SCHEME AND SYLLABUS FOR

TWO YEAR FULL TIME P.G PROGRAMME

M.TECH (CNIS)

IN

INFORMATION TECHNOLOGY

SEPTEMBER 2016

DEPARTMENT OF INFORMATION TECHNOLOGY

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

HYDERABAD – 500 075

DEPARTMENT OF INFORMATION TECHNOLOGY

VISION

To be a center of excellence in the field of information technology that yields pioneers, research experts who can contribute for the socioeconomic development of the nation.

MISSION

- To impart state-of-the-art value based education in the field of Information Technology.
- To collaborate with industries and research organizations and excel in the emerging areas of research.
- To imbibe social responsibility in the students.
- To motivate students to be trend setters and entrepreneurs. - "The Leader of Leaders"

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SCHEME OF INSTRUCTION AND EXAMINATION
M.Tech (IT-CNIS) (REGULAR)
INFORMATION TECHNOLOGY

I- SEMESTER

Course Code	Subject	No. of Hrs./Week		Marks for		Total Marks	Credits
		Lecture	T/P/S	Internal Assessment	End Exam		
16ITC101	Number Theory	3	1	30	70	100	4
16ITC102	Advanced Computer Networks	3	1	30	70	100	4
16ITC103	Cryptography and Network Security	3	1	30	70	100	4
16ITE11X	Elective –I	3	--	30	70	100	3
16ITE12X	Elective- II	3	--	30	70	100	3
16ITE13X	Elective-III	3	--	30	70	100	3
16ITC104	Lab-1	---	3	50	-	50	2
16ITC105	Seminar-1	---	3	50	-	50	2
Total		18	09	340	360	700	25

Soft Skills is included as a non-credit course in the I-semester

S.No	Course Code	Elective – I
1.	16ITE111	Distributed Systems
2.	16ITE112	Distributed Databases
3.	16ITE113	Software Reuse Techniques
		Elective – II
1.	16ITE121	Information Retrieval Systems
2.	16ITE122	Machine Learning
3.	16ITE123	Web Engineering
		Elective –III
1.	16ITE131	Data Mining
2.	16ITE132	Data Hiding
3.	16ITE133	Electronic Commerce

II-SEMESTER

Course Code	Subject	No. of Hrs./Week		Marks for		Total Marks	Credits
		Lecture	T/P/S	Internal Assessment	End Exam		
16ITC201	Information Systems Security	3	1	40	60	100	4
16ITC202	Big Data Analytics	3	1	40	60	100	4
16ITC203	Advanced Algorithms	3	1	40	60	100	4
16ITE24X	Elective-IV	3	---	40	60	100	3
16ITE25X	Elective-V	3	---	40	60	100	3
16ITE26X	Elective-VI	3	---	40	60	100	3
16ITC204	Lab-II	---	3	50	-	50	2
16ITC205	Seminar-II	---	3	50	-	50	2
16ITC206	Mini Project		2	50	-	50	1
Total		18	11	390	360	750	26

S.No	Course Code	
Elective – IV		
1.	16ITE241	Grid Computing
2.	16ITE242	Semantic Web
3.	16ITE243	Mobile Adhoc and Sensor Networks
Elective – V		
1.	16ITE251	Cloud Computing
2.	16ITE252	Data Analysis Using R
3.	16ITE253	Web Mining
Elective –VI		
1.	16ITE261	Biometric Security
2.	16ITE262	Forensic Computing
3.	16ITE263	Digital Image Processing &Computer Vision

III-SEMESTER

Course Code	Subject	Marks for		Total Marks	Credits
		Internal Assessment	End Exam		
16ITC301	Project Seminar i) Problem formulation and submission of synopsis within 8weeks from thecommencement of 3rd semester.(50 Marks) ii) Preliminary work on Project Implementation. (50 Marks)	100	----	100	6
Total		100		100	6

IV-SEMESTER

Course Code	Subject	Marks for		Total Marks	Credits
		Internal Assessment	End Exam		
16ITC401	Project Work	100	100	200	12
Total				200	12

Course Structure:

Sl No	Description	Credits	%
1.	Core Courses :	28	47
2.	Elective Courses:	18	26
3.	Seminars, Mini Project, Project Seminar and Project	23	33
	Total	69	100

Course Code 16ITC101

NUMBER THEORY

Instruction	3L + 1T per week
Duration of End Examination	3 Hours
End Examination Marks	70Marks
Sessional	30 Marks
Credits	4

Course prerequisites: Mathematics

Course Objectives:

1. To introduce the basics concepts of number theory
2. To familiarize with linear congruences and Chinese remainder theorem
3. To know Fermat's little theorem, and Euler's extension of it;
4. To expose the students to some of the applications of Fermat and Euler theorems
5. To make the students to understand relevance of number theory to coding theory
6. To introduce him to basics of cryptography

Course Outcomes:

After the completion of the course, student will be able to

1. Solve the problems of elementary number theory
2. Apply number theory concepts to cryptography
3. Solve some of the divisor problems.
4. Understand the importance of Euler's phi function in RSA crypto system
5. Appreciate the importance of larger primes in coding theory
6. Apply the theory of congruences to derive some of powerful theorems in number theory

UNIT – I

Divisibility and Primes : Division Algorithm, Euclid's algorithm for the greatest common divisor, Linear Diophantine equations, Prime numbers, fundamental theorem of arithmetic, infinitude of primes. Distribution of primes, twin primes, Goldbach conjecture, Fermat and Mersenne primes, Primality testing and factorization.

UNIT–II

Congruences, Congruences with a Prime-Power Modulus : Modular arithmetic, Linear congruences, Simultaneous linear congruences, Chinese Remainder Theorem, An extension of Chinese Remainder Theorem (with non-coprime moduli), Arithmetic modulo p, Fermat's little theorem, Wilson's theorem, Pseudo-primes and Carmichael numbers, Solving congruences modulo prime powers.

UNIT–III

Euler's Function and RSA Cryptosystem, Units Modulo an Integer: Definition of Euler function, examples and properties, Multiplicative property of Euler's function, RSA cryptography, The group of units modulo an integer, primitive roots, Existence of primitive roots.

UNIT – IV

Quadratic Residues and Quadratic Forms: Quadratic residues, Legendre symbol, Euler's criterion, Gauss lemma, law of quadratic reciprocity, Quadratic residues for prime-power moduli and arbitrary moduli.

UNIT – V

Binary quadratic forms, equivalent forms, Discriminant, principal forms, positive definite forms, indefinite forms, Representation of a number by a form-examples, Reduction of
Positive definite forms, reduced forms, Number of proper representations, automorph, class number.

Text Book:

1. G.A. Jones & J.M. Jones, "Elementary Number Theory", Springer UTM, 2007.

Reference Books:

1. Niven, H.S. Zuckerman & H.L. Montgomery, "Introduction to the Theory of Numbers", Wiley,2000.
2. D. Burton, "Elementary Number Theory", McGraw-Hill, 2005.

Course Code 16ITC102

ADVANCED COMPUTER NETWORKS

Instruction	3L + 1T per week
Duration of End Examination	3 Hours
End Examination Marks	70 Marks
Sessional	30 Marks
Credits	4

Course prerequisites: Data Communications, Computer Networks

Course Objectives:
This course is intended to introduce

1. Fundamental concepts of computer networks and networking devices
2. Data link layer protocols for data transmission
3. Network layer protocols for addressing and routing.
4. Recent developments in the transport and application layer protocols.
5. Operating principles of WLANs, Cellular, Wireless Mesh and Optical, networks.
6. VPN technology, VOIP and multimedia networking.

Course Outcomes:
After completion of the course, student will be able to

1. Describe the components and infrastructure that form the basis for most computer networks.
2. Understand the role of data link layer protocols in data transmission;
3. Employ addressing and routing protocols of Network Layer to solve relevant networking problems.
4. Describe how the services provided by Transport Layer and Application layer enable multiple applications to communicate over the network.
5. Compare the operating principles and protocols of wireless LANs, cellular networks, wireless mesh networks and optical networks.
6. Describe VPN technology for securing remote access to networks and real time signalling protocols used in voice over IP (VoIP) telephony and multimedia networking.

UNIT- I

Computer Networks and the Internet: What is the Internet, The Network edge, The Network core, Access Networks and Physical media, ISPs and Internet Backbones, Delay and Loss and throughput in Packet-Switched Networks - **Foundation of Networking Protocols:** 5-layer TCP/IP Model, 7-layer OSI Model, Internet Protocols and Addressing, Equal-Sized Packets Model: ATM **Networking Devices:** Multiplexers, Modems and Internet Access Devices, Switching and Routing Devices, Router Structure.

UNIT- II

The Link Layer and Local Area Networks: Link Layer: Introduction and Services, Error-Detection and Error-Correction techniques- Multiple Access Protocols, Link Layer Addressing, Ethernet, Interconnections: Hubs and Switches, PPP: The Point-to-Point Protocol, Link Visualization - **Logical Addressing:** IPv4 Addresses, IPv6 Addresses - **Internet Protocol:**

Internetworking, IPv4, IPv6, Transition from IPv4 to IPv6

Routing and Internetworking: Network-Layer Routing, Least-Cost-Path algorithms, Non-Least-Cost-Path algorithms, Intra-domain Routing Protocols, Inter-domain Routing Protocols, Congestion Control at Network Layer, **Multicasting Techniques and Protocols:** Basic Definitions and Techniques, Intra-domain Multicast Protocols, Inter-domain Multicast Protocols, Node-Level Multicast algorithms

UNIT- III

Transport and End-to-End Protocols: Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Mobile Transport Protocols, TCP Congestion Control - **Application Layer:** Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing, Socket Programming with TCP and UDP, Building a Simple Web Server.

UNIT- IV

Wireless Networks: Infrastructure of Wireless Networks, Wireless LAN Technologies, IEEE S02.11 Wireless Standard, Cellular Networks, Wireless Mesh Networks (WMN)**Optical Networks and WDM Systems:** Overview of Optical Networks, Basic Optical Networking Devices, Large-Scale Optical Switches, Optical Routers, Wavelength Allocation in Networks, Case Study: An All-Optical Switch.

UNIT- V

VPNs, Tunneling and Overlay Networks: Virtual Private Networks (VPNs), Multiprotocol Label Switching (MPLS), Overlay Networks-**VoIP and Multimedia Networking:** Overview of IP Telephony, VoIP Signalling Protocols, Real-Time Media Transport Protocols, Distributed Multimedia Networking, Stream Control Transmission Protocol.

Text Books:

1. James E Kurose, Keith W. Ross "Computer Networking: A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2012.
2. Nader F. Mir, "Computer and Communication Networks", Pearson Education, 2015.

Suggested Reading:

1. Behrouz A. Forouzan, "Data Communications and Networking", Fourth Edition, Tata McGraw Hill, 2007.
2. Greg Tomsho.EdTittel, David Johnson, "Guide to Networking Essentials", Fifth Edition, Course Techlogy 2006
3. Diane Teare, Catherine Paquet, "Campus Network Design Fundamentals", Pearson Education (CISCO Press), 2005
4. Andrew S. Tanenbaum, "Computer Networks", Fifth Edition, Pearson Education, 2013.
5. A. Farrel, "The Internet and Its Protocols", Elsevier, 2004

Course Code 16ITC103

CRYPTOGRAPHY AND NETWORK SECURITY

Instruction	3L + 1T per week
Duration of End Examination	3 Hours
End Examination Marks	70 Marks
Sessional	30 Marks
Credits	4

Course Prerequisites: Computer Networks, Mathematics, Probability and Number Theory.

Course Objectives:

1. Introduces Cryptography mechanisms on confidential information.
2. To familiarize with Authentication and Data Integrity protocols between communicating parties.
3. To provide a practical survey of both the principles and practice of cryptography and network security.
4. To encourage research on Cryptography and network Security.

Course Outcomes

Students who complete this course should be able to

1. Understand Security Requirements for various organizations.
2. Provide security using symmetric and asymmetric cryptography mechanisms for confidential information.
3. Apply Authentication and Data Integrity techniques on communicating parties.
4. Understand Public Key Certificate contents of participated entities in secure communication.
5. Understand Security services between Application and Transport layers in TCP/IP Network Architecture.
6. Identify Security Protocols and methods to provide solutions for a specific Security Problem.

