KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)
COIMBATORE – 641 029

DEPARTMENT OF COMPUTER SCIENCE (PG)

CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)
(2019 - 2020)

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)
Coimbatore – 641029

Vision:

Developing the total personality of every student in a holistic way by adhering to the principles of Swami Vivekananda and Mahatma Gandhi.

Mission:

- Imparting holistic and man-making education with emphasis on character, culture and value - moral and ethical.
- Designing the curriculum and offering courses that transform its students into value added skilled human resources.
- Constantly updating academic and management practices towards total quality management and promotion of quality in all spheres.
- Extending the best student support services by making them comprehensive and by evolving a curriculum relevant to student community and society at large.
- Taking steps to make education affordable and accessible by extending scholarships to the meritorious and economically disadvantaged students.
- Moulding the teachers in such a way that they become the role models in promoting Higher Education.

DEPARTMENT OF COMPUTER SCIENCE (PG)

Vision:

- To achieve excellent standards of quality education by keeping pace with rapidly changing technologies.

Mission:

- To provide outstanding education and training to our graduate students for their productive careers in industry, academia, and government.

PROGRAMME OUTCOMES (PO)

PO1 To enhance their skills in new computing technologies through practical and theoretical knowledge of computer science and software engineering

PO2 To think creatively, propose real ideas in explaining facts and figures or providing new solutions as computer professionals

PO3 To contribute to the economic development of the region, state and nation.

PO4 To analyze the impact of computing on individuals, organizations, and society.

PO5 To progress as developers providing software solutions for ethical, legal security, and global policy issues.

PO6 To identify, analyse and synthesize scholarly literature relating to the field of Computer Science.

PO7 To apply knowledge of computing to create effective designs and solutions for complex problems.

PO8 To develop scientific outlook that solves any problem, encompassing the expected aspects of market demands

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1 Acquires adequate knowledge of fundamentals to enhance the skills in contemporary computing technology.

PSO2 Capable to establish and configure computer networks and resolve security conflicts.

PSO3 Proficiency in optimizing issues in data management with varying complexity.

PSO4 Construct and simulate computerized solution for defined objectives.

PSO5 Evolves with exposure in advanced computing favoring research.

PCS 1

KONGUNADU ARTS AND SCIENCE COLLEGE [AUTONOMOUS]

COIMBATORE - 641 029

MASTER OF SCIENCE IN COMPUTER SCIENCE

CURRICULUM & SCHEME OF EXAMINATION UNDER CBCS

[APPLICABLE TO THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2019-2020]

Semester	Subject code	Title of the Paper	Instruction Hours / Cycle	Exam. Marks			Duration of Exam.(hours)	Credits
				CIA	ESE	Total		
I	19PCS101	C.P.1 Data Structures using Python	5	25	75	100	3	4
	19PCS102	C.P.2 Wireless Networks	5	25	75	100	3	4
	19PCS103	C.P.3 Information Security	5	25	75	100	3	4
	19PCS104	C.P.4 Relational Database Management Systems	5	25	75	100	3	4
	19PCS1CL	C.Pr.1 Data Structures using Python Lab	5	30	45	75	3	3
	19PCS1CM	C.Pr.2 RDBMS Lab	5	30	45	75	3	3
		Total	**30**					
II	19PCS205	C.P.5 Advanced Java Programming	4	25	75	100	3	4
	19PCS 206	C.P.6 Data Mining and Warehousing	4	25	75	100	3	4
	19PCS 207	C.P.7 .NET Framework	4	25	75	100	3	4
	19PCS 208	C.P.8 Software Development and Quality Assurance	4	25	75	100	3	4
	19PCS2E1	Major Elective Paper – I	4	25	75	100	3	4
	19PCS2CN	C.Pr.3 Advanced Java Lab	5	30	45	75	3	3
	19PCS2CO	C.Pr.4 .NET Lab	5	30	45	75	3	3
		Total	**30**					
III	19PCS 309	C.P.9 Web Technologies	5	25	75	100	3	4
	19PCS 310	C.P.10 Unix Programming	5	25	75	100	3	4
	19PCS 311	C.P.11 Big Data Analytics	5	25	75	100	3	4
	19PCS 3E2	Major Elective Paper - II	5	25	75	100	3	4
	19PCS 3Z1	Mini Project	---	15	60*	75	3	3
	19PCS3CP	C.Pr.5 Web Technologies Lab	5	30	45	75	3	3
	19PCS3CQ	C.Pr.6 Unix Programming Lab	5	30	45	75	3	3
		Total	**30**					

IV	19PCS412	C.P.12 Internet of Things	5	25	75	100	3	4
	19PCS4E3	Non-Major Elective Paper - I	5	25	75	100	3	4
	19PCS4CR	C.Pr.7 Internet of Things Lab	5	30	45	75	3	3
	19PCS4Z2	Project and Viva-Voce	15	40	160**	200	3	6
		Total	**30**					
		GRAND TOTAL	**120**			2300		90

*Project Record – 45 and Viva-Voce – 15
**Project Record – 120 and Viva-Voce – 40

Major Elective Papers:

1. Network Security And Cryptography
2. Bio Inspired Computing
3. Advanced Computing
4. Green Computing
5. Artificial Intelligence and Machine Learning
6. Computational Intelligence

Non Major Elective Papers:

1. Management Information Systems
2. Bio Informatics
3. Robotics

Tally Table:

Subject	No. of Subjects	Total Marks	Credits
Core – Theory	12	1200	48
Core – Practical	7	525	21
Major Elective Papers	2	200	8
Non Major Elective Papers	1	100	4
Mini Project	1	75	3
Project	1	200	6
Grand Total	**24**	**2300**	**90**

- **25 % CIA is applicable to all Subjects except JOC, COP and Swayam Courses which are considered as Extra Credit Courses**
- **The Students are advised to complete a Swayam, MOOC before the completion of the Third Semester and the Course Completed Certificate should be submitted to the HoD. Two Credits will be given to the Candidates who have successfully completed the course**
- **A Field trip preferably relevant to the course should be undertaken every year.**

Note:
CBCS - Choice Based Credit System

CIA - Continuous Internal Assessment

ESE - End of Semester Examinations

ADVANCED LEARNERS COURSE [ALC] - SELF STUDY SCHEME [OPTIONAL]

Subject Code	Title of the Paper	Instruction Hours/Cycle	Exam Marks			Duration of the Exam.(Hours)	Credits
			CIA	ESE	TOTAL		
19PCS0D1	ALC.1 Programming in C#	-	-	100	100	3	4
19PCS0D2	ALC.2 J2EE	-	-	100	100	3	4

Components of Continuous Internal Assessment

Components		Marks	Total
Theory			
CIA I	75	(75+75 = 150/10) 15	25
CIA II	75		
Assignment/Seminar		5	
Attendance		5	
Practical			
CIA Practical		20	30
Observation Notebook		5	
Attendance		5	
Mini Project			
Review		10	15
Regularity		5	
Project			
Review		30	40
Regularity		10	

PCS 4
BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating

1. **Theory Examination - Part I, II & III**

   (i) CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	75
K2 Q11 to 15	B (Either or pattern)	5 x 5 = 25	Short Answers	
K3 & K4 Q16 to 20	C (Either or pattern)	5 x 8 = 40	Descriptive / Detailed	

2. **Practical Examination:**

Knowledge Level	Section	Marks	Total
K3	Experiments	40	45
K4	Record Work	5	
K5			

3. **Mini Project Viva Voce:**

Knowledge Level	Section	Marks	Total
K3	Project Report	45	60
K4	Viva voce	15	
K5			

4. **Project Viva Voce:**

Knowledge Level	Section	Marks	Total
K3	Project Report	120	160
K4	Viva voce	40	
K5			

PCS 5

QUESTION PAPER PATTERN for CIA and ESE

M.Sc Computer science (PG)

Theory

Max Marks: 75 **Time: 3Hrs**

Section A (10 x 1 = 10 marks)

Q.No. 1 to 10 : Multiple choice type alone with four distractors each.

Section B (5 x 5 = 25 marks)

Q.No. 11 to 15 : Either or / short notes type questions (one question 'a' or 'b' from each unit).

Section C (5 x 8 = 40 marks)

Q.No. 16 to 20 : Either or / essay type questions (one question 'a' or 'b' from each unit).

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PCS 6

19PCS101

Programme Code: 09		**Title:** M.Sc.Computer Science		
Course Code: 19PCS101		**Title:** Core Paper :Data Structures using Python		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	I	5	75	4

Course Objectives

1. To Inculcate the Knowledge of various data structures and definitions.
2. To provide the use of data structure background for programming with Python.
3. To develop the proficiency for planning & organizing the data structures.

Course Outcomes (CO)

K1	CO1	Students will get the knowledge of data structures and its usage
K2	CO2	Distinguish the Various data structures
K3	CO3	Skills to describe the data structures appropriately for programming
K4	CO4	Apply appropriate algorithms and data structures for various applications

UNIT I **[15 Hrs]**

Introduction to Python: Python – Features of Python – Data types in python – Built-in data types – sequences in python – sets – literals – operators in python - input and output – control statements: if, while, for, Arrays: creating an array – importing the array module – indexing and slicing on arrays – processing the arrays – viewing and copying arrays – dimensions of array.

UNIT II **[15 Hrs]**

Strings and characters: creating, indexing, removing spaces from a string. – string testing methods – formatting the string – sorting – searching. Function: defining a function – calling a function – returning results from a function – returning multiple values from a string – Lists and Tuples: creating lists using range() function – updatating the elements of list – methods to process lists- sorting the list elements- operations in dictionaries: dictionaries-dictionaries methods.

19PCS101

UNIT III **[15 Hrs]**

Introduction & overview: Data Structures, Data Structure operations- Algorithm:Complexity, Time space, Trade off. Array, Records & Pointers: Introduction – Linear Array- Representation of Linear Array-Inserting and Deleting. Linked Lists: Introduction -Representation of Linked list in memory – Traversing a linked list – Insertion into a linked list – Deletion from linked list.

UNIT IV **[15 Hrs]**

Stacks & Queues, Recursion: Introduction – Stack – Array representation of stack – linked representation of stack – Recursion – Queues – linked representation – Dequeue – * Applications of Stack & Queue.

UNIT V **[15 Hrs]**

Trees: Binary Tree – Traversing Binary tree – Binary Search Tree.

