Sl. No.	Course Code	Course Title	Contact Hours				Credits	% Weightage				ESE Duration Hrs.
			L	T	P	Total Contact Hrs.		MSE - I	MSE - II	TA	ESE	
I SEMESTER												
1	IT1901	Advanced Database Systems	3	0	0	3	3	15	15	10	60	3
2	IT1902	Lab: Advanced Database Systems	0	0	2	2	1			40	60	
3	IT1903	Advances in Algorithms	3	0	0	3	3	15	15	10	60	3
4	IT1904	Lab: Advances in Algorithms	0	0	2	2	1			40	60	
5	IT1905	Soft Computing	3	0	0	3	3	15	15	10	60	3
6	IT1906	Lab: Soft Computing	0	0	2	2	1			40	60	
7	IT1907	Advanced Computer Architecture	3	0	0	3	3	15	15	10	60	3
8	**Professional Elective-I**		3	0	0	3	3	15	15	10	60	3
	IT1908	Geographical Information Systems										
	IT1909	Artificial Intelligence										
	IT1910	Internet Technology										
	IT1911	High Performance Computer Networks										
Total			**15**	**0**	**6**	**21**	**18**					

II SEMESTER												
1	IT1912	Parallel Computing	3	0	0	3	3	15	15	10	60	3
2	IT1913	Lab: Parallel Computing	0	0	2	2	1			40	60	
3	IT1914	Object Oriented Systems	3	0	0	3	3	15	15	10	60	3
4	IT1915	Lab: Object Oriented Systems	0	0	2	2	1			40	60	
5	IT1916	Business Intelligence & Analytics	3	0	0	3	3	15	15	10	60	3
6	IT1917	Lab:Business Intelligence & Analytics	0	0	2	2	1			40	60	
7	IT1918	Computer System Secutity	3	0	0	3	3	15	15	10	60	3
8	**Professional Elective-II**		3	0	0	3	3	15	15	10	60	3
	IT1919	Advanced Digital Image Processing										
	IT1920	Advanced Compiler Design										
	IT1921	Bioinformatics										
	IT1922	Mobile Communication Systems										
9	IT1923	Seminar	0	0	2	2	1			100		
Total			**15**	**0**	**8**	**23**	**19**					

Chairperson		Date of Release	May 2014
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Applicable for AY 2014-15 Onwards

III SEMESTER

1	**Professional Elective-III**		3	0	0	3	3	15	15	10	60	3
	IT1924	Distributed Systems										
	IT1925	Operation Research Techniques										
	IT1926	Pattern Recognition										
	IT1927	Wireless Sensor Networks										
	IT1928	Software Architecture										
2	**Professional Elective-IV**		3	0	0	3	3	15	15	10	60	3
	IT1929	Cloud Computing										
	IT1930	Computer Vision										
	IT1931	Cyber Forensics										
	IT1932	Internet Routing Design										
	IT1933	Embedded Systems Design										
	IT1934	Management Information Systems										
3	IT1935	Project Phase- I	0	0	16	16	8			100		
Total			**6**	**0**	**16**	**22**	**14**					

IV SEMESTER

1	IT1936	Project Phase - II	0	0	24	24	12	40	60	
Total			**0**	**0**	**24**	**24**	**12**			
Grand Total Of Credits							**63**			

I Semester

IT1901	Advanced Database Systems	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Unit 1:

Introduction to DBMS, SQL Overview, Anatomy of DBMS, process, memory and disk structure.

[07 Hrs]

Unit 2:

ACID properties Implementation , Concurrency control and Isolation level, implementation of commit, Log based Recovery, Read consistency, write consistency, implementation of Read consistency, write consistency using time stamped based protocol and log based protocol.

[06 Hrs]

Unit3:

Logical and Physical storage: table storage, index organized table, clusters, partitions, Query optimization: Generation of query execution plan, representation, cost based and rule based optimization, Access path optimization, join optimization.

[07 Hrs]

Unit 4:

Security and auditing , Introduction to Database Security Issues, Types of Security, Database Security and DBA,Access Protection, User Accounts, and Database Audits, Materialized Views , Query rewriting.

[06 Hrs]

Unit 5:

Distributed databases: homogeneous and heterogeneous, distributed data storage, distributed transactions, ACID properties in distributed database.

[06 Hrs]

Unit 6:

Introduction to Parallel database architecture, Hadoop file system, columnar databases.

[08 Hrs]

Text books :

- Database System Concepts *Sixth Edition*. Avi Silberschatz · Henry F.*Korth* · S. Sudarshan. McGraw-Hill ISBN 0-07-352332-1
- Fundamentals of Database Systems *5th Edition*. Textbook authors: Shamkant B. *Navathe*, Ramez Elmasri Addison-Wesley ISBN: 9780321369574////978-81-317-1625-0
- *Distributed Databases*. Author, Stefano CERI. Publisher, McGraw-Hill, 1988. ISBN, 0070265119, 9780070265110.

Reference Books:

- Principles of Distributed Database Systems 3rd Edition Author Özsu, M. Tamer, Valduriez, Patrick Springer
- Readings in Database Systems, Third Edition (The Morgan Kaufmann Series in Data Management Systems) [Paperback]
- Michael Stonebraker (Author), Joseph Hellerstein (Author)
- Oracle 11g Concepts guide
- Oracle 11g Administration Guide
- Oracle 11g Performance and Tuning
  Lab Experiments based on above syllabus

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
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IT1903	Advanced Algorithms	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Prerequisites: Data Structures, Elementary algorithmic, efficiency of algorithms, Asymptotic Notations

Unit I: Algorithmic analysis: Analyzing control structures, Solving recurrences, Review of data structures. Amortized Analysis **Greedy algorithms**: General characteristics, Graphs algorithms, Scheduling. Mininmum spaning tree

[06 Hrs]

Unit II: Divide and conquer algorithms: General template, Searching, Sorting, Matrix multiplication,. **Dynamic programming**: Principle of optimality, shortest paths, Chained matrix multiplication, Approaches using recursion, Memory functions, Knapsack Problems Multistage graphs.

[08 Hrs]

Unit III: Linear programming: Formulating problems as linear programs, The simplex algorithm, Duality.Algorithms on Arrays, String matching Algorithms

[06 Hrs]

Unit IV: Probabilistic algorithms: Introduction, Pseudorandom generation, Numerical probabilistic algorithms, Monte Carlo algorithms, Las Vegas algorithms.

[08 Hrs]

Unit V: Parallel algorithms: Basic techniques, Parallel evaluation of expressions, Parallel sorting networks, parallel sorting and distributed computation.

[06 Hrs]

Unit VI: Computational complexity: Introduction, Linear reductions, Introduction to NP-completeness. **Heuristic algorithms and Approximate algorithms**: Heuristic algorithms, NP-hard approximation problems.