UNIT- I

Introduction: Attributes of Security, Integrity, Authenticity, Non-repudiation, Confidentiality, Authorization, Anonymity, Types of Attacks, DoS, IP Spoofing, Replay, Man-in-the-Middle attacks, General Threats to Computer Network, Worms, Viruses, Trojans

UNIT- II

Secret Key Cryptography: DES, Triple DES, AES, IDEA, Key distribution, Attacks ,**Public Key Cryptography**: RSA, Elliptical Curve Cryptography(ECC), Key Exchange (Diffie-Hellman), ElGamal Crypto System.

UNIT- III

Integrity, Authentication and Non-Repudiation: Hash Function (MD5, SHA5), Message Authentication Code (MAC), Digital Signatures (RSA, DSS).

UNIT- IV

PKI Interface: Digital Certificates, Certifying Authorities, POP Key Interface, System Security using Firewalls and VPN's.

IPSec:IP Security Overview, IP Security Policy, Authentication Header,Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

UNIT- V

Applications:PGP, S/MIME, Kerberos, Web Security Protocols (SSL), Electronic Payments, E-cash, Secure Electronic Transaction.

Text Book:

1. William Stallings, "Cryptography and Network Security", 5th Edition, Pearson, 2013.

Suggested Reading:

1. Behrouz A Forouzan, "Cryptography and Network Security", TMH, 2009.
2. Joseph MiggaKizza, "A Guide to Computer Network Security ", Springer, 2010.
3. Dario Cataiano, Contemporary Cryptology ", Springer, 2010.
4. William Stallings, "Network Security Essentials: Application and standards", 4th Edition, Pearson, 2012.

Web Resources:

1. http://www.linuxsecurity.com/
2. http://www.honeynet.org/
3. https://crypto.stanford.edu/cs155/
4. http://www.itprc.com/security.htm

Course Code 16ITC104

CRYPTOGRAPHY AND NETWORK SECURITY LAB
(Lab- I)

Instruction	3P per week
Duration of End Examination	3 Hours
Internal Examination	50 Marks
Credits	2

Course Prerequisites:

Computer Networks, Probability and Number Theory.

Course Objectives:

1. Understand information security awareness and its importance.
2. To master fundamentals of secret and public cryptography,
3. Understand the concept of digital signatures and its application.
4. Expose to original research in network security.

Course Outcomes:

1. Apply symmetric and asymmetric encryption techniques in network applications
2. Implement digital signature algorithms when it's required in applications.
3. Analyze and compare different hash functions
4. To be familiar with network security designs using available secure solutions

List of Tasks:

1. Implementation of Mono alphabetic cipher
2. Implementation of Vigenere cipher (Polyalphabetic substitution)
3. Implementation of Hill cipher and Gauss cipher
4. Implementation of S-DES algorithm for data encryption
5. Implement RSA asymmetric (public key and private key)-Encryption. Encryption key (e, n) & (d, n)
6. Implement Diffie-Hellman Key Exchange Protocol.
7. Generate digital signature using Hash code.
8. Generate digital signature using MAC code.
9. Study of MD5 hash function and implement the hash code using MD5.
10. Study of SHA-1 hash function and implement the hash code using SHA-1.

Text Book

1. William Stallings, "Cryptography and Network Security", 5th Edition, Pearson, 2013.

Suggested Reading:

2. Behrouz A Forouzan, "Cryptography and Network Security", TMH, 2009.
3. Joseph MiggaKizza, "A Guide to Computer Network Security ", Springer, 2010.
4. Dario Cataiano, Contemporary Cryptology ", Springer, 2010.
5. William Stallings, "Network Security Essentials: Application and standards", 4th Edition, Pearson, 2012.

16ITC105

SEMINAR-I

Instruction	3P per week
Internal Examination	50 Marks
Credits	2

Oral presentation and technical report writing are two important aspect of engineering education. The objective of the seminar is to prepare the student for a systematic and independent study of the state of the art topics in the advanced fields of Computer Networks and Information Security and related topics.

Seminar topics may be chosen by the students with advice from the faculty members. Students are to be exposed to the following aspects for a seminar presentation.

- Literature survey
- Organization of the material
- Presentation of OHP slides / LCD presentation
- Technical writing

Each Student is required to

1. Submit one page of synopsis of the seminar talk two days before for display on notice board
2. Give 20 minutes of PowerPoint presentation followed by 10 minutes of discussion.
3. Submit a report on the seminar topic with a list of references and slides used within a week.

Seminars are to be scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged.

The sessional marks will be awarded to the students by at least two faculty members on the basis of oral and written presentation in addition to their involvement in the discussion.

Course Code 16ITE111

DISTRIBUTED SYSTEMS
(Elective-I)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Objectives:

1. To present the basic concepts and principles of distributed systems.
2. To introduce the architectures and models of distributed systems
3. To describe processes, threads and various communication methods
4. To summarize the principles of synchronization, consistency and replication, fault tolerance in distributed systems.
5. To provide understanding of various security issues in distributed environments

Course Outcomes:

Upon successful completion of the course, student will be able to

1. Describe the various models and architectures of distributed systems.
2. Illustrate use of threads in distributed systems
3. Demonstrate the distributed communication mechanisms
4. Describe various naming and synchronization mechanism in distributed systems
5. Analyse consistency, replication and fault tolerance in distributed systems.
6. Compare and contrast various distributed object-based systems

UNIT – I

INTRODUCTION: Definition of A Distributed System; Goals- Making Resources Accessible, Distribution Transparency, Openness, Scalability, Pitfalls; Types of Distributed Systems- Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems.

ARCHITECTURES: Architectural Styles, System Architectures- Centralized Architectures, Decentralized Architectures, Hybrid Architectures; Architectures versus Middleware-Interceptors, General Approaches to Adaptive Software, Discussion.

UNIT – II

PROCESSES: Threads- Introduction to Threads, Threads in Distributed Systems; Virtualization, The Role Of Virtualization In Distributed Systems, Architectures of Virtual Machines; Clients- Networked User Interfaces, Client-Side Software for Distribution Transparency; Servers- General Design Issues, Server Clusters, Managing Server Clusters; Code Migration- Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems.

COMMUNICATION: Fundamentals- Layered Protocols, Types of Communication; Remote Procedure Call- Basic RPC Operation, Parameter Passing; Asynchronous RPC, Example: DCE RPC; Message-Oriented Communication- Message Oriented Transient Communication, Message Oriented Persistent Communication, Example: IBM'S WebSphere Message-Queuing System;

Stream-Oriented Communication- Support for Continuous Media, Streams and Quality of Service, Stream Synchronization; Multicast Communication, Application-Level Multicasting, Gossip-Based Data Dissemination.

UNIT-III

NAMING: Names, Identifiers, and Addresses, Flat Naming, Simple Solutions, Home-Based Approaches, Distributed Hash Tables, Hierarchical Approaches; Structured Naming, Name Spaces, Name Resolution, the Implementation of a Name Space, Example: The Domain Name System; Attribute-based Naming, Directory Services

SYNCHRONIZATION: Clock Synchronization- Physical Clocks, Global Positioning System, Clock Synchronization Algorithms; Logical Clocks- Lamport's Logical Clocks, Vector Clocks; Mutual Exclusion-Overview, A Centralized Algorithm, A Decentralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm, A Comparison of the Four Algorithms; Global Positioning of Nodes, Election Algorithms- Traditional Election Algorithms

UNIT-IV

CONSISTENCY AND REPLICATION: Introduction- Reasons for Replication, Replication as Scaling Technique; Data-Centric Consistency Models- Continuous Consistency, Consistent Ordering of Operations; Client-Centric Consistency Models- Eventual Consistency, Monotonic Reads, Monotonic Writes, Read your Writes, Writes Follow Reads; Replica Management- Replica-Server Placement, Content Replication and Placement, Content Distribution; Consistency Protocols- Continuous Consistency, Primary-Based Protocols, Replicated-Write Protocols, A Cache-Coherence Protocols

FAULT TOLERANCE, Introduction To Fault Tolerance-Basic Concepts, Failure Models, Failure Masking by Redundancy; Process Resilience- Design Issues, Failure Masking and Replication, Agreement in Faulty Systems, Failure Detection; Reliable Client-Server Communication- Point-To-Point Communication, RPC Semantics in The Presence Of Failures; Reliable Group Communication- Basic Reliable-Multicasting Schemes, Scalability in Reliable Multicasting, Atomic Multicast; Distributed Commit-Two-Phase Commit, Three-Phase Commit; Recovery-Introduction, Check pointing, Message Logging, Recovery-Oriented Computing.

UNIT-V

SECURITY: Introduction to Security- Security Threats, Policies, and Mechanisms, Design Issues, Cryptography; Secure Channels- Authentication, Message Integrity and Confidentiality, Secure Group Communication, Example: Kerberos; Access Control- General Issues in Access Control, Firewalls, Secure Mobile Code, Denial of Service; Security Management- Key Management, Secure Group Management, Authorization Management.

DISTRIBUTED OBJECT-BASED SYSTEMS: Architecture- Distributed Objects, Example: Enterprise Java Beans, Example- Globe Distributed Shared Objects; Processes- Object Servers, Example: The Ice Runtime System; Communication- Binding a Client to an Object, Static versus Dynamic Remote Method Invocations, Parameter Passing, Example: Java RMI, Object-Based Messaging; Naming- CORBA Object References, Globe Object References; Synchronization, Consistency and Replication- Entry Consistency, Replicated Invocations; Fault Tolerance-Example: Fault-Tolerant CORBA, Example: Fault-Tolerant Java; Security- Example: GLOBE , Security for Remote Objects.

Text Book:

1. Andrew S. Tanenbaum and Van Steen "Distributed Systems", Second Edition, PHI,2014

Reference Books:

1. Colouris G., Dollimore Jean and Kindberg Tim, "Distributed Systems Concepts and Design", 3rd Edition, Pearson education, 2002.
2. SunithaMahajan, Seema Shah, "Distributed Computing", SecondEdision, Oxford University Press, 2013
3. Kai Hwang, GeofferyC.Fox, Jack J.Dongarra, "Distributed and Cloud Computing", Morgan Kaufmann publishers, 2012.
4. S.Ghosh, Chapman & Hall/CRC, "Distributed Systems", Taylor & Francis Group, 2010.
5. Ajay D. KshemakalyaniMukeshSinghal, "Distributed Computing, Principles, Algorithms and Systems", Cambridge, 2010.

Course Code 16ITE112

DISTRIBUTED DATABASES
(Elective-I)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Prerequisites: Database Systems, Distributed Systems

Course Objectives:

1. To introduce the features of distributed databases and different levels of Distribution transparency.
2. Impart knowledge about the design of distributed database and working of fragment queries
3. To provide understanding about optimization of queries and management of distributed transactions
4. To discuss the basics of distributed concurrency control and reliability
5. To teach about distributed database administration and heterogeneous distributed database systems

Course Outcomes:

After successful completion of the course, students will be able to

1. Explain the features of distributed databases and different levels of distribution transparency.
2. Understand the intricacies of distributed database design.
3. Gain knowledge to handle all types of queries, query optimization techniques.
4. Understand and analyse distributed Concurrency Control.
5. Understand the administration of distribute databases
6. Analyse the working of Heterogeneous distributed databases

UNIT -I

Distributed Databases: An overview: Features of distributed versus centralised databases, why distributed databases?, distributed database management systems. **Principles of Distributed Databases:** Levels of Distribution Transparency: Reference architecture for distributed databases, types of data fragmentation, distribution transparency for read-only applications, distribution transparency for update applications, distributed database access primitives, integrity constraints in distributed databases.

UNIT - II

Distributed Database design: A framework for Distributed Database Design, The design of database fragmentation, the allocation of fragments, **Translation of global queries to fragment queries:** Equivalence transformations for queries, transforming global queries into fragment queries, distributed grouping and aggregate function evaluation, parametric queries.

UNIT - III

Optimization of Access Strategies: A framework for query optimization, join queries, general

queries. **The management of distributed transactions:** A framework for transaction management, supporting atomicity of distributed transactions, concurrency control for distributed transactions, architectural aspects of distributed transactions.

