Allocation, Garbage Collection ✓ The Binding of Referencing Environments - Subroutine Closures, Object Closures, Nested Subroutines, Declaration Order ✓ Scope Rules, Static Scoping, Dynamic Scoping ✓ Overloading, Polymorphism and related concepts, Macro Expansion	8
Unit-III	Data Types ✓ Primitive Data Types - Numeric Types, Integer, Floating point, Complex, Decimal, Boolean Types, Character Types, Character String Types-Design Issues, Strings and Their Operations, String Length Operations, Implementation of Character String Types. ✓ User defined Ordinal types - Enumeration types, Designs, Evaluation, Subrange types, Evaluation, Implementation of User defined ordinal types ✓ Array types - Array initialization, Array operations, Rectangular and Jagged arrays, Slices, Evaluation, Implementation of Array Types ✓ Associative Arrays – Structure and operations, Implementing Associative arrays ✓ Record Type – Definitions of records, References to record fields, Operations on records, Evaluation, Implementation of Record types ✓ Union Type – Design issues, Discriminated versus Free unions, Evaluation, Implementation of Union types ✓ Pointer and Reference Types - Design issues, Pointer operations, Pointer problems – Dangling pointers, Lost heap dynamic variables, Pointers in C and C++, Reference types, Evaluation, Implementation of pointer and reference types, Representation of pointers and references, Solution to dangling pointer problem, Heap management	8
Unit-IV	Control Flow ✓ Expression Evaluation-Precedence and Associativity, Assignments, Initialization, Ordering Within Expressions, Short-Circuit Evaluation ✓ Structured and Unstructured Flow – Structured Alternatives to GOTO Sequencing ✓ Selection – Short Circuited Conditions, Case/Switch Statements ✓ Iteration – Enumeration Controlled Loops, Combination, Loops, Iterators, Logically Controlled Loops ✓ Recursion-Iteration and Recursion, Applicative and Normal Order Evaluation	8
Unit-V	Subroutines and Control Abstraction ✓ Subprograms – Fundamentals of Subprograms, Design Issues for subprograms, Overloaded Subprograms, Nested Subprograms ✓ Generic Subroutines – Generic Functions in C++, Generic Methods in Java ✓ Design Issues for Functions, User Defined Overloaded Operators Coroutines ✓ Parameter Passing Methods, Local Referencing Environments, The General Semantics of Calls and Returns	8

Unit-VI	Data Abstraction and Object Orientation ✓ Encapsulation and Inheritance - Modules, Classes, Nesting, Type, Extensions, Extending without Inheritance ✓ Initialization and Finalization-Choosing a Constructor, References and Values, Execution Order ✓ Dynamic Method Binding-Virtual and Non-Virtual Methods, Abstract Classes and Interfaces, Member Lookup, Polymorphism, Object Closures ✓ Multiple Inheritance-Semantic Ambiguities, Shared Inheritance, Replicated Inheritance, Mix-In Inheritance	8
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References:

1. Scott, Programming Language Pragmatics, 3e(With CD) ISBN 9788131222560 Kaufmann Publishers, An Imprint of Elsevier, USA
2. Robert W. Sebesta, Concepts of Programming Languages, Eighth Edition, Pearson Education
3. Carl Townsend, Introduction to Turbo Prolog
4. Patrick Henry Winston & Berthold Klaus Paul Horn ,LISP 3rd edition –BPB
5. M. Gabbrielli, S. Martini, , Programming Languages: Principles and Paradigms, Springer ISBN: 9781848829138

NOTE: 48 LECTURE FOR CURRICULUM (TEACHING) & 12 LECTURES FOR LEARNING

Class: M.Sc. (Computer Science) (Semester-I)
 Title of paper: Cryptography and Cyber Forensics
 Credit -4

Paper Code: PSCS112
 Paper: II
 No. of Lectures: 60

Learning Objectives:

- To enable students to get sound understanding of Info-Sys-Security, Network Security, Cryptography and cyber forensics.
- To equip with knowledge and skills necessary to support for their career in Network Security.
- To encourage them to do further academic studies / research in this area.
- To develop IT professionals skilled in information/network security and forensic analysis of compromised systems and who are efficient in documentation pertaining to cyber forensic analysis to be provided to the courts of law.


