

Deccan Education Society's
FERGUSSON COLLEGE, PUNE
(AUTONOMOUS)

SYLLABUS UNDER AUTONOMY
SECOND YEAR M.Sc. (Computer Applications)
SEMESTER - III

w.e.f. Academic Year 2018-2019

**Deccan Education Society's
Fergusson College (Autonomous), Pune
Faculty of Science
Post Graduate Syllabus (Computer Applications)
Second Year**

Semester	Course Code	Title of the Course	Core/Elective	No. of Credits
III	CSA5301	Python Programming	CORE	4
	CSA5302	Mobile Technology	CORE	4
	CSA5303	Networking Concepts	ELECTIVE-I	4
	CSA5304	Software Testing	ELECTIVE-I	4
	CSA5305	Operating System	ELECTIVE-I	4
	CSA5306	Soft Computing	ELECTIVE-II	4
	CSA5307	Big Data Analytics	ELECTIVE-II	4
	CSA5308	Advanced Web Technologies	ELECTIVE-II	4
	CSA5309	Practical – 1 (Python)	PCORE	4
	CSA5310	Project	PCORE	4
	CSA5311	Self Learning : DOT NET	CORE	1
Note: Students should choose one Elective subject out of the given Elective sets.				
IV	CSA5401	Internet of Things	CORE	4
	CSA5402	Information System Security	CORE	4
	CSA5403	Advanced Networking	ELECTIVE-III	4
	CSA5404	Cloud Computing	ELECTIVE-III	4
	CSA5405	Artificial Intelligence	ELECTIVE-III	4
	CSA5406	E-Commerce	ELECTIVE-IV	4
	CSA5407	Digital Image Processing	ELECTIVE-IV	4
	CSA5408	Machine Learning	ELECTIVE-IV	4
	CSA5409	Practical – I (Based on Internet of Things, Information System Security)	PCORE	4
	CSA5410	Project	PCORE	4
	CSA5411	Self Learning : Current Trends and Technologies (Umbrello)	CORE	1
Note: Students should choose one Elective subject out of the given Elective sets.				
			TOTAL	50

Extra Credits

Semester	Course Code	Title of Course	No. of Credits
III	XCS0007	Introduction to Cyber Security / Information Security-III	1
	XSD0008	Skill Development - III	1
IV	XCS0009	Introduction to Cyber Security / Information Security-IV	1
	XSD0010	Skill Development - IV	1
		TOTAL	04

Paper Code: CSA5301

Prerequisite:

1. Knowledge of any Programming Language.

Course Objectives:

1. To develop problem solving skills and their implementation through Python
2. To understand and implement concepts of object oriented methodology using Python

PAPER CODE: CSA5301		
PAPER –I: Python Programming		
[Credits -4: No. of Lectures-48]		
	Title and Contents	No. of Lectures
Unit –I	Introduction to Python 1.1 History of Python 1.2 Need of Python Programming 1.3 Applications of Python Programming 1.4 Values 1.5 Variables and Keywords 1.6 Operators in Python 1.7 Operator Precedence 1.8 Expressions and Statements 1.9 Accepting Input and Displaying Output 1.10 Putting Comments	5
Unit –II	Conditional Constructs and Looping 2.1 if, if..else statement 2.2 While, For (range function) 2.3 break, continue, else, pass 2.4 Nested Loops 2.5 Use of Compound expression in conditional constructs and looping	4
Unit –III	Functions : Importing Modules 3.1 Invoking built-in functions 3.2 Functions from math module 3.3 Using random() and randint() functions of random module to generate random numbers 3.4 Composition 3.5 Invoking User-defined functions 3.6 Passing Parameters (Default parameter values, keyword arguments) 3.7 Scope of Variables 3.8 Void functions and function returning values	5

	3.9	Flow of execution	
Unit –IV	Strings	4.1 Creating, Initializing and Accessing Elements 4.2 String Operators: +,*, in, not in, range, slice [n:m] 4.3 Comparing strings using relational operators 4.4 String functions and methods 4.5 Pattern matching	5
Unit –V	Data Structures	5.1 Concepts of Mutable lists: Creating, Initializing and Accessing elements in lists, Traversing, Updating and Deleting elements 5.2 List Operations: Joining, List slices 5.3 List functions and methods 5.4 Dictionaries: Concept of key-value pair, Creating, Initializing and Accessing elements in a Dictionary, Traversing, Updating and Deleting elements, Dictionary functions and methods 5.5 Tuples: Immutable Concept, Creating, Initializing and Accessing elements in a Tuple, Tuple functions	6
Unit –VI	Modules	6.1 Executing modules as scripts 6.2 The Module Search Path 6.3 “Compiled” Python files 6.4 Standard Modules 6.5 The dir() function 6.6 Packages: Importing * from a Package, Intra-Package References, Packages in Multiple Directories	2
Unit–VII	Input and Output	7.1 Output Formatting 7.2 Reading and Writing Files	2
Unit-VIII	Errors and Exceptions	8.1 Syntax Errors 8.2 Exceptions: Handling Exceptions, Raising Exceptions User-defined Exceptions 8.3 Defining Clean-Up Actions 8.4 Predefined Clean-Up Actions	2

Unit – IX	Classes and Object Oriented Concepts 9.1 Objects 9.2 Python Scopes and Namespaces 9.3 Classes 9.4 Class Objects 9.5 Instance Objects 9.6 Method Objects 9.7 Class and Instance Variables 9.8 Object Oriented concepts and Programming	8
Unit-X	Standard Library 10.1 String Pattern Matching 10.2 Mathematics 10.3 Date and Time 10.4 Output Formatting	2
Unit-XI	GUI Development 11.1 The simple GUI program in Python 11.2 Event-driven programming 11.3 Changing the layout 11.4 Getting input from the user 11.5 Examples on GUI: Designing a GUI	7

References:

1. Bruce J. MacLennan, Functional Programming: Practice and Theory
2. Greg Michaelson , An Introduction to Functional Programming Through Lambda Calculus (Dover Books on Mathematics) Paperback
3. Kenneth C. Louden, Programming Languages: Principles and Practice
4. Programming with python, A users Book, Michael Dawson, Cengage Learning
5. Python Essential Reference, David Beazley, Third Edition
6. E-Books : python_tutorial. pdf, python_book_01.pdf Mark Lutz , Learning Python, O'reilly
7. <https://docs.python.org>
8. <https://docs.python.org/3/tutorial/index.html>

Paper Code: CSA5302

Prerequisite:

Knowledge of Computer Networking Concepts

Course Objectives:

1. To make the student understand the concept of wireless communication
2. To understand the concept of Medium Access Control
3. To get the familiarity with GSM and its Architecture
4. To understand the functionality of Mobile Network layer and Mobile Transport Layer

PAPER CODE:CSA5302		
PAPER II: Mobile Technology		
[Credits - 4: No. of Lectures-48]		
	Title and Contents	No. of Lectures
Unit –I	Wireless communication 1.1 Introduction 1.2 Types of wireless communication 1.3 Need and Application of wireless communication 1.4 Wireless Data Technologies Market for mobile	3
Unit –II	Wireless transmission 2.1 Frequency for radio transmission signal antennas 2.2 Signal propagation 2.3 Multiplexing Modulation 2.4 Spread and Cellular systems	4
Unit –III	Medium Access Control 3.1 Specialized MAC 3.1.1 Hidden and Exposed terminals 3.1.2 Near and Far terminals 3.2 SDMA 3.3 FDMA 3.4 TDMA: Fixed TDM, Classical ALOHA, Slotted ALOHA 3.5 Carrier Sense Multiple Access 3.6 CDMA	8

Unit –IV	Telecommunication Systems 4.1 Introduction to GSM 4.2 GSM Architecture 4.3 DECT systems, Architecture and protocols 4.4 Tetra frame structure 4.5 UMTS basic architecture and UTRA modes	5
Unit - V	Wireless LAN 5.1 Introduction 5.2 Infrared v/s Radio transmission 5.3 Infrastructure and ad-hoc network 5.4 IEEE 802.11 5.5 HIPERLAN 5.6 Blue Tooth	6
Unit - VI	Wireless ATM 6.1 WATM services 6.2 Location Reference model function radio access layer handover Location management 6.3 Addressing 6.4 Mobile QoS 6.5 Access point control protocol	6
Unit - VII	Mobile Network Layer 7.1 Introduction 7.2 Mobile IP: IP Packet Delivery, Agent Discovery, Agent Advertisement, Registration 7.3 Mobile Ad-hoc Networks 7.4 DHCP	5
Unit - VIII	Mobile Transport Layer 8.1 TCP 8.2 Fast and selective retransmission and recovery Transaction oriented TCP.	3
Unit - IX	Support for Mobility 9.1 File systems 9.2 World Wide Web 9.3 Wireless Application Protocol with example Applications	3
Unit - X	Wireless Telephony Applications 10.1 Overview of the WTA Architecture 10.2 The WTA client Framework 10.3 The WTA Server and security 10.4 Design considerations 10.5 Application Creation Toolbox	5

References:

1. Jachan Schiller , Mobile Communications, ISBN: 9788131724262 , Pearson Education
2. Pater T. Davis Carig R. Mc.Guffin, Wireless Local Area Networks, McGraw-Hill
3. Sandeep Sighat Jari Alvinen and group, The Wireless Application Protocol, Addison Wesley

Paper Code: CSA5303

Prerequisite:

1. Knowledge of Computer basics

Course Objectives:

1. To describe the principles of how to design networks and network protocols
2. To obtain a theoretical understanding of data communication and computer networks

PAPER CODE: CSA5303

Elective-I: Networking Concepts

[Credits -4: No. of Lectures-48]

	Title and Contents	No. of Lectures
Unit –I	Introduction to Computer Networks 1.1 Data Communication: Characteristics of data communication, Components, Data representation, Data flow 1.2 Computer Networks: Distributed processing, Physical structure-Point to Point, Broadcast, Categories of topology (mesh, star, ring, bus, etc.) 1.3 Categories of network: LAN, WAN, MAN, INTERNET etc. 1.4 Protocols and Standards: Definition of protocol, Key elements, Defacto & Dejure standard, Standards organizations 1.5 Network Software: Protocol Hierarchies – layers, protocols, peers, interfaces, network architecture- protocol stack, design issues of the layers –addressing, error control, flow control, multiplexing and demultiplexing, routing, Connection-oriented and connectionless service, Service Primitives – listen, connect, receive, send, disconnect, The relationships of services to Protocol	8
Unit –II	Network Models 2.1 OSI Reference model- Functionality of each layer 2.2 TCP/IP model - Introduction to IP, TCP & UDP, TCP/IP Protocol Suite 2.3 Addressing - Physical, Logical & Port addresses	4

Unit –III	The Physical Layer 3.1 The Basic Concepts of analog & digital data and signals 3.2 Line Coding digital to digital conversion : Characteristics, Line Coding Schemes: Unipolar, NRZ, RZ, Manchester and Differential Manchester 3.3 Transmission Modes: Parallel Transmission, Serial Transmission – Asynchronous and Synchronous 3.4 Multiplexing: FDM, TDM, WDM 3.5 Switching: Circuit Switching, Message Switching, Packet Switching	4
Unit –IV	The Data Link Layer 4.1 Framing: Character Count, Byte Stuffing, Bit Stuffing , Physical Layer Coding Violations 4.2 Error Control: Hamming Code and CRC 4.3 Elementary data link protocols: Simplex stop & wait protocol, Simplex protocol for noisy channel 4.4 Sliding Window Protocols: 1-bit sliding window protocols, Pipelining, Go-Back N, Selective Repeat	7
Unit –V	Medium Access Control layer 5.1 Random Access Protocols: ALOHA – pure and slotted, CSMA: 1-persistent, p-persistent and non-persistent, CSMA/CD, CSMA/CA 5.2 Controlled Access: Reservation, Polling Token Passing 5.3 Channelization: FDMA, TDMA, CDMA	7
Unit –VI	Wired & wireless LANs 6.1 Ethernet Standard: Frame Format, Access Method , Physical Layer, Changes In The Standard: Bridged Ethernet, Switched Ethernet and Full Duplex Ethernet, Fast Ethernet: Goals and MAC Sub layer Specifications, Gigabit Ethernet: Goals, MAC Sublayer Specifications 6.2 Wireless LAN: Architecture, BSS & ESS, Bluetooth	6
Unit –VII	The Network layer 7.1 Design Issues: Store-and-forward packet switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection Oriented Service, Comparison of Virtual Circuit and Datagram	12

	7.2	Logical Addressing : IPV4 Addresses- Address Space, Notations, Classful Addressing, Classless Addressing, Network Address Translation(NAT), IPV6 Addresses -Addressing Structure, Address Space	
	7.3	IPV4 Protocol: Datagram Format, Fragmentation, Checksum, Options	
	7.4	Routing Concepts: Properties of routing algorithm, Comparison of Adaptive and Non-Adaptive Routing Algorithms	
	7.5	Congestion Control: General Principles of Congestion Control, Congestion Prevention Policies	

References:

1. Tanenbaum, Computer Networks, ISBN:788177581652, Pearson
2. Behrouz Forouzan, Data Communication and Networking, TATA McGraw Hill, Fourth edition
3. Halsall / Kulkarni, Computer Networking and the Internet, ISBN:9788177584752, Pearson
4. Irvine, Data Communications and Networks: An Engineering Approach, ISBN:9788126507658, Wiley India
5. Gouda, Elements of Network Protocol Design, ISBN:9788126516476, Wiley India
6. Peterson, Computer Networks-A Systems Approach, 5e, ISBN :9789380501932, Elsevier

Paper Code: CSA5304

Prerequisite:

1. Basic knowledge of programming languages.

Course Objectives:

1. To study fundamental concepts in software testing, including software testing objectives
2. To learn how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.

PAPER CODE: CSA5304		
Elective –I: Software Testing		
[Credits -4: No. of Lectures-48]		
	Title and Contents	No. of Lectures
Unit –I	Introduction 1.1 Testing as an Engineering Activity 1.2 Role of Process in Software Quality, Testing as a Process, Basic Definitions 1.3 Software Testing Principles 1.4 The Tester’s Role in a Software Development Organization 1.5 Origins of Defects ,Defect Classes 1.6 The Defect Repository and Test Design, Defect Examples 1.7 Developer/Tester Support for Developing a Defect Repository.	9
Unit –II	Test Case Design 2.1 Introduction to Testing Design Strategies, The Smarter Tester 2.2 Test Case Design Strategies: Using Black Box Approach to Test Case Design, Random Testing ,Requirements based testing , positive & negative testing , Boundary Value Analysis, decision tables Equivalence, Class Partitioning state-based testing, cause effect graphing, error guessing, compatibility testing, user documentation testing, domain testing, Using White-Box Approach to Test design 2.3 Test Adequacy Criteria, static testing vs.	10

	<p>structural testing, code functional testing</p> <p>2.4 Coverage and Control Flow Graphs</p> <p>2.5 Covering Code Logic</p> <p>2.6 Paths, Their Role in White-box based Test Design.</p>	
Unit –III	<p>Levels of Testing</p> <p>3.1 The Need for Levels of Testing</p> <p>3.2 Unit Test, Unit Test Planning, Designing the Unit Tests.</p> <p>3.3 The Test Harness</p> <p>3.4 Running the Unit tests and Recording results</p> <p>3.5 Integration tests: Designing Integration Tests, Integration Test Planning, scenario testing , defect bash elimination</p> <p>3.6 System Testing , types of system testing, Acceptance testing, performance testing, Regression Testing, internationalization testing, ad-hoc testing , Alpha – Beta Tests , testing OO systems, usability and accessibility testing</p>	12
Unit –IV	<p>Test Management</p> <p>4.1 People and organizational issues in testing , organization structures for testing teams , testing services</p> <p>4.2 Test Planning: Test Plan Components , Test Plan Attachments, Locating Test Items, test management, test process, Reporting Test Results</p> <p>4.3 The role of three groups in Test Planning and Policy Development</p> <p>4.4 Introducing the test specialist: Skills needed by a test specialist , Building a Testing Group.</p>	10
Unit –V	<p>Controlling and Monitoring</p> <p>5.1 Software test automation: skills needed for automation, scope of automation , design and architecture for automation , requirements for a test tool , challenges in automation</p> <p>5.2 Test metrics and measurements, project, progress and productivity metrics</p> <p>5.3 Status Meetings</p> <p>5.4 Reports and Control Issues</p> <p>5.5 Criteria for Test Completion: SCM Types of reviews,Developing a review program , Components of Review Plans, Reporting Review Results.</p>	7

	evaluating software quality , defect prevention , testing maturity model	
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References:

1. Srinivasan Desikan and Gopaldaswamy Ramesh, “ Software Testing – Principles and Practices”, Pearson education, 2006.
2. Aditya P.Mathur, “Foundations of Software Testing”, Pearson Education,2008.
3. Boris Beizer, “Software Testing Techniques”, Second Edition,Dreamtech, 2003
4. Elfriede Dustin, “Effective Software Testing”, First Edition, Pearson Education, 2003.
5. Renu Rajani, Pradeep Oak, “Software Testing – Effective Methods, Tools and Techniques”, Tata McGraw Hill, 2004.