UNIT - IV

Concurrency control: Foundations of distributed concurrency control, distributed deadlocks, concurrency control based on timestamps, optimistic methods for distributed concurrency control. **Reliability:** Basic Concepts, Nonblocking Commitment protocols, reliability and concurrency control, determining a consistent view of the network, detection and resolution of inconsistency, checkpoints and cold restart

UNIT - V

Distributed Database Administration: Catalog management in distributed databases, Authorization and protection, **Heterogeneous Distributed Database System:** Problems of Heterogeneous Distributed Databases, MULTIBASE, DDTS: A Distributed Testbed System, Heterogeneous SIRIUS-DELTA

Text Books:

1. Stefano Ceri, Giuseppe Pelagaui, "Distributed Databases Principles & Systems", TMH, 1988.
2. M. Tamer Ozsu, Patrick Valduriez, "Principles of Distributed Database Systems", Pearson Education, 3rdEdition, 2011.

Suggested Reading:

1. Chhanda Ray, "Distributed Database Systems", Pearson Education, 2009.
2. Donald K. Burleson, "Managing distributed databases: building bridges between database islands", Wiley, 1994.

Web Resources:

1. http://docs.oracle.com/cd/B10501_01/server.920/a96521/ds_concepts.htm
2. http://www.csee.umbc.edu/portal/help/oracle8/server.815/a67781/c30dstdb.htm
3. http://cadp.inria.fr/

Course Code 16ITE113

SOFTWARE REUSE TECHNIQUES
(Elective-I)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Prerequisites: Software Engineering, Object Oriented Software Design

Course Objectives:

1. Metrics used in software reusable components.
2. Development of reusable components
3. Reuse in business

Course Outcomes:

Upon successful completion of the course the student will be able to:

1. Understand the basics of software reuse.
2. Understand and apply creational design patterns.
3. Understand and apply structural design patterns
4. Understand various Behavioural patterns.
5. Understand the various architectural patterns
6. Apply architectural patterns using case studies.

UNIT-I

Software reuse success factors, Reuse driven software engineering business, Object oriented software engineering, applications and component sub systems, use case components, object components.

UNIT-II

Design Patterns – Introduction, Creational patterns, factory, factory method, abstract factory, singleton, builder prototype.

UNIT-III

Structural Patterns- Adapters, bridge, composite, decorator, façade, flyweight, proxy.
Behavioral Patterns – Chain of responsibility, command, interpreter.

UNIT-IV

Behavioral Patterns – Iterator, mediator, memento, observer,state, strategy, template, visitor, other, design patterns- Whole part, master- slave,view handler, forwarder- receiver, client – dispatcher-server, publisher – subscriber.

UNIT-V

Architectural patterns – Layers,pipes and filters, black board, broker, model-view controller,presentation- abstraction – control, micro kernel, reflection.

Text Books:

1. Ivar jacabson, Martin Griss, Patrick Hohson – Software Reuse. Architecture, Process and Organization for Bussiness Success, ACM Press, 1997.

Reference Books:

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides – Design Patterns- Addison, 1995, Pearson Education.
2. Frank Buschmann etc. – Pattern Oriented Software Architecture – Volume 1, Wiley 1996.
3. James W Cooper – Java Design Patterns, a tutorial, Addison 2000, Pearson Education.

Web Resources:

1. www.computer.org/software
2. www.swebok.org
3. www.acm.org/serving/selcode.htm

Course Code 16ITE121

INFORMATION RETRIEVAL SYSTEMS
(Elective-II)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Prerequisites: Database Systems, Data Warehousing and Data Mining

Course Objectives:

1. Learn how to build index of the unstructured data for information retrieval problem
2. To understand basic IR Models
3. To understand various techniques to compress indexing, matching, organizing, and evaluating methods to IR problems
4. To know various classification and clustering algorithms

Course Outcomes:

Students should have gained a good understanding of the foundation concepts of information retrieval techniques and should be able to:

1. Build and manage the unstructured data into a well-organized structure
2. Compress the structured data and apply IR principles to locate relevant information from large collections of data
3. Analyze performance of retrieval systems
4. Apply classification techniques on unstructured data
5. Apply clustering techniques on unstructured data
6. To Analyse current research problems in information retrieval

UNIT- I

Boolean retrieval: An example information retrieval problem, A first take at building an inverted index, Processing Boolean queries, The extended Boolean model versus ranked retrieval.

The term vocabulary and postings lists: Document delineation and character sequence decoding, determining the vocabulary of terms, faster postings list intersection via skip pointers, Positional postings and phrase queries.

Dictionaries and tolerant retrieval: Search structures for dictionaries, Wildcard queries, spelling correction, Phonetic correction.

Index construction: Hardware basic, Blocked sort-based indexing, Single-pass in-memory indexing, distributed indexing, dynamic indexing.

UNIT- II

Index compression: Statistical properties of terms in information retrieval, Dictionary compression, Postings file compression.

Scoring, term weighting and the vector space model:Parametric and zone indexes, Term frequency and weighting, Vector space model for scoring, Variant tf-idf functions.

Computing scores in a complete search system: Efficient scoring and ranking, Components of an information retrieval system, Vector space scoring and query operator interaction.

UNIT- III

Evaluation in information retrieval: Information retrieval system evaluation, Standard test collections, Evaluation of unranked retrieval sets, Evaluation of ranked retrieval results, Assessing relevance, A broader perspective: System quality and user utility.

Relevance feedback and query expansion: Relevance feedback and pseudo relevance feedback, Global methods for query reformulation.

Probabilistic information retrieval: Review of basic probability theory, The Probability Ranking Principle, The Binary Independence Model.

UNIT- IV

Text classification: The text classification problem, Naive Bayes text classification, The Bernoulli model, Properties of Naive Bayes, Feature selection, Evaluation of text classification.

Vector space classification: Document representations and measures of relatedness in vector spaces, Rocchio classification, k nearest neighbor, Linear versus nonlinear classifiers, Classification with more than two classes, The bias-variance trade-off.

Support vector machines and machine learning on documents: Support vector machines: The linearly separable case, Extensions to the SVM model, Issues in the classification of text documents, Machine learning methods in ad hoc information retrieval.

UNIT- V

Flat clustering: Clustering in information retrieval, Problem statement, Evaluation of clustering, K-means, Model-based clustering.

Hierarchical clustering: Hierarchical agglomerative clustering, Single-link and complete-link clustering, Group-average agglomerative clustering, Centroid clustering, Optimality of HAC, Divisive clustering, Cluster labelling.

Matrix decompositions and latent semantic indexing: Linear algebra review, Term-document matrices and singular value decompositions, Low-rank approximations, Latent semantic indexing.

Text Book:

1. Christopher D. Manning and PrabhakarRaghavan and HinrichSchütze, "Introduction to Information Retrieval" *Cambridge University Press*, 2009.
2. David A. Grossman, OphirFrieder, "Information Retrieval – Algorithms and Heuristics", Springer, 2nd Edition, Universities Press, 2004.

Suggested Reading:

1. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark T Maybury, Springer.
2. Modern Information Retrieval, Baeza-Yates Ricardo and BerthierRibeiro-Neto. 2nd edition, Addison-Wesley, 2011.

Web links:

1. https://class.coursera.org/nlp/lecture
2. http://www.dcs.gla.ac.uk/Keith/Preface.html

Course Code 16ITE122

MACHINE LEARNING
(Elective-II)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Prerequisites: Discrete Mathematics, Probability and Random Theory

Course Objectives:

1. To Learn the concepts of linear classification and nonlinear classification
2. Understand the mathematical concepts related to Multilayer perception.
3. To develop an understanding of the clustering techniques

Course Outcomes:

1. Acquire the basic knowledge of Machine Learning, identify algorithms, machine learning problems.
2. Ability to classify data sets using nonlinear classifiers.
3. To be familiar with Linear Regression Techniques.
4. Able to recognize patterns using graphical models.
5. Ability to apply dimensionality reduction techniques on datasets.
6. Capacity to apply clustering techniques.

UNIT-I

Introduction: Learning, Types of Machine Learning.

Concept learning: Introduction, Version Spaces and the Candidate Elimination Algorithm. **Learning with Trees:** Constructing Decision Trees, CART, Classification Example.

UNIT-II

Linear Discriminants: The Perceptron, Linear Separability.

Linear Regression Multilayer Perceptron (MLP): Going Forwards, Backwards, MLP in practices, Deriving back.

Propagation SUPPORT Vector Machines: Optimal Separation, Kernels.

UNIT-III

Some Basic Statistics: Averages, Variance and Covariance, The Gaussian.

The Bias-Variance Tradeoff Bayesian learning: Introduction, Bayes theorem, Bayes Optimal Classifier, Naive Bayes Classifier.

Graphical Models: Bayesian networks, Approximate Inference, Making Bayesian Networks, Hidden Markov Models, The Forward Algorithm.

UNIT-IV

Evolutionary Learning: Genetic Algorithms, Genetic Operators.

Genetic Programming Ensemble learning: Boosting, Bagging.

Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis

UNIT-V

Clustering: Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods, Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison.

Text Book:

1. Tom M. Mitchell, "Machine Leaming ",MacGraw Hill, 1997

References:

1. Stephen Marsland, "Machine Learning - An Algorithmic Perspective ", CRC Press, 2009.
2. Margaret H Dunham, "Data Mining", Pearson Edition, 2003.
3. GalitShmueli, Nitin R Patel, Peter C Bruce, "Data Mining for Business Intelligence", Wiley India Edition, 2007.
4. RajjallShinghal, "Pattern Recognition ", Oxford University Press, 2006.

Course Code 16ITE123

WEB ENGINEERING

(Elective-II)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Prerequisites:

Course objectives:
At the end of the course, student will be able to

1. Understand the concepts, principles and methods of Web engineering.
2. Familiarize with Web application development software tools and environments currently available on the market.
3. Understand the web metrics & quality and Web resource management.

Course outcomes:
Upon successful completion of the course will be able to

1. Apply the web engineering methodologies for Web application development
2. Apply proven engineering methodologies to improve performance and effectiveness of web sites in marketing products and services.
3. Identify the limitations of search engine technologies and develop solutions to meet application requirements.
4. Use web intelligence to analysis and customization of web based electronic catalog.
5. Understand about a number of state-of-the-art intelligent web methodologies
6. Develop or customize a web system which uses the Web of Data and Web 2.0 techniques

UNIT-I

Web Engineering: Concepts and Reference Model.

Web Engineering: Introduction and Perspectives, Web Engineering Resources Portal (WEP): A reference Model and Guide.

UNIT-II

Web Application Development: Methodologies and Techniques.

Web Application Development Methodologies, Relationship Analysis: A Technique to Enhance Systems Analysis for Web Development, Engineering Location - Based Services in the Web.

UNIT-III

Web Metrics and Quality: Models and Methods.

Architectural Metrics for E-Commerce: A Balance between Rigor and Relevance.

The equal Approach to the Assessment of E-Commerce Quality: A Longitudinal Study of Internet Bookstore, Web Cost.

Estimation: An Introduction.

UNIT-IV

Web Resource Management: Models and Techniques Ontology Supported Web Content Management, Design Principles and Applications of XRML.

UNIT-V

Web Maintenance and Evolution: Techniques and Methodologies Program Transformations for Web Application Restructuring, The Requirements of Methodologies for
Developing Web Applications, A Customer based Methodology for Improving Web Business Systems.

Web Intelligence: Techniques and Applications
Analysis and Customization of Web-Based Electronic Catalogs, Data Mining using Qualitative Information on the Web.

Text Book:

1. WoojongSuh, "Web Engineering: Principles and Techniques ", Idea Group Publications, 2005.

References:

1. Roger Pressman, David Lowe, “Web Engineering: A Practioner's Approach”, McGraw-Hill. 2009.
2. GertiKappel, Birgit Proll, Siegried Reich, Werner Retschitzegger , “Web Engineering”, Wiley India Pvt. Ltd.
3. Emilia Mendes, Nile Mosley “Web Engineering”, Kindle Edition, Springer, 2005.