Learning Outcomes:

- Learn the security concepts and techniques.
- In future these experts will be an asset to this country for serving in the fields of information security and digital forensics

Units	Title & Contents	No. of Lectures
Unit – I	Introduction to Security, Cryptography and techniques: The Need for Security, Security Approaches, Principles of Security, Types of Attacks. Introduction to Cryptography, Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric key cryptography, Steganography.	09
Unit – II	Symmetric Key Algorithms and AES: Algorithm Types and Modes, Overview of Symmetric Key Cryptography, DES, IDEA, Blowfish	09
Unit – III	Asymmetric Key Algorithms, Digital Signature and RSA: Brief History of Asymmetric Key Cryptography, overview, RSA Algorithm, Comparison between Symmetric & Asymmetric Key Algorithms, Digital Signature	06
Unit – IV	Digital Certificates and Public Key Infrastructure (PKI): Introduction, Digital Certificates, private key management.	04
Unit – V	Introduction to Cyber forensics: Information Security Investigations, Corporate Cyber Forensics, Scientific method in forensic analysis, investigating large scale Data breach cases. Analyzing malicious software. Types of Computer Forensics Technology, Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised Internet Tracing Methods, Security and Wireless Technologies, Avoiding Pitfalls with Firewalls Biometric Security Systems.	12

Unit – VI	Types of Computer Forensics Systems: Internet Security Systems, Intrusion Detection Systems, Storage Area Network Security Systems, Network Disaster Recovery Systems, Satellite Encryption Security Systems, Instant Messaging (IM) Security Systems, Net Privacy Systems, Identity Management Security Systems, Identity Theft, Router Forensics. Cyber forensics tools and case studies. Ethical Hacking: Essential Terminology, Windows Hacking, Malware, Scanning, Cracking.	10
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Reference:

1. Atul Kahate, “Cryptography and Network Security”, Second/ Third/ Forth Edition, McGraw Hill Publication.
2. John R. Vacca,” Computer Forensics: Computer Crime Scene Investigation”, 2nd Edition, Charles River Media, 2005
3. Ravi Kumar & B Jain, “Cyber Forensics - Concepts and Approaches”, icfai university press, 2006
4. Christof Paar, Jan Pelzl,” Understanding Cryptography: A Textbook for Students and Practitioners”, Second Edition, Springer’s, 2010
5. “Live Hacking: The Ultimate Guide to Hacking Techniques & Countermeasures for Ethical Hackers & IT Security Experts”, Ali Jahangiri, First edition, 2009
6. Kizza, Springer, “ Computer Network Security”


NOTE: 50 LECTURE FOR CURRICULUM (TEACHING) & 10 LECTURES FOR LEARNING

Class : M.Sc.(Computer Science)(Semester-I)

Paper Code : PSCS113

Title of paper: Database Technologies

Paper III

Credit : 4

No. of Lectures: 60

Prerequisites: Knowledge of RDBMS

Course objectives:

1. To study the usage and applications of Parallel and Distributed databases, Object relational database and emerging systems.
2. To acquire knowledge on NoSQL databases.

Course outcomes:

1. Compare different database technologies.
2. Compare and contrast NoSQL databases with RDBMS.

Units	Title & Contents	No. of Lectures
Unit-I	Parallel and Distributed Databases Database System Architectures: Centralized and Client-Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems Parallel Databases : I/O Parallelism, Inter and Intra Query Parallelism, Inter and Intra operation Parallelism Distributed Database Concepts: Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control, Distributed Query Processing, Three Tier Client Server Architecture	08
Unit-II	Object and Object Relational Databases Concepts for Object Databases: Object Identity, Object Structure, Type Constructors, Encapsulation of Operators, Methods, Persistence, Type and Class Hierarchies, Inheritance, Complex Objects, Object Database Standards Languages and Design: ODMG Model, ODL, OQL Object Relational and Extended Relational Systems: Object Relational features in SQL/Oracle, Case Studies	12
Unit-III	Mobile Databases Location and Handoff Management, Effect on Mobility on Data Management	08

	Location Dependent Data Distribution, Mobile Transaction Models Concurrency Control, Transaction Commit Protocols Mobile Database Recovery Schemes Examples: Oracle Database Lite, Microsoft SQL Server Compact	
Unit–IV	Introduction to NoSQL Concepts and evolution , History of NoSQL , Different No SQL products: MongoDB, CouchDB, Cassandra Exploring MongoDB , Advantages of MongoDB over RDBMS Interfacing and Interacting with NoSQL Sharding Replication	08
Unit–V	Working with NoSQL NoSQL Storage Architecture , CRUD operations with MongoDB Querying, Modifying and Managing NoSQL data stores, Indexing and ordering datasets, Surveying database internals Migrating from RDBMS to NoSQL Implementing NoSQL with PHP	08
Unit – VI	MongoDB Aggregation and data management Introduction to aggregation, Types of Aggregation Performance Tuning Export and Import of data to and from MongoDB, Capped collections/ Expired data from TTL hands on examples.	06
References:		
<ol style="list-style-type: none"> 1. Henry Korth, Abraham Silberschatz and S.Sudarshan, “Database System Concepts”, Sixth Edition, McGraw Hill, 2011. 2. M.Tamer Ozsu and Patrick Valduriez, “Principles of Distributed Database Systems”, Third Edition, Springer, 2011. 3. Thomas Connolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Fourth Edition, Pearson Education, 2008, Fifth Edition, Pearson Education, 2010, Sixth Edition, Pearson Education, 2015. 4. R.Elmasri, S.B.Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, 2017. 5. C.J.Date, A. Kannan, S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006. 6. Dan Sullivan, “NoSQL for Mere Mortals”, First Edition, Pearson Education, 2015. 7. Kristina Chodorow, “MongoDB-The Definitive Guide”, Second Edition, O’Reilly, 2013. 8. https://www.mongodb.com/docs/manual/ 		