Paper Code: CSA5305

Prerequisites:

1. Knowledge of computer fundamentals
2. Introductory knowledge of different Operating Systems

Course Objectives:

1. To understand basic functions and concepts of Operating system
2. To understand Architecture of Operating System, process management and memory management
3. To gain knowledge of process synchronization, CPU scheduling and deadlock
4. To be acquainted with the concept of I/O and File management
5. To study various Memory management techniques and related algorithms

PAPER CODE:CSA5305		
ELECTIVE-I: Operating System		
[Credits - 4: No. of Lectures-48]		
	Title and Contents	No. of Lectures
Unit –I	Introduction to Operating System 1.1 Definition of operating system 1.2 Services provided by OS 1.3 System Calls: definition, implementation	1
Unit-II	Process Management 2.1 Introduction and definition of process 2.2 Process state transition 2.3 Process Control Block 2.4 Process scheduling 2.5 Scheduling queues 2.6 Types of schedulers: Long Term Schedulers, Middle Term Schedulers, Short Term Schedulers, IO Scheduler 2.7 Context Switch	3
Unit-III	CPU Scheduling 3.1 Introduction 3.2 Scheduling Concepts: CPU- I/O Burst Cycle, CPU Scheduler, Preemptive and Non-preemptivescheduling, Dispatcher 3.3 Scheduling criteria(terminologies used in scheduling): CPU Utilization, Throughput, Turnaround time, Waiting time, Response time 3.4 Scheduling Algorithms: FCFS,SJF (Preemptive & nonpreemptive), Priority Scheduling	9

	(Preemptive & nonpreemptive), Round Robin Scheduling 3.5 Multilevel Queues, Multilevel Feedback queues	
Unit-IV	Process Synchronization 4.1 Introduction 4.2 Critical section problem 4.3 Semaphores: Concept, Implementation, Deadlock & Starvation 4.4 Classic Problems of synchronization: Bounded buffer problem, Readers & writers problem, Dining Philosophers problem 4.5 Monitors	6
Unit-V	Deadlocks 5.1 Introduction 5.2 Deadlock characterization: Necessary Conditions, Resource-Allocation Graph 5.3 Methods for handling deadlocks: Deadlock Avoidance 5.4 Deadlock Prevention: Mutual Exclusion, Hold and Wait, No Preemption, Circular Wait 5.5 Deadlock Avoidance: Safe state, Resource Allocation Graph Algorithm, Banker's Algorithm 5.6 Deadlock Detection 5.7 Recovery from Deadlock	8
Unit-VI	Memory Management 6.1 Introduction to memory management 6.2 Problems with memory management 6.3 Logical vs. physical addresses 6.4 Dynamic vs. static linking 6.5 Swapping 6.6 Paging 6.7 Structure of Page Table 6.8 Segmentation 6.9 Virtual memory 6.10 Demand paging 6.11 Page Replacement: Page replacement algorithms: FIFO, MRU, LRU, MFU, LFU, Second Chance algorithm, Optimal replacement	9
Unit-VII	File System 7.1 Introduction 7.2 File concepts : File attributes, File operations, File types, File structure 7.3 Access Methods: Sequential Access, Direct Access, Other Access Methods 7.4 Directory and Disk Structure	6

	7.5 File Protection 7.6 Allocation methods: Contiguous allocation, Linked Allocation, Indexed Allocation 7.7 Free space management: Bit map or bit vector, Linked list, Grouping, Counting	
Unit-VIII	Device Management & I/O System 8.1 Introduction 8.2 I/O Hardware: Polling, Interrupt (Maskable and Non-maskable) 8.3 Kernel I/O Subsystem: I/O Scheduling, Buffering, Caching, Spooling and device Reservation, Error Handling, Kernel Data Structures 8.4 Disk Scheduling: First Come First Served(FCFS), Shortest seek time first (SSTF), Scan, C-Scan, LOOK, C-LOOK	6

References:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating Systems, – Willey Publication (8th Edition).
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating Systems, – Willey Publication (9th Edition).
3. Pabitra Pal Choudhary, Operating Systems : Principles and Design – (PHI Learning Pvt. Ltd)
4. William Stallings, Operating Systems: Internals and Design Principles, Prentice Hall (7th Edition)

Paper Code: CSA5306

Prerequisite:

Knowledge of traditional problem solving approach.

Course Objectives:

To make aware of different soft computing techniques and its application in real world.

PAPER CODE: CSA5306		
ELECTIVE-II: Soft Computing		
[Credits -4: No. of Lectures-48]		
	Title and Contents	No. of Lectures
Unit –I	Introduction to Soft Computing 1.1 What is soft computing 1.2 Principle of soft computing (SC Paradigm) 1.3 How is it different from hard computing 1.4 Constituents of SC (Fuzzy Neural, Machine Learning, Probabilistic reasoning)	2
Unit –II	Fuzzy Logic - Classical Sets and Fuzzy Sets 2.1 Operations on Classical sets 2.2 properties of classical sets 2.3 Fuzzy set operations 2.4 properties of fuzzy sets: cardinality, operations	3
Unit –III	Classical Relations and Fuzzy Relations 3.1 Cartesian Product 3.2 Classical relations – Cardinality, operations, Properties, composition 3.3 Fuzzy Relations - Cardinality, operations, Properties, composition, Max product	3
Unit –IV	Membership functions 4.1 Features of membership functions 4.2 standard forms and boundaries 4.3 fuzzification methods 4.4 problems on Inference method of fuzzification	4
Unit –V	Fuzzy to Crisp conversions 5.1 Fuzzy Tolerance and equivalence relations 5.2 Lambda (α) cuts for fuzzy sets and relations 5.3 Defuzzification methods: Max-membership, centroid, weighted average	4

	method, mean-max membership, center of sums, center of largest area, first of maxima	
Unit –VI	Fuzzy Arithmetic and Fuzzy Numbers 6.1 Fuzzy Arithmetic 6.2 Fuzzy numbers 6.3 Extension Principle	2
Unit –VII	Logic and fuzzy systems 7.1 Fuzzy Logic 7.2 Approximate reasoning 7.3 Fuzzy Implication 7.4 Fuzzy systems	4
Unit –VIII	Fuzzy Rule based Systems 8.1 Linguistic Hedges 8.2 Aggregation of fuzzy Rules	4
Unit - IX	Artificial Neurons, Neural Networks and Architectures 9.1 Neuron abstraction 9.2 Neuron signal functions 9.3 Definition of Neural Networks 9.4 Architectures: feedforward and feedback 9.5 Salient properties and application domains	2
Unit - X	Binary Threshold neurons 10.1 Convex sets 10.2 hulls and linear separability 10.3 Space of Boolean Functions 10.4 Binary neurons 10.5 Pattern dicotomizers 10.6 TLN's 10.7 XOR problem	6
Unit - XI	Perceptrons and LMS 11.1 Learning and memory 11.2 Learning Algorithms 11.3 Error correction and gradient descent rules 11.4 The learning objectives for TLNs 11.5 Pattern space and weight space 11.6 Perceptron learning algorithm 11.7 Perceptron convergence algorithm 11.8 Perceptron learning and Nonseparable sets 11.9 α -Least Mean Square Learning 11.10 MSE Error Surface and its Geometry 11.11 Steepest Descent Search with Exact Gradient 11.12 information 11.13 μ -LMS: Approximate Gradient Descent 11.14 backpropagation Learning algorithm 11.15 difference between α -LMS and μ - LMS 11.16 Applications of Neural Networks 11.17 Pattern Recognition and classification	10

Unit - XII	Genetic Algorithms (GA) 12.1 What are GA's 12.2 Why GA's? 12.3 Brief introduction to traditional optimization and search techniques 12.4 GA and search space 12.5 Steps in GA 12.6 Operators in GA 12.7 Genetic Algorithms Vs. Traditional Methods 12.8 Basic terminologies in GA 12.9 Schema Theorem 12.10 Problem solving using GA 12.11 Application of Genetic Algorithm: Travelling salesman problem	4
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References:

1. S. N. Sivanandam, S. N. Deepa, Principles Of Soft Computing (With CD), ISBN:9788126527410, Wiley India
2. Timothy J Ross, Fuzzy Logic: With Engineering Applications, ISBN : 978-81-265-3126- Wiley India, Third Edition
3. Kumar Satish, Neural Networks: A Classroom Approach, ISBN:9780070482920, 2008 reprint, 1/e TMH
4. David E. Goldberg, Genetic Algorithms in search, Optimization & Machine Learning , ISBN:81-7808-130-X, Pearson Education

Paper Code: CSA5307

Prerequisites:

1. Introductory Probability
2. Programming Fundamentals
3. Database Systems

Course Objectives:

1. To introduce students the concept and challenge of big data (3 V's: volume, velocity, and variety).
2. To teach students in applying skills and tools to manage and analyze the big data.