Course Code 16ITE131

DATA MINING
(Elective-III)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Prerequisites:

Basic Programming, Mathematics-Statistics, Database Concepts

Course Objectives:

1. To introduce the basic concepts of Data Mining techniques.
2. Examine the types of the data to be mined and apply pre-processing methods on raw data.
3. Build a classification model to predict class label of future data.
4. Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

Course Outcomes:

Students who complete this course should be able to

1. Understand contribution of data mining to the decision support level of organizations.
2. Apply Pre-Process techniques on raw data to make it suitable for various data mining algorithms.
3. Identify situations for applying different data mining techniques: mining frequent pattern, association, correlation, classification, prediction, and cluster analysis.
4. Propose data mining solutions for Business applications.
5. Evaluate the performance of different data mining algorithms.
6. Encourage to do research in data mining issues.

UNIT-I

Introduction: Introduction to Data Mining, Data mining and machine learning, Data Mining Functionalities, Classification of Data Mining Systems, Fielded applications, Simple examples: The weather problem and others,Major Issues in Data Mining.**Preparing the input:** Gathering the data together**,** ARFF format**,** Sparse data**,** Attribute types, Missing values**,** Inaccurate values,**Getting to know your data:** BasicStatisticalDescriptions of Data.**Data Preprocessing:** An Overview, DataCleaning, DataIntegration, DataReduction, Data Transformation and Data Discretization.

UNIT-II

Mining Frequent Patterns,Associations and correlations: Basic Concepts, Frequent Item Set Mining Methods, Interesting patterns, Pattern Evaluation Methods, Pattern Mining in Multilevel and multidimensional space, Case study on Association Analysis.

Advanced Pattern Mining: Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining, Mining High-Dimensional Data and Colossal Patterns, Mining Compressed or Approximate Patterns, Pattern Exploration and Application

UNIT-III

Classification: Basic Concepts**,** Decision Tree Induction,Bayes Classification Methods,Rule-Based Classification,Model Evaluation and Selection,Techniques to Improve Classification Accuracy: Introducing Ensemble Methods, Bagging, Boosting and AdaBoost.**Classification: Advanced Methods** Bayesian Belief Networks, Classification by Backpropagation, Support Vector Machines,Lazy Learners (or Learning from Your Neighbors), Other Classification Methods, Case study on Classification problems using different classifiers.

UNIT-IV

Cluster Analysis: Basic Concepts and Methods, Overview of Basic Clustering Methods,Data Similarity and Dissimilarity,Partitioning Methods, Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic Methods, BIRCH: Multiphase Hierarchical Clustering Using Clustering Feature Trees.

Density-Based Methods: DBSCAN: Density-Based Clustering Based on Connected Regions with High Density, OPTICS: Ordering Points to Identify the Clustering Structure,Grid-Based Methods.

Evaluation of Clustering: Assessing Clustering Tendency, Determining the Number of Clusters, Measuring Clustering Quality.

UNIT-V

Outlier Detection: Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Proximity-Based Approaches **Data Mining Trends and Research Frontiers:** Mining Complex Data Types: Mining Sequence Data: Time-Series, Symbolic Sequences and Biological Sequences, Mining Other Kinds of Data, Data Mining Applications, Data Mining and Society, Data Mining Trends.

Text Books:

1. Han J &Kamber M, "Data Mining: Concepts and Techniques", Third Edition, Elsevier, 2011.
2. Ian H.witten&Eibe Frank, "Data Mining Practical Machine learning tools and techniques",SecondEdition,Elsevier.

Suggested Reading:

1. Pang-Ning Tan, Michael Steinback, Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2008.
2. M.Humphires, M.Hawkins, M.Dy,"Data Warehousing: Architecture andImplementation", Pearson Education, 2009.
3. Anahory, Murray, "Data Warehousing in the Real World", Pearson Education, 2008.
4. Kargupta, Joshi,etc., "Data Mining: Next Generation Challenges and Future Directions", Prentice Hall of India Pvt Ltd, 2007.

Useful web Links:

1. http://www.cs.waikato.ac.nz/ml/weka/
2. http://archive.ics.uci.edu/ml/
3. http://www.the-data-mine.com/
4. http://www.uky.edu/BusinessEconomics/dssakba/relateds.htm

Course Code 16ITE132

DATA HIDING
(Elective-III)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Prerequisites: Cryptography and Network security and Digital Image processing

Course Objectives:

This course is introduced to

1. Teach students theoretical aspects of the watermarking and steganography
2. Give awareness about the History of watermarking and steganography
3. Introduce the basic models of watermarking
4. Teach about the basic concepts of watermarking and steganography
5. Make the students to understand the embedding process in steganography
6. Expose students to various scenarios of Steganalysis

Course Outcomes:

After completion of the course, student will be able to

1. Know the History and importance of watermarking and steganography
2. Analyze Applications and properties of watermarking and steganography
3. Demonstrate Models and algorithms of watermarking
4. Possess the passion for acquiring knowledge and skill in preserving authentication of Information
5. Identify theoretic foundations of steganography and steganalysis
6. Differentiate between watermarking and steganography

UNIT- I

Introduction: Information Hiding, Steganography, and Watermarking, History of Watermarking, History of Steganography, Importance of Digital Watermarking, Importance of Steganography. Applications and Properties: Applications of Watermarking, Applications of Steganography, Properties of Watermarking Systems, Evaluating Watermarking Systems, Properties of steganography and SteganalysisSystems.Evaluatingand Testing SteganographicSystems.

UNIT- II

Models of Watermarking: Notation, Communications, Communication-Based Models of Watermarking, Basic model,Watermarking as Communications with Side Information at the Transmitter, Watermarking as MultiplexedCommunications, Geometric Models of Watermarking, Modeling Watermark Detection by Correlation, Linear Correlation, Normalized Correlation,CorrelationCoefficient, Robust Watermarking: Approaches, Robustness to Volumetric Distortions.

UNIT-III

Watermark Security: Security Requirements, Restricting Watermark Operations, Public and Private Watermarking, Categories of Attack, Assumptions about the Adversary, Watermark Security and Cryptography, The Analogy between Watermarking and Cryptography, Preventing Unauthorized Detection, Embedding and Removal, Some Significant KnownAttacks, Scrambling Attacks, Pathological Distortions, Copy Attacks, Ambiguity Attacks, Sensitivity Analysis Attacks, Gradient Descent Attacks, Content Authentication: Exact Authentication , Selective Authentication, Localization, Restoration.

UNIT-IV

Steganography: Information-Theoretic Foundations of Steganography, Cachin‟s Definition of Steganographic Security, Practical Steganographic Methods: Statistics Preserving Steganography, Model-Based Steganography, Masking Embedding as Natural Processing, Minimizing the Embedding Impact, Matrix Embedding, and Nonshared Selection Rule.

UNIT-V

Steganalysis: Steganalysis Scenarios, Detection, Forensic Steganalysis, the Influence of the Cover Work on Steganalysis, Significant Steganalysis Algorithms, LSB Embedding and the Histogram attack, Sample Pairs Analysis. Blind Steganalysis of JPEG Images UsingCalibration, BlindSteganalysis in the Spatial Domain.

Text Book:

1. Ingemar Cox, Matthew Miller, Jeffrey Bloom, and Jessica Fridrich, “Digital Watermarking and Steganography”, 2nd Edition, (The Morgan Kaufmann Series in Multimedia Information and Systems).

References:

1. Frank Y. Shih. “Digital Watermarking and Steganography: Fundamentals and Techniques”, CRC Press.
2. Stefan Katzenbeisser, Fabien, and A.P. Petitcolas, “Information Hiding Techniques for Steganography and Digital Watermarking”, Artech House.
3. Neil F. Johnson; ZoranDuric; SushilJajodia,“Information Hiding: Steganography and Watermarking - Attacks and Countermeasures”, Springer.
4. Gregory Kipper,“Investigator's Guide to Steganography”, Auerbach Publications.

Web Resources:

1. www.viprefect.com/steganography-vs-digital-watermarking
2. simson.net/ref/2004/csci_e-170/handouts/L09b.ppt
3. www.fi.muni.cz/.../CHAPTER%2013%20-%20Steganography%20and%20Watermark..

Course Code 16ITE133

ELECTRONIC COMMERCE
(Elective-III)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course objectives:

1. To understand the applications of E-Commerce.
2. To understand the role of multimedia in E-Commerce and security issues of E-Commerce.
3. To understand the Emerging tools for Resource search and discovery.

Course outcomes:

1. Able to use e-commerce in business applications
2. To make effective use of multimedia in E-commerce applications.
3. To resolve security issues in Electronic Payment Systems
4. Able to describe the key features of Internet, Intranets and Value Added networks and explain how they relate to each other and Discuss legal issues and privacy in E-Commerce
5. Able to describe the Document infrastructure for E-commerce and advertisement in Market.
6. To make use of emerging tools in Resource search and discovery.

UNIT-I

Electronic Commerce: Electronic Commerce Frame Work, Electronic Commerce and Media Convergence, Anatomy of E-Commerce appellations, Electronic Commerce Consumer applications, Electronic Commerce Organization Applications.

Consumer Oriented Electronic Commerce: Consumer- Oriented Applications, Mercantile Process Models, Mercantile Models from the Consumer's Perspective, Mercantile Models from the Merchants' Perspective.

UNIT-II

Electronic Payment systems: Types of Electronic Payment Systems, Digital Token - Based Electronic Payment Systems, Smart Cards Electronic Payment Systems, Credit Card- Based Electronic Payment Systems, Risk and Electronic Payment systems, Designing Electronic Payment Systems.

UNIT -III

I**nter Organizational Commerce and EDI:** Electronic Data Interchange, EDI applications in business, EDI: Legal, Security, and Privacy issues, EDI and Electronic Commerce. EDI Implementation, MIME and Value added networks.-Standardization and EDI, EDI Software Implementation, EDI Envelope for Message Transport, Value-Added Networks, Internet-Based EDI.

Intra organizational Electronic Commerce: Internal Information Systems, Work Flow Automation and Coordination, Customization and internal Commerce, Supply chain Management.

UNIT-IV

Corporate Digital Library: Dimensions of Internal electronic Commerce Systems, Types of Digital Documents, Issues behind Document Infrastructure, Corporate Data Warehouse Advertising and Marketing on the Internet - Information based marketing, advertising on Internet, on-line marketing process, market research.

UNIT -V

Consumer Search and Resource Discovery: Search and Resource Discovery paradigms, Information search and Retrieval, Electronic Commerce catalogues or Directories, information filtering, Consumer-Data Interface, Emerging Tools.

Multimedia and Digital video: key multimedia concepts, Digital Video and Electronic Commerce, Desktop video processing, Desktop video conferencing.

Text Books:

1. Ravi Kalakota& A. B. Whinstong: "Frontiers of Electronic Commerce", Pearson Education, lndia, 2006.

References:

1. Daniel Minoli, Emma Minoli, “Web Commerce Technology Handbook” Tata McGraw Hill 2007.
2. J Christopher W, Theodore HKC, "Global Electronic Commerce: Theory and Case Studies", Universities Press, 2001.

Web Resources:

https://www.coursera.org/learn/mafash/lecture/7pu0h/e-commerce

Course Code 16ITC201

INFORMATION SYSTEMS SECURITY

Instruction	3L + 1T per week
Duration of End Examination	3 Hours
End Examination Marks	70 Marks
Sessional	30 Marks
Credits	4

Course Objectives:

1. To understand fundamental concepts of information systems and the key practices and processes for managing security effectively.
2. To have an overview of security management and its building blocks for information security.
3. Describe the need for risk management and the vulnerabilities associated with them.
4. To familiarize with access controls and authentication as they are used to secure systems and information.
5. To understand threats posed by emails and security issues related to databases and operating systems.
6. To develop frameworks, standards and models and analyse the need for security audits.

Course Outcomes:

Students who complete this course should be able to:

1. State the importance and changing nature of Information system in global context and identify threats to information systems and its associated attacks.
2. Understand how security policies, standards and practices are implemented in the organization.
3. Analyze the risk the organization is facing and implement physical security and technological security.
4. Aware of the requirements and mechanisms for the need of security in email, databases and operating systems.
5. Select appropriate models,frameworks, standards to tackle and solve problems in the discipline of information system security.
6. Demonstrate the importance and scope of process areas of SSE-CMM and need for security audits in Organizations.