NOTE: 50 LECTURE FOR CURRICULUM (TEACHING) & 10 LECTURE FOR LEARNING

Class: M.Sc. (Computer science) (Semester-I)
 Title of Paper: Design & Analysis of Algorithm
 Credit: 4

Paper Code: PSCS114
 Paper: IV
 No. of .lectures:60

Learning Objectives: Student successfully completing this course will be able to

- Understand Basic Algorithm Analysis techniques and the use o-asymptotic notation
- Understand different design strategies
- Understand the use of data structure proving algorithm performance
- Understand classical problem and solutions
- Learn a variety of useful algorithms
- Understand classification of problems

Learning Outcome

- Basic algorithms and data structure concepts.
- Basic programming concepts

Units	Title and Contents	No. of Lectures
Unit-I	Analysis & Design Strategies Algorithm definition , space complexity ,time complexity ,worst case–best case –average case complexity, asymptotic notation, sorting algorithms(insertion sort, heap sort) sorting in linear time, searching algorithms, recursive algorithms (Tower of Hanoi , Permutations). Divide and Conquer -control abstraction, binary search, merge sort, Quick sort , Strassen’s matrix Multiplication	10
Unit-II	Greedy Method Knapsack problem ,job sequencing with deadlines ,minimum-costs Spanning trees, Kruskal’s and Prim’s algorithm, optimal storage on tapes, optimal merge patterns, Huffman coding	10
Unit-III	Dynamic programming Matrix chain multiplication, single source shortest paths, Dijkstra’s algorithm, Bellman-ford algorithm, all pairs shortest path, longest common subsequence, string editing ,0/1 knapsack problem, Traveling salesperson problem.	10
Unit-IV	Decrease and conquer DFS and BFS ,Topological sorting ,Strongly connected components	6
Unit-V	Backtracking & Branch and Bound Technique General method, 8 queen’s problem, sum of subset problem, graph coloring problem, Hamiltonian cycle. FIFO, LIFO, LCBB, TSP problem,0/1knapsack Problem.	8
Unit-VI	Transform and Conquer & Problem Classification Horner’s Rule and Binary Exponentiation–Problem Reduction Nondeterministic algorithm, The class of P, NP, NP-hard and NP-Complete problems, significance of Cook’s theorem.	6

NOTE: 50 LECTURE FOR CURRICULUM (TEACHING) &10 LECTURES FOR LEARNING

References:

1. Ellis Horowitz, Sartaj Sahni & Sanguthevar Rajasekaran, Computer Algorithms, Galgotia.
2. T. Cormen, C. Leiserson, & R. Rivest, Algorithms, MIT Press, 1990
3. A. Aho, J. Hopcroft, & J. Ullman, The Design and Analysis of Computer Algorithms, Addison Wesley, 1974
4. Donald Knuth, The Art of Computer Programming (3 vols., various editions, 1973-81), Addison Wesley
5. Steven Skiena, The Algorithm Manual, Springer ISBN: 9788184898651
6. Jungnickel, Graphs, Networks and Algorithms, Springer, ISBN: 3540219056

Class: M.Sc. (Computer science) I (Semester-I)

Paper Code:PSCS115

Title of Paper: Dot Net Framework & C#

Paper: V

Credit: 4

No. of lectures:60

Prerequisites–

- Knowledge of object-oriented programming concepts such as data abstraction, encapsulation, inheritance and polymorphism.
- Familiarity with programming language such as C++and/or Java.

Learning Objectives:

Able to understand the DOTNET framework, C# language features and Windows application development using C#.Net.

Learning Outcome:

Ability to write the Visualized programming and design different real life problems.

