DAYANANDA SAGAR UNIVERSITY

Shavige Malleshwara Hills, Kumaraswamy Layout,

Bengaluru - 560078, Karnataka.

SCHOOL OF ENGINEERING

SCHEME & SYLLABUS
FOR
MASTER OF TECHNOLOGY (M.Tech) – 2016
COMPUTER SCIENCE & ENGINEERING

SPECIALIZATION: COMPUTER SCIENCE AND ENGINEERING (BIG DATA/IOT)

(With Effect from 2016-17)

DAYANANDA SAGAR UNIVERSITY

SCHEME OF TEACHING AND EXAMINATION 2016 – 2017

SEMESTER I BRANCH: M Tech Computer Science & Engineering

(Specialization in a)Big Data, and b) IoT)

SL. NO	COURSE CODE	COURSE TITLE	$\frac{C}{AU}$	NO. OF HOURS OF TEACHING				SCHEME OF EVALUATION	
								CONTINUOUS	EXAMINATION
				L	T	P	C		SEMESTER END EXAM
1	16CSE501	ADVANCED ALGORITHMS	CR	03	02	--	04	40	60
2	16CSE502	ADVANCED OPERATING SYSTEM	CR	03	-	-	03	40	60
3	16CSE503	ADVANCED DBMS	CR	03	-	--	03	40	60
4	16CSEXXX	DEPARTMENT ELECTIVE -1	CR	03	--	02	04	40	60
5	16CSEXXX	DEPARTMENT ELECTIVE-2	CR	03	--	02	04	40	60
6	16CSE571	ADVANCED OS LAB	CR	--	--	04	02	40	60
7	16CSE572	ADVANCED DBMS LAB	CR	--	--	04	02	40	80
Grand Total 700				**15**	**02**	**12**	**22**	**280**	**420**

Continuous evaluation: 1. 2 IA Tests(20), 2. Assignment or mini project (10 marks), 3. Any two of Self-study presentation, survey reports, quiz, Laboratory exercises, presentation in seminar & work shops (10 marks)

DAYANANDA SAGAR UNIVERSITY

SCHEME OF TEACHING AND EXAMINATION 2016 – 2017

SEMESTER II BRANCH: M Tech Computer Science & Engineering (Specialization in (a) Big Data, and (b) IoT)

SL. NO	COURSE CODE	COURSE TITLE	CR / AU	NO. OF HOURS OF TEACHING				SCHEME OF EVALUATION	
				L	T	P	C	CONTINUOUS	EXAMINATION END EXAM
1	16CSE504	HIGH PERFORMANCE COMPUTING	CR	03	--	--	03	40	60
2	16CSE505	ADVANCED COMPUTER NETWORKS	CR	03	--	--	03	40	60
3	16CSE506	FORMAL METHODS IN SOFTWARE ENGINEERING	CR	03	02	--	04	40	60
4	16CSE5XX	DEPARTMENT ELECTIVE -1	CR	03	--	02	04	40	60
5	16CSE 5XX	DEPARTMENT ELECTIVE -2	CR	03	--	02	04	40	60
6	16CSE573	HPC LAB	CR	--	--	04	02	40	60
7	16CSE574	COMPUTER NETWORKS LAB	CR	--	--	04	02	40	60
GRAND TOTAL 700				**15**	**02**	**14**	**22**	**280**	**420**

Continuous evaluation: 1. 2 IA Tests (20), 2. Assignment or mini project (10 marks), 3. Any two of Self-study presentation, survey reports, quiz, Laboratory exercises, presentation in seminar & workshops (10 marks)

DAYANANDA SAGAR UNIVERSITY

SCHEME OF TEACHING AND EXAMINATION 2016 – 2017

SEMESTER III BRANCH: M Tech COMPUTER SCIENCE & ENGINEERING

(SPECIALIZATION IN A)BIG DATA, AND b) IoT)

SL. NO	COURSE CODE	COURSE	$\frac{CR}{AU}$	NO. OF HOURS OF TEACHING				SCHEME OF EVALUATION	
								CONTINUOUS	END SEMESTER
				L	T	P	C		SEMESTER END EXAM
1	16CSEXXX	DEPARTMENT ELECTIVE	CR	03	--	02	04	40	60
2	16IEE6XX	INSTITUTIONAL ELECTIVE	CR	03	--	--	03	40	60
3	16CSE681	DISSERTATION	CR	--	--	--	03	100	--
GRAND TOTAL 300				**06**	**--**	**--**	**10**	**180**	**120**

SEMESTER IV BRANCH: M Tech COMPUTER SCIENCE & ENGINEERING

(SPECIALIZATION IN A)Big Data, and b) IoT)

SL. NO.	COURSE CODE	COURSE	$\frac{CR}{AU}$	NO. OF HOURS OF TEACHING				SCHEME OF EVALUATION	
								CONTINUOUS	END SEMESTER
				L	T	P	C		SEMESTER END EXAM
1	16CSEXXX	DEPARTMENT ELECTIVE	CR	03	--	02	04	40	60
3	16CSE682	DISSERTATION	CR	--	--	--	06	200	100
GRAND TOTAL 400				**03**	**00**	**02**	**10**	**240**	**160**
GRAND TOTAL 2000 TOTAL CREDITS 64									

Continuous evaluation: 1. 2 IA Tests (20), 2. Assignment or mini project (10 marks), 3. Any two of Self-study presentation, survey reports, quiz, Laboratory exercises, presentation in seminar & workshops (10 marks)

DEPARTMENTAL ELECTIVES FOR BIG DATA STREAM

DEPARTMENTAL ELECTIVE		DEPARTMENTAL ELECTIVE	
16CSE521	DISTRIBUTED COMPUTING	16CSE537	DATA ANALYTICS & VISUALIZATION
16CSE522	LINUX KERNEL PROGRAMMING	16CSE543	MODELING & SIMULATION
16CSE523	MULTI-CORE ARCHITECTURES		
16CSE524	DATA SCIENCE	16CSE 622	MEDICAL IMAGE PROCESSING
16CSE525	WEB TECHNOLOGIES	16CSE 623	AGILE SOFTWARE DEVELOPMENT
16CSE526	IMAGE PROCESSING	16CSE 624	BUSINESS INTELLIGENCE TECHNOLOGY
16CSE528	INFORMATION RETRIEVAL TECHNIQUES	16CSE 626	NATURAL LANGUAGE PROCESSING
16CSE 529	DATA MINING	16CSE628	PRODUCT DEVELOPMENT & MANAGEMENT
16CSE 530	MOBILE COMPUTING	16CSE629	SOFTWARE PROJECT MANAGEMENT
16CSE 531	STORAGE SYSTEMS	16CSE631	MACHINE LEARNING
16CSE 532	PROBABILITY & STATISTICS FOR ANALYTICS	16CSE639	COMPUTER VISION
16CSE 533	VIRTUALIZATION & CLOUD COMPUTING		
16CSE 534	PARALLEL PROGRAMMING		
16CSE 535	ONLINE COMPUTATION & COMPETITIVE ANALYSIS		

DEPARTMENTAL ELECTIVES FOR IOT STREAM

DEPARTMENTAL ELECTIVE		DEPARTMENTAL ELECTIVE	
16CSE521	DISTRIBUTED COMPUTING	16CSE 535	ONLINE COMPUTATION & COMPETITIVE ANALYSIS
16CSE522	LINUX KERNEL PROGRAMMING	16CSE537	DATA ANALYTICS & VISUALIZATION
16CSE523	MULTI-CORE ARCHITECTURES	16CSE538	SOFTWARE APPLICATIONS FOR ENERGY DOMAIN
16CSE524	DATA SCIENCE	16CSE542	WEARABLE DEVICE TECHNOLOGIES
16CSE525	WEB TECHNOLOGIES	16CSE543	MODELING & SIMULATION
16CSE527	WIRELESS SENSOR NETWORKS	16CSE544	INTERNET OF THINGS
16CSE 529	DATA MINING	16CSE 623	AGILE SOFTWARE DEVELOPMENT
16CSE 536	REAL TIME SYSTEMS		
16CSE 530	MOBILE COMPUTING	16CSE627	SOFTWARE APPLICATIONS FOR SMART CITIES & BUILDING
16CSE 533	VIRTUALIZATION & CLOUD COMPUTING	16CSE628	PRODUCT DEVELOPMENT & MANAGEMENT
16CSE 534	PARALLEL PROGRAMMING	16CSE630	SOFTWARE APPLICATIONS FOR SMART VEHICLES