UNIT- I

Information Systems in Global Context: Basics and importance of Information Systems, Changing Nature of Information Systems, Global Information Systems: Role of Internet and Web Services.

Threats to Information Systems: New Technologies Open Door to the Threats, Information-Level Threats versus Network-Level Threats, Threats and Attacks, Classifications of Threats and Assessing Damages, Protecting Information Systems Security

UNIT- II

Information Security Management in Organizations: Information Security Management (ISM)Context, Policy, Standards, Guidelines and Procedures, Security Scenario in the Financial

Sector, Information Security Management System (ISMS), Organizational Responsibility, Information Security Awareness Scenario.

Building Blocks of Information Security: Principles of Information Systems Security, Three Pillars of Information Security, Information Classification, Criteria for Classification of Data and Information, Information Classification: variousroles.

UNIT- III

Information Security Risk Analysis: Terms and Definitions for Risk Analysis of Information Security, Risk Management and Risk Analysis, Approaches and Considerations in Risk Analysis, Auditing Perspective on Risk Analysis.

Intrusion Detection for Securing the Networks: Intrusion Monitoring and Detection, Intrusion Detection for Information Systems Security.

Firewalls for Network Protection: Firewalls, Demilitarized Zone (DMZ), Need and Protection provided by Firewalls, Proxy Servers, Topologies for Different Types of Firewalls.

Virtual Private Networks for Security: VPN, Need and Role of a VPN for an Enterprise, Working of VPN,VPN Architecture.

UNIT- IV

Security of Electronic Mail Systems: Today's Email Usage Scenario, Email System Mechanism, Security Threats posed by Emails, Protection from Threats, Governance for Emails Systems.

Security of Databases: Database Security Issues, Federated Databases: Need and Security Issues, Securing the Mobile Databases, Securing Connectivity with Enterprise Databases, Data Integrity as a parameter for security, Database Security Policy.

Security of Operating Systems: Operating Systems role in Information Systems Application, Operating System Types, Functions and Tasks, Network Operating Systems and Security, Host Security and OS Hardening, Patched Operating System, OS hardening fundamentals.

UNIT- V

Security Models, Frameworks, Standards and Methodologies: Terminology, Methodologies for Information Systems Security.

Systems Security Engineering Capability Maturity Model - The SSE-CMM: Definition Nature, Scope and Importance,Target Audience for the SSE-CMM, SSE-CMM - Structure and Architecture, Process Areas of the SSE-CMM.

Auditing for Security: Need for Security Audits in Organizations, Organizational Roles and Responsibilities, Types and Approaches to Security Audits, Technology-based Audits - Vulnerability Scanning and Penetration Testing, Phases in Security Audit.

Text Books:

1) Nina Godbole,**"**Information Systems Security: Security Management, Metrics, Frameworks And Best Practices", Wiley India Pvt.Ltd.,2013
2) Michael E. Whitman and Hebert J Mattord, "Principles of Information Security", 4th edition Ed. Cengage Learning 2011

References Books:

1) Thomas R Peltier, JustingPeltier, John Blackley, "Information Security. Fundamentals", Auerbacj Publications 2010
2) Detmar W Straub, Seymor Goodman, Richard L Baskerville, "Information Security: Policy Processes and Practices", PHI 2008
3) Marks Merkow and Jim Breithaupt, "Information Security: Principle and Practices", Pearson Education, 2007.

Web Resources:

1) www.mvatcybernet.com
2) www.csrc.nist.gov

Course Code 16ITC202

BIG DATA ANALYTICS

Instruction	3L + 1T per week
Duration of End Examination	3 Hours
End Examination Marks	70 Marks
Sessional	30 Marks
Credits	4

Course Prerequisites:

Data Structures, Design and Analysis of Algorithms, Database Systems

Course Objectives:

1. To introduce the concepts and challenges of big data, role of HDFS in handling big data and MapReduce Architecture.
2. To explore mapper and reducer to solve real world problems.
3. To introduce the features of NoSQL and study the working mechanisms of MongoDB
4. To impart knowledge to work with semi structured and unstructured data using Pig
5. To familiarise with features of Hive to process and query big data

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Use Hadoop framework for handling Big Data.
2. Acquire, Store and prepare big data in business environments using HDFS
3. Write programs in MapReduce to solve real world problems
4. Differentiate between SQL and NoSQL databases
5. Handle semi structured and unstructured big data using Pig
6. Make use of Hive to query big data in HDFS environment.

Unit - I

What is Big Data?, Why is Big Data Important: When to consider a Big data solution, Big Data use cases: IT for IT Log Analytics, The Fraud Detection Pattern, Social Media Pattern.

The Hadoop Distributed Files system: The Design of HDFS, HDFS Concepts, Blocks, Name nodes and Data nodes, Block Caching, HDFS Federation, HDFS High Availability, The Command-Line Interface, Basic File system Operations, Hadoop File systems, Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the File System API, Writing Data, Directories, Querying the File system, Deleting Data, Data Flow, Anatomy of a File Read, Anatomy of a File Write, Coherency Model, Parallel Copying with distcp, Keeping an HDFS Cluster Balanced

Unit - II

MapReduce: A Weather Dataset, Data Format, Analyzing the Data with Hadoop, Map and Reduce, Java MapReduce, Scaling Out, Data Flow, Combiner Functions, Running a Distributed MapReduce Job

Developing a MapReduce Application: Writing a Unit Test with MRUnit, Mapper, Reducer, Running Locally on Test Data, Running a Job in a Local Job Runner, Testing the Driver, Running on a Cluster, Packaging a Job, Launching a Job, TheMapReduce Web

Unit – III

How MapReduce Works: Anatomy of a MapReduce Job Run, Job Submission, Job Initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion, Failures, Task

Failure, Application Master Failure, Node Manager Failure, Resource Manager Failure, Shuffle and Sort, The Map Side, The Reduce Side, **MapReduce Types and Formats:** MapReduce Types, The Default MapReduce Job, Input Formats, Input Splits and Records, Text Input, Output Formats, Text Output

Unit – IV

No SQL Databases: Review of traditional Databases, Need for NoSQL Databases, Columnar Databases, Failover and reliability principles, CAP Theorem, Differences between SQL and NoSQL databases

Working mechanisms of Mongo DB: Overview, Advantages, Environment, Data Modelling, Create Database, Drop Database, Create collection, Drop collection, Data types, Insert, Query, Update and Delete operations, Limiting and Sorting records, Indexing, Aggregation

Unit - V

Pig: Installing and Running Pig, an Example, Generating Examples, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators, Pig in Practice.

Hive: Installing Hive, The Hive Shell, An Example, Running Hive, Comparison with Traditional Databases, HiveQL, Tables, Querying Data, User-Defined Functions, Writing a User Defined Functions, Writing a User Defined Aggregate Function.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2015.
2. Paul C. Zikopoulos, Chris Eaton, Dirk DeRoos, Thomas Deutsch, George Lapis, "Understanding Big Data - Analytics for Enterprise class Hadoop and Streaming Data", McGrawHill, 2012.
3. Kristina Chodorow, "MongoDB: The Definitive Guide-Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Media, 2013

Suggested Reading:

1. Pramod J. Sadalage, Martin Fowler," NoSQL distilled", Addison Wesley Professional, 2012.
2. Chuck Lam, Mark Davis, AjitGaddam, "Hadoop in Action", Manning Publications Company, 2016.
3. Alex Holmes," Hadoop in Practice", Manning Publications Company, 2012.
4. Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.
5. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Media Inc, October 2012.
6. VigneshPrajapati, "Big data Analytics with R and Hadoop", Packt Publishing, November 2013.

Web Resources:

1. http://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights
2. http://www.planetcassandra.org/what-is-nosql/
3. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
4. https://class.coursera.org/datasci-001/lecture
5. http://bigdatauniversity.com/

Course Code 16ITC203

ADVANCED ALGORITHMS

Instruction	3L + 1T per week
Duration of End Examination	3 Hours
End Examination Marks	70 Marks
Sessional	30 Marks
Credits	4

Prerequisites:
Data Structures, Design and Analysis of Algorithms

Course Objectives:

1. To understand asymptotic notation for representing Algorithmic complexity
2. To understand various algorithmic strategies like greedy method, divide and conquer and dynamic programming
3. To learn advanced algorithms for networks, string processing and computational geometry

Course Outcomes:
After the completion of the course, student will be able to

1. Choose a data structures that effectively model the data and assess how itimpacts the performance.
2. Design, implement solutions using a variety of data structures including hash tables, binary search trees, heaps, splaytrees and graphs
3. Select suitable algorithmic strategy and appropriate data structures for solving real world problems in various domains
4. Formulate solutions to various network problems
5. Understandthoroughly the text processing techniques such as pattern matching, compression and searching.
6. Understand various Cryptographic Algorithms, Protocols and implement them in formulating solutions to real world problems.

UNIT-I

Algorithm Analysis: Asymptotic Notation, Amortization.

Basic Data Structures: Stacks and Queues, Vectors, Lists and Sequences, Trees, Priority Queues, Heaps, Dictionaries and Hash Tab1es.

Search Trees and Skip Lists: Ordered Dictionaries and Binary Search Trees, AVL Trees, Bounded- Depth Search Trees, Splay Trees, Skip Lists.

UNIT-II

Fundamental Techniques: The Greedy Method, Divide-and-Conquer, Dynamic Programming. **Graphs:** The Graph Abstract Data Type, Data Structures for Graphs, Graph Traversal, Directed Graphs.

UNIT-III

Weighted Graphs: Single-Source Shortest Paths, All-Pairs Shortest Paths, Minimum Spanning Trees.

Network Flow and Matching: Flows and Cuts, Maximum Flow, Maximum Bipartite Matching, Minimum-Cost Flow.

UNIT-IV

Text Processing: Strings and Pattern Matching Algorithms, Tries, Text Compression, Text Similarity Testing.

Number Theory and Cryptography: Fundamental Algorithms involving numbers, Cryptographic Computations, Information Security Algorithms and Protocols.

UNIT-V

Computational Geometry: Range Trees, Priority Search Trees, Quadtrees and k-DTrees, Convex Hulls.

Text Books:

1) M T Goodrich, R Tornassia, "Algorithm Design - Foundations, Analysis, and Internet Algorithms ", John Wiley, 2002.
2) E Horowitz S Salmi, S Rajasekaran, "Fundamentals of Computer Algorithms" 2nd Edition, University Press, 2007.

Suggested Reading:

1) Aho, A V Hopcraft, Ullman J D, "The design and analysis of Computer Algorithms", Pearson Education, 2007.
2) Hari Mohan Pandy, "Design Analysis and Algorithms", University Science Press, 2009.
3) Cormen, Lieserson, Rivest "Introduction to Algorithms", 2nd Edition, PHI, 2003.

Web Resources:

1) http://ww3.algorithmdesign.net/
2) http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-854j-advanced-algorithms-fall-2008/study-materials/
3) http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-introduction-to-algorithms-sma-5503-fall-2005/video-lectures/

Course Code 16ITC204

BIG DATA ANALYTICS LAB
(Lab-II)

Instruction	3P per week
Duration of End Examination	3 Hours
Internal Examination	50 Marks
Credits	2

Course Prerequisites: Java and Web Programming, Computational Intelligence

Course Objectives:

1. To provide the knowledge to setup a Hadoop Cluster
2. To impart knowledge to develop programs using MapReduce Technique
3. To learn file handling in HDFS
4. To introduce Pig, PigLatin and HiveQL to process big data
5. To learn machine learning operations using Mahout Hadoop
6. To introduce NoSQL databases

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Understand Hadoop working environment
2. Work with big data applications in multi node clusters
3. Write scripts using Pig to solve real world problems
4. Write queries using Hive to analyse the datasets
5. Build a recommendation system using Mahout Hadoop
6. Apply big data and eco system techniques for real world problems

Experiments:

1. Understanding and using basic HDFS commands
2. Word count application using MapperReducer on single node cluster
3. Analysis of Weather Dataset on Multi node Cluster
4. Working with files in Hadoop file system: Reading, Writing and Copying
5. Writing User Defined Functions/Eval functions for filtering unwanted data in Pig
6. Retrieving user login credentials from /etc/passwd using Pig Latin
7. Working with HiveQL using Cloud.
8. Writing User Defined Functions in Hive using Cloud
9. Perform classification & clustering in Mahout Hadoop
10. Building a Mahout Recommendation System on a Hadoop Cluster

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, April 2015.
2. Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.