Sorting & Searching:Insertion – Selection sort – Bubble sort – Quick sort – Merge sort – Radix sort – Shell sort. Hashing.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOKS:

1. Dr. R. Nageswara Rao, Core Python Programming, 2nd (Kindle Edition), 2017 (unit I & II)

2. Seymour Lipschutz, Adopted by G.A.V. PAI , Data Structures, Schaum's Outline, McGraw Hill Publications. 2013 & 2006
(Unit III, IV & V)

REFERENCE BOOKS:

1. Wiley, Data Structures and Algorithms Using Python, Wiley Student edition.2016.

2. Problem Solving in Data Structures & Algorithms Using Python, First edition, 2016.

PCS 8

19PCS101

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	L
CO2	S	M	S	H	H
CO3	S	M	S	H	H
CO4	S	S	S	S	S

S – Strong **H** – High **M** – Medium **L** – Low

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PCS 9

19PCS102

Programme Code: 09		M.Sc Computer Science		
Course Code: 19PCS102		Core Paper 2 : Wireless Networks		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	I	5	75	4

Course Objectives

1. To impart adequate knowledge of wireless communication.
2. To provide exposure of various kinds of wireless communications with its architecture and different types of wireless networks.
3. To Familiarize IEEE wireless standards, Wi-max and Video coding.

Course Outcomes (CO)

K1	CO1	Students will get the knowledge of wireless communication
K2	CO2	Knows the structures and standards of wireless communication
K3	CO3	Describe the components & operations of various wireless networks
K4	CO4	Access the standards and types of wireless networks

UNIT I **[15 Hrs]**

WIRELESS NETWORK ARCHITECTURE AND OPERATION: Cellular concept-cell fundamentals-mobility management-introduction to GSM –GSM network and system architecture. CDMA network and system architecture. **Generation of cellular systems*.**

UNIT II **[15 Hrs]**

WIRELESS LANS and PANS Introduction to wireless LANs –evolution-design issues-mac layer operations-security.IEEE802.15x technologies-PAN application and architecture- Physical layer detail-bluetooth link controller –operational states

PCS 10

19PCS102

UNIT III **[15 Hrs]**

WIRELESS MAN: Wireless MAN-IEEE802.16x wireless MANS-mac layer details-IEEE802.16 physical layer detail-common system operations. WIRELESS WANS: wireless in local loop: Generic WLL Architecture- WLL Technologies.-wireless ATM

UNIT IV **[15 Hrs]**

WIRELESS INTERNET: Introduction-mobile IP-bindings-route optimization-handoffs-security in mobile IP. -Traditional TCP- TCP over wireless –mobile TCP.WAP-Model-Protocol stack. ADHOC SENSOR NETWORKS: Introduction - Ad hoc wireless internet. **WiMax / IEEE 802.16 699**: Introduction – System Overview .

UNIT V **[15 Hrs]**

RECENT ADVANCES IN WIRELESS NETWORKS: Wireless Fidelity Systems: Service provider model. Optical wireless networks: Short range infrared communication - optical wireless WDM. **Video Coding:** Introduction - Video Coding Standards.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOKS:

1. Gary J.Mullet (2006), Introduction to Wireless Telecommunication and networks , India edition (Unit I,II,III)

2. C.Siva Ram Murthy,B.S.Manoj (2007), Adhoc Wireless networks-Architecture and protocols. Pearson / Prentice Hall (Unit IV, V)

3. T.L Singal (2017), “Wireless communications”, TMH.. (Unit V)

REFERENCE BOOKS:

1. William Stallings (2007), Wireless Communications and networks, Pearson / Prentice Hall of India, 2nd Edition..

2. Vijay K.Garg (2008), Wireless communications and networking,.

PCS 11

19PCS102

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	M	H
CO2	S	S	M	H	M
CO3	S	S	H	H	M
CO4	S	S	H	H	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 12

19PCS103

Programme Code: 09		M.Sc Computer Science		
Course Code: 19PCS103		Core Paper 3: Information Security		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	I	5	75	4

Course Objectives

1. The course is intended to preach the common goals of security.
2. To educate the Legal issues of Information Security and its cons.
3. To inculcate the Security Technologies and its methods of implementation.

Course Outcomes (CO)

K1	CO1	Understanding the fundamental and history of Information Security, its legal and professional issues.
K2	CO2	Aware of Intrusion Detection tools and Biometric controls in market.
K3	CO3	Capable to handle sensitive real time security technologies and establishing VPNs
K4	CO4	Students are able to implement information security projects and its technical aspects.

UNIT I **[15 Hrs]**

Introduction to Information Security: Introduction-The history of information security- what is security? - Components of an information system-The security systems development life cycle. The need for security: Threats-Attacks.

UNIT II **[15 Hrs]**

Legal, Ethical and professional issues in Information Security: Introduction-Law and ethics in information security- International Laws and Legal Bodies- Ethics and information security. Risk Management: An overview of risk management-Risk identification-Risk assessment-**Risk Control strategies***.

PCS 13

19PCS103

UNIT III **[15 Hrs]**

Security Technology: Firewalls and VPNs: Introduction-Access control-Firewalls-Protecting remote connections.

UNIT IV **[15Hrs]**

Security Technology: Intrusion detection and prevention systems, Other security tools: Intrusion detection and prevention systems-Honeypots, Honeynets and padded cell systems-Scanning and analysis tools-Biometric access controls.

UNIT V **[15Hrs]**

Implementing Information Security: Introduction-Information Security project management-Technical aspects of implementation– **non Technical aspects of implementation. Information Security***. Maintenance: Security management maintenance models: The Security maintenance models-monitoring the external environment.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOK:

1. Michael E. Whitman, Herbert J. Mattord,(2014), **"**Principles of Information Security **"**, Fifth Edition, Cengage Learning Publications.

2.

REFERENCE BOOKS:

1. Mark Rhodes-Ousley,(2013),"Information Security The Complete Reference", Second Edition McGraw Hill Professional.
2. John Vacca,(2013),"Managing Information Security", Second Edition, Syngress Imprint.
3. Nayak, Umesha, Rao, Umesh Hodeghatta,(2014)," The InfoSec Handbook an Introduction to Information Security", Apress Publisher, First Edition.

PCS 14

19PCS103

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	L	M	H
CO2	M	S	M	H	H
CO3	L	S	S	H	H
CO4	M	H	H	S	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 15

19PCS104

Programme Code: 09		M.Sc Computer Science		
Course Code:19PCS104		Core Paper 4 - Relational Database Management Systems		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	I	5	75	4

Course Objectives

1. To understand and apply the principles of data modelling using Entity Relationship and develop a good database design.
2. To understand the use of SQL and its syntax and apply Normalization.
3. To understand the concept of information retrieval.

Course Outcomes (CO)

K1	CO1	Student will master the basic concepts of Databases
K2	CO2	Student will have high level understanding of relational model and SQL.
K3	CO3	Student will be proficient in data Normalization
K4	CO4	Students will understand security concept and informational retrieval.

UNIT I **[15 Hrs]**

Overview of Database Systems: Managing data-File System versus a DBMS-Advantages of DBMS-Describing and storing data in a DBMS -Database design: Database design and ER diagrams-Entities, Attributes and Entity sets-Relationship and relationship sets-Additional features of the E-R model-Conceptual design with E-R model-Logical database design-Introduction to Views-Destroying altering tables and views.

UNIT II **[15 Hrs]**

Queries, Constraints and Triggers: Overview-the form of a basic SQL query-Union, Intersect and Except-Join types and conditions: Natural Join - Inner Join – Outer Join-Nested queries-Aggregate operators-Null values-Complex integrity constraints in SQL-Triggers and active databases.

19PCS104

UNIT III **[15 Hrs]**

Transaction Management: The ACID properties-Transaction and schedule-Concurrent execution of transactions-Lock based concurrency control - **Performance of locking*** - Transaction support in SQL-Concurrency control: 2PL, Serializability and Recoverability-Introduction to lock management-Lock conversion-Dealing with deadlocks.

UNIT IV **[15 Hrs]**

Schema refinement and normal forms: Introduction-Functional dependencies - Normal forms - Properties of decomposition-Normalization-Schema refinement in database design-Other kind of dependencies

Security and Authorization : Introduction-Access control-Discretionary access control -Mandatory access control.

UNIT V **[15 Hrs]**

Object-database system: New data types - Manipulating the new data - Structured data types - Operations on structured data – Encapsulation and ADT – Inheritance - Database design for ORDBMS - ORDBMS implementation challenges – OODBMS - Compare RDBMS, ORDBMS, OODBMS

Information Retrieval : Introduction to IR - DBMS versus Information Retrieval - Indexing for text search – Web search engines – Managing text in DBMS.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOK:

1. Ragu Ramakrishnan, Johannes Gehrke ,(2003) " Database Management Systems" , 3 rd Edition , Tata McGraw Hill Publication.

REFERENCE BOOKS

1. Elmarsri Navathe, Ranez Shankand, (2008) "Fundamentals of Database Systems", 5th Edition, Pearson Publication.
2. Silberschatz,Henry Korth, (2011)" Database System Concepts", 6th Edition, Tata McGraw Hill Publication.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	S	H	H
CO2	M	H	H	S	H
CO3	H	S	S	M	S
CO4	H	M	H	S	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 18

19PCS1CL

Programme Code: 09		M.Sc Computer Science		
Course Code: 19PCS1CL		Core Practical 1: Data Structures using Python Lab		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	I	5	75	3

Course Objectives

1. To Inculcate the Knowledge of various data structures and definitions.
2. To provide the use of data structure background for programming.
3. To make a decision of appropriate data structure for programming.

Course Outcomes (CO)

K3	CO1	Distinguish the Various data structures
K3	CO2	Skills to describe the data structures appropriately for programming
K4	CO3	Apply appropriate algorithms and data structures for various applications
K5	CO4	Evaluate the Various Data Structures with various applications

LIST OF PRACTICAL PROGRAMS

1. Array Creation and Operations.
2. Stack and Queue Operations.
3. Recursion, Infix to Postfix Conversion.
4. Implementation of Linked List.
5. Tree Traversals.
6. Graph-Shortest Path.
7. Searching-Linear, binary, Fibonacci.
8. Sorting-Radix, shell, Quick, Heap, Merge.

PCS 19

19PCS1CL

Teaching Methods:

Demonstration ,simulation, assignment and Discussion.