INSTITUTIONAL ELECTIVES

COURSE CODE	COURSE TITLE	OFFERING DEPARTMENT
16IEE651	DIGITAL MARKETING	COMPUTER SCIENCE & ENGINEERING
16IEE652	PRODUCT LIFE CYCLE MANAGEMENT	MECHANICAL ENGINEERING
16IEE653	PROJECT MANAGEMENT	ELECTRONICS & COMMUNICATION ENGINEERING

SEMESTER/YEAR : **I SEM**
COURSE CODE : **16CSE501**
TITLE OF THE COURSE : **ADVANCED ALGORITHMS**
L: T/A: P: C : **3: 2: 0: 4**

DEPARTMENTAL CORE COURSES: SEMESTER -1

COURSE OBJECTIVES

1. To understand the design of advanced algorithms and data structures.
2. To understand the applications of algorithms in different fields such as geometry, number theory, signal processing and linear algebra.

COURSE OUTCOMES

1. Skill of advanced algorithm design.
2. Knowledge of advanced data structures

MULTI-THREADED ALGORITHMS AND MATRIX OPERATIONS:

The basics of dynamic multi-threading; multi-threaded versions of matrix multiplication, solution of linear equations, matrix inversion, and least squared approximation.

FAST FOURIER TRANSFORMS AND NUMBER THEORETIC ALGORITHMS:

Representation of polynomials, DFT and FFT; efficient FFT implementation (sequential and parallel). Elementary number theoretic notions, greatest common divisor, modular arithmetic, solving modular linear equations, Chinese remainder theorem, powers of an element, RSA public crypto system, primality testing, and integer factorization.

STRING MATCHING ALGORITHMS:

Rabin-Karp, Knuth-Morris-Pratt and Boyer-Moore string matching algorithms. Suffix trees and their applications in computational biology.

COMPUTATIONAL GEOMETRY AND PROBABILISTIC ANALYSIS:

Line segment properties, determining whether pair of line segments intersects, finding the convex hull, finding the closest pair of points. Hiring problem, indicator random variables, randomized algorithms; probabilistic analysis and further uses of indicator random variables.

ADVANCED DATA STRUCTURES AND GRAPH ALGORITHMS:

Fibonacci heaps, mergeable heap operations, decreasing a key and deleting a node, bounding the maximum degree. Van emdeboas tree. Data structures for disjoint sets, analysis of union by rank with path compression. Flow networks, Ford-Fulkerson method, maximum bipartite matching.

TEXT BOOK:

1. Thomas H. Cormen, Charles E Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms. 3rd ed., The MIT Press, 2009.

REFERENCES:

1. Donald E Knuth, Art of Computer Programming, Volumes 1-4A, Addison-Wesley, 2011.

SEMESTER/YEAR : **I SEM**
COURSE CODE : **16CSE502**
TITLE OF THE COURSE : **ADVANCED OPERATING SYSTEMS**
L: T/A: P: C : **3: 0: 0: 3**

COURSE OBJECTIVES

1. To understand the advanced Operating Systems, their design and implementation.

2. To understand the implementation in UNIX/LINUX, Windows and Embedded Oss.

COURSE OUTCOMES

1. Skill of designing OSs

2. Implementations of Design strategies in existing OSs and Distributed Process Management

MODULE 1:

INTRODUCTION, REVIEW: Operating Systems Strategies: User' perspectives, technologies and examples of Batch Systems, Timesharing Systems, Personal computer systems, Embedded systems, and small communicating computers; The genesis of modern operating systems.

USING THE OPERATING SYSTEMS & OPERATING SYSTEMS ORGANIZATION: The programmer's abstract machine; Resources; Processes and threads; Writing concurrent programs. Basic functions; General implementation considerations; Contemporary OS kernels.

DESIGN STRATEGIES: Design considerations; Device Drivers, Monolithic kernels; Modular organization; Microkernel; Layered organizations; Operating Systems for distributed system.

DISTRIBUTED SYSTEMS: Networking; The Need for a Protocol Architecture; The TCP/IP Sockets; Linux Networking; Client/Server Computing; Distributed Message Passing; Remote Procedure Calls; Clusters; Windows Vista Cluster Server; Linux Clusters;

DISTRIBUTED PROCESS MANAGEMENT; Process Migration; Distributed Global States; Distributed Mutual Exclusion; Distributed Deadlock.

TEXT BOOKS:

1. Gary Nutt: Operating Systems, 3rd Edition, Pearson, 2004.
2. William Stallings: Operating Systems: Internals and Design Principles, 6th Edition, Prentice Hall, 2008.

REFERENCE BOOKS:

1. Silberschatz, Galvin, Gagne: Operating System Concepts, 8th Edition, Wiley, 2008
2. Andrew S. Tanenbaum, Albert S. Woodhull: Operating Systems, Design and Implementation, 3rd Edition, Prentice Hall, 2006.
3. Pradeep K Sinha: Distribute Operating Systems, Concept and Design, PHI, 2007.

SEMESTER/YEAR	**: I SEM**
COURSE CODE	**: 16CSE503**
TITLE OF THE COURSE	**: ADVANCED DATA BASE MANAGEMENT SYSTEMS**
L: T/A: P: C	**: 3: 0: 0: 3**

COURSE OBJECTIVES

1. To understand advanced Data base concepts, query optimization,

2. To understand Data Warehouse, ETL and OLAP, Data Base Architecture, OO data bases and document data bases.

COURSE OUTCOMES

1. Understanding advanced concepts in DBMS and query optimization

2. Understand and develop skills to handle data warehouse, OO data bases and document data bases

DATABASE CONCEPTS AND SQL: Advanced SQL - Join Operations, Union, Group By, Having clauses, Subqueries, Indexes

Stored Procedures and Triggers - Stored Procedures, Stored Functions, Constraints and Triggers. Concurrency, Recovery and Query Optimization:

Transactions and the ACID Property of Transactions, Serializability, Two-Phase Locking, Deadlocks, Multiversion Concurrency Control

FAILURE RECOVERY: Roll forward/Rollback

Query Optimization: Stages in Query Processing, Query Processing Algorithms, Query Plan Execution, Cost-Based Query Optimization

Data Warehousing: Definition and Terminology, Characteristics of Data warehouses, Data Modeling for data warehouses, Architectural components, ETL and OLAP

Database System Architectures: Centralized and Client-Server Systems, Server-System Architectures, Distributed Databases, Graph databases

Advances in Databases: Beyond RDBMS, Object-Oriented and Object-Relational Databases - Query Processing in Object-Oriented Databases,

Storage Structures for Object-Oriented Databases, Object-Relational Model

Document Databases - XML Databases, BLOB data storage systems, No-SQL Data stores, Time Series Databases

TEXT BOOK

1. Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Wisdom, Database Systems: The Complete Book, Prentice Hall

2. Ramez Elmasri and Shamkant Navathe, Database Systems – Models, Languages, Design and Application Programming –– Pearson

3. Shashank Tiwari, Professional No-SQL , Publisher: Wiley / Wrox

SEMESTER/YEAR : I SEM
COURSE CODE : 16CSE571
TITLE OF THE COURSE : ADVANCED OS LAB
L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVES

1. To have practical implementation of OS
2. To implement design strategies for Operating System.
3. To design Distributed systems and give implementation aspects of distributed Process management

COURSE OUTCOMES

1. Understanding the design and implementation aspects OS Understand and develop skills to design distributed systems and process Management Lab experiments and mini projects will include concurrent programming, process management, socket programming, client server computing, distributed message passing, remote procedure calls, and distributed process management**.**

SEMESTER/YEAR : I SEM
COURSE CODE : 16CSE572
TITLE OF THE COURSE : DBMS LAB
L: T/A: P: C : 0: 0: 4: 2

COURSE OBJECTIVES

1. To have practical exposure to advanced Data base concepts, query optimization and concurrency control.
2. To design Relational Data bases for a few applications and carry out various activities.
3. To implement a graph algorithms as applicable in Social Networks

COURSE OUTCOMES

1. Understanding advanced concepts in DBMS and query optimization Understand and develop skills to handle data warehouse, OO data bases and document data bases Lab experiments and mini projects will include Query Optimizer, concurrency control and locking, relational data base design, social network analysis.