Suggested Reading:

1. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Media Inc, October 2012.
2. VigneshPrajapati, "Big data Analytics with R and Hadoop", Packt Publishing, November 2013.

Web Resources:

1. http://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture
4. http://bigdatauniversity.com/

Course Code 16ITC205

SEMINAR-II

Instruction	3P per week
Internal Examination	50 Marks
Credits	2

Oral presentation and technical report writing are two important aspect of engineering education. The objective of the seminar is to prepare the student for a systematic and independent study of the state of the art topics in the advanced fields of Computer Networks and Information Security and related topics.

Seminar topics may be chosen by the students with advice from the faculty members. Students are to be exposed to the following aspects for a seminar presentation.

- Literature survey
- Organization of the material
- Presentation of OHP slides / LCD presentation
- Technical writing

Each Student is required to

4. Submit one page of synopsis of the seminar talk two days before for display on notice board
5. Give 20 minutes of PowerPoint presentation followed by 10 minutes of discussion.
6. Submit a report on the seminar topic with a list of references and slides used within a week.

Seminars are to be scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged.

The sessional marks will be awarded to the students by at least two faculty members on the basis of oral and written presentation in addition to their involvement in the discussion.

Course Code 16ITC206

MINI PROJECT

Instruction	3P per week
Internal Examination	50 Marks
Credits	1

Instruction	Sessional Marks	Examination – Duration	End Exam	Credits
2 Periods per week	--	3 Hours	50	1

Student should carry out mini project in the area of interest/course studied, identifying a real time problem under the supervision of guide.

Mini Projects will be monitored during the semester through individual presentations.

Every student should maintain a mini project dairy, wherein he/she needs to record the progress of his/her work and get it signed at least once in a week by the guide(s). If working outside and college campus, both the external and internal guides should sign the same.

Sessional marks should be based on the marks, awarded by a mini project monitoring committee of faculty members as well as the marks given by the guide.

Common norms are established for final documentation of the mini project report, the students are directed to download from the website regarding the guidelines for preparing the mini project report and the mini project report format.

The mini project report shall be evaluated for 50 Marks and credits 1 by the committee.

If the mini project work found inadequate in the end examination, the candidate should repeat the mini project work with a new problem or improve the quality of work and report it again.

1. Power point presentation
2. Thesis/Report preparation
3. Viva-voce

Course Code 16ITE241

GRIDCOMPUI1NG
(Elective-IV)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 marks
Sessional	30 Marks
Credits	3

Course objectives:

1. To understand the genesis of grid computing
2. To know the application of grid computing
3. To understanding the technology and tools to facilitated the grid computing.

Course outcomes:

1. Understand the need for and evolution of Grids in the context of processor.
2. To be familiar with the fundamental components of Grid environments, such as authentication, authorization, resource access, and resource discovery.
3. Able to form a grid infrastructure.
4. Capable to design and implement Grid computing applications using Globus or similar toolkits.
5. Analyse solve the complex problems using Grid Computing.
6. Able to justify the applicability, or non-applicability, of Grid technologies for a specific application.

UNIT-I

Introduction to Grid Computing: Grid Computing Concept, History of Distributed Computing Computational Grid Applications, Grid Computing Infrastructure Development, Grid Computing Software Interface Job Submission: Introduction, Globus Job Submission, Transferring Files.

UNIT-II

Schedulers: Scheduler Features, Scheduler Examples, Grid Computing Meta-Schedulers, Distributed Resource Management Application (DRMAA).

Security Concepts: Introduction, Symmetric Key Cryptography, Asymmetric Key Cryptography, (Public Key Cryptography), Public Key Infrastructure, Systems/Protocols Using Security Mechanisms.

Grid Security: Introduction, Grid Security Infrastructure (GSI), Delegation, Higher-Level Authorization Tools.

UNIT-III

System Infrastructure I: Web Services: Service-Oriented Architecture, Web Services and Web Service Implementation.

System Infrastructure II: Grid Computing Services: Grid Computing and Standardization Bodies, Interacting Grid Computing Components, Open Grid Services Architecture (OGSA), WSRF.

User-Friendly Interfaces: Introduction Grid Computing Workflow Editors, Grid Portals.

UNIT-IV

Grid-Enabling Applications: Introduction, Parameter Sweep, Using an Existing Program on Multiple Grid Computers, Writing an Application Specifically for a Grid, Using Multiple Grid Computers to Solve a Single Problem.

UNIT-V

Case Studies:

Globus: Overview of Globus Toolkit 4, Installation of Globus, GT4 Configuration, Main Components and programming Model, Using Globus.

gLite: Introduction, Internal Workings of gLite, Logging and Bookkeeping (LB), Security Mechanism Using gLite.

Resource management using Gridway and Gridbus.

Scheduling using Condor, SGE, PBS, LSF Grid scheduling with QoS.

Text Books:

1) Barry Wilkinson, "Grid Computing Techniques and Applications", CRC Press, 2010.
2) Luis Ferreira, ViktorsBerstis, Jonathan Armstrong, Mike Kendzierski, Andreas Neukoetter, MasanobuTakagi, Richard Bing-Wo, Adeeb Amir, Ryo Murakawa, Olegario Hernandez, James Magowan, Norbert Bieberstein "Introduction to Grid Computing with Globus", IBM Redbooks.

Suggested Reading:

1) Frederic Magoules, Jie Pan, Kiat-An Tan, Abhinit Kumar, "Introduction to Grid Computing" CRC Press, 2009.
2) Vladimir Silva, "Grid Computing for Developers ", Dream Tech Press, 2006.
3) Ian Foster, Carl Kesselman. "The Grid 2- Blueprint for a new computing Infrastructure". Elsevier Series, 2004.
4) Fran Berman, Geoffrey Fox. Anthony J.G Hey, "Grid Computing: Making the Global Infrastructure a Reality", Wiley, 2003.
5) Joshey Joseph, Craig Fellenstein, "Grid computing", IBM Press, 2004.

Web Links:

1) Globus project: http://www.globus.org/alliance/

2) Global Grid Forum: http://www.ggf.org

Course Code 16ITE242

SEMANTIC WEB
(Elective-IV)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 marks
Sessional	30 Marks
Credits	3

Course Prerequisites: Discrete Structures, Web Programming

Course Objectives:
This course is intended to introduce
1. Features, rationale, and advantages of Semantic Web technology.
2. XML (Extensible Markup Language) language structure, RDF model and RDF Schema.
3. Requirements and features of web ontology language (OWL) and Rule Markup languages
4. Different Semantic web services and various ontology development methods
5. Software agent architecture and role of semantic web in various applications

Course Outcomes:
At the end of the course student will be able to:
1. Distinguish between semantic web and syntactic web
2. Describe knowledge using DL, XML, RDF and RDF Schema
3. Represent domain knowledge using OWL and Rule Markup Languages
4. Develop an ontology for a given knowledge domain
5. Understand the role of software agents
6. Realize the role of Semantic Web technologies in various application areas

UNIT- I
The Future of the Internet: Introduction, Syntactic Web, Semantic Web, Working of Semantic Web, What is not a Semantic Web, Side Effects.
Ontology: Definitions, Taxonomies, Thesauri and Ontologies, Classifying Ontologies, Web Ontology Description language, Ontologies-Categories-Intelligence.

UNIT- II
Knowledge Description in Description Logic: Introduction, Example, Family of Attributive Languages, Inference problems.
RDF and RDF Schema: Introduction, XML Essentials, RDF, RDF Schema.

UNIT- III
OWL: Introduction, Requirements for Web Ontology Description Languages, Header Information, Versioning and Annotation Properties, Properties, Classes, Individuals, Data types.
Rule Languages: Introduction, Usage Scenarios, Datalog, RuleML, SWRL, TRIPLE.

UNIT- IV
Semantic Web Services: Introduction, Web Service Essentials, OWL-S Service Ontology, OWL-S Example.

Methods for Ontology Development: Introduction, Uschold and King Ontology Development Method, Toronto Virtual Enterprise Method, Methontology, KACTUS Project Ontology Development Method, Lexicon-Based Ontology Development Method, Simplified Methods.

UNIT- V

Ontology Sources: Introduction, Metadata, Upper Ontologies.

Software Agents: Introduction, Agent Forms, Agent Architecture, Agents in the Semantic Web Context.

Applications: Introduction, Horizontal Information Products, Open academia, Bibster, Data Integration, Skill Finding, Think Tank Portal, e-learning, Web Services.

Text Books:

1. Karin K Brietman, Marco Antonio Casanova, Walter Truszkowski, "Semantic Web – Concepts Technologies and Applications", Springer 2007.
2. Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer", PHI 2008.

Suggested Reading:

1. Liyang Yu, "Semantic Web and Semantic Web Services", CRC 2007.
2. Dean Allemang, James Hendler, "Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL", Elsevier, 2011.
3. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, "Foundations of Semantic Web Technologies", CRC Press 2009.

Web Resources:

1. http://www.cambridgesemantics.com/resources/case-study
2. The World Wide Web Consortium www.w3.org
3. http://protege.stanford.edu/
4. http://protege.stanford.edu/publications/ontology_development/ontology101-noy-mcguinness.html

Course Code 16ITE243

MOBILE ADHOC AND SENSOR NETWORKS
(Elective-IV)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 marks
Sessional	30 Marks
Credits	3

Course prerequisites: Data Communications

CourseObjectives:

This course is intended to introduce

1. Principles and protocols of cellular networks, WLANs and PANs
2. Routing and transport layer protocols over wireless networks
3. Characteristics, applications and routing protocols for MANETs
4. TCP over ad-hoc networks and QoS issues in MANETs
5. Architecture of wireless sensor networks, Mac layer and routing layer support for MANETs

Course Outcomes:

After successful completion of the course, student will be able to

1. Understand the operating principles of cellular networks , wireless LANs and PANs
2. Illustrate e Routing and transport layer protocols over wireless networks
3. Comprehend Characteristics, applications and routing protocols for MANETs
4. Apply TCP solutions for ad-hoc networks
5. Employ MAC layer and network layer solutions for providing QoS in MANETs.
6. Describe architecture of wireless sensor networks, Mac layer and routing layer support for MANETs

UNIT – I

Introduction- Issues in Mobile computing, Overview of wireless telephony: Cellular concept, GSM, System Architecture, Protocols, Connection Establishment, FrequencyAllocation, Routing, Handover, Security, GPRS, **Wireless LAN** – IEEE 802.11 Standard, Architecture, services, HIPERLAN, Ad-HocNetwork, Blue Tooth.

UNIT - II

Mobile IP – Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunnelling and encapsulation, Optimizations, Reverse tunnelling, IPv6, IP micro-mobility support, Dynamic host configuration protocol, **TCP over Wireless Networks:** Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit /Fast Recovery, Transmission/Timeout Freezing, SelectiveRetransmission, Transaction Oriented TCP,**WAP**: WAP Architecture, WDP, WTLS, WTP, WSP, WML, WML Script, WAE, WTA.

UNIT - III

Introduction to Ad-hoc Networks: Characteristics of MANETs, Applications of MANETs and challenges of MANET, **Routing in MANETs:** Topology based routing protocols-Proactive routing, reactive routing, hybrid routing, Position based routing protocols, Signal stability based routing,

Power Aware Routing, Associativity based routing, QoS based routing, **Broadcasting, Multicasting and Geocasting**: Broadcast storm- Broadcasting in a MANET, Flooding generated broadcast storm, rebroadcasting schemes, Issues in providing multicast in a MANET, Multicast Routing protocols, Geocast routing protocols

UNIT - IV

TCP over Ad-Hoc: TCP protocol overview: TCP basics, Header format, congestion control, Round trip time estimation, TCP and MANETs: Effect of partitions on TCP, Impact of lower layers on TCP, TCP Solutions for Ad hoc networks: Mobility related, Fairness related solutions

QoS Issues in Ad-hoc Networks: QoS parameters in Ad-hoc networks, Issues and challenges in providing QoS in Ad-hoc Wireless networks, Classification of QoS solutions, MAC layer and Network Layer solutions.