PAPER CODE:CSA5307		
Elective II: Big Data Analytics		
[Credits - 4: No. of Lectures-48]		
	Title and Contents	No. of Lectures
Unit –I	Introduction to Big Data 1.1 Introduction about distributed file system, Big Data and its importance 1.2 Four Vs, Drivers for Big data 1.3 Big data analytics 1.4 Big data applications 1.5 Algorithms using map reduce 1.6 Algorithms Matrix-Vector Multiplication by Map Reduce	6
Unit –II	Introduction to Hadoop 2.1 What is Hadoop? 2.2 Core Hadoop Components 2.3 Hadoop Ecosystem 2.4 Physical Architecture 2.5 Hadoop limitations	6
Unit –III	NoSQL 3.1 Introduction to NoSQL 3.2 NoSQL business drivers 3.3 NoSQL data architecture patterns: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores 3.4 Variations of NoSQL architectural patterns 3.5 Using NoSQL to manage big data: What is a big data NoSQL solution?, Understanding the types of big data problems, Analyzing big data with a shared-nothing architecture, Choosing	8

	distribution models:master-slave versus peer-to-peer, Four ways that NoSQL systems handle big data problems	
Unit –IV	Map Reduce and the New Software Stack 4.1 Distributed File Systems: Physical Organization of Compute Nodes, Large Scale File-System Organization 4.2 MapReduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping With Node Failures 4.3 Algorithms using MapReduce: Matrix-Vector Multiplication by MapReduce, Relational-Algebra Operations, Computing Selections by MapReduce, Computing Projections by MapReduce, Union, Intersection, and Difference by MapReduce, Computing Natural Join by MapReduce, Grouping and Aggregation by MapReduce, Matrix Multiplication, Matrix Multiplication with One MapReduce Step	12
Unit - V	Mining Data Streams 5.1 The Stream Data Model: A Data-Stream-Management System, Examples of Stream Sources, Stream Query, Issues in Stream Processing 5.2 Sampling Data in a Stream: Obtaining a Representative Sample, The General Sampling Problem, Varying the Sample Size 5.3 Filtering Streams: The Bloom Filter, Analysis	4
Unit - VI	Link Analysis 6.1 Efficient computation of Page Rank: PageRank Iteration Using MapReduce, Use of Combiners to Consolidate the Result Vector 6.2 Topic sensitive Page Rank, link Spam	4
Unit - VII	Clustering 7.1 PageRank Definition, Structure of the web,dead Ends 7.2 Using Page rank in a search engine 7.3 Hubs and Authorities 7.4 CURE Algorithm 7.5 Stream-Computing 7.6 A Stream-Clustering Algorithm 7.7 Initializing and Merging Buckets 7.8 Answering Queries	10

References:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, ISBN: 9788126551071, 2015, Wiley.
2. Chris Eaton, Dirk deroos et al. , “Understanding Big data ”, McGraw Hill, 2012.
3. Tom White, “HADOOP: The definitive Guide” , O Reilly 2012.

4. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packet Publishing 2013.
5. Jy Liebowitz, "Big Data and Business analytics", CRC press, 2013.
6. Ullman, Rajaraman, Mining of Massive Datasets

Paper Code: CSA5308

Prerequisite:

1. Basics of Scripting Languages, Networking

Course Objectives:

1. To gain the knowledge of using PHP to access the database
2. To know the concept of using Graphics in PHP
3. To gain the knowledge of XML, DOM
4. To understand Web services
5. To make application more dynamic using AJAX

PAPER CODE: CSA5308

ELECTIVE-II: Advanced Web Technologies

[Credits -4: No. of Lectures-48]

	Title and Contents	No. of Lectures
Unit-I	XML DOM 1.1 Overview 1.1.1 Advantages of XML-DOM 1.1.2 Disadvantages of XML-DOM 1.2 XML DOM - Model 1.3 XML DOM - Nodes 1.4 XMLDOM - NodeTree 1.5 XML DOM - Methods 1.6 XML DOM – Loading: Parser , Loading and Parsing XML, Content as XML file, Content as XML string 1.7 XML DOM-Traversing 1.8 XML DOM-Navigation 1.9 XML DOM-Accessing 1.10 XML DOM Operations: Get Node, Set Node Create Node, Add Node, Replace Node, Remove Node, Clone Node 1.11 XML DOM Objects: Node Object NodeListObject, NameNodeMapObject DOMImplementationObject, DocumentTypeObject, DOM- ProcessingInstructionObject, DOM- EntityObject, Entity Reference Object, Notation Object, DOM –Element Object Attribute Object, CDATASection Object CommentObject, XMLHttpRequestObject	15

	DOMExceptionObject	
Unit –II	AJAX 2.1 Introduction 2.2 AJAX from User’s Perspective 2.3 AJAX from Developer’s Perspective 2.4 How AJAX works 2.5 Applications of AJAX 2.6 AJAX web application model 2.7 AJAX –PHP framework 2.8 Performing AJAX validation 2.9 Handling XML data using php and AJAX 2.10 Connecting database using php and AJAX	12
Unit –III	JSON 3.1 What is JSON 3.2 JSON versus XML 3.3 JSON Object 3.4 JSON Array 3.5 Example of PHP JSON 3.6 Example of AJAX JSON	9
Unit-IV	Web Services 4.1 What are web services? 4.2 Characteristics of web services 4.3 Web services – Architecture 4.4 Web services – Components :XML-RPC, SOAP, WSDL, UDDI 4.5 Web services – Security 4.6 Web services – Standards	12

References:

1. AJAX Black Book, Kogent solution
2. Sas Jacobs, Beginning XML with DOM and Ajax: From Novice to Professional Paperback, Apress
3. Sai Srinivas Sriparsa, Javascript and JSON Essentials, ISBN: 9781783286034, packt publishing
4. Erban Cerami, Web services Essentials, O’Rielley
5. PHP web services , Wrox publication
6. www.php.net.in
7. www.w3schools.com
8. www.wrox.com
9. www.tutorialspoint.com

CSA5309: Practical –I (Python)

Continuous Internal Assessment

1	Journal	10 Marks
2	Viva	
	Python	20 Marks
3	Flexible - Internal test	10 Marks
4	Attendance + Active Participation	10 Marks
	TOTAL	50 Marks

End Semester Assessment

1	Python Program1	20 Marks
2	Python Program2	20 Marks
3	Viva	10 Marks
	TOTAL	50 Marks

PAPER CODE:CSA5309

Practical I (Python)

[Credits - 4: No. of Sessions-12]

Python : Set of Assignments

Sr. No.	Title of Experiment/ Practical
1	Write a program to find all prime numbers within a given range
2	Write a program to print 'n' terms of Fibonacci Series using Iteration
3	Write a program to demonstrate the use of slicing in string
4	Write a program that accepts a sequence of whitespace separated words as input and prints the words after removing all duplicate words and sorting them alphanumerically.
5	Write a program to demonstrate the use of list & related functions
6	Write a program to demonstrate the use of Dictionary& related functions
7	Write a program to demonstrate the use of tuple
8	Write a program to read and write from a file
9	Write a program to demonstrate Exception Handling mechanism
10	Write a program to demonstrate the working of classes and objects
11	Write a program to demonstrate the use of Composition
12	Write a program to create a small GUI application for insert, update and delete in a table using MySQL as backend and front end for creating form

Paper code: CSA5310

PAPER CODE:CSA5310
Practical II (Project)

Evaluation for Internal (50-Marks):

Sr.No	Description	Marks
1	Analysis and Design Document	10 Marks
2	First Demo	15 Marks
3	Second Demo	15 Marks
4	Presentation	10 Marks

End term Evaluation (50-Marks):

Sr.No	Description	Marks
1	Demo	20 Marks
2	Report	10 Marks
3	Presentation	10 Marks
4	Viva	10 Marks

Paper Code: CSA5311

Prerequisite:

Knowledge of any programming language

Course Objectives:

1. Understand and develop programming concepts using DOTNET

PAPER CODE:CSA5311-DOTNET		
[Credit-1: Learning Hours -15]		
	Title and Contents	Learning Hours
Unit-I	Introduction to .NET Programming 1.1 .Net Concepts 1.2 Framework 1.3 Common Language Runtime 1.4 Base Class Library 1.5 Common Type System (CTS) 1.6 Intermediate Language 1.7 Assemblies 1.8 Namespaces	3
Unit –II	Programming with C# 2.1 Variables 2.2 Comments 2.3 XML Documentation 2.4 Constants 2.5 Keywords 2.6 Data Types 2.7 Reference Types 2.8 Control Statements 2.9 Conditional Statements 2.10 Switch Statement 2.11 Loops 2.12 Jump Statements 2.13 Goto 2.14 break 2.15 Continue 2.16 Return 2.17 Arrays	4
Unit – III	Standard Controls - Windows Application 3.1 Labels 3.2 Textboxes 3.3 RichTextBox 3.4 Button	8

	3.5	CheckBox	
	3.6	RadioButton	
	3.7	ComboBox	
	3.8	PictureBox	
	3.9	ListBox	
	3.10	ImageList	
	3.11	ListView	
	3.12	TabControl	
	3.13	MenuStrip	
	3.14	DataGridView	
	3.15	DatePicker	
	3.16	Event Handlers: Creating Event Handlers, Default Event Handlers, Associating Event Handlers at Run Time, Order of events	
	3.17	MDI Forms	
	3.18	Dialog Forms	
	3.19	Visual Inheritance	
	3.20	Inheriting a Form	
	3.21	Custom Controls	

Note: The evaluation is for 10 Marks based on above concepts.