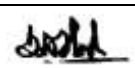
[06 Hrs]

Text Books:

1. T. H. Cormen, C. E. Leiserson, Rivest, C. Stein, “Introduction to Algorithms”, PHI.

Reference Books:

1. G. Brassard, P. Bratley, “Fundamentals of Algorithmics”, PHI
2. A.V. Aho, J. E. Hopcroft, J.D. Ulman, “The Design & Analysis of Computer Algorithms”, Addison Wesley.3. Horowitz E., Sahni S, Rajasekharan S., “Fundamentals of computer algorithms”, University press

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

IT905	Soft Computing	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Course Objectives:-

1. To understand the Soft Computing and how it is different from Hard Computing.
2. To comprehend the basics of each of the three Soft Computing methodologies and to understand their advantages and limitations.
3. To analyze and design a given system using Soft Computing methodologies.
4. To understand the basic principles of hybrid systems and their applications.

Unit I : [7 Hrs]
Introduction to soft Computing**,** History of Neural Networks**,** overview of biological Neural system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, Neural Network Learning Rules.

UNIT-II: [7 Hrs]
ANN training Algorithms, Multilayer Perceptron Model, Back Propagation Algorithm, Hopfield Networks, Self Organizing map, Associative Memories, ART networks, Applications of Artificial Neural Networks.

Unit III: [6 Hrs]
Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Operations on Fuzzy Sets**:** Compliment, Intersections, Unions, fuzzy relations, Cylindrical extension, projection, and composition.

Unit IV: [6 Hrs]
Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Fuzzy inference, design of a fuzzy controller, Extension principal, Fuzzy Inference Systems, Fuzzy Information Retrieval.

Unit V: [7 Hrs]
Introduction to genetic algorithms (GA):overview of GA, operators in GA- selection, crossover, mutation, GA cycle, GA in problem solving.

Unit VI:[7 Hrs]
Introduction to Hybrid Systems:- types of hybrid systems:- Sequential, Auxiliary and Embedded hybrid systems, Neuro-fuzzy, Neuro-Genetic and Fuzzy-Genetic hybrid systems, Applications of Soft Computing and case studies.

Course Outcomes:-
At the end of the course student will be able to:-

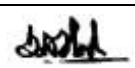
1. define soft computing and differentiate between hard and soft problems.
2. understand the basic principles of working of each of the soft computing methodologies (neural networks, fuzzy logic and genetic algorithms).
3. select appropriate soft computing methodology for the given problem and analyze and design an effective system for solving the problem using the methodology selected.
4. to comprehend the basics of hybrid systems and their applications.

Text Books:

1. Karray and Silva, Soft Computing and Intelligent System Design, Pearson education (LPE), 2009
2. Introduction to Artificial Neural Systems,J. M. Zurada,Second Ed. (1994),Jaico Publishing House
3. Fuzzy Logic With Engineering Applications, T. J. Ross, 2004, McGraw Hill
4. An Introduction to Genetic Algorithms (Complex Adaptive Systems), Melanie Mitchell, MIT Press.

Reference Books

1. Neuro-fuzzy and Soft Computing, JangSun and E. Mizutani, 1996, Prentice Hall.
2. Real life applications of Soft Computing, AnupamShukla, RituTiwari, Rahul Kala, 2010,CRC Press

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

IT1907	Advanced Computer Architecture	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Unit I: [05 Hrs.]
Classification of parallel computers, Multiprocessors and multicomputer, Multi vector and SIMD computers.

Unit II: [07 Hrs.]
Conditions of parallelism, Data and resource Dependencies, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms

Unit III: [08 Hrs.]
Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design, Computer arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines

Unit IV: [06 Hrs.]
Cache basics & cache performance, reducing miss rate and miss penalty, multilevel cache hierarchies, main memory organizations, design of memory hierarchies.

Unit V: [06 Hrs.]
Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors.

Unit VI: [08 Hrs.]
Symmetric shared memory architectures, distributed shared memory architectures, models of memory consistency, cache coherence protocols (MSI, MESI, MOESI), scalable cache coherence, overview of directory based approaches, design challenges of directory protocols, memory based directory protocols, cache based directory protocols, protocol design tradeoffs, synchronization.

Text Books:
1. Kai Hwang, “Advanced Computer Architecture”; TMH.

Reference Books:
1. Harvey G.Cragon, ”Memory System and Pipelined processors”; Narosa Publication.
2. V.Rajaranam & C.S.R.Murthy, “Parallel computer”; PHI
3. R.K.Ghose, Rajan Moon & Phalguni Gupta, “Foundation of Parallel Processing”, Narosa Publications
4. Kai Hwang and Zu, “Scalable Parallel Computers Architecture”, MGH.
5. D.Sima, T.Fountain, P.Kasuk, “Advanced Computer Architecture-A Design space Approach,”Addison Wesley,
6. M.J Flynn, “Computer Architecture, Pipelined and Parallel Processor Design”; Narosa Publishing.
7. Hwan and Briggs, “Computer Architecture and Parallel Processing”; MGH

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
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IT1908	Geographical Information Systems	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Course Objectives:

1. Introduction to the concepts, principles, and theories behind Geographic Information Systems and Science (GIS), with emphasis on the nature of geographic information, data models and structures for storing geographic information, geographic data input, data manipulation, and simple spatial analysis and modeling techniques.
2. Identify the applications in GIS

UNIT I: [7 Hrs]

Fundamentals of GIS and Cartography : Roots of GIS, Four M's, Definition, GIS Architecture, Models of GIS, Framework for GIS, GIS Categories, Map as a Model, Spatial Referencing System, Map Projections, Commonly Used Map Projections, Grid Systems, Cartographic Symbolization, Types of Maps, Typography, Map Design, Map Productions, Map Applications.

UNIT II: [7 Hrs]

Data Management, Models and Quality Issues : Conceptual Models, Geographical Data Models, Data Primitives, Data Types - Raster and Vector Approach, Data Modeling and Spatial Analysis, Sources of Geographical Data, Data Collectors and Providers, Creating Digital Data Sets, Data Presentation, Data Updating, Data Storage, Spatial Data Costs, Quality of GIS Output, Sources of Errors in Spatial Data, Factors affecting Reliability of Spatial Data, Faults from Assumptions.

UNIT III: [8 Hrs]

Remote Sensing Fundamentals : Remote Sensing - Basic Principles, Electromagnetic Remote Sensing,Energy Sources, Energy Interactions with Earth's Surface Materials,Microwave Remote Sensing, The Radar Principle, Factors Affecting Microwave Measurements, Radar Wavebands, SLAR Systems, Sar, , Interpreting Sar Images, Geometrical Characteristics, Remote Sensing , Platform and Sensors, Satellite System Parameters, Sensor Parameters,Imaging Sensor Systems, Earth Resources Satellites, Meteorological Satellites.

UNIT IV: [7 Hrs]

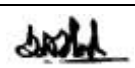
Image Processing : Digital Image Processing, Basic Character of Digital Images, Preprocessing, Registration, Enhancement, Spatial Filtering, Transformations, Classification, Image Classification and GIS, Visual Image Interpretation, Types of Pictorial Data Products, Image Interpretation Strategy, Image Interpretation Process, Overview of Image Interpretation Equipments.

UNIT V: [6 Hrs]

Terrain Mapping, Geocoding and Segmentation : Interpolation, Visualization of Continuous Surfaces, Data Sources forInterpolations, Methods for Interpolations, Global Interpolation, LocalDeterministic Methods, Comparison of Global and Local Method, Optimal
Interpolation Using Geo Statistics – Kriging, Variogram, Geocoding,Applications of Geocoding, Dynamic Segmentation, Applications of DynamicSegmenation.