SEMESTER/YEAR : II SEM
COURSE CODE : 16CSE504
TITLE OF THE COURSE : HIGH PERFORMANCE COMPUTING
L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVES:

1. To understand the architectural, hardware, OS and programming aspects in High Performance Computing.

2. To understand the distributed memory programming, shared memory programming, and a few parallel applications.

COURSE OUTCOMES:

1. Knowledge and understanding of high performance computing at various levels/layers.

2. Design and implement parallel solutions to the given problems.

Introduction to Computer Systems: Processors, Memory, I/O Devices; Cost, timing, and scale (size) models. Program Execution: Process, Virtual Memory, System Calls, Dynamic Memory Allocation.

Machine-Level View of a Program, typical RISC instruction set and execution, Pipelining. Performance issues and Techniques, Cost and Frequency Models for I/O, paging, and caching. Temporal and spatial locality.

Typical Compiler Optimizations. Identifying program bottlenecks – profiling, tracing. Simple high-level language optimizations – locality enhancement, memory disambiguation. Choosing Appropriate Computing Platforms: benchmarking, cost-performance issues,

Parallel Computing: Introduction to parallel Architectures and Interconnection Networks, communication latencies. Program parallelization: task partitioning and mapping, data distribution, Message passing, synchronization and deadlocks.

Distributed memory programming using MPI/PVM. Shared memory parallel programming. Multithreading. Parallel applications: Laplace equation, molecular dynamics. Parallel dense linear algebra: Gaussian elimination, iterative methods.

COURSE MATERIAL:

- Dowd, K., High performance Computing, O'Reilly Series, 1993.
- Culler, D., and Singh, J.P., Parallel Computer Architecture: A Hardware/Software Approach. Morgan Kaufmann Pub., 1999.
- Gropp, W., Lusk, E., and Skjellum, A., Using MPI: Portable Parallel Programming with the Message-passing Interface, MIT Press, 1997.
- Grama, Gupta, A., Karypis, G., Kumar, V., Introduction to Parallel Computing, Addison Wesley, 2003. ISBN: 0-201-64865-2

SEMESTER/YEAR : II SEM
COURSE CODE : 16CSE505
TITLE OF THE COURSE : ADVANCED COMPUTER NETWORKS
L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVES:

1. To understand advanced topics such as Intra and Inter Network protocols, TMN, SNMP V3, QOS, Traffic Engineering, MPLS & VPN

2. To understand need of IOT, it's definition and applications in different industry domains.

COURSE OUTCOMES:

1. Design and implementation aspects of Network Management, Inter and Intra network protocols, MPLS, VPN and importance of QOS

2. Understand and appreciate importance of IOT and its applications.

TMN and Network Management: Network management Overview, Network Management, SNMP and Network Management, TMN, Network Management Applications, Management of Heterogeneous Network with Intelligent Agents, Network Security Management, Internet Management

Routing Protocols, BGP & Traffic Engineering: Intra and inter-domain internet routing, Border Gateway Protocols, QoS and Traffic Engineering

MPLS & VPN: Role of MPLS, MPLS operations, Labels, FECs, LSPs & Labels, Label Distribution, VPNs.

IOT: Introduction to IOT, Putting the Internet of Things Forward to the Next Level, the Internet of Things Today, the Internet of Things Tomorrow, Potential Success Factors.

Internet of Things Strategic Research and Innovation Agenda: Internet of Things Vision, Internet of Things Common Definition, IoT Strategic Research and Innovation Directions, IoT Applications and Use Case Scenarios, IoT Functional View:

Application Areas: IoT Smart-X Applications, Smart Cities, Smart Energy and the Smart Grid, Smart Mobility and Transport, Smart Home, Smart Buildings and Infrastructure, Smart Factory and Smart Manufacturing,

TEXT BOOKS:

1. William Stallings, High-Speed Networks and Internets, Performance and Quality of Service, Second Edition, PHI

2. D E Comer, Automated Network Management Systems, Pearson/ Prentice Hall,

SEMESTER/YEAR : II SEM
COURSE CODE : 16CSE506
TITLE OF THE COURSE : FORMAL METHODS IN SOFTWARE ENGINEERING
L: T/A: P: C : 3: 2: 0: 4

COURSE OBJECTIVES:

1. To understand specification, validation and verification of software systems
2. To understand and learn program specification and verification through Hoare's logic and Dijkstra's weakest preconditions, formal specification and refinement towards implementation,
3. To integrate formal methods with existing programming languages and object-oriented approaches, model-based specifications, and comparison of formal techniques.

COURSE OUTCOMES:

1. Understand the basics of Hoare's logic.
2. Write program specifications in terms of pre- and post-conditions.
3. Use formal techniques for verification of programs.
4. Use formal techniques for derivation of programs from their formal specifications.
5. Learn Design by Contract and Object Constraint Language (OCL).
6. Develop basic understanding of Algebraic and Model based specifications

Introduction to Formal Methods, Dijkstra's Algorithm, Implications, Some useful Equivalances, Model Building Tools (Logic and Set Theory), Propositional and Predicate Calculus, Logic Problem (Knights and Knaves), Logic and Set Theory, Logic Problem (Gold on Island), Properties of Equivalence, Logic and Proposition, Logic problem (Restaurant), Golden Rule, Introduction to Hoare's Logic, Introduction to Hoare's Logic, Hoare's Logic (Weakest Pre-condition and Loops), Hoare's Logic (Conditional and Control Flow, Invariant Condition),

Hoare's Logic with Example (Tower of Hanoi), Hoare's Logic, Verification of Functions, Specification of Functions using Pre and Post-Conditions, Dijkstra's Guarded if Statement, Constructing Conditional Statement, Output Variables, Ghost Variables, Simultaneous Assignment, Example: Max.of Two Numbers, Constructing Loops, The Dutch National Flag Problem, Defensive Programming, Design by Contract, Design by Contract and its Components. Implementation of Design by Contract (jContractor), A Pure Java Implementation - Design by Contract, Object Constraint Language (OCL), The Structure Of an Algebraic Specification, The Structure Of an Algebraic Specification,

Implementation of Design by Contract (jContractor), A Pure Java Implementation - Design by Contract, Object Constraint Language (OCL), The Structure Of an Algebraic Specification, Algebraic Specification: Rules and Methods, New_List Specification Methods: Queue Operations, Errors Specification and Boolean Function with Tools and Techniques, Structure

of the File System Specification, How to use Specification of Boolean, Pair, List, Quad and Bimap, Tools for Algebraic Specification (Sub-System Interfaces), Larch Specification Languages, Interface of Algebraic Specification and Larch (Family of Specification) Languages.

OBJ (Family of Specification), Model Based Specification, VDM: Vienna Development Method, Incubator, Main Operations on Sets, Sequences and Mappings, Z-Specification, Structure and Schema (A Birthday Book), Z-Specification, Refinement and Totalization, Z-Specification, (A Program Refinement, Different Operations Simulation, Lifting, Forward Simulation),

System Components, Using Z-Specification, Operating System Scheduler, Operations: Delete Start, Middle and End, How to Specify Concurrent and Real Time System, Introduction to Petri Nets, Development of Concurrent System (Petri Nets), Conflict, Concurrency and Confusion, Behavioural Properties, Development of Concurrent System (Petri Nets), Behavioural Properties with Examples, Activities, Limitations and Acceptance of Formal Methods, Seven Myths of Formal Methods

TEXT BOOKS:

1) Michael Huth and Mark Ryan, Logic in Computer Science: Modelling and Reasoning about Systems, Cambridge University Press.
2) Roland Backhouse, Program Construction: Calculating Implementation from Specifications,
   1st Edition, Wiley
3) B. Cohen, W. T. Harwood and M. I. Jackson, The Specification of Complex Systems, 1st Edition, Addison-Wesley
4) Jim Woodcock and Jim Davies, Using Z: Specification, Refinement, and Proof, 1st Edition, Printice Hall

REFERENCE BOOKS:

1) Jos Warmer and Anneke Kleppe, The Object Constraint Language, precise modeling with UML, 1st Edition, Addison-Wesley
2) Richard Mitchell and Jim McKim, Design by contract, by example, 1st Edition, Addison-Wesley

SEMESTER/YEAR : II SEM
COURSE CODE : 16CSE573
TITLE OF THE COURSE : HPC LAB
L: T/A: P: C : 0: 0: 4: 2

COURSE OBJECTIVES:

1. To have practical exposure to OS and programming aspects in High Performance Computing.
2. To design and implement distributed memory programming, shared memory programming and parallel applications.