Guidelines to the distribution of marks for Practical Examinations: (Total marks:75)

CIA : Total marks – 30 [Practical – 20, Observation- 5, Attendance – 5]

ESE: Two Questions will be given for each student (3 Hours / 45 Marks)

Record Work - 5 Marks

Algorithm, Coding and execution – 40 Marks

Particulars	Program 1 (Marks)	Program II (Marks)
Algorithm	5	5
Coding	10	10
Execution & viva voce	5	5

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	L
CO2	S	M	S	H	H
CO3	S	M	S	H	H
CO4	S	S	S	S	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 20

19PCS1CM

Programme Code: 09		M.Sc Computer Science		
Course Code: 19PCS1CM		Core Practical 2 : RDBMS Lab		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	I	5	75	3

Course Objectives

1. To define schema and creation of Databases.
2. To write SQL Queries to retrieve information from Databases.
3. To use host language interface with Embedded SQL.

Course Outcomes (CO)

K3	CO1	Creation of Databases
K3	CO2	Retrieval of Information of Databases
K4	CO3	Use of Forms and Report writer packages
K5	CO4	Use of host language interface with Embedded SQL

LIST OF PRACTICAL PROGRAMS

1. Queries to perform SET operations, Views, Aggregate Operators and Triggers.
2. Online Reservation System.
3. Personal Information.
4. Student Mark Processing.
5. otel Management.
6. Stock Maintenance.
7. College Admission.

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PCS 21

19PCS1CM

Teaching Methods:

Demonstration ,simulation, assignment and Discussion.

Guidelines to the distribution of marks for Practical Examinations: (Total marks:75)

CIA : Total marks – 30 [Practical – 20, Observation- 5, Attendance – 5]

ESE: Two Questions will be given for each student (3 Hours / 45 Marks)

Record Work - 5 Marks

Algorithm, Coding and execution – 40 Marks

Particulars	Program 1 (Marks)	Program II (Marks)
Algorithm	5	5
Coding	10	10
Execution & viva voce	5	5

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	L
CO2	S	M	S	H	H
CO3	S	M	S	H	H
CO4	S	S	S	S	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 22

SEMESTER II **19PCS205**

Programme Code: 09		M.Sc. Computer Science		
Course Code: 19PCS205		Core Paper 5 : Advanced Java Programming		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	II	4	60	4

Course Objectives

1. To understand the basic concepts of Object oriented programming.
2. To inculcate the concepts of networking and graphics offering a GUI environment.
3. To educate the concepts of database management and essentials of Servlets

Course Outcomes (CO)

K1	CO1	Ability to understand the applications in OOPS paradigm.
K2	CO2	Student can establish Client-Server network and enable Multithreaded applications
K3	CO3	Will Effectively use Applets , Event and Construction of Bean API , providing a GUI environment,
K4	CO4	Capable of better Backend Management, Can compose complex Applications with Swings and Servlet.

UNIT I **[12 Hrs]**

Introduction: Inheritance: basics-Using super keyword- Multilevel inheritance – overriding – Dynamic method dispatch – Abstract – Using final with inheritance.

Packages and Interfaces: Packages- Access protection-Importing Packages. Interface –Defining interface- Variables in interface-Implementing an interface.

UNIT II **[12 Hrs]**

Exception handling: Fundamentals – Using try and catch – Nested try statements - Throw – Throws – Finally – Using built in exceptions – Creating own exceptions.

Multithreading: Thread model – Creating a thread- Using isAlive() and join() Thread priorities – Synchronization – Deadlock- Suspending ,resuming and stopping threads.

File Input Stream-File Output Stream. Networking: Inet address TCP/IP client/ server sockets.-Datagrams.

Applet Class: Applet basics-Applet Skeleton-A simple Applet-HTML Applet tag

UNIT III **[12 Hrs]**

Event handling: Event model - Event classes - Event Listener interface- Adapter classes.

Graphics: Window Fundamentals - Working with graphics, color and font. AWT Controls Fundamentals – Labels-Buttons- Checkboxes-Lists – Text field – Layout managers - Menu bars and menus.

UNIT IV **[12 Hrs]**

JDBC: Connecting java with Oracle-Java Beans: advantages – using BDK – JAR files – Introspection- **Developing simple bean using the BDK** *.

UNIT V **[12 Hrs]**

Swing – Japplet – Icons and JLabel, JTextField, JPasswordField, JButton, JCheckBox, JRadioButton, JComboBox, JScroll panes - JTabbed panes – Trees – Tables. Servlets – simple servlet – life cycle – Servlet API – Servlet Package .

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOKS:

1. Herbert Schildt,(2011), “Java, The Complete Reference“, Eighth edition, Tata McGraw HillPublication.
2. Paul Deitel and Harvey Deitel,(2014), “Java How to Program, Late Objects”, Tenth Edition, Pearson Education Asia.

REFERENCE BOOKS:

1. Cay S. Horstmann, Gary Cornell, (2013), **"**Core Java®, Volume II—Advanced Features, Ninth Edition" Prentice Hall.

2. Hariom Choudhary, (2015),"Introduction to Java Programming, Comprehensive Version 2014-2015".

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	L
CO2	S	S	H	H	M
CO3	H	M	H	S	L
CO4	M	H	S	H	H

S – Strong H – High M – Medium L – Low

PCS 25

19PCS206

Programme Code: 09		M.Sc Computer Science		
Course Code: 19PCS206		Core Paper 6 : Data mining and Warehousing		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	II	4	60	4

Course Objectives

1. To inculcate the basics of Data Mining and Data Warehousing.
2. To recognize the various data mining and warehousing tools in the business environment/ state of the market.
3. To develop the proficiency for planning & applying the DM techniques.

Course Outcomes (CO)

K1	CO1	Understand the basics of DataMining & DataWarehousing.
K2	CO2	Identify the appropriate Data Mining techniques for problem solving
K3	CO3	Demonstration of various data mining techniques and ware housing tool
K4	CO4	Implement the methods and techniques to develop a small Project

UNIT I **[15 Hrs]**

Data Mining: Introduction - what is Decision tree? – Where to use Decision Trees – How the Decision Tree Works – Case Study – Strengths and Weaknesses.

Neural Networks: What is Neural Network? – Where to use Neural Networks – How the Neural Networks – Case Study - Strengths and Weaknesses.

UNIT II **[15 Hrs]**

Nearest Neighbor and Clustering: Where to use Clustering and Nearest-Neighbor Prediction – How Clustering and Nearest-Neighbor Prediction Work – Case Study - Strengths and Weaknesses.

PCS 26

19PCS206

Genetic Algorithms: What are Genetic Algorithms – Where to use Genetic Algorithms – How the Genetic Algorithm works – Case Study - Strengths and Weaknesses.

UNIT III **[15 Hrs]**

Rule Induction: Where to use Rule Induction – How Rule Induction Works – Case Study - Strengths and Weaknesses.

Data Visualization: Data Visualization Principles- Parallel Coordinates – Visualizing Neural Networks – **Visualization of Trees** *– State of the Industry.

UNIT IV **[15 Hrs]**

Business Analysis: Reporting and Query Tools and Applications: Tool Categories – The Need for Applications - Cognos Impromptu – Applications.

On-Line Analytical Processing (OLAP): Need for OLAP – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – **Categorization of OLAP Tools** *– State of the Market – OLAP Tools and the Internet.

UNIT V **[15 Hrs]**

Data warehousing: Introduction – Data Warehousing Components – Overall Architecture – Data Warehouse Database – Sourcing, Acquisition, Cleanup, and Transformation Tools – Metadata – Access Tools – Data Marts – Data Warehouse Administration and Management – Information Delivery System.

Applications of data warehousing and data mining in government: Introduction - national data warehouses – other areas for data warehousing and data mining.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOK:

1. Alex Berson ,Stephen J.Smith, (2004), Data Warehousing (2004), Data Mining & OLAP Tata McGraw Hill

REFERENCE BOOKS:

1. Jiawei Han and Micheline Kamber ,"Data Mining Concepts and Techniques", Morgn Kaufman Publishers, Second Edition, 2008
2. Margaret H. Dunham, "Data mining introductory and advanced topics", Pearson education, 2003.
3. Reema Thareja, "Data Warehousing", Oxford University Press, First Edition, 2009.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	M	S	H	S
CO3	S	H	S	H	S
CO4	S	H	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 28

19PCS207

Programme Code: 09		M.Sc Computer Science		
Course Code: 19PCS207		Core Paper 7 - .Net Framework		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	II	4	60	4

Course Objectives

1. To understand .Net framework features like portability and language interoperability concepts.
2. To understand the vb.Net and ASP.Net controls.
3. To understand how to work with database with the help of ADO.Net.

Course Outcomes (CO)

K1	CO1	Student will be able to understand .Net framework concepts.
K2	CO2	Student will be able to remember VB.Net controls windows application.
K3	CO3	Student will be able to analyse how to use a ASP.Net controls and web application.
K4	CO4	Student will be able to create or apply database driven Windows application and ASP.Net web applications.

UNIT I **[12 Hrs]**

Understanding .Net-The .Net strategy-The origins of .Net technology-The.Net framework-The CLR-Framework base classes-Visual studio .net-.Net languages-Benefits of .Net approach-VB.NET-new in vb.net-operators-conditionals & loops-Procedures, scope & exception handling.

UNIT II **[12 Hrs]**

Windows forms and controls-General controls: Label, textbox, button, rich textbox, Link labels,check boxes, radiobutton, combobox, listbox, timer, progress bar.

Container controls: Groupbox, panel, tab control-tooltip-splitters- menus-menu items-context menus-builtindialogbox

19PCS207

UNIT III **[12 Hrs]**

ASP.NET:Webforms:Buttons,textboxes,labels,Literals,placeholders,checkboxes,radio buttons,tables,panels- images-image lists-tree and list view-toolbars-status bar and progress bars.

UNIT IV **[12 Hrs]**

Image button, list boxes, drop downlist, hyperlink & link button-Validation controls: required field, regular expression, compare, **range validators***-calendars-adrotators-html controls.

UNIT V **[12 Hrs]**

Data access with ADO.Net - **Binding controls to database***-database access with web applications-creating window services, web services-deploying applications.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOKS:

1. E.Balagurusamy (2008), “Programming in C# A Premier”, TMH Publisher co Ltd. (UNIT I)
2. Steven Holzner (2008),“Visual Basic.Net Programming Black Book”, Dream Tech. (UNIT II.III.IV,V)

REFERENCE BOOKS:

1. Evangelos Petroustes,(2002) “Mastering Visual Basic.Net”, BPB Publications, First Edition.
2. KoGENT Solutions Inc(2010)., ASP.NET 3.5 (Covers C# and VB 2008 codes) Black Book, Platinum Edition, Dreamtech press.