UNIT VI:[6 Hrs]

Issues and Applications in GIS :
Changes in Technology, Data Supply and Users, Role of Satellite Imagery and Data Sets, Urban and Municipal Applications, Other Applications.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

Course Outcomes : At the end of the course students will be able to :

1. Describe what GIS is; name the major GIS software available; know where to find more Information.
2. Explain the components and functionality of a GIS and the differences between GIS and Other information systems.
3. Understand the nature of geographic information and explain how it is stored in computer(including map projection) and the two types of GIS data structure.
4. Enlist the issues and applications in GIS.

Books:

1. Peter A Burrough and McDonell, “Principles of Geographical InformationSystems”, Oxford University Press, 1998.
2. M. AnjiReddi, “Remote Sensing and Geographical Information Systems”, B.S. Publications, Second Edition, 2001.
3. George B Korte, “The GIS Book”, Onword press, Thomson Learning, 5th Edition, 2003.
4. Kang-tsung Chang, “Introduction to Geographical Information Systems”, TataMcGraw Hill, Third Edition, 2003.

IT1909	Artificial Intelligence	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Objectives:-

1. Describe the key components of the artificial intelligence (AI) field
2. Describe search strategies and solve problems by applying a suitable search method
3. Describe minimax search and alpha-beta pruning in game playing.
4. Describe and apply knowledge representation
5. Describe and list the key aspects of planning
6. Describe the key aspects of intelligent agents
7. Describe the key aspects of Evolutionary computation, including genetic algorithms and natural language ..
8. Describe the key aspects of Machine learning and expert system.

UNIT I : **[7 Hrs]**
INTRODUCTION : Intelligent Agents – Agents and environments - Good behavior – The nature of environments – structure of agents - Problem Solving - problem solving agents – example problems – searching for solutions – uniformed search strategies - avoiding repeated states – searching with partial information.

UNIT II : **[7 Hrs]**
SEARCHING TECHNIQUES :Informed search and exploration – Informed search strategies – heuristic function – local search algorithms and optimistic problems – local search in continuous spaces – online search agents and unknown environments - Constraint satisfaction problems (CSP) – Backtracking search and Local search for CSP – Structure of problems - Adversarial Search – Games – Optimal decisions in games – Alpha – Beta Pruning – imperfect real-time decision – games that include an element of chance.

UNIT III: **[7 Hrs]**
KNOWLEDGE REPRESENTATION :First order logic – representation revisited – Syntax and semantics for first order logic – Using first order logic – Knowledge engineering in first order logic - Inference in First order logic – prepositional versus first order logic – unification and lifting – forward chaining – backward chaining - Resolution - Knowledge representation - Ontological Engineering - Categories and objects – Actions - Simulation and events - Mental events and mental objects

UNIT IV : **[7 Hrs]**
LEARNING :Learning from observations - forms of learning - Inductive learning - Learning decision trees - Ensemble learning - Knowledge in learning – Logical formulation of learning – Explanation based learning – Learning using relevant information – Inductive logic programming - Statistical learning methods - Learning with complete data - Learning with hidden variable - EM algorithm - Instance based learning - Neural networks - Reinforcement learning – Passive and active reinforcement learning ,Generalization in reinforcement learning.

UNIT V: **[6 Hrs]**
Design and development of Expert Systems

UNIT VI : **[6 Hrs]**
Natural Language Understanding :Communication, Formal grammar for a fragment of English – Syntactic analysis – Augmented grammars – Semantic interpretation – Ambiguity and disambiguation – Discourse understanding – Grammar induction - Probabilistic language processing - Probabilistic language models – Information retrieval and Extraction – Machine translation.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

Outcomes :-
Students are able to:

1. Apply artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning.
2. To design and implement appropriate solutions for search problems (such as playing two-person games) and for planning problems (such as determining a sequence of actions for a robot).
3. To analyse problem specifications and derive appropriate solution techniques for them.
4. To design expert system .

TEXT BOOKS:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, 2nd Edition, Pearson Education / Prentice Hall of India, 2004.
2. George F. Luger, “Artificial Intelligence-Structures And Strategies For Complex Problem Solving”, Pearson Education / PHI, 2002.

REFERENC BOOKS:

1. Nils J. Nilsson, “Artificial Intelligence: A new Synthesis”, Harcourt Asia Pvt. Ltd., 2000.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, 2nd Edition, Tata McGraw-Hill, 2003.

IT1910	Internet Technology	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Course Objectives:
At the end of the course, the students will be able to:
1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

UNIT I: [7 Hrs]
The OSI Model and The TCP/IP Protocol Suite:
Protocol Layers ,The OSI Model , TCP/IP Protocol Suite , Addressing ,**Underlying Technologies :** Wired Local Area Networks , Wireless LANs , IEEE 802.11, Point-to-Point WANs, Connecting devices

UNIT II: [7Hrs]
Network Layer : Introduction to Network Layer , Switching, Packet Switching at Network Layer, Network Layer Services , Other Network Layer Issues,IPv4 Addresses , Classful Addressing , Classless Addressing , Special Addresses , NAT ,Delivery and Forwarding of IP Packets.

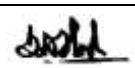
UNIT III: [6 Hrs]
Internet Protocols: Introduction , Datagrams , Fragmentation , Options ,Checksum , IP over ATM, Security , IP Package , **Address Resolution Protocol (ARP) :** Address Mapping , ARP Protocol , ATMARP , ARP Package , Internet Control Message Protocol ICMPv4 and ICMPv6, **Mobile IP :** Addressing , Agents , Three Phases , Inefficiency in Mobile IP .

UNIT IV: [6 Hrs]
Transport Layer : Introduction to the Transport Layer , Transport-Layer Services , Transport-Layer Protocols ,User Datagram Protocol (UDP) , Transmission Control Protocol (TCP) , SCTP

UNITV: [7 Hrs]
Application Layer: Introduction to the Application Layer ,Client-Server Paradigm , Peer-to-Peer Paradigm , **Host Configuration:** BOOTP**,** DHCP ,Domain Name System (DNS) , **Remote Login:** TELNET and SSH , **File Transfer:** FTP and TFTP

UNIT VI: [7 Hrs]
World Wide Web and HTTP, **Electronic Mail:** SMTP, POP, IMAP, MIME , **Network Management:** SNMP , **Multimedia:** Streaming Stored and Live Audio/Video, RTP , RTCP, Voice Over IP (VOIP), SIP, VPN.

Learning Outcomes:
After completing this course the student must demonstrate the knowledge and ability to:
1. Independently understand basic computer network technology.
2. Understand and explain Data Communications System and its components.
3. Identify the different types of network topologies and protocols.
4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
5. Identify the different types of network devices and their functions within a network
6. Understand and building the skills of subnetting and routing mechanisms.
7. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

Text Book:

1. TCP/IP Protocol Suite - Behrouz A. Forouzan , Fourth Edition , McGraw-Hill .

Reference Books:

1 Communication Networks, 2/e - Alberto Leon-GarciaIndraWidjaja, McGraw-Hill.
2 Internetworking with TCP / IP - Douglas E .Comer; PE.
3 Computer Networks - Andrew S. Tannenbaum; PHI.
4 Computer Networks and Internets - Douglas E. Comer; PE.
5 Data and Computer Communication - William Stallings; PHI.