References :

1. Jeff Gabriel, Denise Gosnell,.NET framework, wrox publication
2. .NET framework essentials by 2001, O'Reilly Media
3. Krzysztof Cwalina, Framework Design Guidelines, Addison-Wesley
4. Tom Archer and Andrew Whitechapel, Inside C#
5. Professional C#2005/2008,WroxPublication
6. ProfesionalASP.NET2005/2008,WroxPublication
7. Carsten Thomsen , Database Programming with C#, Apress

Deccan Education Society's
FERGUSSON COLLEGE, PUNE
(AUTONOMOUS)

SYLLABUS UNDER AUTONOMY
SECOND YEAR M.Sc. (Computer Applications)
SEMESTER - IV

w.e.f. Academic Year 2018-2019

**Deccan Education Society's
Fergusson College (Autonomous), Pune
Faculty of Science
Post Graduate Syllabus (Computer Applications)
Second Year**

IV	CSA5401	Internet of Things	CORE	4
	CSA5402	Information System Security	CORE	4
	CSA5403	Advance Networking	ELECTIVE-III	4
	CSA5404	Cloud Computing	ELECTIVE-III	4
	CSA5405	Artificial Intelligence	ELECTIVE-III	4
	CSA5406	E-Commerce	ELECTIVE-IV	4
	CSA5407	Digital Image Processing	ELECTIVE-IV	4
	CSA5408	Machine Learning	ELECTIVE-IV	4
	CSA5409	Practical – I (Based on Internet of Things, Information System Security)	PCORE	4
	CSA5410	Project	PCORE	4
	CSA5411	Self Learning : Current Trends and Technologies	CORE	1
Note: Students should choose one Elective subject out of the given Elective sets.				
			TOTAL	50

Paper Code: CSA5401

Prerequisite:

1. Fundamentals of Computer Networks

Course objectives:

1. To understand what Internet of Things is.
2. To get essential knowledge of RFID Technology, Sensor Technology and Satellite Technology.
3. To make students aware of resource management and security issues in Internet of Things.

PAPER CODE:CSA5401		
PAPER-I: Internet of Things		
[Credits-4: No. of Lectures - 48]		
	Title and Contents	No. of Lectures
Unit-I	Introduction 1.1 What is the Internet of Things? 1.2 History of IoT 1.3 About IoT 1.4 Overview and Motivations 1.5 Examples of Applications 1.6 Internet of Things Definitions and Frameworks : IoT Definitions, IoT Architecture, General Observations, ITU-T Views, Working Definition, IoT Frameworks, Basic Nodal Capabilities	8
Unit-II	Fundamental IoT Mechanisms and Key Technologies 2.1 Identification of IoT Objects and Services 2.2 Structural Aspects of the IoT 2.3 Environment Characteristics 2.4 Traffic Characteristics: Scalability, Interoperability, Security and Privacy 2.5 Open Architecture 2.6 Key IoT Technologies 2.7 Device Intelligence 2.8 Communication Capabilities 2.9 Mobility Support 2.10 Device Power 2.11 Sensor Technology 2.12 RFID Technology	8

	2.13 Satellite Technology	
Unit-III	Radio Frequency Identification Technology(RFID) 3.1 RFID 3.2 Introduction 3.3 Principle of RFID 3.4 Components of an RFID system 3.5 Issues 3.6 EPC Global Architecture Framework: EPCIS & ONS, Design issues, Technological challenges, Security challenges 3.7 IP for IoT 3.8 Web of Things 3.9 Wireless Sensor Networks 3.10 History and context 3.11 WSN Architecture: The node, Connecting nodes, Networking Nodes, Securing Communication, WSN specific IoT applications challenges: Security, QoS, Configuration, Various integration approaches, Data link layer protocols, Routing protocols and infrastructure Establishment	8
Unit-IV	Resource Management in Internet of Things 4.1 Clustering 4.2 Software Agents 4.3 Clustering Principles in an Internet of Things Architecture 4.4 Design Guidelines 4.5 Software Agents for Object Representation 4.6 Data Synchronization 4.7 Identity portrayal 4.8 Identity management 4.9 Various identity management models: Local, Network, Federated and global web identity User-centric identity management, Device centric identity management, Hybrid-identity management, Identity and trust	8
Unit-V	Internet of Things Privacy, Security and Governance 5.1 Vulnerabilities of IoT 5.2 Security requirements 5.3 Threat analysis 5.4 Use cases and misuse cases 5.5 IoT security tomography and layered attacker model 5.6 Identity establishment 5.7 Access control 5.8 Message integrity 5.9 Non-repudiation and availability	8

	5.10 Security model for IoT	
Unit-VI	Business Models for Internet of Things 6.1 Business Models and Business Model Innovation 6.2 Value Creation in the Internet of Things 6.3 Business Model Scenarios for the Internet of Things 6.4 Internet of Things Application : Smart Metering Advanced Metering , Infrastructure, e-Health Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards	8

References:

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
2. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
3. Parikshit N. Mahalle& Poonam N. Railkar, "Identity Management for Internet of Things", River Publishers, ISBN: 978-87-93102-90-3 (Hard Copy), 978-87-93102-91-0 (ebook).
4. Hakima Chaouchi, " The Internet of Things Connecting Objects to the Web" ISBN : 978-1-84821-140-7, Willy Publications
5. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, ISBN: 978-1-119-99435-0, 2nd Edition, Willy Publications
6. Daniel Kellmerit, Daniel Obodovski, "The Silent Intelligence: The Internet of Things",. Publisher: Lightning Source Inc; 1 edition (15 April 2014). ISBN-10: 0989973700, ISBN-13: 978-0989973700.
7. Fang Zhaho, Leonidas Guibas, "Wireless Sensor Network: An information processing approach", Elsevier, ISBN: 978-81-8147-642-5.

Paper Code: CSA5402

Prerequisites:

1. Knowledge of mathematical concepts
2. Knowledge of basic data communication and networking concepts

Course objectives:

1. To understand the basics of Information Security
2. To provide an understanding of principal concepts, major issues, technologies, and basic approaches in information security
3. To enable students to obtain sound understanding of Information System Security, Cryptography
4. To equip with knowledge and skills necessary to support for their career in Information Security

PAPER CODE:CSA5402		
PAPER–II: Information System Security		
[Credits-4: No. of Lectures - 48]		
	Title and Contents	No. of Lectures
Unit-I	Introduction to Concept of Security 1.1 Need for security 1.2 Principles of security 1.3 Policy 1.4 Types of attacks	3
Unit-II	Basic Cryptography 2.1 Definition 2.2 Goals of Cryptography 2.3 Encryption and Decryption 2.4 Classical Cryptographic Techniques 2.5 Substitution ciphers 2.6 Transposition ciphers 2.7 Steganography : uses and security 2.8 Cryptanalysis	4
Unit-III	Symmetric Key Algorithms 3.1 Introduction to Symmetric Key Cryptography 3.2 Stream Ciphers 3.3 Block Ciphers 3.4 Algorithm Types and modes: Electronic code book, Cipher block chaining, Cipher feedback, Output Feedback 3.5 Computer based Symmetric Key Cryptographic Algorithms: Data Encryption Standard (DES) and variations 3.6 International Data Encryption Algorithm	10

	3.7 RC5 3.8 Blowfish	
Unit-IV	Mathematical Foundation (Number Theory) 4.1 Prime number 4.2 Fermat's Theorem 4.3 Euler's Theorem 4.4 Modular arithmetic 4.5 Discrete Logarithms 4.6 Quadratic Residues 4.7 Chinese remainder theorem 4.8 Primality testing	2
Unit-V	Asymmetric Key Cryptography (Public Key Cryptography) 5.1 Diffie Hellman Key exchange algorithm 5.2 RSA algorithm 5.3 One way hash function 5.4 Digital Signature 5.5 MD5 5.6 Secure hash algorithm	10
Unit-VI	Digital Certificates and Public Key Infrastructure 6.1 Digital Certificates 6.2 Private key management 6.3 PKIX Model 6.4 Public key cryptography standards (PKCS)	4
Unit-VII	Network Security 7.1 Introduction 7.2 Revision of TCP/IP 7.3 IP datagram format 7.4 Virtual private networks	3
Unit-VIII	Internet Security Protocols 8.1 Socket layer 8.2 Secure hypertext transfer protocol 8.3 Secure electronic transaction 8.4 Pretty Good Privacy 8.5 S/MIME	4
Unit-IX	Authentication 9.1 User Authentication 9.2 Password based authentication 9.3 Certificate based authentication 9.4 Biometric authentication 9.5 Kerberos 9.6 Authentication Model 9.7 Kerberos and Public key cryptography 9.8 Applications of Kerberos	4
Unit-X	Firewall 10.1 Introduction 10.2 Packet Filters 10.3 Application level gateways	4

	10.4	Circuit level gateways	
	10.5	Firewall architecture	
	10.6	Benefits and limitations of Firewall	
	10.7	Access control mechanism	

References:

1. Andrew Tanenbaum, Computer Networks Fourth Edition
2. Atul Kahate, Cryptography and Network Security Second Edition, Tata Mcgraw-hill Publishing Company Limited
3. V.K. Pachghare, Cryptography and Information Security, PHI Learning Private Limited
4. Matt Bishop and Sathyanarayana, Introduction to Computer Security, Pearson Education
- 5.