PCS 30

19PCS207

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	H	S	H
CO2	M	H	H	S	H
CO3	H	S	H	S	H
CO4	H	H	H	S	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 31

19PCS208

Programme Code: 09		M.Sc Computer Science		
Course Code: 19PCS208		Core Paper 8 : Software Development and Quality Assurance		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	II	4	60	4

Course Objectives

1. To understand the concepts of software project and product life cycle.
2. To analyze software requirements, design and development of the project.
3. To equip testing and ensuring the software Quality Assurance.

Course Outcomes (CO)

K1	CO1	Students will be aware of project and product life cycle and its requirements.
K2	CO2	Thorough understanding in various key aspects which are involved in the process of project development.
K3	CO3	Gathering requirements enable the students to analyze them in order to achieve goal.
K4	CO4	Applying all the techniques and methods learned to improve the quality of the software.

UNIT I **[12 Hrs]**

Product life cycle-Project life cycle models-metrics-introduction-The metrics Roadmap-A typical metrics strategy-what should you measure-set targets and track them-Understanding and trying to minimize variability-Act on data.

UNIT II **[12 Hrs]**

Software Configuration management-some basic definitions and terminology-The processes and activities of Software configuration management-Configuration status accounting-Configuration Audit.

Risk management-What is Risk management and why it is important?-Risk management cycle-Risk Identification: Common tools and techniques-Risk Quantification-Risk monitoring-Risk mitigation.

Project initiation: Introduction- Activities-output, quality records and completion criteria-interfaces to the process database.

19PCS208

UNIT III **[12 Hrs]**

Software Requirements gathering-inputs and start criteria for requirements gathering-dimensions of requirements gathering-steps to be followed during requirements gathering-outputs and quality records from the requirements phase-skill sets required during the requirement phase

Estimation-what is estimation?-when and why is estimation done?-three phases of Estimation-estimation methodology-formal models for size estimation-translating size estimate into effort estimate-translating effort estimate into schedule estimate.

UNIT IV **[12 Hrs]**

Design and development phases-some differences in our chosen approach-salient features of design-evolving an architecture for blueprint-design for reusability-technology choices/constraints-Design for standards-Design for portability-Design for testability-Design for diagnosability -Design for maintainability-Design for installability-interoperability design.

Project management in testing phase-Introduction-what is testing?-what are the activities that make up testing?-**Test scheduling and types of tests***.

Software Quality Assurance-How do you define Quality?-Why is quality important in software?-Quality control and Quality Assurance-Cost and benefits of quality-Software Quality assurance tools - Quality Assurance.

UNIT V **[12 Hrs]**

Quality planning: Introduction - Quality plan for objectives - Planning process overview - The organisation level processes - organizational maturity effect on the organisation.

Developing process framework: Introduction – Process Concept – Best Practices – types of processes on the basis of their level in the organization - Process Classification on the Basis of Type of Organisation – Process Continuum - Process of Implementation of process framework – Process-improvement teams – The process-improvement process - Process-improvement process steps – Problems with quality improvement – Process-definitions problems – Process implementation problem – Continual improvement problem – The bottom line for quality improvements – Difference between process control and product control.

* Self study – Questions for examination may be taken from the self study portions also.

PCS 33

19PCS208

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOKS:

1. Gopalaswamy Ramesh,"Managing Global Software Projects", Tata McGraw Hill publishing company,2003.

2. Milind Limaye, "Software Quality Assurance", Tata McGraw Hill publishing company, 2011.

REFRENCE BOOK:

Bob Hughes and Mike Cotterell ,"Software Project Management", 5th Edition, Tata McGraw Hill,2011.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	S	H	S
CO2	S	M	S	S	S
CO3	S	M	H	S	S
CO4	S	M	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 34

19PCS2CN

Programme Code: 09		M.Sc Computer Science		
Course Code: 19PCS2CN		Core Practical 3 : Advanced Java Lab		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	II	5	75	3

Course Objectives

1. The course inculcates the fundamentals and dynamics of OOPs paradigm.
2. To demonstrate the the GUI and advanced functionalities enriching the development skill.
3. To simulate the industrial demands and expertise in the specified domain.

Course Outcomes (CO)

K3	CO1	Students will be capable to understand and apply the better usage of OOPs concept.
K3	CO2	Proficient in developing GUI environment and event handling
K4	CO3	Establishing networks with socket programming and Sessions
K5	CO4	Simulates applications with Swings and Servlets.

LIST OF PRACTICAL PROGRAMS

1. Develop applications using package, polymorphism, inheritance and inner class.
2. Applications with applets and sockets.
3. Application with Swing and JDBC concepts.
4. Create applications with multithreading and file concepts.

PCS 35

19PCS2CN

Teaching Methods:

Demonstration ,simulation, assignment and Discussion

Guidelines to the distribution of marks for Practical Examinations: (Total marks:75)

CIA : Total marks – 30 [Practical – 20, Observation- 5, Attendance – 5]

ESE: Two Questions will be given for each student (3 Hours / 45 Marks)

Record Work - 5 Marks

Algorithm, Coding and execution – 40 Marks

Particulars	Program 1 (Marks)	Program II (Marks)
Algorithm	5	5
Coding	10	10
Execution & viva voce	5	5

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	M
CO2	H	M	S	S	H
CO3	H	S	S	H	M
CO4	H	S	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 36

19PCS2CO

Programme Code: 09		M.Sc Computer Science		
Course Code: 19PCS2CO		Core Practical 4 : .Net Framework Lab		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	II	5	75	3

Course Objectives

1. To educate the usage of .Net framework Environment.
2. To understand the usage of controls in .Net.
3. To create database application with ADO.Net.

Course Outcomes (CO)

K3	CO1	Effective use of .Net framework concepts.
K3	CO2	Develop a working knowledge of VB.Net controls
K4	CO3	Student will be able to build well formed web controls with validation
K5	CO4	Student will be able to create or apply database driven Windows application and ASP.Net web applications.

List of Practical Problems

1. Develop applications with windows controls.
2. Develop ADO.Net application to insert, delete, update records in database.
3. Develop a web site using Web controls.
4. Develop a web site with database connection.

PCS 37

19PCS2CO

Teaching Methods:

Demonstration ,simulation, assignment and Discussion

Guidelines to the distribution of marks for Practical Examinations : (Total marks:75)

CIA : Total marks – 30 [Practical – 20, Observation- 5, Attendance – 5]

ESE : Two Questions will be given for each student(3 Hours / 45 Marks)

Record Work - 5 Marks

Algorithm, Coding and execution – 40 Marks

Particulars	Program 1 (Marks)	Program II (Marks)
Algorithm	5	5
Coding	10	10
Execution & viva voce	5	5

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	H	S	H
CO2	M	S	H	S	S
CO3	H	S	H	H	H
CO4	H	S	H	**S**	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 38

SEMESTER III

19PCS309

Programme Code: 09		M.Sc Computer Science		
Course Code: 19PCS309		Core Paper 9 : Web Technologies.		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	III	5	75	4

Course Objectives

1. To educate the benefits of proprietary and non proprietary softwares.
2. To inculcate the significance of freeware Web Technologies
3. To promote the web designing skills and data handling with Server side scripts.

Course Outcomes (CO)

K1	CO1	Will enhance their presentation skills in designing, recollecting Html tags.
K2	CO2	Students can escalate their web design and prune it to perfection with style sheets
K3	CO3	Can enhance data manipulation at client end will have sound knowledge in data validation and handling dynamic data with Php fundamentals
K4	CO4	Handling challenges at backend, performing validation at Server end with PHP-MySQL suite

UNIT I **[15 Hrs]**

Introduction to HTML: what is html, how does it work – Working with Lists: creating different types of lists – Working with Images: inserting an image, the alt attribute, adding borders, alignment, using links with images, image maps – HTML Forms: designing a form, form controls: buttons, textboxes, checkboxes, radio buttons, select, legend tags – Frames: creating frames, horizontal and vertical frames, hyperlink targets to a frame.

PCS 39

19PCS309

UNIT II **[15 Hrs]**

Introduction to CSS: what is CSS, how does it work – Including Styles: inline, internal, and external styles – Properties and Values in CSS – The CSS box model – Classes and IDs – Applying styles to blocks of information (div blocks)- containers.

UNIT III **[15 Hrs]**

Introduction to PHP: creating and running a PHP script – Variables and Constants – Data types – Operators – Strings, echo command– Conditional Statements: exploring different conditional statements , defining nested if statements – Looping Statements: exploring different looping statements – Break, Continue, and Exit statements.

UNIT IV **[15 Hrs]**

Functions in PHP: syntax, naming conventions, built in functions: string functions, math functions, date and time functions, understanding variable scopes, calling a function, recursion.

Arrays in PHP: Introduction to PHP – numeric arrays – associative arrays – multidimensional arrays – iterating through an array.

Working with Forms in PHP: using and manipulating different form elements, submitting form data, retrieving form data, get and post methods, displaying errors, include, require.

UNIT V **[15 Hrs]**

Connecting a form to a Database: checking configuration, connecting to a database, selecting a database, creating a table, inserting records, altering, updating, and deleting a table.

Regular Expressions in PHP – preg_match(), preg_match_all() – File Handling – reading from a file, writing to a file – Exception Handling in PHP – Cookies and Session in PHP.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

.

19PCS309

TEXT BOOK:

1. Deitel and Deitel **"**Internet and World wide web" Pearson International,4 th Edition

REFERENCE BOOKS:

1. Adam Rizvi,(2011), Click Start Internet Basics: The Internet Basics, Written for Beginners, Click start publishing, UK.