IT1911	High Performance Computer Networks	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Objectives:
Understanding of how modern networks provide high performance and advanced classes of service, with a focus on topics such as high-performance networks like ATM, performance factors and performance modeling, quality of service protocols in IP networks, and investigate voice-over-IP, mobile IP networks.

UNIT I: [7 Hrs]
BACKGROUND: A Brief Networking History, The Need For Speed And Quality Of Service, Advanced TCP/IP and ATM Networks, Protocols and The TCP/IP Suite, TCP and IP, IPv6.

UNIT II: [6 Hrs]
HIGH-SPEED NETWORKS: Frame Relay, Asynchronous Transfer Mode, High-Speed LANs.

UNIT III: [6 Hrs]
PERFORMANCE MODELING AND ESTIMATION: Overview of Probability and Stochastic Process, Queuing Analysis, Self-Similar Traffic.

UNIT IV: [7 Hrs]
CONGESTION AND TRAFFIC MANAGEMENT: Congestion Control in Data Networks, Link-Level Flow and Error Control, TCP Traffic Control, Traffic and Congestion Control in ATM Networks.

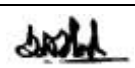
UNIT V: [7 Hrs]
INTERNET ROUTING: Overview of Graph Theory and Least-Cost, Interior Routing Protocols, Exterior Routing Protocols and Multicast.

UNIT VI: [7Hrs]
QUALITY OF SERVICE IN IP NETWORKS: Integrated and Differentiated Services: Protocols for QoS Support.

Learning Outcomes:
At the completion of the subject, students should be able to:
1. Define the various high-speed networking technologies and their design issues.
2. Perform the Queuing Analysis theory to estimate the performance parameter for network traffic volume.
3. Compare and contrast the congestion control mechanism and traffic management used in high-speed network environment.
4. Conclude the Quality of Service (QoS) in IP Networks and evaluate their performances

Text Book :
1. William Stallings: High Speed Networks and Internets, performance and quality of service, second edition, Pearson Education

Reference Books:
1. Communication Networks, 2/e - Alberto Leon-GarciaIndraWidjaja, McGraw-Hill.
2. M Shwartz: Telecommunication Network Protocol Modeling and Analysis:Addison Wesley
3. Fred Halsall: Data Communication Computer Networks, And Open Systems: Addison Wesley
4. Kershanbaum : Telecommunication Network Design Algorithms: McGraw-Hill
5. Computer Networks & Internet: Comer

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

II Semester

IT1912	Parallel Computing	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Unit-1 : **[6Hrs]**

Introduction to parallel computing: need of ever increasing performance, building parallel systems, need to write parallel programs, Parallel hardware: SIMD systems, MIMD systems, Interconnection networks,. Cache coherence, Shared-memory versus distributed-memory,Parallel Software: Caveats, Coordinating the processes/threads, Shared-memory, Distributed-memory, Programming hybrid systems.

Unit-2: **[7Hrs]**

Parallel Programming Platforms: implicit parallelism, Limitation of Memory system performance, Dichotomy of parallel computing platforms, physical organization of parallel platforms, communication cost in parallel machines.

Unit-3:

Dependence Concepts : Basic introduction of dependence in single loop and double loop, index and iteration spaces and perfect loop nest, test for dependences, GCD test, Bound test.

Unit-4: **[8Hrs]**

Shared-Memory Programming with OpenMP: What is OpenMP, creating team of threads, OpenMP Memory model, thread synchronization, Directives, Sharing the Work among Threads in an OpenMP Program : Loop Construct, The Sections Construct , The Single Construct , Workshare Construct, Combined Parallel Work-Sharing Constructs ,Clauses to Control Parallel and Work-Sharing Constructs, OpenMP Synchronization Constructs ,Interaction with the Execution Environment, OpenMP Clauses : If Clause , Num threads Clause, Ordered Clause, Reduction Clause, Copyin Clause ,Copyprivate Clause ,Advanced OpenMP Constructs: Nested Parallelism , Flush Directive , Threadprivate Directive.

Unit-5: **[7Hrs]**

Distributed-Memory Programming with MPI :

Compilation and execution,MPI programs ,MPI_Init and MPI_Finalize, Communicators: MPI_Comm_ size and MPI_ Comm_rank, MPI_Send ,MPI_Recv, Message matching, Semantics of MPI_Send and MPI_Recv, Dealing with I/O,Collective communication,MPI derived data types.

Unit-6: **[6Hrs]**

Compute Unified Device Architecture (CUDA):

CUDA Architecture, Introduction to CUDA C, Kernel Call, Passing parameters, Querying Devices, Thread Cooperation: Splitting blocks, Shared Memory and Synchronization.

Text and Reference Books:

1. Introduction to Parallel Computing by AnanthGrama, Anshul Gupta, George Karypis, Vipin Kumar, Addison Wesley, Second edition.
2. Dependence Concept by Utpal Banerjee (Intel Corporation) Kluwer Academic Publishers
3. CUDA by Example:An IntroductIon to General- Purpose GPU Programming by Jason Sanders,Edward Kandrot (Addison Wesley)
4. Using OpenMP by Barbara Chapman, Gabriele Jost, Ruud van der Pas (MIT Press)
5. An Introduction to Parallel Programming by Peter S. Pacheco , Morgan Kaufmann.

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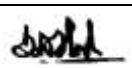
Dean (Acad. Matters)		Version	**1.00**	

IT1914	Object Oriented Systems	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

OBJECTIVES: -

- Learn what the **object-oriented (OO) approach** to software development is, through OO principles and design patterns.
- Practice the application of principles of object-oriented software development through the course
- Learn the concepts such as reuse, quality, iterative development, and risk management.

Unit I: [06 Hrs]

Introduction: Software Engineering, object orientation and reusable technology

Unit II: [06 Hrs]

Developing requirements: Domain analysis, types of requirements.
Modeling with classes: UML, essentials of UML class diagrams, associations and multiplicity, generalization, instance diagrams

Unit III: [08 Hrs]

Design patterns: Abstraction-occurrence pattern, general hierarchical pattern, play-role pattern, singleton pattern, observer pattern, delegation pattern, adaptor pattern, facade pattern, immutable pattern, read-only interface pattern and proxy pattern
Focusing on users and their tasks: User-centered design, characteristics of users, developing use case models of systems, the basics of user interface design, usability principles, evaluating user interfaces

Unit IV: [06 Hrs]

Modeling interactions and behavior: Interaction diagrams, state diagrams, activity diagrams, **Designing and testing software**: The process of design, principles leading to good design, techniques for making good design decisions, software architecture, writing a good design document

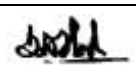
Unit V: [08 Hrs]

Testing and inspecting: Basic definitions of defect, error and failure, effective and efficient testing, defects in ordinary and numerical algorithms, defects in timing and coordination, defects in handling stress and unusual situations, documentation defects, writing formal test cases and test plans, strategies for testing large software, inspections, quality assurance in general. **Managing the software process**: Project management, software process model, cost estimation, building software engineering teams, project scheduling and tracking, contents of a project plan