Paper Code: CSA5403

Prerequisites:

1. Basic Understanding of Networking Concepts

Course objectives:

1. Students will get aware of advanced networking concepts.
2. Course discusses the concepts underlying in the design and implementation of Networking Concepts
3. Most of the Units start with the theory and then switches focus on how the concepts are implemented in a C program

PAPER CODE:CSA5403		
ELECTIVE–III: Advanced Networking		
[Credits-4: No. of Lectures - 48]		
	Title and Contents	No. of Lectures
Unit-I	Underlying Technologies 1.1 Point-to-point WANS 1.2 Switched WANS	3
Unit-II	Network Layer 2.1 Forwarding 2.2 Structure of a Router 2.3 Routing Tables 2.4 Intra – And Inter-Domain Routing 2.5 Distance Vector Routing 2.6 Routing Protocol: RIP, OSPF, BGP 2.7 Multicast Routing	5
Unit-III	The Internet Layer Protocols 3.1 ARP and RARP 3.2 IPv4 3.3 IPv6 3.4 Transition from IPv4 to IPv6 3.5 ICMPv4 3.6 ICMPv6 3.7 Socket Address Structures (IPv4 & IPv6) 3.8 Value-Result Arguments 3.9 Byte Ordering Functions 3.10 Byte Manipulation Functions 3.11 inet_aton 3.12 inet_addr and inet_ntoa Functions 3.13 inet_pton and inet_ntop Functions 3.14 sock_ntop and Related Functions 3.15 readn, writen, and readline Functions	10

	3.16 isfdtype Function 3.17 getsockopt and setsockopt Functions 3.18 Checking If an Option Is Supported and Obtaining the Default 3.19 Socket States 3.20 Generic Socket Options 3.21 IPv4 Socket Options 3.22 ICMPv6 Socket Option 3.23 IPv6Socket Options 3.24 TCP Socket Options	
Unit-IV	The Transport Layer 4.1 The Transport Service 4.2 Elements of Transport Protocols 4.3 TCP 4.4 UDP	6
Unit-V	Elementary TCP Socket 5.1 socket Function 5.2 connect Function 5.3 bind Function 5.4 listen Function 5.5 accept Function 5.6 fork and exec Functions 5.7 Concurrent Servers 5.8 close Function 5.9 getsockname and getpeername Functions 5.10 TCP Echo Server: main Function 5.11 TCP Echo Server: str_echo Function 5.12 TCP Echo Client: main Function 5.13 TCP Echo Client: str_cli Function 5.14 Normal Startup 5.15 Normal Termination 5.16 Connection Abort before accept Returns 5.17 Termination of Server Process 5.18 SIGPIPE Signal 5.19 Crashing of Server Host 5.20 Crashing and Rebooting of Server Host 5.21 Shutdown of Server Host 5.22 I/O multiplexing 5.23 select Function 5.24 str_cli Function (Revisited) 5.25 Batch Input 5.26 shutdown Function 5.27 str_cli Function (Revisited) 5.28 TCP Echo Server (Revisited) 5.29 pselect Function 5.30 poll Function 5.31 TCP Echo Server (Revisited)	10
Unit-VI	Elementary UDP Socket 6.1 recvfrom and sendto Functions	6

	6.2 UDP Echo Server: main Function 6.3 UDP Echo Server: dg_echo Function 6.4 UDP Echo Client: main Function 6.5 UDP Echo Client: dg_cli Function 6.6 Lost Datagrams 6.7 Verifying Received Response 6.8 Server Not Running 6.9 Summary of UDP example 6.10 Connect Function with UDP 6.11 dg_cli Function (Revisited) 6.12 Lack of Flow Control with UDP 6.13 Determining Outgoing Interface with UDP 6.14 TCP and UDP Echo Server Using select User Datagram Protocol 6.15 File Transfer 6.16 Error Handling	
Unit-VII	Protocols, Sessions, State, and Implementing Custom Protocols 7.1 State vs. Stateless 7.2 Methods for Maintaining State 7.3 What Is a Protocol? 7.4 Designing a Custom Protocol 7.5 Our Chat Protocol 7.6 Protocol Registration	4
Unit-VIII	Elementary Name, Address Conversions and design decisions 8.1 Domain Name System 8.2 gethostbyname Function 8.3 RES_USE_INET6 Resolver Option 8.4 gethostbyname2 Function and IPv6 Support 8.5 gethostbyaddr Function 8.6 uname Function 8.7 gethostname Function 8.8 getservbyname and getservbyport Functions	4

References:

1. Behrouz A. Forouzan, TCP / IP Protocol Suite Fourth Edition
2. Andrew Tanenbaum, Computer Networks Fourth Edition
3. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Unix Network Programming, Volume 1: The Sockets Networking API, 3/E PHI
4. KEIR DAVIS, JOHN W. TURNER, AND NATHAN YOCOM, The Definitive Guide to Linux Network Programming, Apress.

Paper Code: CSA5404

Prerequisites:

1. Knowledge of Operating System, Computer Networks and Web Technologies

Course objectives:

1. To understand and get familiar with the basic concepts of cloud computing.
2. To understand how to build large scale distributed systems and cloud applications.
3. To comprehend the importance of cloud security.
4. To understand Ubiquitous Computing and applications.

PAPER CODE:CSA5404		
ELECTIVE-III: Cloud Computing		
[Credits-4: No. of Lectures - 48]		
	Title and Contents	No. of Lectures
Unit-I	Introduction to Cloud Computing 1.1 Definition 1.2 Characteristics 1.3 Components 1.4 Cloud service provider 1.5 The role of networks in Cloud computing 1.6 Cloud deployment models- private, public & hybrid 1.7 Cloud service models 1.8 Multitenancy 1.9 Cloud economics and benefits 1.10 Cloud computing Platforms- IaaS, PaaS , SaaS	8
Unit-II	Virtualization 2.1 Virtualization concepts 2.2 Server virtualization 2.3 Storage virtualization 2.4 Storage services 2.5 Network virtualization 2.6 Service virtualization 2.7 Virtualization management 2.8 Virtualization technologies and architectures 2.9 Virtual machine 2.10 Measurement and profiling of virtualized applications 2.11 Hypervisors: KVM, Xen, VMware hypervisors	8

	and their features.	
Unit-III	Monitoring and Management 3.1 An architecture for federated cloud computing 3.2 SLA management in cloud computing 3.3 Service provider's perspective: Performance prediction for HPC on clouds 3.3.1 Monitoring Tools	5
Unit-IV	Cloud Security 4.1 Cloud security fundamentals 4.2 Vulnerability assessment tool for cloud 4.3 Privacy and Security in cloud 4.4 Cloud computing security architecture: General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro – architectures 4.5 Identity Management and Access control 4.6 Autonomic security 4.7 Security challenges: Virtualization security management -virtual threats, VM Security Recommendations, VM - Specific Security techniques, Secure Execution Environments and Communications in cloud	9
Unit-V	Issues in Cloud Computing 5.1 Implementing real time application over cloud platform 5.2 Issues in Inter-cloud environments 5.3 QOS Issues in Cloud 5.4 Dependability 5.5 Data migration 5.6 Streaming in Cloud 5.7 Quality of Service 5.8 (QoS) monitoring in a Cloud computing environment Cloud Middleware 5.9 Mobile Cloud Computing 5.10 Inter Cloud issues 5.11 A grid of clouds 5.12 Sky computing 5.13 Load balancing 5.14 Resource optimization 5.15 Resource dynamic reconfiguration 5.16 Monitoring in Cloud	9
Unit-VI	Ubiquitous Computing 6.1 Basics and Vision 6.2 Applications and Requirements 6.3 Smart Devices and Services 6.4 Human Computer Interaction 6.5 Tagging 6.6 Sensing and controlling 6.7 Context-Aware Systems	9

	6.8	Ubiquitous Communication	
	6.9	Management of Smart Devices	
	6.10	Ubiquitous System Challenge and outlook	

References:

1. Gautam Shroff,, Enterprise Cloud Computing, Cambridge publication
2. Ronald Krutz and Russell Dean Vines, Cloud Security, Wiley-India
3. Dr. Kumar Saurabh,”Cloud Computing”, Wiley Publication
4. Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, Cloud Computing for Dummies (Wiley India Edition)
5. Borko Furht, “Handbook of Cloud Computing”, Springer
6. Venkata Josyula,”Cloud computing – Automated virtualized data center”, CISCO Press
7. Greg Schulr,”Cloud and virtual data storage networking”,CRC Press
8. Mark Carlson,”Cloud data management and storage”, Mc Graw hill
9. Stefan Poslad, “Ubiquitous Computing: Smart Devices, Environments and Interactions” by John Wiley & Sons, 2011.
10. A.Shrinivasan, J.Suresh, “Cloud Computing: A practical approach for learning and implementation”, Pearson.
11. Tim Mather, “Cloud Security and Privacy”, O’Reilly

Paper Code: CSA5405

Prerequisites:

1. Programming Fundamentals
2. Discrete Mathematics
3. Probability

Course objectives:

1. To present an overview of artificial intelligence (AI) principles and approaches.
2. To develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic and learning.