2. Jon Duckett, (2008)"Beginning Web Programming with HTML, XHTML, and CSS", Wiley publishers.

3. Ivan Bayross and Sharanam Shah, (2005),"MySQL 5 for Professionals", Shroff Publishers and Distributors, Third Edition.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	M	S	L
CO2	H	S	S	H	M
CO3	M	S	S	S	H
CO4	M	H	H	S	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 41

19PCS310

Programme Code: 09		M.Sc. Computer Science		
Course Code: 19PCS310		Core Paper 10:Unix Programming		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	III	5	75	4

Course Objectives

1. To understand the basic set of commands and utilities in UNIX systems.
2. To provide a comprehensive introduction to Shell Programming.
3. To develop an essential skills required to write simple and complex Shell scripts to automate the applications

Course Outcomes (CO)

K1	CO1	Obtain a foundation for unix operating systems.
K2	CO2	Manifestation of various unix command and its usage.
K3	CO3	Make effective use of Unix shell scripting.
K4	CO4	Exposure to develop software using Unix/Linux systems.

UNIT-I **[15 Hrs]**

INTRODUCTION TO UNIX: The UNIX Operating System, The UNIX Architecture, Features of UNIX, Internal And External Commands, Command Structure.

GENERAL-PURPOSE UTILITIES: cal, date, echo, printf, bc, script, passwd,PATH, who, uname, tty, stty, pwd, cd, mkdir, rmdir, od.

19PCS310

UNIT II **[15 Hrs]**

INTRODUCTION TO SHELLS: Unix Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell Edition Environment Customization.FILTERS: Filters, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters,Ordering a File, uniq.

UNIT III **[15 Hrs]**

REGULAR EXPRESSIONS: Atoms,operators **GREP**: Operation, grep Family, Searching for File Content. **SED**: Scripts, Operation, Addresses, commands, Applications, grep and sed. **AWK**: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, ssociative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications, awk and grep, sed and awk.

UNIT IV **[15 Hrs]**

INTERACTIVE KORN SHELL: Korn Shell Features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, Options, Startup Scripts, Command History, Command Execution Process.

KORN SHELL PROGRAMMING: Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

UNIT V **[15 Hrs]**

INTERACTIVE C SHELL: C shell features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, On-Off Variables, Startup and Shutdown Scripts, Command History , Command Execution Scripts.

FILE MANAGEMENT: File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir,closedir, mkdir, rmdir, umask.

* Self study – Questions for examination may be taken from the self study portions also.

PCS 43

19PCS310

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

.

TEXT BOOK:

1.Sumitabha Das, (1993), Unix Concepts and Applications., 4th Edition, Tata McGraw Hill

REFERENCE BOOKS:

1. Graham Glass, King Ables, (2009), Unix for programmers and users, , Pearson Education, 3rd Edition.
2. .N.B Venkateswarlu, (2010), Advanced Unix programming, BS Publications, 2nd Edition.
3. Yashwanth Kanitkar, (2010), Unix Shell programming , BPB Publisher, 1st Edition .
4. Richard Blum, (2014), Linux Command Line and Shell Scripting – Bible, Wiley

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	H	M
CO2	S	S	H	H	H
CO3	S	S	H	H	H
CO4	S	S	S	S	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 44

19PCS311

Programme Code: 09		M.Sc Computer Science		
Course Code: 19PCS311		Core Paper 11: Big Data Analytics		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	III	5	75	4

Course Objectives

1. To introduce the basic concepts of big data.
2. To face the challenges of big data.
3. To teach students in applying skills and tools to manage and analyse big data

Course Outcomes (CO)

K1	CO1	Understand the concept and challenges of big data.
K2	CO2	Collect, manage, store, store, query and analyse various forms of big data.
K3	CO3	Gain hands-on experience on large-scale analytics tools to solve some open big data problems.
K4	CO4	Understand the big data tools like Hadoop,Hbase,NoSQL and Neo4J

UNIT I **[15 Hrs]**

What is big data – why big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies - open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.

19PCS311

UNIT II **[15 Hrs]**

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features.

UNIT III **[15 Hrs]**

Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Cassandra – cassandra data model – cassandra examples – cassandra clients – Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

UNIT IV **[15 Hrs]**

Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships– schemaless databases – materialized views – distribution models -peer- peer replication –consistency – relaxing consistency – version stamps – partitioning and combining – composing map-reduce calculations -**Document based Database** *– MongoDB- Introduction- Data Model- Working with data- Replication & Sharding- Development.

UNIT V **[15 Hrs]**

Graph databases Neo4J- Key concept and characteristics-Modelling data for neo4j-Importing data into neo4j-Visualizations neo4j-Cypher Query Language-Data visualization-Creating Visual analytics with Tableau-Connecting your data-Creating Calculation-Using maps-Dashboard-Stories.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

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TEXT BOOK:

1. Tom White, (2012) "Hadoop: The Definitive Guide", Third Edition ,O'Reilly Media Inc.,.

REFERENCE BOOKS:

1. Rik Van Bruggen, (2014) "Learning Neo4j" Packt Publishing.
2. Daniel G. Murray, (2016)"Tableau Your Data!: Fast and Easy Visual Analysis with Tableau Software" 2nd Edition,Wiley Publications.
3. Eelco Plugge, David Hows, Peter Membrey, Tim Hawkins (2015) "The Defininetive Guide to Mongodb",Apress.
4. Pramod J. Sadalage, Martin Fowler, (2014)"NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence" Pearsons Education.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	H	S	H	S
CO2	M	H	S	M	S
CO3	M	S	S	M	S
CO4	M	M	S	M	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 47

19PCS3Z1

Programme Code: 09		MSc.Computer Science		
Course Code: 19PCS3Z1		Mini Project		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	III			3

Course Objectives

1. To implement the concepts of SDLC.
2. To experience development of real time applications.
3.

To practice the students rapid application development.

Course Outcomes (CO)

K1	CO1	Understand the concept and challenges in Software Project Management.
K2	CO2	To analyse the issues in developing applications.
K3	CO3	Gain hands-on experience on systematic approach in project development.
K4	CO4	Can experience the bottlenecks of various languages and solve it.

MARK DISTRIBUTION:

	Marks
CIA	**15**
VIVA-VOCE *	**15**
PROJECT RECORD *	**45**

*** Both Internal and External Examiner shall evaluate Project and Viva-Voce Jointly**

PCS 48

19PCS3Z1

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	M
CO2	H	M	S	S	H
CO3	H	S	S	H	M
CO4	H	S	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 49

19PCS3CP

Programme Code: 09		M.ScComputer Science		
Course Code: 19PCS3CP		Core Practical 5 : Web Technology Lab		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	III	5	75	3

Course Objectives

1. The course educates the advanced concepts in web designing with Open Source tools.
2. To demonstrate the development of web application and its validation.
3. To inculcate the significance of Server Scripts and simulating applications with backends.

Course Outcomes (CO)

K3	CO1	Posses better presentation and manipulating skills for developing a dynamic web page
K3	CO2	Validating the essentials in an application using JavaScript .
K4	CO3	Capable to develop Web application with Server script
K5	CO4	Performs better Data manipulation for web application using PHP-Mysql suite.

LIST OF PRACTICAL PROGRAMS

1. Designing Websites with HTML and CSS.
2. Developing applications with JavaScript.
3. Validations with PHP.
4. File Handling in PHP.
5. Develop applications with PHP and MySQL

PCS 50

19PCS3CP

Teaching Methods:

Demonstration ,simulation, assignment and Discussion.

Guidelines to the distribution of marks for Practical Examinations: (Total marks:75)

CIA : Total marks – 30 [Practical – 20, Observation- 5, Attendance – 5]

ESE: Two Questions will be given for each student (3 Hours / 45 Marks)

1. Record Work - 5 Marks
2. Algorithm, Coding and execution – 40 Marks

Particulars	Program 1 (Marks)	Program II (Marks)
Algorithm	5	5
Coding	10	10
Execution & viva voce	5	5

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	M
CO2	H	M	S	S	H
CO3	H	S	S	H	M
CO4	H	S	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 51

19PCS3CQ

Programme Code: 09		M.Sc. Computer Science		
Course Code: 19PCS3CQ		Core Practical 6 : Unix Programming Lab		
Batch 2019-2020	Semester III	Hours / Week 5	Total Hours 75	Credits 3

Course Objectives

1. Execute the basic set of commands and utilities in Linux/UNIX systems.
2. To write shell scripts to solve regular exercises.
3. To implement some standard Linux/Unix utilities and can able to develop some software applications

Course Outcomes (CO)

K3	CO1	Make effective use of Unix utilities, and scripting languages
K3	CO2	Apply shell scripts to develop a small types of applications
K4	CO3	Exposure to develop a software using Unix/Linux systems
K5	CO4	Execution of simple programs and shell script with various applications

LIST OF PRACTICAL PROGRAMS

1. Implementation of basic commands, File commands and Directory commands.
2. Develop various application programs with vi editor.
3. Develop applications using shell scripts.

Teaching Methods:

Demonstration ,simulation, assignment and Discussion.

Guidelines to the distribution of marks for Practical Examinations : (Total marks:75)

CIA : Total marks – 30 [Practical – 20, Observation- 5, Attendance – 5]

PCS 52

19PCS3CQ

ESE : Two Questions will be given for each student(3 Hours / 45 Marks)

Record Work - 5 Marks

Algorithm, Coding and execution – 40 Marks

Particulars	Program 1 (Marks)	Program II (Marks)
Algorithm	5	5
Coding	10	10
Execution & viva voce	5	5

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	H	M
CO2	S	H	S	H	H
CO3	S	H	S	H	H
CO4	S	S	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 53

SEMESTER IV

19PCS412

Programme Code: 09		M.Sc. Computer Science		
Course Code: 19PCS412		Core Paper 12 : Internet of Things		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	IV	5	75	4

Course Objectives

1. To understand Smart Objects and IoT Architectures
2. To learn about various IOT - related protocols
3. To develop IoT infrastructure for popular applications

Course Outcomes (CO)

K1	CO1	Students will get the knowledge of IoT
K2	CO2	Understand the IoT Protocols & IoT Access Technologies
K3	CO3	Describe Design & Development of IoT
K4	CO4	Know IoT supporting services

UNIT I **[15 Hrs]**

FUNDAMENTALS OF IoT: Evolution of Internet of Things -Enabling Technologies –IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -–Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.

19PCS412

UNIT II **[15 Hrs]**

IoT PROTOCOLS: IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions – Optimizing IP for

IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Layer Protocols: CoAP and MQTT

UNIT III **[15 Hrs]**

DESIGN AND DEVELOPMENT: Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - introduction.

UNIT IV **[15 Hrs]**

DATA ANALYTICS AND SUPPORTING SERVICES : Structured Vs Unstructured Data and Data in Motion Vs Data in Rest –Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Python Web Application Framework.