Unit VI: [06 Hrs]
Case studies on the analysis and design of object oriented systems

OUTCOMES : -

1) Analyse and model requirements and develop software using object-oriented analysis and design,
2) 2)Express object models in UML
3) Design basic object-oriented software systems that meet requirements by applying OO software development principles and design/architectural patterns.
4) Work as a member of a software development team

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

Text Book:

1. Timothy Lethbridge, Robert Langaniere, "Object-Oriented Software Engineering Practical software development using UML and Java", Mcgraw-Hill

Reference Books:

1. Roger S. Pressman, "Software Engineering A Practitioner's Approach", 5th Ed. Tata McGraw Hill.
2. Grady Booch, James Rumbaugh, Ivar Jacobson "The Unified Modeling Language User Guide", Addison-Wesley.
3. Edwards Yourdon, Carl Argila, "Case Studies in Object Oriented Analysis and Design", Prentice Hall.
4. Booch, Rumbaugh & Jacobson, "The Unified Modeling Language User Guide", Addison-Wesley.
5. Bernd Bruegge, Allen H. Dutoit "Object Oriented Software Engineering: Using UML, Patterns and Java", Pearson Education

IT1916	Business Intelligence & Analytics	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Unit 1: Introduction to Business intelligence and Multidimensional Modeling:
Introduction to OLTP, OLAP, BI definition and concepts, Business applications of BI, BI roles and responsibilities, Multidimensional data model, ER- modeling Vs. multidimensional modeling, concepts of dimension, facts, cubes, concept hierarchies, star, snowflake and Fact constellation ,Schemas for multidimensional database, OLAP operations in Multidimensional data model.

[07 Hrs]

Unit 2: ETL- Data source categorization, data transformation: Basic Tasks, Major Transformation Types, Data Integration and Consolidation, Loading data from multiple sources, loading data in stages.

[06 Hrs]

Unit 3: Social Media Analytics:
Social network analysis, representation of social data, social media analysis, using Open source tools to collect and analyze data of social media.

[06 Hrs]

Unit 4 : Mining Frequent Patterns and Association Rules:
Market Basket Analysis, Frequent Itemsets and Association rules, Apriori Algorithm, improving the efficiency of Apriori, FP- growth Algorithm.

[07 Hrs]

Unit 5: Classification and Clustering:
Classification : Introduction, decision tree, building a decision tree- the tree induction algorithm, split algorithm based on information theory, gini index, overfitting and pruning, decision tree rules, naïve Bayes method.
Clustering : Types of data in cluster analysis, categorization of major clustering methods: Partitioning methods, Hierarchical methods. Applications of clustering.

[08 Hrs]

Unit 6: Visualization and Prediction:
Visualization : Motivation for visualization, general concepts, techniques
Prediction: Linear regression (least square method), analyzing regression error, analyzing goodness of fit.

[06 Hrs]

Text books:

1. Introduction to data mining ,Pang-Ning Tan, Michael Steinbach, vipin kumar, Addison- Wesley 2005 ISBN: 0321321367.
2. Data mining Techniques 2nd edition(2006) , Jiawei Han and Micheline Kamber, Elsevier.
3. Business Intelligence, David Loshin.

Reference books:

1. Data Warehousing ETL toolkit, Indian edition.
2. Data mining methods and models, second reprint 2007, Daniel Larose Wile interscience.
Practicals based on the syllabus using various open source tools.

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IT1918	Computer System Security	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Course Objectives:
At the end of the course, the students will be able to:
1. Build an understanding of basic components of computer security.
2. A knowledge of security policies for integrity and confidentiality.
3. Understand and explain design principles for security.
4. A knowledge of a set of security attacks and the safeguards to prevent them.

UNIT I: (7 hr)
Introduction , security attacks, security services, security mechanisms, a model for network security, encryption model, steganography, classical encryption techniques, modern techniques - block cipher principles, data encryption standard, differential and linear cryptanalysis, block cipher modes of operation, algorithm – triple DES, international data encryption algorithm.

UNIT II: (6 hr)
Confidentiality using conventional encryption: Placement of encryption function, traffic confidentiality, Public key cryptography: Principles, RSA algorithm, Symmetric Key Management: Diffie – Hellman key exchange, Public Key Distribution: Certification authority, X.509, public key infrastructure.

UNIT III: (7 hr)
Integrity, Authentication: Message integrity, message authentication, cryptographic hash functions, digital signature.

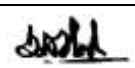
UNIT IV: (7 hr)
Web security: Requirements, secure socket layer, secure electronic transaction.
Database Security: Integrity of database, element integrity, auditability, access control, user authentication, direct attack, indirect attack, aggregation, SQL Injection, defending against SQL injection.

UNIT V:(6 hr)
Program/System Security: Intruders, password management, viruses and related threats, virus countermeasures, worms, distributed denial of service attacks, trojan horses, firewall design principles, trusted systems.

UNIT VI:(7 hr)
Network security: Threats in networks, firewalls and proxies, honeypots,
Networks management security: Basic concepts of SNMP.
Security at Application Layer: Pretty Good Privacy (PGP), S/MIME, data compression using ZIP Radix-64 conversion,

Learning outcomes
After completing this course the student must demonstrate the knowledge and ability to:
1. Critically analyse and describe elements of Computer System Security.
2. Critically analyse and describe a selection of hardware and physical layer security solutions.
3. analyse network security issues and solutions from the LAN and WAN (Internet) perspectives.
4. evaluate platform specific operating systems and application security issues and solutions.
5. Analyse a given case study with a view to determining and evaluating possible security solutions

TEXT BOOKS:
1. Behrouz A. Forouzan “Cryptography and Network Security” The McGraw-Hill.
2. William Stallings “cryptography and networks security” (Pearson Education Prentice Hall).
3. C.P. Pfleeger and S.L.Pfleeger, “Security in Computing”, Pearson Education.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

REFERENCE BOOKS:

1. Atul Kahate, “Cryptography and Network Security”, Tata Mc Graw Hill
2. Scott Mann, Ellen L, Mitchell Krell:”Linux System security: An Administrator Guide to Open Source security Tools “Pearson Education.
3. Brian hatch, James Lee, George Kurtz:”hacking Linux Exposed: Linux Security Secrets & Solutions”, Tata McGraw-Hill
4. Matt Bishop, “Computer Security: Art and Science”, Pearson Education

IT1919	Advanced Digital Image Processing	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Course Objectives:-

1. To analyse the techniques of image enhancement in the frequency and spatial domain.
2. To appreciate the significance of 2-D DFT as an important image processing tool.
3. To understand the problem of image segmentation, its need and study different techniques of it.
4. To understand internal and external representation of an image region and to select appropriate representation for the given problem.
5. To understand the Model of the Image Degradation/ Restoration Process and to apply the principles and techniques of image restoration on the degraded images.
6. To comprehend the basics of color image processing techniques .
7. To understand the basics of image compression and various techniques of compressing images and their performance analysis.