UNIT - V

Basics of Sensors and Applications: Introduction, applications, Empirical energy consumption, Sensing and communication range, localization scheme, clustering of sensor nodes, Architecture of wireless sensor networks, Network life time, physical layer, MAC layer, Design Issues, MAC protocols, The sensor-MAC, Routing layer- Directed diffusion, Sequential assignment roting, Minimum cost forwarding algorithm, Energy aware routing, coherent and non-coherent processing.

Text Books:

1. Carlos de MoraisCordeiro and Dharma PrakashAgrawal, "Ad Hoc and Sensor Networks: Theory and Applications", Second Edition, World Scientific Publishers, 2011.
2. Jochen Schiller, "Mobile Communications", Second Edition, Prentice Hall of India, Pearson Education, 2014.

References:

1. William Stallings, "Wireless Communications and Networks", Second Edition, Prentice Hall of India, Pearson Education, 2004.
2. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, New York, 2003.
3. PrasantMohapatra and Srihanamurthy, "Ad-Hoc Networks Technologies and Protocols", Springer, Springer International Edition, 2009.
4. KazemSohraby, Daniel Minoli, TaiebZnati, "Wireless Sensor Networks", A John Wiley & Sons, Inc., Publication, 2007.
5. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, 2005.
6. Feng ZHAO. Leonidas GUIBAS, "Wireless Sensor Network-An Information Processing Approach", Morgan Kaufmann Publishers, Elsevier, 2004.

Course Code 16ITE251

CLOUD COMPUTING
(Elective-V)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 marks
Sessional	30 Marks
Credits	3

CourseObjectives:

At the end of the course, student should be able to

1. Understand cloud computing technologies, such as Infrastructure as a Service, Platform as a Service and Software as a Service
2. Understand different virtualization technologies
3. Understand security issues in cloud

Course Outcomes:

After successful completion of the course, student will be able to

1. Understand the concepts, models, technologies and services of cloud computing, reasons for the shift to this model, and its advantages and dis-advantages
2. Learn, differentiate and analyse various virtualization tools and techniques.
3. Understand the virtualization in data centres
4. Comprehend cloud data security mechanisms in cloud
5. Design and develop applications in GAE,AWS and Azure cloud platforms using API support
6. To understand cloud common standards of Developers,standards for Messages and Security

UNIT-I

Introduction to Cloud Computing: Cloud Computing in a Nutshell, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

UNIT-II

Virtual Machines and Virtualization of Clusters and Data Centers, Levels of Virtualization, Virtualization Structures / tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation.

Case Studies: Xen Virtual machine monitors – Xen API. VMware – VMware products – VMware features. Microsoft Virtual Server – Features of Microsoft Virtual Server.

UNIT-III

Cloud Computingarchitectures over Virtualized Data Centers: Data–Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

UNIT-IV

Cloud Security and Trust Management, data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, CryptDb:OnionEncryption layers – DET, RND, OPE, JOIN, SEARCH, HOM and Holomorphic Encryption, FPE Trust, Reputation and Security Management.

UNIT-V

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, parallel and distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWs and Microsoft Azure, Emerging Cloud Software Environments.

Common Standards in Cloud Computing: The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers,Standards for Messaging. Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

Suggested Reading:

1. John W. Rittenhouse, James F. Ransome, "Cloud Computing: Implementation, Management, and Security ", CRC Press 2009.
2. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, "Distributed and Cloud Computing From Parallel Processing to the Internet of Things", Elsevier, 2012.
3. RajkumarBuyya, James Broberg and Andrzej M. Goscinski,"Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing), Wiley *Publishing* ©2011
4. Raluca Ada Popa, Catherine M.S.Redfield, NickolaiZeldovich and HariBalakrishnana, "CryptDB:Protecting Confidentiality with encrypted Query Processing" 23rd ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
5. A Fully Homomorphic Encryption Scheme, Craig Gentry September 2009.
6. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

Course Code 16ITE252

DATA ANALYSIS USING R

(Elective-V)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 marks
Sessional	30 Marks
Credits	3

Course Prerequisites: Probability and Random Processes, Java Programming, Big Data Analytics

Course objectives:

This course is intended to introduce

1. R, an easy to use tool for high level data analytics.
2. Various built-in data types and usage of R packages
3. Numerical and statistical calculations using R
4. Operations for managing data frames using R package
5. Lexical scoping of R
6. Debugging tools of R

Course outcomes:

After successful completion of the course students will be able to

1. Learn and use various built-in data types in R and read and write data from other datasets using R packages.
2. Use Textual and binary formats for storing data and perform numerical and statistical calculations using Vectorized operations, Date and Time.
3. Perform operations for managing Data frames using dplyr package and write programs using control structures and Functions.
4. Appreciate lexical scoping of R that simplifies statistical computations and use loop functions to implement loops in a compact form.
5. Debug programs using interactive debugging tools of R and optimize R programs using Rprofiler
6. Simulate a system bymodeling random inputs using a random number generators.

UNIT-I

History and Overview of R: Basic Features of R, Design of the R System, Limitations of R, R Resources,**Introduction to R:**Installation, Interface, Entering Input, Evaluation, R Objects, Numbers, Attributes, Creating Vectors, Mixing Objects, Explicit Coercion, Matrices, Lists, Factors, Missing Values, Data Frames, Names,**Getting Data In and Out of R :**Reading and Writing Data, Reading Data Files with read.table(), Reading in Larger Datasets with read.table, Calculating Memory Requirements for R Objects, **Using the readr Package**

UNIT-II

Using Textual and Binary Formats for Storing Data: Usingdput() and dump(), Binary Formats,**Interfaces to the Outside World**: File Connections, Reading Lines of a Text File, Reading From a URL Connection, **Subsetting R Objects**: Subsetting a Vector, Subsetting a Matrix, Subsetting Lists, Subsetting Nested Elements of a List Extracting Multiple Elements of a List, Partial Matching, Removing NA Values,**Vectorized Operations**: VectorizedMatrix Operations, **Dates and Times**: Dates in R, Times in R, Operations on Dates and Times.

UNIT-III

Managing Data Frames: Data Frames, The dplyr Package, dplyr Grammar, Installing the dplyr package, select(), filter(), arrange(), rename(), mutate(), group_by(), Pipeline operator, **Control Structures**: if-else, for Loops, Nested for loops, while Loops, repeat Loops, next, break, **Functions**:Functions in R, Argument Matching, Lazy Evaluation, The ... Argument, Arguments Coming After the ... Argument.

UNIT-IV

Scoping Rules of R:A Diversion on Binding Values to Symbol, Scoping Rules, Lexical Scoping: Lexical vs. Dynamic Scoping, Application: Optimization, Plotting the Likelihood, **Coding Standards for R, Loop Functions**:, Looping on the Command Line, lapply(), sapply(), split(), Splitting a Data Frame, tapply, apply(), Col/Row Sums and Means, Other Ways to Apply, mapply(), Vectorizing a Function, **Debugging:** Figuring Out What's Wrong, Debugging Tools in R, Using traceback(), Using debug(), Using recover().

UNIT-V

Profiling R Code: Usingsystem.time(), Timing Longer Expressions, The R Profiler Using summaryRprof(), **Simulation:** Generating Random Numbers, Setting the random number seed, Simulating a Linear Model, Random Sampling, **Data Analysis Case Study:** Simulation, Loading and Processing the Raw Data , Results.

Text Book:

1. Roger D. Peng, "R Programming for Data Science", Lean Pub Publishers,2015.

Suggested Reading:

1. Jared P. Lander,"R for Everyone: Advanced Analytics and Graphics", Addison Wesley Data and Analytics Series, 2015.
2. Mark Gardener, "Beginning R: The Statistical Programming Language", Wiley India Pvt. Ltd., 2013

Web Resources:

3. http://tryr.codeschool.com/levels/1/challenges/
4. http://www.introductoryr.co.uk/R_Resources_for_Beginners.html
5. https://cran.r-project.org/doc/contrib/usingR.pdf
6. https://cran.r-project.org/doc/contrib/Rossiter-RIntro-ITC.pdf

Course Code 16ITE253

WEB MINING
(Elective-V)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 marks
Sessional	30 Marks
Credits	3

Course Prerequisites:

Knowledge of data structures, Basic knowledge of database design and programming, Data Mining.

Objectives:

1. Introduce students to the basic concepts and techniques of Information Retrieval, Web Search and Machine Learning for extracting knowledge from the web.
2. Develop skills for extracting useful knowledge by mining the hyperlink structure of the Web, its contents and the usage logs.
3. Promote research projects in the respective domain

Outcomes:

After the course is completed student should be able to:

1. Understand the concepts to crawl and index the data.
2. Learns how to retrieve and rank the web pages.
3. Apply supervised learning classification on various domains.
4. Learn the algorithms for ranking pages and evaluate them.
5. Able to identify Important Pages using various Topologies and discover Topics\Communities.
6. Able to work at the research frontier for the current state-of-the-art.

UNIT-I

Introduction: Crawling and Indexing, Topic Directories, Clustering and Classification, Hyperlink analysis, Resource Discovery and Vertical Portals. Structured vs Unstructured Data Mining.**Crawling the web:** HTML and HTTP basics, Crawling Basics, Engineering Large Scale Crawlers, Putting Together a Crawler.

UNIT-II

Web Search and Information Retrieval: Boolean Queries and Inverted index, Relevance Ranking, Similarity Search.

Similarity and Clustering: Foundations and Approaches, Bottom-up and Top-Down partitioning paradigms.

UNIT-III

Supervised learning: Introduction, Overview of classification strategies, Nearest Neighbor Learners, Feature Selection, Bayesian Learners, Discriminative Classification, Hypertext Classification.

UNIT-IV

Semi supervised learning: Expectation Maximization, LabelingHypertext Graphs, Co-Training

Social network analysis: Social Sciences and bibliometry, Page Rank and HITS, Coarse Grained Graph, Model, EnhancedModel and Techniques, Evaluation of Topic Distillation.

UNIT-V

Resource discovery: Collecting Important Pages, Similarity Search using Link Topology, Topical Locality and Focused Crawling, Discovering Communities.

Future of Web Mining: Information Extraction, Natural Language Processing, Question Answering, Profile, Personalization and Collaboration.

Text Book:

1. ChakrabartiSoumen, "Mining the Web: Discovering Knowledge from Hypertext Data ", Morgan Kaufmann Publishers, 2003.
2. Bing Liu, " Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data", Second Edition, July 2011.

Suggested Reading:

1. Manu Konchady, "Text Mining Application Programming" Cengage Learning, 2006.

Web Links:

https://www.cse.iitb.ac.in/~soumen/mining-the-web/

Course Code 16ITE261

BIOMETRIC SECURITY
(Elective-VI)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 marks
Sessional	30 Marks
Credits	3

Objectives:

1. to provide students with understanding of biometrics, biometric equipment and standards applied to security.
2. to learn basic methods of fingerprint recognition and face recognition
3. to impart methods of iris recognition
4. to introduce biometric computing knowledge and methods
5. to resolve security issues biometric systems

Outcomes:

Upon successful completion of the course, student will be able to

1. Describe biometric equipment and standards applied to security.
2. Illustrate basic methods of fingerprint recognition and face recognition
3. Demonstrate iris recognition techniques
4. Distinguish additional biometric traits
5. Discusssmultibiometrics
6. Analysesecurity issues biometric systems

UNIT - I

Introduction: Person Recognition, Biometric Systems, Biometric Functionalities, Biometric System Errors, The Design Cycle of Biometric Systems, Applications, Security and Privacy Issues.

UNIT - II

Fingerprint recognition: Introduction, Friction Ridge Pattern, Fingerprint Acquisition, Feature Extraction, Matching, Fingerprint Indexing, Fingerprint Synthesis, Palmprint.

Face Recognition: Introduction, Image Acquisition, Face Detection, Feature Extraction and Matching.