UNIT V **[15 Hrs]**

CASE STUDIES/INDUSTRIAL APPLICATIONS: Cisco IoT system - IBM Watson IoT platform –Manufacturing - Home Automation, smart cities, Smart, Agriculture, * Smart Parking Architecture and Smart Traffic Control.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

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PCS 55

19PCS412

TEXT BOOKS:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press, 2017.
2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things –Key applications and Protocols, Wiley, 2012 .

REFERENCE BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things –A hands-on approach‖, Universities Press, 2015.
2. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'ReillyMedia,2011.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	M	H
CO2	S	S	M	H	M
CO3	S	S	H	H	M
CO4	S	S	H	H	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 56

19PCS4CR

Programme Code: 09		M.Sc Computer Science		
Course Code: 19PCS4CR		Core Practical 7 : Internet of Things Lab		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	IV	5	75	3

Course Objectives

1. To understand IoT techniques.
2. To introduce IoT Application using IDEs
3. To know how to Implement IoT.

Course Outcomes (CO)

K3	CO1	Effective use of IoT
K3	CO2	Ability to use different IDEs for IoT implementation.
K4	CO3	Student can able to implement IoT Applications
K5	CO4	Student can able to embed IoT Applications

LIST OF PRACTICAL PROGRAMS

* Automated electrical product
* A Smart hose hold monitoring system
* A smart agriculture monitoring system
* Sensors (Temprature & Humidity etc.)

PCS 57

19PCS4CR

Teaching Methods:

Demonstration ,simulation, assignment and Discussion.

Guidelines to the distribution of marks for Practical Examinations : (Total marks:75)

CIA : Total marks – 30 [Practical – 20, Observation- 5, Attendance – 5]

ESE : Two Questions will be given for each student(3 Hours / 45 Marks)

Record Work - 5 Marks

Algorithm, Coding and execution – 40 Marks

Particulars	Program 1 (Marks)	Program II (Marks)
Algorithm	5	5
Coding	10	10
Execution & viva voce	5	5

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	H	H	M
CO2	H	M	H	H	M
CO3	M	M	M	H	H
CO4	H	M	H	H	M

S – Strong **H** – High **M** – Medium **L** – Low

PCS 58

19PCS4Z2

Programme Code: 09		MSc. Computer Science		
Course Code: 19PCS4Z2		Project Work and Viva-Voce		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	IV	15	225	6

Course Objectives

1 To develop real time applications.

2 To implement the concepts of Software Project Management.

3 To teach students in applying skills and tools to manage and develop a solution.

Course Outcomes (CO)

K1	CO1	Understand the concept and challenges of market.
K2	CO2	Collect, manage ,plan and develop a real time application.
K3	CO3	Gain hands-on experience on different project models.
K4	CO4	Helps to understand the complexity and maintaining quality.

MARK DISTRIBUTION:

	Marks
CIA	**40**
VIVA-VOCE *	**40**
PROJECT RECORD *	**120**

*** Both Internal and External Examiner shall evaluate Project and Viva-Voce jointly**

PCS 59

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	M
CO2	H	M	S	S	H
CO3	H	S	S	H	M
CO4	H	S	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 60

ELECTIVE PAPERS

Programme Code: 09		M.Sc Computer Science		
Course Code:		Elective Paper : Network Security and Cryptography		
Batch 2019-2020	Semester	Hours / Week	Total Hours	Credits 4

Course Objectives

1. To familiarize basic concepts of cryptography and algorithms.
2. To know about various security issues.
3. To understand the process of implementing the cryptographic algorithms.

Course Outcomes (CO)

K1	CO1	Understanding fundamental concepts of network security.
K2	CO2	Knowing how the encryption and decryption are done.
K3	CO3	Familiarize various kinds of viruses and related threats.
K4	CO4	Implementing various cryptography algorithms.

UNIT I

Introduction: The OSI Security Architecture-Security Attacks-Security Services-Security Mechanisms-A model for network security. Classical Encryption Techniques: Symmetric Cipher Model-Substitution technique-Transposition Technique-Rotor Machines-Steganography.

UNIT II

Block Ciphers and the data Encryption Standard: Block Cipher Principles-The Data Encryption Standard-Block Cipher Design Principles. Advanced Encryption Standard: Evaluation Criteria for AES-The AES Cipher.

Public Key Encryption and Hash Functions: Introduction to Number theory-Public Key Cryptography and RSA-Key Management.

PCS 61

UNIT III

Message Authentication and Hash Functions: Authentication Registration-Authentication Functions-Authentication Codes-Hash Functions-Security of Hash Functions and MACs.

Hash and MAC Algorithms: Secure Hash algorithm-Whirlpool-HMAC-CMAC.Digital Signatures-Authentication protocols-Digital Signature Standard.

UNIT IV

Network Security Applications: Authentication Applications-**Electronic Mail Security***-IP Security-Web Security.

UNIT V

Intruders-Intrusion Detection-Password Management-Viruses and Related Threats-Virus Counter measures-Firewall Design Principles-Trusted Systems.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOK:

1. William Stallings (2011) "Cryptography and Network Security Principles and Practices", Fourth Edition, PHI Publications.

REFERENCE BOOKS:

1. Atul Kahate (2005), "Cryptography and Network Security", Third Edition, TMH.
2. Haribhaskar (2008), "Cryptography and Network Security", Sam Publishers, First Edition.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	H	S
CO2	H	S	H	H	H
CO3	H	S	H	H	H
CO4	H	S	H	M	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 62

Programme Code: 09		M.Sc Computer Science		
Course Code:		Elective Paper : Bio Inspired Computing		
Batch 2019-2020	Semester	Hours / Week	Total Hours	Credits 4

Course Objectives

1. To Inculcate the basics of Bio-Inspired algorithms
2. To provide exposure of various kinds of Heuristic and Meta-heuristics algorithms
3. To develop the proficiency for planning & implementing the various Bio-Inspired algorithms.

Course Outcomes (CO)

K1	CO1	Obtain a foundation for Bio-Inspired algorithms
K2	CO2	Distinguish nature based algorithms and bio inspired algorithms
K3	CO3	Most real-world optimization problems can be recognized
K4	CO4	Apply relevant Bio-Inspired problem solving methodologies for optimization

UNIT I

Natural to Artificial Systems – Biological Inspirations in problem solving – Behavior of Social Insects: Foraging - Division of Labor - Task Allocation – Cemetery Organization and Brood Sorting – Nest Building - Cooperative transport.

UNIT II

Ant Colony Optimization [ACO]: Ant Behavior - Towards Artificial Ants - Combinatorial Optimization - Ant Colony Optimization Meta heuristic – Problem solving using ACO - Extensions of Ant Systems – ACO and Local search methods -
ACO theoretical considerations and Convergence.

PCS 63

UNIT III

Ant Colony Optimization algorithms for NP - hard problems - Routing problems - Assignment problems - Scheduling problems – Subset problems - Machine Learning Problems – ACO for Travelling Salesman problem*.

UNIT IV

Swarm Intelligence: Biological foundations of Swarm Intelligence – Swarm Intelligence in Optimization – Particle Swarms for dynamic optimization problems.

UNIT V

Biological Inspired computing to Natural Computing – Integration of Evolutionary Computation Components in Ant Colony Optimization – Particle Swarm optimization based on Socio-cognition.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOKS:

1. Eric Bonabeau, Marco Dorigo, Guy Theraulaz, (2000) ” Swarm Intelligence: From Natural to Artificial Systems” , Oxford University press. (Unit I)

2. Marco Dorigo, Thomas Stutzle, (2004), Ant Colony Optimization , MIT Press. (Unit –II,III)

3. Christ ian Blum, Daniel Merkle (Eds.), (2008) Swarm Intelligence: Introduction and Applications , Springer Verlag,. (Unit – IV)

4. Leandro N De Castro, Fernando J Von Zuben, (2005), Recent Developments in Biologically In spired Computing , Idea Group Inc, (Unit –V)

REFERENCE BOOKS:

1. Anna Ursyn, Biologically-Inspired Computing for the Arts – Scientific Data through graphics, Information Science Reference

2. De-Shuang Huang, Yong Gan, Prashan Premaratne, Kyungsook Han(Eds.) (2014), Bio-Inspired Computing and Applications, LNBI 6840, Springer

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MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	H	S
CO2	S	H	S	H	S
CO3	S	S	S	H	S
CO4	S	S	S	S	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 65

Programme Code: 09		M.Sc Computer Science		
Course Code:		Elective Paper : Advanced Computing		
Batch 2019-2020	Semester	Hours / Week	Total Hours	Credits 4

Course Objectives

1. To Inculcate the basics of Grid Computing Architecture and Framework
2. To provide exposure to Cluster Computing Middlewares
3. To understand the concepts of Cloud Computing and its Applications

Course Outcomes (CO)

K1	CO1	Obtain a foundation for Grid Computing Concepts and Architecture
K2	CO2	Exposure to various toolkits used in Grid
K3	CO3	Proficient in single system image
K4	CO4	Apply Cloud in various Real-time Applications

UNIT I

GRID COMPUTING **:** Grid Computing -The data Centre, the Grid and the distributed/High performance computing –Cluster computing and Grid computing – Meta computing–Scientific, business and E-Governance Grids, web services and Grid computing. Technologies and architecture for Grid computing. World wide Grid Computing Activities, Organizations and projects. Web services and the Service oriented Architecture (SOA).

UNIT II

GRID COMPUTING ARCHITECTURE : OGSA for Resource distribution – Stateful web services in OGSA –Web services Resource Framework(WSRF) – Resource approach to

stateful services-WSRF specification – Globus Toolkit. Grid Resource Management system - Grid Security Requirements – ***Data management challenges.**

UNIT III

CLUSTER COMPUTING : Approaches to parallel computing –How to achieve low cost parallel computing through clusters – Definition and architecture of a cluster – Cluster Middleware : An Introduction –Levels and layers of single system Image(SSI) –Cluster middleware design objectives –Resource Management and scheduling –Cluster programming environment and tools. Process Scheduling - Load sharing and Load balancing.

UNIT IV

UNDERSTANDING CLOUD COMPUTING: Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services

UNIT V

DEVELOPING CLOUD SERVICES: Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service –Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds.