COURSE OUTCOMES:

1. Understand, design and develop programs for better performance, Understand and develop programs in the distributed memory programming and shared memory programming environments. Also develop skills in developing parallel programs to solve the problems.

2. Lab experiments and mini projects will include program execution (processes, virtual memory, system calls, and dynamic memory allocations), Identifying program bottlenecks (profiling, tracing,), Simple high level language optimization, program parallelization, programming using MPI/PVM.

SEMESTER/YEAR : II SEM
COURSE CODE : 16CSE574
TITLE OF THE COURSE : ADVANCED NETWORKS LAB
L: T/A: P: C : 0: 0: 4: 2

COURSE OBJECTIVES:

1. To have exposure to implementing Routing protocols using NS2
2. To design Network Management system for the given networks.
3. To implement experiments on MPLS and Traffic Engineering

COURSE OUTCOMES

1. Understanding the simulation of networks and Routing protocols suing NS2
2. Understand and develop skills in Network Management and MPLS

Lab experiments and mini projects will include installation of NS2, simulating routing protocols, QoS, configuring Open NMS for network management, study of open source MPLS

DEPARTMENTAL ELECTIVES:

COURSE CODE : 16CSE521
TITLE OF THE COURSE : DISTRIBUTED COMPUTING
L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVES:

1. To understand distributed computing environment, distributed storage, and various storage stacks.

2. To understand distributed processing, introduction to Hadoop eco system, Massively Parallel processing and security in distributed systems.

COURSE OUTCOMES:

1. Knowledge of distributed computing environment, and know about important storage stacks.
2. Get skills in using map reduce framework to manage huge data on large clusters and designing distributed algorithms.

Introduction to Distributed Computing and building blocks for Distributed System Design:

Introduction, Google's Paper "Introduction to Distributed System Design", Implementing Remote Procedure Calls. Time, Clocks, and Global States - Ordering of Events in a Distributed System, Determining Global States of Distributed Systems, Network Time Protocol, Concurrency Control and Recovery. Consensus - Loosely-Coupled Distributed Systems and introduction to Locking service

Distributed Storage: Challenges – Scale-out (Elasticity), High Availability, Reliability vs Cost. Performance Metrics – Storage Efficiency, Saturation Throughput, Mean Time to Data Loss, Sequential Read/Write Bandwidth. Popular Storage Stacks – Hadoop (HDFS), Spanner, DynamoDB

Distributed Processing : Map Reduce: Data Processing on Large Clusters. Distributed Algorithms. Introduction to Hadoop Ecosystem – Hbase, Hive, Pig, Zookeeper

MPP (Massively Parallel Processing) : Scatter and Gather; An alternative to MapReduce. Massively Parallel Processing and In-Memory Databases

Security in Distributed Systems: Practical Byzantine Fault Tolerance. A Logic of Authentication

Textbook

1. Andrew Tannenbaum and Maarten van Steen, ``Distributed Systems: Paradigms and Principles'', Prentice-Hall, 2002.
2. Hadoop: The Definitive Guide, 3rd Edition - O'Reilly Media

COURSE CODE : 16CSE522
TITLE OF THE COURSE : LINUX KERNEL PROGRAMMING
L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVES

1. To understand Linux internal concepts, and design of character device drivers

2. To understand Linux Image creation and installation of GNU toolchain and kernel building.

COURSE OUTCOMES

1. Understand the steps in kernel building

2. Acquire skills designing device drivers and implementing them for various applications

INTRODUCTION: Introduction to device driver in Linux, Linux Kernel Extensibility Features: Kernel module concepts, Compiling and loading the Kernel module, Difference between Kernel module and application, Kernel symbol table, Kernel module parameter, Device driver basics and debugging techniques-printk,

LINUX INTERNAL CONCEPTS: Linux File system-virtual file system, Superblock structure, Inode block structure,'/proc' and 'ext2' file systems; Linux process Management-Kernel tasklist, Scheduler, Runqueue, Waitqueue and Idle & busy states; Linux memory model, User space allocation, kernel space allocation, Process address space and virtual memory. Demo of adding kernel module

CHARACTER DRIVERS: Major/minor number, Allocation/ Deallocation of device number, Allocating memory and I/O Ports, Fundamental driver operations, Character device registration, advanced character driver operations and case study: UART/TTY/PCI, Demo of character device driver (UART/TTY/PCI)

INTRODUCTION TO DEVICE DRIVER IN LINUX, LINUX KERNEL IMAGE CREATIONS: Linux booting Linux initialization process, U-boot, Linux BSP, Installation of GNU tool-chain for embedded target, kernel configuration and kernel building. Demo of installation of GNU toolchain and kernel building.

CONCURRENT PROGRAMMING: Race condition, solutions to race condition, Mutex semaphore, Exception/Interrupt Handling, Tasklet mechanism and system calls. Block Device Driver and Network Device driver with case study, Demo of race condition handling in character device, Demo of Ethernet device driver modification

PROGRAMMING ASSIGNMENT:

1. Cross development environment creation for specific target (Eg. ARM9).
2. Building and compiling Linux kernel module
3. Refreshing process management, file system and memory management concepts through practices.
4. Race condition and concurrent programming
5. Writing device driver in Linux for CMOS device on PC
6. UART/USB/TTY/PCI device driver development
7. Ethernet device driver modification.

REFERENCE BOOKS:

1. Jonathan corbet, Alessandro Rubini and Greg Kroah-Hatman Linux Device Drivers-3rd edition. Oreilly, 2005
2. Robert Love ,Linux system Programming- Talking directly to the kernel and C Library, O'Reilly Media, Sept 2007.
3. Sree krishnan Venkateshwaran "Essential Linux Device Driver"2008
4. Daniel P. Bovet and Marco Cessti "Understanding the Linux Kernal" 3rd Edition. Oreilly, 2000.

COURSE CODE : 16CSE527
TITLE OF THE COURSE : WIRELESS SENSOR NETWORKS
L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVES:

1. Architect sensor networks for various application setups.
2. Explore the design space and conduct trade-off analysis between performance and resources.
3. Devise appropriate data dissemination protocols and model links cost.
4. Determine suitable medium access protocols and radio hardware.
5. Understanding of IoT characteristics, IoT use cases, and Applications of IoT in different domains.

COURSE OUTCOMES:

1. Competency to develop applications of wireless sensor actuator networks.
2. Implement the elements of distributed computing and network protocol.
3. Knowledge of various hardware, software platforms that exist for sensor networks.
4. Understanding of IoT and use of WSN in IoT.

INTRODUCTION: Background of wireless sensor network (WSN) technology, Application of sensor networks, Architecture elements of sensor network, enabling technologies for sensor network, challenges involved in WSN, advantages of sensor network

WIRELESS SENSOR TECHNOLOGY: Sensor node technology: Hardware components, Energy consumption of sensor nodes, example of sensor nodes, gateway concepts, operating systems, example of IoT operating systems, database management in a sensor, Middleware for WSN,various wireless technologies for sensor network: Bluetooth, IEEE 802.15.4, IEEE 802.11, RFID

COMMUNICATION PROTOCOLS : MAC layer: Fundamentals of MAC protocol, Low duty cycle protocols and wakeup concepts, content based protocol, schedule based protocol, error control, link management, topology control, time synchronization, Networking layer: addressing, routing, discovery, forwarding, network management, IPv6, 6LoWPAN, ICMPv6.