PartI : C#		
1.	Introduction to DOTNET Framework & C# a. Introduction to DOTNET b. DOTNET class framework c. Common Language Runtime i. Overview ii. Elements of .NET application iii. Memory Management iv. Garbage Collector d. User and Program Interface e. Language features i. Variables and Expressions, type conversion ii. Flow Control iii. Functions, Delegates iv. Debugging and error handling, exception handling(System Defined and User Defined) f. Object Oriented Concepts i. Defining classes, class members, Interfaces, properties ii. Access modifiers , Implementation of class, interface and properties iii. Concept of hiding base class methods, Overriding iv. Event Handling g. Collections, Comparisons and Conversions i. Defining and using collections, Indexers, iterators ii. Type comparison, Value Comparison h. Generics i. Using generics, ii. Defining Generics , iii. Generic Interfaces iv. Generic methods v. Generic Delegate	10
2.	Window Programming a. Window Controls i. Common Controls	10

	<ul style="list-style-type: none"> ii. Container Controls iii. Menus and Toolbars iv. Printing v. Dialogs vi. Data tools <p>b. Deploying Window Application</p> <ul style="list-style-type: none"> i. Deployment Overview ii. Building the project: Installation <p>c. Data Handling</p> <ul style="list-style-type: none"> i. File System Data ii. XML Data , JSON iii. DatabasesandADO.NET <p>d. Reporting Tools</p> <ul style="list-style-type: none"> i. Data Report ii. Crystal Report 	
3.	<p>Dot NET Assemblies</p> <ul style="list-style-type: none"> a. Components b. .NET Assembly features c. Structure of Assemblies d. Calling assemblies, private and shared assemblies 	2
4.	<p>LINQ</p> <ul style="list-style-type: none"> a. Operators b. SQL c. Objects d. Dataset e. XML f. Entities g. Lambda Expressions 	6
5.	<p>Entity Framework</p> <ul style="list-style-type: none"> a. Overview b. Architecture c. Environment setup <ul style="list-style-type: none"> a. Database Setup b. Entity Data Model c. DB Context d. Entity Types e. Entity Relationships f. Entity Lifecycle Entity Approaches 	10
6.	<p>Database Operations</p> <ul style="list-style-type: none"> a. CRUD b. Concurrency c. Transactions d. Views e. Index f. Stored Procedures g. Disconnected Entities h. Table Valued Functions i. Native SQL j. Projection Quires 	10

NOTE: 48 LECTURE FOR CURRICULUM (TEACHING) &12 LECTURES FOR LEARNING

Recommended Text and Reference books:

1. Beginning Visual C#, Wrox Publication
2. Professional Visual C#, Wrox Publication
3. InsideC#,byTomArcherISBN:0735612889MicrosoftPressÂ©2001,403pages
4. BeginningASP.NET3.5,WroxPublication
5. ProgrammingASP.NET3.5byJesseLiberty,DanMaharry,DanHurwitz,O'Reilly
6. IllustratedC#2008,Solis,PublicationAPRESS,ISBN978-81-8128-958-2
7. ProfessionalC#4.0and.NET4byChristianNagel,BillEvjen,JayGlynn,KarliWatson,
8. Morgan Skinner, WROX
9. Beginning C# Object-Oriented Programming By Dan Clark, Apress
10. ADO.NETExamplesandBestPracticesforC#Programmers,ByPeterD.BlackburnApress
11. Database Programming with C#,By Carsten Thomsen, Apress
12. <https://www.tutorialspoint.com>

Class: M.Sc.(Computer science)-I (Semester-I)

Paper Code:PSCS116

Title of Paper: Lab Course On DOT NET,PPL,DBT,DAA

Paper: VI (Lab Course)

Credit: 4(3Hr.Practical/week/batch)

No. of Practical's: 12

Console Application	
Assignment1	Parameter Modifiers(ref, out ,params)
Assignment2	Delegate and Events
Assignment3	Properties and Indexers
Assignment4	Inheritance and Interface
Assignment5	Polymorphism(Method Overloading, Operator Overloading and Method Overriding)
Assignment6	Exception Handling
Assignment7	Collections
Assignment8	Generics
Windows Application	
Assignment1	Use of Basics Form Controls
Assignment2	Use of List Box
Assignment3	Event Handling(Calculator)
Assignment4	Use of Dialogue Boxes
Assignment5	Simple Database Operations
Assignment6	Advanced Database Operations
Assignment7	Simple Crystal Report
Assignment8	Advanced Crystal Report
ASP.Net Web Applications	
Assignment1	Database Operations 1
Assignment2	Database Operations 2
Assignment3	Database Operations 3
Assignment4	Database Operations 4
PPL Assignments	
Assignment1	LISP
Assignment2	PROLOG
Database Technologies Assignments	
Assignment1	Creating database, collections, insert, update & delete documents in NoSQL
Assignment2	Querying documents in NoSQL
Design and Analysis Of Algorithm	
Assignment1	Implementation and Time analysis of sorting algorithms Insertion sort, Merge sort and Quicksort
Assignment 2	Implementation of Graph and Searching (DFS and BFS).
Assignment 3	Implement prim's algorithm
Assignment 4	Implement kruskal 's algorithm.