Cloud Computing for the family - Cloud Computing for the Community - Cloud Computing for the Corporation.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOKS:

1. C.S.R Prabhu,(2008) Grid and Cluster computing, Prentice Hall of India, (Units I, II & III)
2. Michael Miller, (2008)“Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online”, Que,. (Units IV & V)

PCS 67

REFERENCE BOOK:

1. Ian Foster, Carl Kesselman,(2004) The Grid 2: Blueprint for a New Computing Infrastructure, Elsevier Series,.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	H	S
CO2	S	H	S	H	S
CO3	S	S	S	H	S
CO4	S	S	S	S	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 68

Programme Code: 09		M.Sc Computer Science		
Course Code:		Elective Paper : Green Computing		
Batch 2019-2020	Semester	Hours / Week	Total Hours	Credits 4

Course Objectives

1. To introduce students the concepts of Green computing
2. To understand the concept of green Enterprise architecture and how to minimize e-waste.
3. To teach students in applying skills to manage the Environmentally Responsible Business Strategies (ERBS).

Course Outcomes (CO)

K1	CO1	Understand how to build environmentally responsible business policies, practices and metrics.
K2	CO2	Understand the concepts of green assets and modelling, green enterprise architecture, green information system.
K3	CO3	Understand the concepts of Grid framework and green data centre.
K4	CO4	Apply Green IT strategies and applications to a home, Hospital, packaging industry and telecom sector.

UNIT I

Fundamentals of Green IT : Business, IT, and the Environment –Green computing: carbon foot print, scoop on power –Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics -Approaches to green computing -Middleware Support -Compiler Optimization -Product longevity -Software induced energy consumption -its measurement and rating.

PCS 69

UNIT II

Green Assets and Modeling: Green Assets: Buildings, Data Centers, Networks, and Devices –Green Business Process Management: Modeling, Optimization, and Collaboration –Green Enterprise Architecture –Environmental Intelligence –Green Supply Chains –Green Information Systems: Design and Development Models.

UNIT III

Grid Framework: Virtualizing of IT systems –Role of electric utilities, Telecommuting, teleconferencing and teleporting –Materials recycling –Best ways for Green PC –***Green Data center** –Green Grid framework.

UNIT IV

Green Compliance and Green Mobile : Socio-cultural aspects of Green IT –Green Enterprise Transformation Roadmap –Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future -Green mobile -optimizing for minimizing battery consumption -Web, Temporal and Spatial Data Mining Materials recycling.

UNIT V

Case Studies: The Environmentally Responsible Business Strategies (ERBS) –Case Study Scenarios for Trial Runs –Case Studies –Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOK:

1. Bhuvan Unhelkar,(2011) “Green IT Strategies and Applications -Using Environmental Intelligence”, CRC Press.

PCS 70

REFERENCE BOOKS:

1. Alin Gales, Michael Schaefer, Mike Ebbers, (2011)"Green Data Center: steps for the Journey", Shoff/IBM rebook.
2. John Lamb,(2009)"The Greening of IT", Pearson Education.
3. Jason Harris,(2012) " Green Computing and Green IT Best Practices on Regulations and Industry Initiatives, Virtualization, Power Management, Materials Recycling and Telecommuting", Emereo Publishing.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	M	M	L	S
CO2	M	M	M	L	S
CO3	M	M	M	L	S
CO4	M	M	M	L	S

S – Strong **H** – High **M** – Medium **L** – Low

PCS 71

Programme Code: 09		M.Sc Computer Science		
Course Code:		Elective paper : Artificial Intelligence and Machine Learning		
Batch 2019-2020	Semester	Hours / Week	Total Hours	Credits 4

Course Objectives

1. To familiarize AI problems and AI techniques.
2. To learn various search techniques and knowledge representations.
3. To inculcate expert system concepts and applying them to solve the problems.

Course Outcomes (CO)

K1	CO1	Understanding basic concepts Artificial Intelligence, AI problems and its techniques.
K2	CO2	Analyze state space search, problem characteristics and knowledge representations.
K3	CO3	Students can able to differentiate between different types of learning.
K4	CO4	Students can solve the problem by acquiring knowledge of supervised and unsupervised learning.

UNIT I

Introduction: AI Problems - Al techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search.

UNIT II

Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -**Issues in Knowledge representations*** - Frame Problem.

UNIT III

Using Predicate logic: Representing simple facts in logic - Representing Instance and Isarelationships - Computable functions and predicates - Resolution - Natural deduction.

PCS 72

Representing knowledge using rules: Procedural Vs Declarative knowledge - Logic programming - Forward Vs Backward reasoning - Matching - Control knowledge.

UNIT IV

Learning: Types of learning - Machine learning - Intelligent agents. Clustering: k-means clustering - fuzzy clustering - hierarchical clustering - cluster similarity - case studies**.** Reinforcement learning: Markov decision problem - Q-learning - temporal difference learning - case studies.

UNIT V

Artificial neural nets: ANN basics - ANN learning process-types of networks - perceptron. Supervised learning: support vector machines – inductive logic programming - case based reasoning - nearest neighborhood - fuzzy network- case studies**.** Unsupervised learning: Expectation maximization - self organizing maps - adaptive resonance theory - case studies**.**

* Self study – Questions for examination may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOKS:

1. Elaine Rich and Kevin Knight," Artificial Intelligence", Tata McGraw Hill Publishers company Pvt Ltd, Second Edition, 2002.
2. Vinod Chandra. S.S. and Anand Hareendran. S, "Artificial Intelligence and Machine Learning", PHI Learning Private Limited, 2014.

REFERENCE BOOKS:

1. Richard E .Neapolitan and Xia Jiang,"Artificial Intelligence with an Introduction to Machine Learning",2nd Edition ,CRC Press,2018.

PCS 73

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	H	H	S
CO2	H	M	S	M	S
CO3	H	M	M	M	H
CO4	M	M	M	M	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 74

Programme Code: 09		M.Sc Computer Science		
Course Code:		Elective Paper : Computational Intelligence		
Batch 2019-2020	Semester	Hours / Week	Total Hours	Credits 4

Course Objectives

1. To understand the fundamental of neural networks.
2. To understand the concepts of machine intelligence applications of fuzzy logic.
3. To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

Course Outcomes (CO)

K1	CO1	Student will be able to understand concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
K2	CO2	Student will be able to remember fuzzy sets, knowledge representation using fuzzy rules.
K3	CO3	Student will be able study approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic
K4	CO4	Student will be able know genetic algorithms and its application to engineering optimization problems

UNIT I

INTRODUCTION – ARTIFICIAL INTELLIGENCE : Artificial Intelligence: History and Applications – Production Systems – Structures and Strategies for state space search – Data driven and goal driven search – Depth First and Breadth First Search – DFS with Iterative Deepening – Heuristic Search – Best First Search – A* Algorithm – AO* Algorithm – Constraint Satisfaction – Using heuristics in games – Minimax Search – Alpha Beta Procedure planning.

UNIT II

ARTIFICIAL INTELLIGENCE – REPRESENTATION SCHEMES : Knowledge representation – Propositional calculus – Predicate Calculus – Theorem proving by Resolution –

PCS 75

Answer Extraction – AI Representational Schemes – Semantic Nets – Conceptual Dependency – Scripts – Frames – Introduction to Agent based problem solving.

UNIT III

NEURAL NETWORKS : Neural networks (NNs) for machine learning – models of neuron – perceptrons and perceptron learning rule – limitations of perceptrons – Multilayer perceptrons (MLPs) – back propagation learning algorithm – MLPs as classifiers – local minima and ovefitting – applications of MLPs – Radial basis functions (RBFs) – interpolation and approximation with RBFs – RBFs *vs.* MLPS – related classical optimization.

UNIT IV

GENETIC ALGORITHM AND EVOLUTIONARY PROGRAMMING : Genetic algorithms: Introduction – genetic Operators – chromosomes – mutations and cross – over – Fitness functions – Evolutionary programing – learning classification systems Multi – agent systems – PCA and SOM with evolutionary computations – Modeling uncertainty – distributions– intervals– fuzzy sets– rough sets– Fuzzy Vs Crisp– membership pas– Fuzzy systems.

UNIT V

EXPERT SYSTEM AND LANGUAGE PROCESSING : Overview of Expert System Technology – Rule based Expert Systems– Introduction to Natural Language Processing – Languages and Programming Techniques for AI – **Introduction to PROLOG and LISP*** – Search strategies and Logic Programming in LISP– Production System examples in PROLOG.

* Self Study - questions for examinations may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

PCS 76

TEXT BOOKS:

1. George.F.Luger, (2002) "Artificial Intelligence –Structures and Strategies for Complex Problem Solving", 4th edition, Pearson Education,.
2. E. Rich, K.Knight, (1991)"Artificial Intelligence", 2nd edition, Tata McGraw Hill, Winston. P. H, "LISP", Addison Wesley

REFERENCE BOOKS:

1. Ivan Bratko, (2000)"Prolog Programming for Artificial Intelligence", 3rd edition, Addison Wesley,
2. A.P. Engelbrecht, "Computational Intelligence", John Wiley &Sons, 2002.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	H	S	S
CO2	M	H	H	S	H
CO3	H	S	S	M	S
CO4	H	M	H	S	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 77

Non Major Elective Papers

Programme Code: 09		M.Sc Computer Science		
Course Code:		Non-Major Elective Paper : Management Information Systems		
Batch 2019-2020	Semester	Hours / Week	Total Hours	Credits 4

Course Objectives

1. Students will identify the core concepts of Management Information Systems
2. To examine the concepts of business and information.
3. To design and implement the manufacturing sector

Course Outcomes (CO)

K1	CO1	Student will learn the principles and fundamentals of business management
K2	CO2	Demonstrate knowledge of the Information concepts
K3	CO3	Student will able to configure and develop a Management Information Systems
K4	CO4	Analyses the various streams of manufacturing sector

UNIT I

Management's information systems: role and importance of management-process of management -organization and theory -strategic management of business.

UNIT II

Concepts –methods-tools and the name of the procedures -behavioral concepts in decision making: information–Information concepts-information: a quality product-classification of the information-methods of data and information collection -Value of the information -general model of a human as an information preprocessor -organization and information.

PCS 78

UNIT III

Development of MIS-Development of long range plans of MIS -ascertaining the class of information-determining the information requirement-Development and implementation of the MIS -management of quality in the MIS -organization for Development of the MIS - choice of information technology –nature of it decision-strategic decision-configuration design–evaluation.