TRANSPORT LAYER AND MIDDLEWARE FOR WIRELESS SENSOR NETWORKS: Transport protocols, reliable data transport, TCP, UDP, Mobile IP, RESTful architecture, MQTT, CoAP

NETWORK MANAGEMENT, OPERATING SYSTEM FOR WIRELESS SENSOR NETWORKS, AND APPLICATIONS & CURRENT RESEARCH IN WSN:
Introduction, Network Management Requirements, Traditional Network Management Models, Network Management Design Issues. **Operating Systems for Wireless Sensor NETWORKS:** Introduction, Operating System Design Issues, and Examples of Operating Systems. Emerging

Applications, application specific support, advanced in-network processing, security, and network for high data rate applications

INTRODUCTION TO INTERNET OF THINGS: Introduction, architecture, characteristics of IOT systems, Prevalent IoT architectures, applications, Overview of different technologies involved for IoT realization, History of IoT: The transition from mainframes and personal computing, Planet lab and origins of distributed computing; Robotics, AI and Cyber Computing Infrastructure; M2M communications; P2P networks; Universal identification and RFID; Autonomic computing, Pervasive computing, Ubiquitous computing; Wireless Sensor Networks; The emergence of IoT.

IOT ECOSYSTEM AND LANDSCAPE: IOT business models and its usage in various domains; Technology Enablers for IOT – Mobility, Analytics, Cloud and Social Media; IOT platforms; Security; Test methodologies; Regulations and Risks.

TEXT BOOKS:

1. Kazem Sohrabi, Daniel Minoli, Taieb F. Znati "Wireless sensor network : technology protocols and applications" Willey , 2007
2. F. Zhao and L. Guibas Morgan Kaufmann "Wireless Sensor Network an information processing approach" 2004
3. Karl H. Wiley "protocols and architecture of wireless sensor networks" 2005
4. Vijay Madisetti, Arshdeep Bahga "Internet of things, A hands-on-approach" 2014
5. Jean-Philippe Vasseur & Adam Dunkels "Interconnecting smart objects with IP", Morgan Kaufmann Publishers, 2010

REFERENCES:

1. Cuno Pfister, "Getting Started with the Internet of Things" , Maker Media Inc, 2011
2. Adrian Mcewen and Hakim, "Designing the Internet of Things", Wiley publication, 2013

SEMESTER/YEAR : II SEM
COURSE CODE : 16CSE523
TITLE OF THE COURSE : Multi-Core Architecture
L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVES:

1. To understand the need for multi core architectures.
2. To understand and use of threads, thread management.
3. To study Parallel Processing, Parallel Programming constructs, and Open MP.

COURSE OUTCOMES:

1. Acquire knowledge of multi-processor architecture and threading
2. Knowledge of threading and parallel programming constructs

INTRODUCTION TO MULTI-CORE ARCHITECTURE: Motivation for Concurrency in software, Parallel Computing Platforms, Parallel Computing in Microprocessors, Differentiating Multi-core Architectures from Hyper- Threading Technology, Multi-threading on Single-Core versus Multi-Core Platforms Understanding Performance, Amdahl's Law, Growing Returns: Gustafson's Law.

SYSTEM OVERVIEW OF THREADING: Defining Threads, System View of Threads, Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, What Happens When a Thread Is Created, Application Programming Models and Threading, Virtual Environment: VMs and Platforms, Runtime Virtualization, System Virtualization

FUNDAMENTAL CONCEPTS OF PARALLEL PROCESSING: Basic concepts, types and level of parallelism, classification of parallel architecture, basic parallel techniques, shared memory multiprocessors, distributed memory multicomputer, parallel Random access machine, VLSI complexity model

THREADING AND PARALLEL PROGRAMMING CONSTRUCTS: Synchronization, Critical Sections, Deadlock, Synchronization Primitives, Semaphores, Locks, Condition

Variables, Messages, Flow Control- based Concepts, Fence, Barrier, Implementation-dependent Threading Features. Threading APIs : Threading APls for Microsoft Windows, Win32/MFC Thread APls, Threading APls for Microsoft. NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking

OPENMP: A Portable Solution for Threading: Challenges in Threading a Loop, Loop-carried Dependence, Data-race Conditions, Managing Shared and Private Data, Loop Scheduling and Portioning, Effective Use of Reductions, Minimizing Threading Overhead, Work-sharing Sections, Performance-oriented Programming, Using Barrier and Nowait, Interleaving Single-thread and Multi-thread Execution, Data Copy-in and Copy-out, Protecting Updates of Shared Variables, Intel Task queuing Extension to OpenMP, OpenMP Library Functions, OpenMP Environment Variables, Compilation, Debugging, performance

SOLUTIONS TO COMMON PARALLEL PROGRAMMING PROBLEMS: Too Many Threads, Data Races, Deadlocks, and Live Locks, Deadlock, Heavily Contended Locks, Priority Inversion, Solutions for Heavily Contended Locks, Non-blocking Algorithms, ABA Problem, Cache Line Ping-ponging, Memory Reclamation Problem, Recommendations, Thread-safe Functions and Libraries, Memory Issues, Bandwidth, Working in the Cache, Memory Contention, Cache-related Issues, False Sharing, Memory Consistency, Current IA-32 Architecture, Itanium Architecture, High-level Languages, Avoiding Pipeline Stalls on IA-32,Data Organization for High Performance

TEXT BOOKS:

1. Shameem Akhter and Jason, Multicore Programming , Increased Performance through Software Multi-threading, Intel Press

COURSE CODE : 16CSE533
TITLE OF THE COURSE : VIRTUALIZATION & CLOUD COMPUTING
L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVES:

1. To understand Virtualization concepts and different types of virtualization.
2. To understand cloud computing concepts, technologies and services.

COURSE OUTCOMES:

1. Conceptual and sound knowledge of virtualization and different types of virtualization.
2. Acquire knowledge of cloud computing, technologies and services.

Virtualization: Definition, benefits, Virtualization History, Virtualizing x86 Computer virtualization: : MMU Virtualization, CPU Virtualization, IO Virtualization; Types of Virtualization: Binary Translation, Para Virtualization, Hardware Assisted, Networking in virtualized environment, Virtual Machines and Access Control.

Storage Virtualization: Introduction and Basic concepts, Storage Interconnect, Abstracting Physical Storage, Virtualization at the host, Virtualization at the Storage Target. Server Virtualization**:** Introduction, Types of Server Virtualization, Server Virtualization Concepts, Planning and other Uses of Server Virtualization, Planning for Deployment, Server Virtualization Platform Differences.

Introduction to Cloud Computing: History of Cloud, Cost angle and Usability angle, Capex to Opex, Cloud Deployment Models (Public, Private, Hybrid), Cloud Service Models (IaaS, PaaS, SaaS)

IaaS Deep Dive: Infrastructure as a service, Understanding of available IaaS models: AWS, Google Compute Engine, Azure, OpenStack.

PaaS Deep Dive: Understanding of available PaaS models: Google App Engine, Elastic Bean Stack, RedHat OpenShift

MBaaS: Overview, MBaaS-Parse, MBaaS-AWS, Using MBaaS Services from Android. Introduction to Business Processes as a Service (BPaaS) and Analytics as a Service (AaaS)

Introduction to 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.

Text Books

1. D. Marshall, W. A. Reynolds, and D. Mc Corry, Advanced Server Virtualization, Aurbech Publications, 2006.
2. T. Clark, *Storage Virtualization: Technologies for Simplifying Data Storage and Management,* Addison-Wesley Professional, 2005.
3. Dan C Marinescu-Cloud Computing Theory and Practice. Elsevier(MK) 2013
4. Rajkumar Buyya , James Broberg, Andrzej Goscinski- Cloud Computing Principles and Paradigms, Willey 2014

COURSE CODE : 16CSE544
TITLE OF THE COURSE : INTERNET OF THINGS
L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVES:

1) To learn the building blocks of Internet of Things (IoTs) and their characteristics.
2) To introduces the students to the programming aspects of Internet of Things with a view towards rapid prototyping of complex IoT applications.
3) To learn Reference architectures for different levels of IoT applications.
4) To learn IoT data analytics and Tools for IoT.