UNIT - III

Iris Recognition: Introduction, Design of an Iris Recognition System, Image Acquisition, Iris Segmentation, Iris Normalization, Iris Encoding and Matching, Iris Quality, Performance Evaluation.

UNIT - IV

Additional Biometric Traits: Introduction, Ear, Gait, Hand Geometry, Soft Biometrics.

Multibiometrics: Introduction, Sources of Multiple Evidence, Acquisition and Processing Architecture Fusion Levels.

UNIT- V

Security of Biometric Systems: Introduction, Adversary Attacks, Attacks at the User Interface, Attacks on Biometric Processing, Attacks on the Template Database.

Suggested Reading:

1) Anil K. Jain, Arun A. Ross,KarthikNandakumar, "Introduction to Biometrics", Springer Science Business Media, LLC 2011.
2) James Wayman, Anil Jain, DavideMaltoni, and Dario Maio (Eds) "Biometric Systems
3) Technology, Design and Performance Evaluation",Springer-Verlag London Limited 2005.
4) Julian Ashbourn,"Guide to Biometrics for Large-Scale Systems Technological, Operational,
5) and User-Related Factors" Springer-Verlag London Limited 2011.
6) "Securing Biometrics Applications"by Charles A. Shoniregun and Stephen Crosier Springer.

Course Code 16ITE262

FORENSIC COMPUTING
(Elective-VI)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 marks
Sessional	30 Marks
Credits	3

CourseObjectives:

At the end of the course, student should be able to

1. understand the fundamentals of computer forensics
2. learn the detailed internals of a modern PC
3. understand file systems and disk geometry
4. understand new technology file system
5. learn where digital evidence resides on computer storage devices
6. learn basic skills for recovering digital evidence from computer storage devices

Course Outcomes:

After successful completion of the course, student will be able to

1. Apply science and engineering to the legal problem for acquiring digital evidence
2. Analyze different file systems to recover digital evidence
3. Identify and organize major characteristics of personal electronic devices like PDA'setc.
4. Apply forensic tools in different situations.
5. Describe and identify basic principles of good professional practice for a forensic computing practitioner
6. Describe the role of computer forensics in the business and private world

UNIT - I

Understanding Information: Binary Systems and Memory, Addressing, Number Systems, Characters, Computer Programs, Records and Files, File Types and Signatures, Use of Hexadecimal Listings, Word Processing Formats, Magic Numbers, Graphic Formats, Archive Formats, Applications.

UNIT - II

IT Systems Concepts: Two Black Boxes, Program, Data, Rules and Objects, Patterns Can Mean Whatever We Choose Them to Mean, Software Development, Breaking Sequence, An Information Processing System.

PC Hardware and Inside the Box : The Black Box Model, The Buses and the Motherboard, Intel Processors and the Design of the PC, A Few Words about Memory, Backing Store Devices, Floppy Disk Drive Units, External Peripherals, Expansion Cards.

UNIT - III

Disk Geometry: A Little Bit of History, Five Main Issues, Physical Construction of the Unit Formation of Addressable Elements, Encoding Methods and Formats for Floppy Disks, Construction of Hard Disk Systems, Encoding Methods and Formats for Hard Disks, The

Formatting Process, Hard Disk Interfaces, IDE/ATA Problems and Workarounds, Fast Drives and Big Drives, Serial ATA(SATA), The POST/Boot Sequence, A Word About Other Systems, The Master Boot Record and Partitions, FATs, Directories and File Systems, RAID.

UNIT - IV

The New Technology File System: A Brief History, NTFS Features, NTFS – How it Works, The MFT in Detail, Analysis of a Sample MFT File Record with Resident Data, Analysis of a Sample MFT File Record with Non-Resident Data, Dealing with Directories, Analysis of a Sample MFT Directory Record with Resident Data, External Directory Listings – Creation of "INDX" Files, Analysis of an "INDX" File.

The Treatment of PCs: The ACPO *Good Practice Guide*, Search and Seizure, Computer Examination – Initial Steps, Imaging and Copying.

UNIT - V

The Treatment of Electronic Organizers: Electronic Organizers, Application of the ACPO *Good Practice Guide* Principles, Examination of Organizers and what may be Possible, JTAG Boundary Scan, A Few Final Words about Electronic Organizers.

Looking A head: Bigger and Bigger Disks, Live System Analysis, Networked Systems Add to the Problems, Encryption, A Final Word.

Text books:

Sammes T, B. Jenkinson, "Forensic Computing", Springer, 2007.

Reference books:

1. Eoghan Casey, Ed. "Handbook of Digital Forensics and Investigation", Academic Press,2010.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.

Web resources:

1. forensiccontrol.com
2. resources.infosecinstitute.com
3. www.computerforensicsworld.com

Course Code 16ITE263

DIGITAL IMAGE PROCESSING AND COMPUTER VISION
(Elective-VI)

Instruction	3L per week
Duration of End Examination	3 Hours
End Examination	70 marks
Sessional	30 Marks
Credits	3

Course objectives:

1. To learn the fundamental concepts and applications of digital image processing
2. To learn the image processing concepts: intensity transformations, spatial filtering, smoothing and sharpening in both spatial and frequency domains, image restoration and reconstruction
3. To impart colour image processing techniques
4. To learn various image compression methods
5. To learn the image analysis concepts: morphological image processing, image segmentation, image representation and description, and object recognition

Course Outcomes:

Upon successful completion of the course, student will be able to

1. explain the fundamental concepts and discuss the applications of digital image processing.
2. explain intensity transformations, spatial filtering, smoothing and sharpening in both spatial and frequency domains, image restoration and reconstruction
3. illustrate colour image processing techniques
4. distinguish and describe various image compression methods
5. demonstrate the image analysis concepts like morphological image processing, image segmentation, image representation and description, and object recognition
6. design and implementation of any one of the techniques mentioned above

UNIT-I

Basics: Introduction, Fundamental steps, Components. Elements of visual perception, image sampling and quantization, some basic relationships between pixels.

Intensity Transformations: Some Basic Intensity Transformation Functions, Histogram Processing

UNIT- II

Spatial Filtering: Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters

Filtering in the Frequency Domain: Preliminary Concepts, Image Smoothing using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters.

UNIT- III

Image Restoration and Reconstruction: A Model of the Image degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only—Spatial Filtering, Minimum Mean Square Error (Wiener) Filtering

Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing

UNIT- IV

Image Segmentation: Fundamentals, Point, Line, and Edge Detection, Segmentation by Thresholding, Region-Based Segmentation, Segmentation Using Watershed Algorithm.

Representation and Description: Representation, Some Simple Descriptors, Shape Numbers, Fourier Descriptors.

Object Recognition: Patterns and Pattern Classes, Matching: Minimum distance classifier, correlation.

UNIT-V

Color Image Processing: Color Fundamentals, Color Models, Pseudo color Image Processing.

Image Compression: Fundamentals, Compression Techniques, Lossless Compression, Lossy Compression, Measuring Information, Lossless Compression, Huffman Encoding, Arithmetic Coding, LZW, Run Length, Predictive Coding.

Suggested Reading:

1. Rafael C Gonzalez and Richard E Woods, "Digital Image Processing", Pearson Education, 3nd Edition, 2008.
2. Vipula Singh, "Digital Image Processing with MatLab and lab View", Elsevier
3. Thomas B. Moeslund, "Introduction to Video and Image Processing: Building Real Systems and Applications",Springer, 2012.
4. Milan Sonka, Vaclav Halvac and Roger Boyle, "Image Processing, Analysis, and Machine Vision", Second Edition, Thomson Learning Publishers.
5. Kenneth R.Castleman, "Digital Image Processing", Pearson Education.

Course Code 16ITC301

PROJECT WORK - PROJECT SEMINAR

Instruction	--
Internal Examination	100 Marks
Credits	6

Prerequisites: A prior knowledge of subjects related to the project work is required.

Course Objectives:

1. To help students to develop understanding of a chosen emerging field in any relative domain of their specialization.
2. To prepare students for the dissertation to be executed in 4th semester, solving a real life problem should be focus of Post Graduate dissertation
3. To explore new research from a range of academic disciplines which throws light on the questions unanswered.
4. To showcase cutting edge research on engineering from outstanding academic researchers.

The main objective of the Project Seminar is to prepare the students for the dissertation to be executed in 4th semester. Solving a real life problem should be focus of Post Graduate dissertation. Faculty members should prepare the project briefs (giving scope and reference) at the beginning of the 3rd semester, which should be made available to the students at the departmental library. The project may be classified as hardware / software / modeling / simulation. It may comprise any elements such as analysis, synthesis and design.

The department will appoint a project coordinator who will coordinate the following:

- Allotment of projects and project guides.
- Conduct project - seminars.

Each student must be directed to decide on the following aspects

- Title of the dissertation work.
- Organization.
- Internal / External guide.
- Collection of literature related to the dissertation work.

Each student must present a seminar based on the above aspects as per the following guidelines:

1. Submit a one page synopsis before the seminar talk for display on the notice board.

2. Give a 20 minutes presentation through OHP, PC followed by a 10 minutes discussion.
3. Submit a report on the seminar presented giving the list of references.

Project Seminars are to be scheduled from the 3rd week to the last week of the semester. The internal marks will be awarded based on preparation, presentation and participation.

Course Outcomes:

Upon completion of this course, the student will be able to

1. Develop and support a relevant and informed thesis, or point of view, that is appropriate for its audience, purpose, discipline, and theme.
2. Demonstrate effective writing skills and processes by employing the rhetorical techniques of academic writing, including invention, research, critical analysis and evaluation, and revision.
3. Effectively incorporate and document appropriate sources in accordance with the formatting style proper for the discipline and effectively utilize the conventions of standard written English.
4. Better understand the role that effective presentations have in public/professional contexts and gain experience in formal/informal presentation.
5. Identify and critically evaluate the quality of claims, explanation, support, and delivery in public and professional discourse, and understand the factors influencing a speaker's credibility.
6. Develop audience-centered presentations meeting concrete professional objectives and integrating ethical and legal visual aids.

Deliver well-rehearsed and polished presentations meeting time, content, and interactive requirements.

Course Code 16ITC401

PROJECT WORK AND DISSERTATION

Instruction	--
Internal Examination	100 Marks
End Exam - Marks	100 Marks
Credits	12

Prerequisites: A prior knowledge of subjects related to the project work is required.

Course Objectives:

The Objectives of the dissertation are to:

1. Put into practice theories and concepts learned on the programme
2. Provide an opportunity to study a particular topic in depth;
3. Show evidence of independent investigation;
4. Combine relevant theories and suggest alternatives;
5. Enable interaction with practitioners (where appropriate to the chosen topic);
6. Show evidence of ability to plan and manage a project within deadlines

The students must be given clear guidelines to execute and complete the project on which they have delivered a seminar in the 3rd semester of the course.

All projects will be monitored at least twice in a semester through student's presentation. Sessional marks should be based on the grades/marks, awarded by a monitoring committee of faculty members as also marks given by the supervisor.

Efforts be made that some of the projects are carries out in industries with the help of industry coordinates.

Common norms will be established for documentation of the project report by the respective department.

The final project reports must be submitted two weeks before the last working day of the semester.

The project works must be evaluated by an external examiner and based on his comments a viva voice will be conducted by the departmental committee containing of HOD, two senior faculty and supervisor.

Course Outcomes:

On satisfying the requirements of this course, students will have the knowledge and skills to:

1. Plan, and engage in, an independent and sustained critical investigation and evaluation of a chosen research topic relevant to environment and society
2. Systematically identify relevant theory and concepts, relate these to appropriate methodologies and evidence, apply appropriate techniques and draw appropriate conclusions
3. Engage in systematic discovery and critical review of appropriate and relevant information sources
4. Appropriately apply qualitative and/or quantitative evaluation processes to original data\
5. Understand and apply ethical standards of conduct in the collection and evaluation of data and other resources
6. Define, design and deliver an academically rigorous piece of research;
7. Understand the relationships between the theoretical concepts taught in class and their application in specific situations
8. Show evidence of a critical and holistic knowledge and have a deeper understanding of their chosen subject area
9. Appreciate practical implications and constraints of the specialist subject