UNIT IV

Applications in manufacturing sector -personnel management –financial management –production management - ***materials management** – marketing management-decision support systems-concept and philosophy, dss: deterministic systems -knowledge based expert systems (kbes**).**

UNIT V

InfoTech infrastructure-technology of information systems-database and client server architecture-data in data warehouse-architecture of data ware houses Self-Study: data in data warehouse Learning outcome: On successful completion of the course the students would have the knowledge about, Development and implementation of the MIS technology of information systems-database.

* Self Study - questions for examinations may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOK:

1. W.s Jawadekar, “Management Information Systems”, Tata McGraw Hill Publishers 2002.

REFERENCE BOOKS:

1. G.Murdick, James R.Clagett, “Information Systems for Modern Management”, Robert third edition prentice hall of India.
2. Amitabh Jain ,Naveena Bajaj,“Management Information System”, 1st edition, 2002
3. Aman Jindal, “Management information system”, 1 st edition, 2003

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MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	H	S	S
CO2	M	H	H	S	H
CO3	H	S	S	M	S
CO4	H	M	H	S	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 80

Programme Code: 09		M.Sc. Computer Science		
Course Code:		Non-Major Elective Paper : Bio Informatics		
Batch 2019-2020	Semester	Hours / Week	Total Hours	Credits 4

Course Objectives

1. To enable the student to know about all biological databases, perl programming.
2. To understand different structure and functions.
3. To learn the different modeling techniques & sequence analysis.

Course Outcomes (CO)

K1	CO1	Student will learn the principles and fundamentals of sequence analysis
K2	CO2	Demonstrate knowledge of the biological concepts and datadbases
K3	CO3	Student will able to configure the elements of perl programming
K4	CO4	Analyses the structural biology and molecular modelling

UNIT I

Introduction – importance of bioinformatics – biological concepts – DNA & protein (Structure and functions)

UNIT II

Model organisms and genome projects, Biological Databases, Sequence databases, Primary, secondary, composite databases, Nucleotide sequence databases (NCBI, EBI, DDBJ), Protein sequence databases (SwissPROT, TrEMBL, PIR, Expasy), Structural databases, DNA structure databases, Protein structure database (PDB, SCOP, CATH), Genome databases, NCBI genome, Pathway database, KEGG.

UNIT III

Sequence analysis – gene identification methods (Prokaryotic and eukaryotic), Needleman and Wunsch algorithm, Smith and Waterman algorithm, pair wise sequence alignment (local and global alignment), scoring a matrix (Pam and Blosum), Multiple sequence alignment, sequence motif analysis

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UNIT IV

Elements of PERL Programming – Data types, syntax, loops, input and outputs.

UNIT V

Structural biology and molecular modeling - Molecular visualization, RasMol, ViewerPro, Swiss PDB Viewer, Protein conformational analysis, Ramachandran plot, Secondary structure prediction, 3DPSSM, Protein Domains, ***Blocks and Motifs**, CD Search, PDB Search, PDB Format, Comparative Modeling.

* Self Study - questions for examinations may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

TEXT BOOKS:

1. T.K. Attwood, D.J. Parry-Smith, "Introduction to Bioinformatics", Pearson Education, Asia, 2003

2. Dan E.Krane, Michael L.Raymer, "Fundamental concept s of Bioinformatics", Pearson Education, Asia, 2003.

REFERENCE BOOK:

3. Dr. K, Mani and N. Vijayaraj, "Bioinformatics for beginners", Kalaikathir Achchagam.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	H	S	S
CO2	M	H	H	S	H
CO3	H	S	S	M	S
CO4	H	M	H	S	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 82

Programme Code: 09		M.Sc Computer Science		
Course Code:		Non-Major Elective Paper : Robotics		
Batch 2019-2020	Semester	Hours / Week	Total Hours	Credits 4

Course Objectives

1. To introduce the functional elements of Robotics.
2. To educate on various path planning techniques.
3. To understand the application of robotics in real life.
4. To introduce robotic safety standards.

Course Outcomes (CO)

K1	CO1	Successful student will be able to understand Robotics concepts.
K2	CO2	Successful student will be able to remember Robotics Path and motion controls.
K3	CO3	Successful student will be able to analyse how to use sensors in robotics.
K4	CO4	Successful student will be able to create or apply robotic models in real time.

UNIT I

Introduction: Objectives - automation and robots - brief history - the technology of robots - economic and social issues - present and future applications. Robot Technology: Objectives-fundamentals general characteristics - basic components - robot anatomy-robot generations-robot selection. Robot classification: objectives - classification-arm geometry - degrees of freedom-power sources - type of motion - path control – intelligence.

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UNIT II

Robot system analysis: Objectives-robot operation - hierarchical control structures - control structure - line tracking - dynamic properties of robots - modular robot components. Robot End Effectors: objectives - types of end effectors-mechanical grippers - gripper forces analysis - other types of grippers-special-purpose grippers-grippers selection and design-process tooling-compliance.

UNIT III

Sensors: objectives-robot sensors - sensor classification - micro switches – solid - state switches - proximity sensors - photoelectric sensors - rotary positions - usage and selection of sensors - signal processing - sensors and control integration. Vision: objectives - Visual sensing - machine Vision - machine Vision applications - other optical methods.

UNIT IV

Control systems: objectives-control systems correlation-control system requirements – programmable logic controller - PLC programming terminals – proportional – integral – derivative - computer numerical control - *** microprocessor UNIT** - universal robot controller - interfacing - work cell control. Programming: objectives - robot programming-programming methods - programming languages - levels of robot programming - space position programming - motion interpolation-program statements - sample programs

UNIT V

Safety: Objectives - robot safety - safety standards - system reliability-human factor issues - safety sensors and monitoring – safeguarding – training - safety guidelines - definitions. Industrial Applications: objectives - automation in manufacturing - robot applications – material - handling applications - processing operations – assembly operations - inspection operation - evaluating the potential of a robot application - future applications - challenge for the future – innovations - case studies.

* Self Study - questions for examinations may be taken from the self study portions also.

Teaching Methods:

Chalk and Talk, Power point presentation, Seminar, Brainstorming, Assignment **,G**oogle Class room

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TEXT BOOK:

1. James G.Keramas “Robot Technology Fundamentals”, Thomson Delmar Publications, 2002.

REFERENCE BOOK:

1. Robert J.Schilling,”Fundamentals of Robotics, Analysis & Control”, PHI, 2002.
2. J.J. Craig-“Introduction to Robotics” ,Pearson Education,2009.

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	H	H	H
CO2	M	H	H	H	H
CO3	H	S	H	H	H
CO4	H	H	H	S	H

S – Strong **H** – High **M** – Medium **L** – Low

PCS 85

ADVANCED LEARNERS COURSE (ALC)

18PCS0D1

ALC 1 : PROGRAMMING IN C #

Programme Code: 09		MSc. Computer Science		
Course Code: 1**8**PCS0D1		ALC 1 : PROGRAMMING IN C #		
Batch 2019-2020	Semester	Hours / Week	Total Hours	Credits 4

Course Objectives

1. To understand the basic elements of C#.
2. To provide exposure to Program Structure and Inheritance.
3. To understand File systems and its operations.

UNIT I

Basic Elements of C #: .Net frame work – C # language – Features – Character set – Lexical elements - Escape sequence – Identifiers – Keywords – Concepts of data – Operators – Punctuators – Primitive data types – Preprocessing Directives.

UNIT II

C# Program Structure: Program Structure – Methods – Instance – new operator – Member access – Invoking a method – Parameter Types - Constructor – Destructor – Default Constructor – this reference – Access Modifiers – Static members – Formatted method – Header of main method – Enumeration operators types – type conversion – Merging of String - is operator – Checked & unchecked operator.

UNIT III

Statements: Classification – Expression – Control Flow – Block – Declaration – Empty – Exception – Lock – Labeled – Checked & unchecked. Arrays: Regular & Jagged Arrays – Two & Three dimensional arrays – Local Arrays - Features of arrays – System Arrays – Passing array as a parameter – Application of arrays – Recursive methods – Structure – Nested Structures.

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UNIT IV

Inheritance: Introduction – Types - .Net building blocks – Name Hiding – Virtual and override methods – Dynamic binding – Abstract method & class –
Advantages. Interface and Operator overloading: Interface – Declaration of Interface – Polymorphism of Interface – Operator overloading – method overloading – Collection Interfaces – Variable method Interfaces list.

UNIT V

File Operations and Multithreading: Stream – File management – File operations – Multitasking – Multi threading – Operation of threads - Secondary threads – Synchronization.

TEXT BOOK:

1. S.Thamarai Selvi, R.Murugesan, (2003)"A Text Book on C# A systematic approach to Object Oriented Programming", Pearson Education.

REFERENCE BOOK:

1. E Balagurusamy (2017) "Programming in C#", Fourth Edition, McGraw Hill Education.

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18PCS0D2

ALC 2: J2EE

Programme Code: 09		MSc. Computer Science		
Course Code: 1**8**PCS0D2		ALC 2 : J2EE		
Batch 2019-2020	Semester	Hours / Week	Total Hours	Credits 4

Course Objectives

1. To understand the basics of J2EE.
2. To provide exposure to Java Servlets, Beans and Remote Method Invocation.
3. To learn the concepts of Web Services.

UNIT I

J2EE and J2SE - The Birth of J2EE - Databases - The Maturing of Java - Java Beans and Java Message Service - Why J2EE? J2EE Multi-Tier Architecture - J2EE Best Practices - J2EE Design Patterns and Frameworks.

UNIT II

J2EE FOUNDATION - Java servlets - Java Server Pages

UNIT III

Enterprise JavaBeans - JavaMail API - Java Interface Definition Language and CORBA.

UNIT IV

Java Remote Method Invocation - Java Message Service – Security - Java Naming and Directory Interface API

UNIT V

WEB SERVICES - SOAP - Universal Description, Discovery, and Integration (UDDI) - Electronic Business XML - The Java API for XML Registries (JAXR) - Web Services Description Language (WSDL)

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TEXT BOOK:

1. James Keogh, “J2EE - The complete Reference”, Mc-Graw Hill, 2002.

REFERENCE BOOK:

1. Stephanie Bodoff, Eric Armstrong, Jennifer Ball, Debbie Bode Carson, Ian Evans, Dale Green Kim, Haase Eric Jendrock, “ The J2EE Tutorial”, Second Edition, Pearson Education, 2004.