COURSE OUTCOMES:

1. Will be able to identify a suitable IOT data analytics and a tool for IOT.

2. Will know in a manner how the general Internet as well as Internet of Things work.

Introduction

Introduction to Internet of Things: Introduction, architecture, characteristics of IOT systems, Prevalent IoT architectures, applications, Overview of different technologies involved for IoT realization, History of IoT: The transition from mainframes and personal computing, Planet lab and origins of distributed computing; Robotics, M2M communications; P2P networks; Universal identification and RFID; Pervasive computing, Ubiquitous computing; Wireless Sensor Networks; The emergence of IoT

IOT Ecosystem

IOT Domains. Domain Specific IOTs: Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry. IoT and M2M- Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, Software Defined Networking, Network Function Virtualization.; IOT business models. Technology Enablers for IOT - Mobility, Analytics, Cloud and Social Media; IOT platforms; Security; Regulations and Risks. Design consideration for consumer and enterprise products. Case studies of Weather monitoring, smart Irrigation, home intrusion detection system;

Designing the things in IOT

The IoT paradigm - Physical layout of IOT systems; Smart objects - Bits and atoms - Goal orientation - Convergence of technologies. Communication stack in end devices. Definition & Characteristics of IoT, Components of IoT, IOT Architecture. Things in IoT ,IoT Protocols used in nodes

Field Area Networks

Roles and responsibilities of nodes, border routers, field area gateways; Mesh networks - mesh over and mesh under; IP based communication; Communication vs power tradeoff in the network; Low power WAN technologies; low power PAN technologies; Emerging standards; IOT network management - bootstrapping and management; Messaging in IOT systems - XML, JSON, EXi, binary

IOT Application development

IoT Platforms Design Methodology; Multi-tier Application Deployment ,IOT platform case studies; Databases for IOT - managing high velocity data; Introduction to Cloud setup; Introduction to Hadoop and managing Big Data; Data Analytics and real time processing; Statistical modelling of data; Introduction to webapp development using MVC methodology. Introduction to mobile application development

Text books

1. ArshdeepBahga and VijayMadisetti , Internet of Things - A Hands-On Approach , VPT; 1 edition (August 9, 2014)

Reference Books:

1. Ian G Smith, The Internet of Things 2012 New Horizons, IERC - Internet of Things European , Research Cluster, 2012.

2. IEEE 802.3 Working Group, http://www.ieee802.org/3, Retrieved 2014. Paul Deitel, C How to Program, 7th Edition, Deitel How to Series.

3. M. Wang, G. Zhang, C. Zhang, J. Zhang, C. Li, An IoT-based Appliance Control System for Smart Homes, ICICIP 2013.

4. H. Zhang, J. Guo, X. Xie, R. Bie, Y, Sun, Environmental Effect Removal Based Structural Health Monitoring in the Internet of Things, International Conference on Innovative Mobile and Internet, Services in Ubiquitous Computing (IMIS), 2013

COURSE CODE : 16CSE529
TITLE OF THE COURSE : Data Mining
L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVES:

This course will cover the standard algorithms for data mining techniques. Special emphasis will be given on the recent trends in mining text data, mining graphs, mining spatio-temporal data, etc.

COURSE OUTCOMES:

1. Will be able to analyze the data coming from various sources, analyze and classify them

2. Will be able to apply the techniques and algorithms to real life problems.

3. Introduction to Data Mining, Data Mining Goals, Stages of the Data Mining process, Data Mining Techniques, Knowledge Representation Methods, Application.

Examples:

Data pre-processing, Data cleaning, Data transformation, Dimensional reduction. Introduction to Weka Data mining algorithms.

Association rules - Basic idea, item sets, Generating item sets and rules efficiently, Correlation analysis, mining association rules.

Classification - Naive Bayes, Random Forests.

Prediction -Instance-based methods (nearest neighbor), Linear models (Regression).

Clustering - K-means, expectation maximization (EM), Hierarchical clustering methods.

Training and Testing: Estimating classifier accuracy (holdout, cross-validation, and leave-one-out). Combining multiple models (bagging, boosting, and stacking). Cross Validation.

Advanced techniques, Data Mining software and applications.

Text mining: extracting attributes (keywords), structural approaches (parsing, soft parsing). Bayesian approach to classifying text.

Web mining: classifying web pages, extracting knowledge from the web.

TEXT BOOKS

1. Jiawei Han, Micheline Kamber and Jian Pei “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.

2. Data Mining: Practical Machine Learning Tools and Techniques by Ian H. Witten and Eibe Frank, Morgan Kaufmann

REFERENCE BOOK:

1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.

2 K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.

3 G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.

4 Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

COURSE CODE : 16CSE537
TITLE OF THE COURSE : DATA ANALYTICS & VISUALIZATION
L: T/A: P: C : 3: 0: 2: 4
COURSE OBJECTIVES:

1. This course the fundamentals statistics and probability required in the analysis of data.

2. This course also gives the details of **R** and it's usage in Data Analytics.

COURSE OUTCOMES:

1. To understand the statistical tools and techniques.

2. To be able apply these tools and techniques in data analytics using R.

Introduction: Probability Fundamentals - Axioms of probability and equal likelihood, Conditional probabilities, Bayes' formula and independent events, Probability Distributions & Random Variables.

Statistics Fundamentals - Mean and Weighted Average, Median, Mode, Standard Deviation, Sampling Distribution and Standard Deviation of the Mean, Gaussian and Poisson Distributions.

Statistical Programming: R Fundamentals, Getting started with R, Data Types, Control Structures, Functions, Data files, Inputting data, Removing data sets, Data Structures, Types of Data, Variables within data, Transposing data, Missing values, Naming columns

Statistical tests and Distance Metrics: Basic Tests: Mean, Variance, Quantile, Length, T-test: Variance equal/unequal, Paired t-test, T-test Step by Step. Chi Squared: Chi-Squared Step by Step, Goodness of Fit test, Distance Metrics.

Correlation and Regression: Inference and Learning, Multiple Regression, Linear and Logistic Regression Models, Regression coefficients, Beta coefficients, R squared, graphing the regression.
Topic modeling: Hidden Markov Models, Latent Semantic Indexing, Probabilistic Latent Semantic Indexing, Latent Dirichlet Allocation (LDA), Gibbs Sampling for LDA.

TEXTBOOK

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Springer 2009
2. Richard Cotton, Learning R,Oreilly Publication

COURSE CODE : 16CSE537
TITLE OF THE COURSE : NETWORK SECURITY
L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVES:

1. To understand the need for Network Security and its importance

2. To understand the various security protocols and techniques available the distributed memory programming, shared memory programming, and a few parallel applications

COURSE OUTCOMES:

1. Will be able to analyze a security protocol and crypt analyze

2. Will be able to design new security protocol

Network security principles and implementation, Security attacks, Computer criminals, secure programs, Viruses and other malicious code, Targeted malicious code, Controls against program threats.

Operating system security, Database security: Security requirements, Reliability and Integrity, Sensitive data, multilevel database, Proposals for multilevel security, Security in Networks: Threats in networks, Network security control, Firewalls, Intrusion detection systems.

Secure e-mail networks, Cryptography, Key management and PKI- Example protocols: PEM, SSL, IPSec, Administrating security,

Cloud computing: Introduction, Cloud computing risk management, Compliance and legal responsibilities of remotely stored and maintained data, Life cycle management, Interoperability.

Business continuity and disaster recovery planning from the perspective of the user and the Cloud provider, handling of incidents and remediation, Application security, Encryption issues, storage, Virtualization mechanisms and vulnerabilities, and access control .

TEXT BOOKS:

1. C. P. Pfleeger, S. L. Pfleeger, Security in Computing, Pearson Education, 4th Edition,2003.
2. Matt Bishop, Computer Security: Art and Science, Pearson Education, 2003.

3. Ronald D. Krutz, Russel Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley India Editions, 2010.

REFERENCE BOOKS:

1. Stallings, Cryptography and Network Security: Principles and practice, 4th Edition, 2006.
2. Perlman, Speciner, Network Security, Prentice Hall, 2nd Edition, 2003.
3. Eric Maiwald, Network Security: A Beginner's Guide, TMH, 1999.
4. Macro Pistoia, Java Network Security, Pearson Education, 2nd Edition, 1999.
5. Whitman, Mattord, Principles of information security, Thomson, 2nd Edition, 2005.