Unit I: [08 Hrs.]
Image Enhancement and Spatial Filtering: A Simple Image Model, Sampling and Quantization, Basic Relationship Between Pixel, Basic gray level Transformations, mathematical tools used in DIP, Histogram Equalization, Histogram Processing, Local Enhancement, Image Subtraction, Image Averaging, Basics of Spatial Filtering, Smoothing Spatial Filtering, Sharpening Spatial Filters,

Unit II: [07 Hrs.]
Frequency Domain Processing: Discrete Fourier Transformation, Fast Fourier Transformation, Fourier Properties, 2D FT, Inverse Fourier Transform, Filtering in Frequency Domain**,** Correspondence between Filtering in the Spatial and Frequency Domain, Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters, Homographic Filtering.

Unit III: [06 Hrs.]
Image Segmentation: Fundamentals, Point, line and edge detection, thresholding, Region Oriented Segmentation, Other Segmentation methods.
Morphing, Representation and Description: Introduction, Basics of morphological operations on images, Chain Code, Polygonal Approximation, Signatures, Boundary Segments, Skeleton of a region, Boundary Descriptors: Simple Descriptors, Shape Numbers, Fourier Descriptors, Regional Descriptors: Simple Descriptors, Topological Descriptors, Texture.

UNIT IV: [06 Hrs.]
Image Degradation and Restoration: Noise Models, Restoration in the presence of Noise only - Spatial Filtering, Periodic Noise reduction by frequency domain filtering, Linear Position-Invariant Degradations, Estimation of Degradation Function, Inverse Filtering, Wiener Filtering, Constrained Least Square Filtering.

UNIT V: [06 Hrs]
Color Image Processing: Color fundamentals and color models, pseudo-color image processing, basics of full color image processing, color transformations, smoothing and sharpening, color image segmentation

Unit VI: [07 Hrs.]
Image Compression: Fundamentals of Image compression, coding redundancy, spatial and temporal redundancy, Irrelevant Information, Measuring Image Information, Fidelity criteria, Image compression models, compression standards, Basic compression methods, Huffman coding, Arithmetic coding, LZW coding, run length coding, digital image watermarking

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

Course Outcomes:-

At the end of the course student will be able to:-

1. to perform the basic image processing operations in the spatial domain and to differentiate between frequency domain and spatial domain.
2. understand the significance of 2-D DFT as an image processing tool and apply it to perform image processing tasks.
3. define image segmentation and explain different techniques of it.
4. differentiate between the internal and external representation of an image region and will be able to choose appropriate representation for the given problem.
5. to understand the basic principles of image degradation and image restoration.
6. to extend the image processing tasks to the domain of color images
7. explain the need for image compression, different techniques for it and the performance parameters to measure the effectiveness of image compression algorithms.

Text Books:

1. Rafael C. Gonzalez & Richard E. Woods, “Digital Image Processing”, Third Edition, 2008, Pearson Education.
2. Tinku Acharya and A. K. Ray, Image Processing Principles and Applications, Wiley Interscience,2005.

Reference Books:

1. A.K.Jain, “Fundamental of Digital Image Processing”, PHI.

IT1920	Advanced Compiler Design	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Prerequisite: Basics of Theoretical Computer Science, Basics of Compilers.

Unit 1: Introduction (6 Hrs)
Review of Compiler Structure, Lexical Analyzer: Implementation and Role, Parsing: Top down and Bottom UP Parsing, Parser Development Tool: YACC, Importance of Code Optimization, Structure of Optimizing Compilers.

Unit 2: Context –Sensitive Analysis & Intermediate Representation (6 Hrs)
Semantic Analysis: Type checking, type conversion, Intermediate code generation (Looping statement, array references in arithmetic expression, procedure call), The Attribute –grammar framework, Adhoc Syntax directed translation, Issues in designing an intermediate languages, Graphical & Linear IR, Static-single Assignment form, Mapping values to names & symbol tables.

Unit 3: Code Optimization (8 Hrs)
Introduction, Redundant expressions, Scope of optimization, Procedural and interprocedural optimization, loop optimization, Global redundancy elimination, Cloning to increase context, Inline substitution, Introduction to control flow analysis, Approaches to control flow analysis, Interval analysis and control trees, Structural analysis, Reaching definitions.

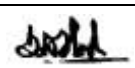
Unit 4: Data Flow Analysis (8 Hrs)
Basic concepts: Lattices, flow functions and fixed points, Lattice of flow functions, defining Use Chains, Data Flow Analysis: Dead Code Elimination, Constant Propagation, Static Single- Assignment Form, Induction Variable Exposure, Iterative data flow analysis, Control –tree based data flow analysis, Structural analysis and interval analysis, Advanced topics: Structures data-flow algorithms and reducibility, Inter procedural analysis (Control flow, data flow, constant propagation, alias).

Unit 5: Instruction Selection & Scheduling (8 Hrs)
Introduction, Instruction selection and code generation, Instruction selection via tree-pattern matching, Instruction selection via peephole optimization, Learning peephole patterns, Generating instruction sequences, Introduction to instruction scheduling, The instruction scheduling problem, List scheduling, Regional scheduling.

Unit 6: Register Allocation (6 Hrs)
Introduction, Issues in register allocation, Local register allocation and assignment, moving beyond single block, Global register allocation and assignment, Variations on Graph Coloring Allocation, Harder problems in register allocation, CASE Study of GCC compiler.

Text Books:

1. Steven S. Muchnick, Advanced Compiler Design Implementation, Elsevier-Morgan Kaufmann Publishers, 2003.
2. Kennedy, Optimizing Compiler for Modern Architecture.
3. Keith D. Cooper and Linda Torczon, Engineering a Compiler, Elsevier-Morgan Kaufmann Publishers, 2004.
4. A.V. Aho, J.D. Ullman, Sethi, Compiler: Principles, Techniques and Tools, Pearson Education
5. Uday Khedker, Amitabha Sanyal, Bageshri Karkare , Data Flow Analysis: Theory and Practice, CRC Press, 2009

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

Reference Books:

1. Andrew Appel, Modern Compiler Implementation in C: Basic Techniques, Cambridge University Press, 1997.
2. Y.N. Srikant, Priti Shankar, The Compiler Design Handbook: Optimizations and Machine Code Generation, CRC Press, 2nd Edition, 2002.
3. David R. Hanson , Christopher W. Fraser, A Retargetable C Compiler: Design and Implementation, Addison-Wesley, 1995
4. Morgan, Robert, Building an Optimizing Compiler, Digital Press Newton, 1998.

IT1921	Bioinformatics	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Objectives: This course provides an introduction to the analysis of biological data using computational methods, as well as investigating problems in molecular and biology from a computational perspective. It is expected that, upon completion of this course, the students will achieve the following objectives:

- Develop an understanding of the basic principles of molecular and cell biology.
- Become familiar with existing tools and resources for computational analysis of biological data, including sequences, phylogenies, microarrays, ontology's, and bio-molecular interactions.
- Develop an awareness of the computational problems that arise in the modelling and analysis of living systems.
- Understand basic abstractions and computational approaches used to formulate and address these problems.
- Be able to use and extend existing computational infrastructure for analyzing biological data.

UNIT I: [06 Hrs.]
Introduction and Information Retrieval : Introduction, Historical overview, Bioinformatics Applications, major databases, data management, data analysis, molecular biology, Tools for Web Search, Data Retrieval tools, Data mining of biological databases.