PAPER CODE:CSA5405		
ELECTIVE-III: Artificial Intelligence		
[Credits-4: No. of Lectures - 48]		
	Title and Contents	No. of Lectures
Unit-I	Introduction 1.1 Introduction to AI applications and AI techniques 1.2 Production systems 1.3 Control strategies 1.4 Reasoning - forward and backward chaining	6
Unit-II	Intelligent Agents 2.1 Definitions of a rational agent, reflex model-based agents 2.2 Goal-based and utility-based agents 2.3 The environment in which a particular agent operates	4
Unit-III	Searching Techniques and Game Playing 3.1 Breadth first search, depth first search 3.2 Iterative deepening, uniform cost search 3.3 Hill climbing, simulated annealing 3.4 Genetic algorithm search 3.5 Heuristic search 3.6 Best first search 3.7 A* algorithm 3.8 AO* algorithm 3.9 Minmax and game trees,refining minmax 3.10 Alpha – Beta pruning, constraint satisfaction	12
Unit-IV	Knowledge Representation 4.1 First order predicate calculus 4.2 Resolution, unification	10

	4.3 Natural deduction system, refutation 4.4 Logic programming 4.5 PROLOG 4.6 Weak structures 4.7 Semantic networks, frame system 4.8 Strong structures 4.9 Value inheritance 4.10 Conceptual dependency 4.11 Scripts 4.12 Ontologies	
Unit-V	Planning 5.1 Basic representation for planning 5.2 Symbolic-centralized vs. reactive-distributed 5.3 Partial order planning algorithm.	4
Unit-VI	Uncertainty 6.1 Different types of uncertainty - degree of belief and degree of truth 6.2 Various probability constructs - prior probability 6.3 Conditional probability, probability axioms 6.4 Probability distributions, and joint probability distributions 6.5 Bayes' rule 6.6 Other approaches to modeling uncertainty such as Dempster-Shafer theory 6.7 Fuzzy sets/logic	6
Unit-VII	Natural Language Processing 7.1 Component steps of communication 7.2 Contrast between formal and natural languages in the context of grammar 7.3 Parsing 7.4 Semantics	6

References:

1. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach (2nd ed.), Pearson Education, 2006.
2. Elaine Rich and Kelvin Knight, Artificial Intelligence, Tata McGraw Hill, 2002.
3. Nils J Nilson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publishers, Inc., San Francisco, California, 2000.
4. R. Akerkar, Introduction to Artificial Intelligence, Prentice-Hall of India, 2005
5. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice Hall of India, 2006.
6. Nils J. Nilson, Principles of Artificial Intelligence, Narosa Publishing House, 2001
7. W.F. Clocksin and C.S. Mellish, Programming in PROLOG, Narosa Publishing House, 2002.
8. Saroj Kaushik, Logic and Prolog Programming, New Age International Publisher, 2006.

Paper Code: CSA5406

Prerequisites:

1. Basic knowledge of Web designing
2. Internet marketing
3. Multimedia tools

Course objectives:

1. To introduce the concept of electronic commerce, and to understand how electronic commerce is affecting business enterprises, governments, consumers and people in general
2. Provide guiding principles behind the design and strategy of the customer web interface
3. Understand the traditional and new communication/marketing approaches that create competitive advantage in the New Economy

PAPER CODE:CSA5406		
ELECTIVE-IV: E-Commerce		
[Credits-4: No. of Lectures - 48]		
	Title and Contents	No. of Lectures
Unit-I	Introduction to E-Commerce 1.1 Meaning and concept of E-Commerce 1.2 History of E-Commerce 1.3 Traditional Commerce and E-Commerce 1.4 Different types of E-Commerce – B2B, B2C, C2C, B2E, G2C 1.5 Need and Role of E-Commerce 1.6 Advantages and Disadvantages of E Commerce	6
Unit-II	E-Commerce Technologies 2.1 Internet & WWW 2.2 Internet Protocols – OSI Model, TCP/IP, TCP, UDP, IP, DNS, FTP 2.3 Multimedia technology – ISDN, ATM, Cell relay, desktop Video Conferencing 2.4 Information Publishing Technology - HTML, URL, HTTP, HTML FORM, HTTPD 2.5 CGI SERVICES, Web Server and client 2.6 Advance Technologies : Mobile Agents, WAP, XML, web 2.0, REST web services, Web Mashup.	7

Unit-III	E-Commerce Strategies 3.1 Consumer Oriented strategies for marketing, sales & promotion 3.2 e-CRM, order delivery Cycle 3.3 Business Oriented strategies for purchasing & support activities (SCM) 3.4 Strategies for Web Auction 3.5 Virtual Communities 3.6 Web Portal	7
Unit-IV	Electronic Payment System 4.1 Introduction to payment system 4.2 Online Payment System , prepaid e-payment service, postpaid e-payment system 4.3 SET protocol 4.4 Operational, Credit & legal risk of e-payment system.	7
Unit-V	Electronic Data Interchange 5.1 Meaning EDI and Paperless trading 5.2 EDI architecture 5.3 EDI standards 5.4 VAN 5.5 Cost of EDI Infrastructure 5.6 Internet based EDI 5.7 FTP- based messaging	7
Unit-VI	E-Commerce Infrastructure 6.1 Cluster of servers 6.2 Virtualization techniques 6.3 Cloud Computing 6.4 Server Consolidation using cloud 6.5 Introduction to Hadoop 6.6 HDFS, Google Apps Engine	7
Unit-VII	Security and Legal Issues 7.1 Computer security classification 7.2 E-Commerce threats 7.3 Security of Clients and sever 7.4 Cyber law introduction 7.5 Copyright and intellectual Property concept relating to ecommerce	7

References:

1. Bharat Bhasker, Electronic Commerce – Frame work technologies and Applications, 3rd Edition. Tata McGrawHill Publications, 2008.
2. Kamlesh K.Bajaj and Debjani Nag, Ecommerce- the cutting edge of Business, Tata McGrawHill Publications, 2008
3. Kalakota et al, Frontiers of Electronic Commerce, Addison Wesley, 2004
4. E- Commerce Strategies, Technology and applications (David) Tata McGrawHill
5. Introduction to E-commerce (jeffrey) Tata- Mcgrawhill
6. E-Business and Commerce- Strategic Thinking and Practice (Brahm) biztantra
7. Google Aps engine (Severance) O'reilly
8. Hadoop : The Definitive Guide (White) O'reilly

Paper Code: CSA5407

Prerequisites:

1. Fundamentals of Mathematical concepts
2. Basics of Digital Image Processing concepts

Course objectives:

1. To walk around various algorithms and techniques involved in Digital Image Processing
2. To be familiar with Basics of Image formation and transformation using sampling and quantization
3. To define different types of techniques for image sharpening and smoothing

PAPER CODE:CSA5407		
ELECTIVE-IV: Digital Image Processing		
[Credits-4: No. of Lectures - 48]		
	Title and Contents	No. of Lectures
Unit-I	Introduction 1.1 Definition of Digital Image Processing 1.2 Origins of Digital Image Processing 1.3 Examples of fields that use Digital Image Processing: 1.3.1X-ray Imaging 1.3.2Ultraviolet Band 1.3.3Visible and Infrared Bands 1.3.4Microwave Band 1.3.5Radio Band Imaging 1.4 Fundamental Steps in Digital Image Processing 1.5 Components of an Image Processing System	3
Unit-II	Digital Image Fundamentals 2.1 Elements of Visual Perception 2.2 Light and the Electromagnetic Spectrum 2.3 Image Sensing and Acquisition 2.4 Single Sensor 2.5 Sensor Strips 2.6 Sensor Arrays 2.7 A Simple Image Formation Model 2.8 Image Sampling and Quantization 2.9 Spatial and Gray-Level Resolution 2.10 Aliasing 2.11 Some Basic Relationships between Pixels :	6

	<p>Neighbors, Adjacency, Connectivity, Regions, Boundaries, Distance Measures</p> <p>2.12 Image Operations on a Pixel Basis</p> <p>2.13 Linear and Nonlinear Operations</p>	
Unit-III	<p>Image Enhancement in the Spatial Domain</p> <p>3.1 Some Basic Gray Level Transformations:Negatives, Log, Power-Law</p> <p>3.2 Piecewise-Linear Transformations: Histogram Processing, Histogram Equalization</p> <p>3.3 Enhancement Using Arithmetic/Logic Operations: Image Subtraction, Image Averaging</p> <p>3.4 Basics of Spatial Filtering</p> <p>3.5 Smoothing Spatial Filters</p> <p>3.6 Smoothing Linear and Order-Statistics Filters</p> <p>3.7 Sharpening Spatial Filters:Use of First Derivatives for Enhancement, Use of Second Derivatives for Enhancement : The Laplacian, High Boost Filtering, High Frequency Emphasis Filtering</p>	10
Unit-IV	<p>Image Enhancement in the Frequency Domain</p> <p>4.1 Introduction to the Fourier Transform and the Frequency Domain</p> <p>4.2 Two-Dimensional DFT and its Inverse</p> <p>4.3 Some Properties of the 2-D Fourier Transform</p> <p>4.4 Filtering in the Frequency Domain</p> <p>4.5 Correspondence between Filtering in the Spatial and Frequency Domains</p> <p>4.6 The Convolution Theorem(Only 2D)</p> <p>4.7 Frequency-Domain Lowpass Filters: Ideal, Butterworth, Gaussian</p> <p>4.8 Frequency Domain Highpass Filters:Ideal, Butterworth, Gaussian</p> <p>4.9 Unsharp Masking</p> <p>4.10 High-Boost Filtering and High-Frequency Emphasis Filtering</p>	8
Unit-V	<p>Image Restoration</p> <p>5.1 A Model of the Image Degradation/ Restoration Process, Noise Models</p> <p>5.2 Restoration in the Presence of Noise Only</p> <p>5.3 Spatial Filtering- Mean, Order-Statistics, and Adaptive Filters</p> <p>5.4 Periodic Noise Reduction by Frequency Domain Filtering – Band reject, Band pass, and Notch Filters</p> <p>5.5 Estimating the Degradation Function</p>	8