COURSE CODE : 16CSE537
TITLE OF THE COURSE : MOBILE COMPUTING
L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVES:

1. To understand about the architecture for Mobile Computing.
2. The course aims to provide basic understanding about Mobile Communication, Mobile Hardware, Mobile Software to understand the basics of Android devices and Platform.
3. Impart knowledge on basic building blocks of Android programming Activities, Services, Broadcast Receivers and Content providers.

COURSE OUTCOMES:

1. Have good understanding of Mobile architecture, Mobile Computing- both hardware and software aspects.
2. Technical competency and skills in developing applications using Android.

Enterprise Mobile Application Development
Characteristics and advantages of mobile communication, types of mobile applications – development approaches, overview of IBM mobile strategy and designing mobile solutions. Introduction to IBM Worklight V6.0, Worklight Studio, Worklight Studio Plug-in's, Worklight project structure, building, testing an application on a simulator. Client-side core APIs, Local storage APIs – Encrypted cache, JSONStore, working with UI frameworks, Apache Cordova.

Using Adapters and Security
Integration Adapters – Overview, SQL, HTTP, Cast Iron adapter, Adapter procedures, invoking adapter procedures from java code, using Worklight integration adapters, Native page and web page integration. Using Worklight native APIs, Security-securing an application.

Introduction to Android
Android: Introduction, trends, platforms, Android Development Setup like, Android Studio, Eclipse, ADT, Android SDK, tools. Emulator setup. Application framework basics: resources, layout, values, asset XML representation, generated R.Java file, Android manifest file.
Activities, Intent and UI Design: Introduction to activities, activities life-cycle-User Interface INTENT – intent object, intent filters, linking activities, user interface design.

Android Components
Fragments, basic views, list views, picker views ,adapter views, Menu, Action Bar etc, layouts, basics of screen design, registering listeners and different event Listeners. Creating application using multiple activities- views with different layouts

Data Persistence
Shared preferences- Managing data using SQLite database. Content Providers – user content provider, android provided content providers. Creating a simple applications using content provider and persisting data into database

TEXT BOOKS:

1. Marko Gargenta, Learning Android by O'reilly Publications
2. IBM Courseware
3. Reto Meier, Professional Android™ Application Development, Wrox Publications

REFERENCE BOOKS

1. Jonathan Simon, Head First Android Development, O'reilly Publications
2. N. N. Jani, Mobile Computing: Technologies and Applications S Chand2009.
3. B. M. Hirwani- Android programming Pearson publications-2013

COURSE CODE : 16CSE537
TITLE OF THE COURSE : MACHINE LEARNING
L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVES:

1. To know about basic concepts of Machine Learning

2. To obtain a thorough knowledge of various Machine learning techniques and their representation schemes

3. To have an overview of various Machine Learning applications

COURSE OUTCOMES:

1. Technical knowhow of Machine Learning applications, heuristics, Knowledge representation Systems,

2. To Acquire knowledge of various Machine Learning techniques

Module 1: 8 Hrs

Introduction: Well Posed Learning Problems, Designing a Learning System, Perspectives and Issues in Machine Learning. **Concepts Learning and the General-to-Specific Ordering:** Concept Learning Task, Concept Learning as Search, Find-S, Version Spaces and the CANDIDATE ELIMINATION Algorithm and Remarks, Inductive Bias.

Module 2: 10 Hrs

Decision Tree Learning: Representations, Appropriate Problems for Decision Tree Learning, Basic Decision Tree Learning, Hypothesis Space Search, Inductive Bias and Issues in Decision Tree Learning.

Module 3: 9 Hrs

Artificial Neural Networks: Introduction, Representations, Appropriate Problems for Artificial Neural Networks, Perceptron, Multilayer Networks and the BACKPROPOGATION Algorithm and Remarks. Illustrative Example: Face Recognition

Module 4: 9 Hrs

Evaluating Hypothesis: Motivation, Estimating Hypothesis Accuracy, Basics of Sampling Theory, A general Approach for Deriving Confidence Intervals, Difference in Error of two Hypothesis, Comparing Learning Algorithms.

Module 5: 8 Hrs

Instance Based Learning: Introduction, K-Nearest Neighbor Learning, Locally weighted Regression, Radial Basis Functions, Case based Reasoning.

Genetic Algorithms: Motivation, Genetic Algorithms, Hypothesis Search Space, Genetic Programming, Models of Evolution and Learning, Parallel Genetic Algorithm.

TEXT BOOK

1. Tom M Mitchell, Machine Learning, MGH, 1997.

COURSE CODE : 16CSE537
TITLE OF THE COURSE : COMPUTER VISION
L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVES:

1. To introduce various topics of computer vision with their applications.
2. Combining the analytics with CV which helps in various Video Analytics processing.

COURSE OUTCOME:

1. Computer Vision along with video analysis helps the students to do the video analytics in a much easier way using Stereo Vision and Structure from motion features.
2. Students will be able to do analysis on various real time application of video analytics.

UNIT 1: Image formation and camera calibration 08 Hours

Introduction to computer vision, geometric camera models, orthographic and perspective projections, weak- perspective projection, intrinsic and extrinsic camera parameters, linear and nonlinear approaches of camera calibration.

UNIT 2: Image Analysis-Feature detection and matching 07 Hours

Edge detection, interest points and corners, local image features for image analysis, feature matching and Hough transform, model fitting and RANSAC, scale invariant feature matching.

UNIT 3: Video Analysis-Stereo Vision 12 Hours

Stereo camera geometry and epipolar constraints, essential and fundamental matrix, image rectification, local methods for stereo matching: correlation and multi-scale approaches, global methods for stereo matching: order constraints and dynamic programming, smoothness and graph based energy minimization, optical flow.

UNIT 4: Analysis on Structure from motion 08 Hours

Camera self-calibration, Euclidean structure and motion from two images, Euclidean structure and motion from multiple images, structure and motion from weak-perspective and multiple cameras

UNIT 5: Video Analytics and its Applications 08 Hours

Introduction to Video Analytics, Analysis Parameters-Real Time Security & User Insights, Storage analysis for Processed Video Data, Applications: Analysis on Facial Surveillance, License Plate Recognition, DWELL Analytics, Queue Line Analytics, People Counter

Analytics-Analytics for shopper Data, Demographic Analytics. Case Study: Leveraging Video Analytics to Boost In-Store Performance.

Text Books

1. Forsyth, D. A. and Ponce, J., "Computer Vision: A Modern Approach", Prentice Hall, 2nd Ed. 2011.
2. Szeliki, R., "Computer Vision: Algorithms and Applications", Springer, 2011.
3. Hartley, R. and Zisserman, A., "Multiple View Geometry in Computer Vision", Cambridge University Press, 2003.
4. Gonzalez, R. C. and Woods, R. E., "Digital Image Processing", Prentice Hall, 3rd Ed, 2009.
5. Trucco, E. and Verri, A., "Introductory Techniques for 3-D Computer Vision", Prentice Hall, 1998.
6. Website Link: http://www.3vr.com/

INSTITUTIONAL ELECTIVES

COURSE CODE : 16IE651
TITLE OF THE COURSE : DIGITAL MARKETING
L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVE:

To learn how to do marketing online- Boost website traffic, generate potential leads & increase sales revenue with better brand awareness using internet platforms like Social Media, Email Marketing, Mobile Marketing, Ecommerce Marketing and Affiliate marketing.

COURSE OUTCOME:

After completion of the program the students will be able to plan, conceptualize and implement Digital Marketing strategy for client requirements.

UNIT-1

Digital Marketing Overview 7 hrs

Introduction, Key terms and concepts, what is marketing? What is digital marketing? Why Digital Marketing wins over traditional Marketing, Understanding marketing strategy, the building blocks of marketing, Understanding Digital Marketing Process: Increasing Visibility, Visitors engagement.

UNIT-2

Search Engine Optimization and Search Markets 10 hrs

Stakeholders in Search, Customer Insights, O n & off-page Optimization, Meta Tags, Layout, Content Updates, Inbound Links & Link Building, Goal Configuration &Funnels, Intelligence Reporting, Conversions, Bounce Rate, Traffic Sources, Scheduling etc.