UNIT II: [07 Hrs.]
Molecular Biology and Bioinformatcis : Introduction to Genes and Proteins Genome Sequences Genome rearrangement, bock allignmeny, global sequence alignment, ORFs, Genes, Intones, Exons, Splice Variants DNA/ RNASecondary Structure, Triplet Coding Protein
Sequences, bioinformatics algorithms.

UNIT III: [07 Hrs.]
Information molecule and information flow : Central dogma of molecular biology, Problem in molecular and bioinformatics approach, Basic component, Chemistry of DNA and RNA, Basics of DNA replication , Introduction to protein ,Amino acid and Protein Structure: Secondary, Tertiary, Quaternary , protein Folding protein function , protein purification and
characterization, Data integration and Data Analysis, Multiplicity of Data and redundancy.

UNIT IV: [07 Hrs.]
Genome Analysis and Gene Mapping : Pairwise Sequence Alignment, Database Similarity Searching :- BLAST,FASTA, Multiple Sequence Alignment, Profiles and Hidden Markov Models, Structure prediction methods for gene, Gene expression and Microarray.

UNIT V: [07 Hrs.]
Protein classification and Structure Visualization, Protein structure Prediction, Proteomics, Protein folding

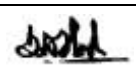
UNIT VI: [06 Hrs.]
Drug Discovery: Introduction, Technology, Cell Cycle, G-Protein coupled Receptor as drug target, applications.

Course Outcome:
At the end of the course, the students would have learnt about

- Sequencing Alignment and Dynamic Programming
- Sequence Databases
- Evolutionary Trees and Phylogeny

Text Books :

1. S.C. Rastogi, Namita Mendirata, Parag Rastogi ''Bioinformatics concepts Skills and application, CBS publisher
2. S.C. Rastogi, Namita Mendirata, Parag Rastogi ''Bioinformatics Methods and application, PHI
3. D. Baxevanis and F. Oulette, (2002), "Bioinformatics: A practical guide to the analysis of genes and proteins", Wiley
4. Arthur M. Lesk, (2002), "Introduction to Bioinformatics" Oxford University

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

IT1922	Mobile Communication Systems	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

COURSE OBJECTIVES:

1. To Study of role of different devices in mobile communication with modern technics .
2. To Study evolution of wireless telecom system
3. To Learn about the diff. networks used in wireless mobile communications.

UNIT-I: [07HRS]
Review of radio transmission, antennas, modulation & demodulation, Radio propagation. Concept of cellular working, Multiplexing in space, frequency time, Code division multiplexing, Spread spectrum medium access methods.

UNIT-II: [08HRS]
Wireless telecom Systems: Evolution, study of 2G system GSM. Network architecture, radio interface, System's internal interfaces, role of VLRs & HLRs. Handover algorithms, security, Operation Maintenance systems.

UNIT-III: [07HRS]
3G Systems & beyond : Evolution towards 3G systems based on GSM & CDMA networks. Radio interface, system internal functioning, handover scenarios, security.

UNIT-IV: [06HRS]
Wireless LAN systems : Medium access control mechanism in 802.11 networks. Radio interface, protocol architecture.

UNIT-V: [07HRS]
Mobile adhoc networks. Algorithms for routing & overall network function. Mobile satellite networks.

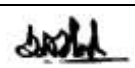
UNIT-VI: [06 HRS]
Support for mobility : Mobile IP, TCP for mobile hosts. Other developments in the TCP/IP stack for mobility support.

COURSE OUTCOMES:
After Completion of this course students will be able to:

1. Analyze basic structure of mobile communication
2. Demonstrate different wireless mobile architecture
3. Prove the basic of 2G,3G,GSM architecture.
4. State and explain support for mobility.

Books :

1. Mobile Communications(2ed- J.Schiller – Pearson Education)
2. Mobile and Personal Communication Systems & Services– Raj Pandya. Prentice Hall.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

IT1923	Seminar	L=0	T=0	P=2	Credits=2

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
		100	100	

The student is expected to study at least four research papers from IEEE/ACM transactions based on any theory course studied in Semester-I and II and deliver a seminar on topic of current research interest that area.

III-Semester

IT1924	Distributed Systems	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

OBJECTIVES: -

1. To study the different design issues of Distributed Operating Systems
2. Create an awareness of the major technical challenges in distributed systems design and implementation;
3. Expose students to current technology and distributed infrastructure software;
4. Expose students to past and current research issues in the field of distributed systems;
5. Provide experience in the implementation of typical algorithms used in distributed systems.

Unit-I **Architecture of Distributed Systems : [6 Hrs]**

Characteristics of Distributed System, Motivation, challenges /Issues in the design & development of Distributed System. Architecture Model, System Architecture, Types of Architectural Model: Client server model, Search engine, Proxy server & caches, Variation on client server model: mobile code, mobile agents. Fundamental Models: Interaction model, failure model, Security model, Inter-process communication, Sockets, middleware, Group communication, and Remote procedure calls.

Unit-II **Distributed Objects & Distributed file system : [6 Hrs]**

RPC,CORBA,RMI ,Distributed file system, Name services, Directory services
File Service types, download/upload model
File sharing semantics, session semantics, Server design : stateless & stateful server, Cache update policies. Case studies on Distributed file system : NFS,AFS.

Unit -III **Theoretical Foundations : [7 Hrs]**

Inherent limitations of distributed systems, Timing issues, clock synchronization, Network time protocol, Lamport's logical clocks, Vector clocks, Casual ordering of messages, Global state, Cuts of Distributed computation, Termination detection.

Unit-IV **Distributed Mutual Exclusion : [8 Hrs]**

Classification of mutual exclusion algorithms, Requirements and performance measures of mutual exclusion algorithms, Leader election, Chang Robert : Ring based leader election algorithm, Bully algorithm. Non Token Based Algorithms : Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm.Token Based Algorithms : Suzuki-Kasami's Algorithm, Raymond's Algorithm, Comparative performance analysis.

Unit-V **Distributed Deadlock Detection & Agreement Protocols: [8 Hrs]**

Resource vs Communication deadlocks, graph theoretic model, deadlock prevention, avoidance, detection, Issues in deadlock detection, Centralized deadlock detection algorithms, distributed deadlock detection algorithms

Agreement Protocols

Synchronous vs. asynchronous computations, model of process failures, authenticated vs. non-authenticated messages. A classification of Agreement problems, Solutions to Byzantine Agreement problem, LSP.

Unit-VI **Failure recovery and Fault Tolerance: [6 Hrs]**

Classification of failures. Backward and forward error recovery, Basic approaches of backward error recovery, recovery in concurrent systems, consistent set of checkpoints, synchronous checkpointing and recovery, asynchronous checkpointing and recovery.
Atomic actions and committing, commit protocols, non-blocking commit protocols, Voting protocols, Dynamic voting protocols, Autonomous vote reassignment.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
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Course Outcomes : After completing this course, students will be able to

1. Analyze and design distributed algorithms for reliable distributed systems.
2. Know how to specify the properties of distributed algorithms, so called liveness and safety properties.
3. Explain the different models of distributed systems, including failure and timing models
4. Master basic algorithms for failure detection, leader elections, broadcast and multicast, basic shared memory in distributed systems, agreement protocols, and group communication
5. Practice in design and implementation of selected distributed algorithms in middleware designed for group communication.