	5.6 Estimation by Image Observation 5.7 Experimentation and Modeling 5.8 Inverse Filtering 5.9 Geometric Mean Filter: Geometric Transformations, Spatial Transformations	
Unit-VI	Morphological Image Processing 6.1 Some Basic Concepts from Set Theory 6.2 Logic Operations Involving Binary Images 6.3 Dilation and Erosion 6.4 Opening and Closing 6.5 The Hit-or-Miss Transformation 6.6 Some Basic Morphological Algorithms:: Boundary Extraction, Region Filling 6.7 Extraction of Connected Components 6.8 Thinning 6.9 Thickening	6
Unit-VII	Image Segmentation 7.1 Detection of Discontinuities: Point Detection Line Detection, Edge Detection Edge Linking and Boundary Detection 7.2 Thresholding: The Role of Illumination, Basic Global Thresholding, Basic Adaptive Thresholding 7.3 Region-Based Segmentation: Region Growing, Region Splitting and Merging	4
Unit-VIII	Representation and Description 8.1 Chain Codes 8.2 Polygonal Approximations 8.3 Signatures 8.4 Shape Methods (Mathematical Problems)	3

References:

1. Gonzalez, R. C. and Woods, R. E. [2002/2008], Digital Image Processing, 3rd ed., Prentice Hall
2. Sonka, M., Hlavac, V., Boyle, R. [1999]. Image Processing, Analysis and Machine Vision (2nd edition), PWS Publishing, or (3rd edition) Thompson Engineering, 2007
3. Gonzalez, R. C., Woods, R. E., and Eddins, S. L. [2009]. Digital Image Processing Using MATLAB, 2nd ed., Gatesmark Publishing, Knoxville, TN.
4. Burger, Willhelm and Burge, Mark J. [2008]. Digital Image Processing: An Algorithmic Introduction Using Java, Springer
5. Anil K. Jain [2001], Fundamentals of digital image processing (2nd Edition), Prentice-Hall, NJ
6. Willian K. Pratt [2001], Digital Image Processing (3rd Edition), John Wiley & Sons, NY

Paper Code: CSA5408

Prerequisite:

1. Knowledge of Linear Algebra and Calculus, Probability Basics

Course objectives:

1. To understand Human learning aspects.
2. To understand primitives in learning process by computer.
3. To understand nature of problems solved with Machine Learning.

PAPER CODE:CSA5408		
ELECTIVE-IV: Machine Learning		
[Credits-4: No. of Lectures - 48]		
	Title and Contents	No. of Lectures
Unit-I	Introduction to Machine Learning 1.1 Why Machine Learning? 1.2 Examples of Machine Learning Problems 1.3 Structure of Learning 1.4 Learning versus Designing 1.5 Training versus Testing 1.6 Characteristics of Machine Learning Tasks 1.7 Predictive and descriptive tasks 1.8 Machine learning Models: Geometric Models, Logical Models, Probabilistic Models. 1.9 Features: Feature types, Feature Construction and Transformation, Feature Selection.	8
Unit-II	Classification and Regression 2.1 Classification: Binary Classification, Assessing Classification performance, Class probability Estimation, Assessing class probability Estimates, Multiclass Classification 2.2 Regression: Assessing performance of Regression, Error measures, Overfitting, Catalysts for Overfitting, Case study of Polynomial Regression. 2.3 Theory of Generalization: Effective number of hypothesis, Bounding the Growth function, VC Dimensions, Regularization theory	10
Unit-III	Linear Models 3.1 Least Squares method 3.2 Multivariate Linear Regression 3.3 Regularized Regression 3.4 Using Least Square regression for Classification 3.5 Perceptron	8

	3.6 Support Vector Machines 3.7 Soft Margin SVM 3.8 Obtaining probabilities from Linear classifiers 3.9 Kernel methods for non-Linearity	
Unit-IV	Logic Based and Algebraic Models 4.1 Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm Hierarchical clustering 4.2 Rule Based Models: Rule learning for subgroup discovery, Association rule mining. 4.3 Tree Based Models: Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees	8
Unit-V	Probabilistic Models 5.1 Normal Distribution and Its Geometric Interpretations 5.2 Naïve Bayes Classifier 5.3 Discriminative learning with Maximum likelihood 5.4 Probabilistic Models with Hidden variables: Estimation-Maximization Methods, Gaussian Mixtures and Compression based Models.	6
Unit-VI	Trends in Machine Learning 6.1 Model and Symbols 6.2 Bagging and Boosting 6.3 Multitask learning 6.4 Online learning and Sequence Prediction 6.5 Data Streams and Active Learning 6.6 Deep Learning 6.7 Reinforcement Learning	8

References:

1. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
2. Hastie, Tibshirani, Friedman: Introduction to Statistical Machine Learning with Applications in R, Springer, 2nd Edition-2012.
3. C. M. Bishop : Pattern Recognition and Machine Learning, Springer 1st Edition-2013.
4. Ethem Alpaydin : Introduction to Machine Learning, PHI 2nd Edition-2013.
5. Parag Kulkarni : Reinforcement and Systematic Machine Learning for Decision Making, Wiley-IEEE Press, Edition July 2012.

CSA5409: Practical –I (Based on Internet of Things and Information System Security)
[Credits -4: No. of Sessions: 12]

Continuous Internal Assessment

1	Journal	10 Marks
2	Viva	
	Internet of Things	10 Marks
	Information System Security	10 Marks
3	Internal test – for skill assessment	10 Marks
4	Attendance + Active Participation	10 Marks
	TOTAL	50 Marks

End Semester Assessment

1	Mini Project on Internet of Things	20 Marks
2	Information System Security Programs	20 Marks
3	Viva	10 Marks
	TOTAL	50 Marks

PAPER CODE:CSA5409**Practical I (Based on Internet of Things and Information System Security)****[Credits - 4: No. of Sessions-12]****Internet of Things**

1 Mini Project

Information System Security: Set of Assignments

Sr. No.	Title of Experiment/ Practical
1	Program to perform encryption and decryption using the following algorithms: a) Ceaser Cipher b) Substitution Cipher
2	Program to implement DES algorithm
3	Program to implement Triple DES algorithm
4	Program to implement Blowfish algorithm
5	Program to encrypt a string using Blowfish algorithm
6	Program to implement RSA Algorithm
7	Program to implement Diffie-Hellman Key exchange mechanism using Javascript and HTML. Consider the end user as one of the party(Alice) and the Javascript application as other party (Bob).
8	Program to calculate the message digest of a text using SHA-1 algorithm
9	Program to perform Digital Signature on text
10	Program to generate key pair (public and private)

Paper code: CSA5410

PAPER CODE:CSA5410

Practical II (Project)

[Credits - 4: No. of Sessions-12]

Evaluation for Internal (50-Marks):

Sr.No	Description	Marks
1	Analysis and Design Document	10 Marks
2	First Demo	15 Marks
3	Second Demo	15 Marks
4	Presentation	10 Marks

End term Evaluation (50-Marks):

Sr.No	Description	Marks
1	Demo	20 Marks
2	Report	10 Marks
3	Presentation	10 Marks
4	Viva	10 Marks

Paper Code: CSA5411

Prerequisite:

Knowledge of UML Concepts

Course Objective:

1. The Umbrello tool helps the students to support software development process, especially during the analysis and design phases of the process.
2. The Umbrello UML Modeller helps the students to get a high quality product.

PAPER CODE:CSA5411-Current Trends and Technologies (Umbrello)

[Credit-1: Learning Hours -15]

	Title and Contents	Learning Hours
Unit-I	Working with Umbrello UML Modeller 1.1 User Interface: Tree View, Documentation Window, Work Area 1.2 Creating, Loading and Saving Models: New Model, Save Model, Load Models, Editing Models 1.3 Adding and Removing Diagrams : Creating Diagrams, Removing Diagrams, Renaming Diagrams 1.4 Editing Diagrams: Insert Elements, Deleting Elements, Editing Elements 1.5 Editing Classes: Class General Settings, Class Attribute Settings , Class Operations Settings , Class Template Settings, Class Associations Page , Class Display Page, Class Color Page 1.6 Associations : Anchor Points	7
Unit –II	Code Import and Code Generation 2.1 Code Generation: Generating Code, Generation Options, Code Verbosity, Folders Overwrite Policy, Language Generation Wizard Generation 2.2 Code Import	3
Unit – III	Other Umbrello UML Modeller Features 3.1 Copying objects as PNG images 3.2 Exporting to an Image 3.3 Printing 3.4 Logical Folders	3
Unit - IV	Case Study – I	1
	Case Study - II	1

Note: The evaluation is for 10 Marks based on above concepts.

References :

1. Unified Modeling Language Introduction: ArgoUML, Umbrello UML Modeller, MagicDraw, UML Tool, Software Analysis Pattern, VIATRA
2. Umbrello UML Modeller Handbook