UNIT-3

Social Media 10 hrs

What is Social Media Marketing? Overview of Facebook, Twitter, LinkedIn, Blogging, Youtube and Flickr, building Brand Awareness Using Social Media, Social Media Management, Insights and Analytics, Best Practice Examples & case Studies

UNIT-4

Website Analytics **9 hrs**

Goal Configuration &Funnels, Intelligence Reporting, Conversions, Bounce Rate, Traffic Sources, Scheduling etc

UNIT-5

Email and Mobile Marketing **8 hrs**

User Behaviour, Segmentation, Key Metrics, Best Practice Case Studies, Split Testing, Campaign Process Optimisation, SMS Strategy, Mobile Advertising, Mobile Optimized Websites, 7 Step Process for Mobile Apps, Proximity Marketing, Strategic Steps, Review & Testing

TEXT BOOKS:

1. Digital Marketing, Vandana Ahuja, Oxford University Press

2. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, Ian Dodson, Wiley 2016

COURSE CODE : 16ESE652
TITLE OF THE COURSE : PRODUCT LIFE CYCLE MANAGEMENT

L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVE:

1. To understand various aspects of Product Life Cycle Management.
2. To understand Digital Manufacturing.

COURSE OUTCOME:

1. Students should be able to use methods, tools and technique taught in the Product Life Cycle Management.

UNIT-1

Introduction to Product Life Cycle Management (PLM) 10 hrs

Definition, PLM Lifecycle model, Threads of PLM, Need for PLM, Opportunities and benefits of PLM, Views, Components and Phases of PLM, PLM feasibility study, PLM visioning.

PLM Concepts, Processes and Workflow -Characteristics of PLM, Environment driving PLM,PLM Elements, Drivers of PLM, Conceptualization, Design, Development, Validation, Production, Support of PLM.

UNIT-2

Product Data Management (PDM) Process and Workflow 10 hrs

PDM systems and importance, reason for implementing a PDM system, financial justification of PDM implementation. Versioning, check-in and checkout, views, Metadata, Lifecycle, and workflow. Applied problems and solution on PDM processes and workflow.

UNIT-3

Tools of Communication for collaborative work 10 hrs

Creation of 3DXML and CAD drawing using CAD software. Creation of an animation for assembly instructions on 3D via composer, creation of an acrobat 3D document. Applied problems and solutions on tools of communication for collaborative work.

Collaborative Product Development-Digital mock-up and prototype development, design for environment, virtual testing and validation, marketing collateral

UNIT-4

Developing a PLM strategy and conducting a PLM assessment 7 hrs

Strategy, Impact of strategy, implementing a PLM strategy, PLM initiatives to support corporate objectives. Infrastructure assessment, assessment of current systems and applications.

UNIT-5

Digital Manufacturing – PLM 8 hrs

Digital manufacturing, benefits manufacturing, manufacturing the first-one, Ramp up, virtual learning curve, manufacturing the rest, production planning.

TEXT BOOKS:

1. Product Lifecycle Management: Grieves, Michael, McGraw-Hill Edition 2006
2. Product Data Management: Burden, Rodger, Resource Pub,2003

REFERENCE BOOKS:

1. Fabio Guidice, Guido La Rosa, Product Design for the environment-A life cycle approach, Taylor and Francis
2. Hartman, Product Lifecycle Management with SAP,2006
3. Robert J Thomas, NDP: Managing and forecasting for strategic processes

COURSE CODE : 15ESE653
TITLE OF THE COURSE : PROJECT MANAGEMENT

L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVE:

1. To understand various aspects of project management
2. To understand role of project manager

COURSE OUTCOME:

1. Students should be able to use project management methods, tools and technique

UNIT I

THE PROJECT MANAGEMENT FRAMEWORK –INTRODUCTION 8 Hrs

What is a Project? What is project Management? Relationship among Project management, Program management and Portfolio Management, Project Management and Operations Management, Role of a Project Manager.

UNIT II

THE PROJECT MANAGEMENT FRAMEWORK-PROJECT LIFE CYCLE AND ORGANISATION 6 Hrs

The project Life Cycle Overview, Project vs. Operational work, Stakeholders, Organizational Influences on Project Management.

UNIT III

THE STANDARD FOR PROJECT MANAGEMENT OF A PROJECT: 11Hrs

Project Management Process for a Project: Common Project Management Process Interactions, Project Management Process Groups, Initiating Process Group, Planning Process Group, Executing Process Group, Monitoring and Controlling Process Group, and Closing Process Group.

UNIT IV

THE PROJECT MANAGEMENT KNOWLEDGE AREAS: PART I **10Hrs**

Project Integration Management, Project Scope Management, Project Time Management Project Cost Management, Project Quality Management,

UNIT V

THE PROJECT MANAGEMENT KNOWLEDGE AREAS: PART II **10Hrs**

Project Human Resource Management, Project Communications Management, Project Risk Management, Project Procurement Management.

TEXT BOOK:

1. A Guide to the Project Management Body of Knowledge (PMBOK® Guide)—Fifth Edition (ENGLISH)

REFERENCES:

3. http://www.pmi.org/

SEMESTER/YEAR : II SEM
COURSE CODE : 16CSE681
TITLE OF THE COURSE : DISSERTATION

L: T/A: P: C : 0: 0: 0: 6

COURSE OBJECTIVES:

1. To develop the work practice in students to apply theoretical and practical tools/techniques.
2. To improve the professional competency.
3. To improve research aptitude by touching the areas which otherwise not covered by theory or laboratory classes.
4. To solve real life problems related to industry and current research.

COURSE OUTCOMES

1. Solving of real time problems not necessarily new line of enquiry, but shows that student has mastered research and synthesizing skills in producing a contribution to knowledge.
2. Builds competency and research aptitude.

The thesis shall consist of research work done by the candidate or a comprehensive and critical review of any recent development in the subject of specialization or a detailed report of project work consisting of experimentation/numerical work, design and or development work that the candidate has executed.

SEMESTER/YEAR : II SEM
COURSE CODE : 6CSE682
TITLE OF THE COURSE : DISSERTATION

L: T/A: P: C : 0: 0: 0: 6

COURSE OBJECTIVES:

1. The dissertation demonstrates the student's mastery of relevant resources and methods.

2. An ordered, critical exposition of knowledge gained through student's own effort.

3. Demonstrates sound under-standing of research process.

4. Demonstrates knowledge of appropriate methodology.
5. Demonstrates ability to present study in a disciplined way in scholarly conventions of the discipline.
6. Ability to make critical use of published work.

COURSE OUTCOMES:

1. Improves the professional competency and research
2. Develops the work to apply theoretical and practical tools/techniques
3. Solve problems related to industry and current research.
4. Possible publication in journal or conferences.

The report generally contains:

1. Cover
2. Title page
3. Certificate(s)
4. Acknowledgements
5. Abstract
6. Contents page
7. List of figures or Tables
8. Introduction
9. Literature survey
10. Methodology
11. Results and Discussion
12. Conclusion and scope of future work.
13. Reference list / Bibliography

14. Appendices.

Avoiding plagiarism

1. Plagiarism is taking the words, theories, or ideas of another person and passing them off as your own.
2. Plagiarism can be copying **inadvertently/advertently** a passage from a book or journal or pasting something from the internet into report without referencing the original source.
3. Plagiarism can also result from wrong **referencing.**

Avoiding plagiarism

The guide/supervisor shall certify that the report is checked for plagiarism and is within 25% of the content.

The thesis shall consist of research work done by the candidate or a comprehensive and critical review of any recent development in the subject of specialization or a detailed report of project work consisting of experimentation/numerical work, design and or development work that the candidate has executed. It is expected that students should refer national and international journals, proceedings of national and international seminars. Emphasis should be given to the introduction to the topic, literature review, and scope of the proposed work along with some preliminary work/experimentation carried out on the thesis topic. Student should submit the thesis covering the content discussed above and highlighting the features of work to be carried out in the thesis. Student should follow standard practice of thesis writing. At the end of successfully finishing the work he/she has to submit a detailed report and has to present for a viva–voce.