Text Books:

1. Singhal M. & Shivratri N.; *Advanced concepts in operating systems*; McGraw Hill

2. George Coulouris, Jean Dollimore & Tim Kindberg Distributed Operating Systems Concepts and Design 2nd Edition, 2000. Pearson (LPE)

Reference Books:

1. Lynch N., Morgan Kaufman; *Distributed Algorithms*

2. A. Tanenbaum; *Modern Operating Systems*; PHI EEE

IT1925	Operational Research	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

UNIT 1: Problem Solving with Mathematical Models

Application Stories, Optimization and the Operations Research Process, System Boundaries, Sensitivity Analysis, Tractability and Validity, Descriptive Models and Simulation, Numerical Search and Exact versus Heuristic Solutions, Deterministic versus Stochastic Models,Perspectives.

[06 Hrs]

UNIT 2: Deterministic Optimization Models in Operations

Research ,Decision Variables, Constraints, and Objective Functions. Graphic Solution and Optimization Outcomes, Large-Scale Optimization Models and Indexing, Linear and Nonlinear Programs. Discrete or Integer Programs. Multi objective, Optimization Models. Classification,Summary.

[06 Hrs]

UNIT 3: Improving Search

Improving Search, Local and Global Optima. Search with Improving and Feasible Directions. Algebraic Conditions for Improving and Feasible Directions. Unimodal and Convex Model Forms Tractable for Improving Search. Searching for Starting Feasible Solutions.

[06 Hrs]

UNIT 4: Linear Programming Models

Allocation Model, Blending Models, Operations Planning Models. Shift Scheduling and Staff Planning Models .Time-Phased Models, Models with Linearizable Nonlinear Objectives.

[06 Hrs]

UNIT 5: **Simplex Search for Linear Programming** LP Optimal Solutions and Standard Form.Extreme-Point Search and Basic Solutions The Simplex Algorithm. Dictionary and Tableau Representations of Simplex, Two Phase Simplex, Degeneracy and Zero-Length Simplex Steps. Convergence and Cycling with Simplex, Doing It Efficiently: Revised Simplex, Simplex with Simple Upper and Lower Bounds, Interior Point Methods for Linear Programming, Searching through the Interior, Scaling with the Current Solution, Affine Scaling Search, Log Barrier Methods for Interior Point Search, Dual -Dual Extensions.

[08 Hrs]

UNIT 6: Duality and Sensitivity in Linear Programming

Generic Activities versus Resources Perspective. Qualitative Sensitivity to Changes in Model Coefficients, Quantifying Sensitivity to Changes in LP Model Coefficients: A Dual Formulation, Formulating Linear Programming Duals. Primal-to-Dual Relationships.. Computer Outputs and What If Changes of Single Parameters. Bigger Model Changes, Reoptimization and Parametric Programming. Multiobjective Optimization and Goal Programming, Multiobjective Optimization Models. Efficient Points a nd the Efficient Frontier. Preemptive Optimization and Weighted Sums of Objectives , Goal Programming.

[08 Hrs]

Text Books:

1. T. Rardin, Ronald L.,, **"Optimization in operations research**",
Upper Saddle River, N.J.Prentice Hall, c1998

Reference Books:

1. G. Brassard, P. Bratley, "Fundamentals of Algorithmics", PHI
2. A.V. Aho, J. E. Hopcroft, J.D. Ulman, "The Design & Analysis of Computer Algorithms", Addison Wesley.3. Horowitz E., Sahni S, Rajasekharan S., "Fundamentals of computer algorithms", University press

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

IT1926	Pattern Recognition	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs.

OBJECTIVES:

The subject gives a review of the pattern classification and recognition from the mathematical point of view and at the same time, applies the methods to several areas of signal processing. The structure of the general problem of pattern recognition (i.e., pre-processing, feature extraction and classification), can be applied to different areas, such as quality control, biomedical applications and diagnosis, communication systems, image processing, and speech recognition.

UNIT I [05 Hrs.]

Machine perception, Components of Pattern recognition systems, the design cycle, learning and adaptation, Statistical Decision Theory.

UNIT II [08 Hrs.]

Probability-probabilities of events, random variables, joint distribution & densities, moments of random variables, estimation of parameters from samples, minimum risk estimators.

UNIT III [06 Hrs.]

Statistical Decision Making, Baye's Theorem, Decision boundaries, estimation of error rates.

UNIT IV [08 Hrs.]

Non parametric decision Making-Histograms, kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminate functions, squared error, estimation functions, choosing a decision making technique.

UNIT V [07 Hrs.]

Clustering-Introduction, hierarchical clustering, partition clustering, fuzzy c-means clustering.

UNIT VI [07 Hrs.]

Problem of dimensionality, Principal component analysis, Hidden Markov models, Support vector machines Applications of Pattern Recognition.

Course Outcomes:

1. To understand the basic principles of pattern recognition system.
2. To understand the probabilistic distributions and to estimate the parameters of the density from the data available in the training samples.
3. To understand the parametric classification/ decision making concept and to determine the optimal boundary between two classes.
4. To comprehend the non-parametric classification/ decision making concept and to choose an appropriate decision making technique for solving the classification given problem.
5. To understand basic principles of different clustering methods and to select appropriate method for solving the given classification problem.
6. To understand the problem of feature dimensionality, Principal Component Analysis and Hidden Markov Models to design efficient and cost effective Pattern Recognition Systems.

Text books:

1 Pattern recognition & Image processing 2003 EarlGose, Richard Johnsonbaugh & Steve Jost Pearson ducation.

Reference books:

1 Pattern Classification 2006, 2nd Ed. RichardDuda, Peter Hart and David G. Stork Wiley

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

IT1927	Wireless Sensor Networks	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Course Objectives:

1. Introduce wireless sensor network architectures and communications protocols
2. Provide an understanding of mutual relationships and dependencies between different protocols and architectural decisions by offering an in-depth investigation of relevant protocol mechanisms.
3. Introduce sensor network platforms, operating systems and programming tools for sensor networks.
4. Introduce design spaces for sensor networks

UNIT I : [06 Hrs.]
Introduction and overview; key definitions, overview of sensor network protocols, architecture, and applications; simulation and experimental platforms; main features of WSNs; research issues and trends. Comparison of ad hoc and sensor network

UNIT II: [06 Hrs.]
Enabling technologies : Fundamentals of 802.15.4, Bluetooth, and UWB; Physical and MAC layers. Issues in designing MAC protocols, classifications of MAC protocols

UNIT III: [07 Hrs.]
Sensor node hardware and software: mica2, micaZ, telosB, Imote2, tmote, btnode, and Sun SPOT. Software (OS): tinyOS, MANTIS, Contiki, and RetOS. Introduction to Programming tools: C, nesC, Mate.

UNIT IV: [07 Hrs.]
Localization, connectivity, and topology: Sensor deployment mechanisms; coverage issues; node discovery protocols.

UNIT V: [07 Hrs.]
Network layer protocols :issues in designing routing protocols, classifications of routing protocols, Data dissemination and processing; multi-hop and cluster based protocols; routing. Middleware and application layer, Data dissemination; data storage; query processing; sensor Web; sensor Grid.

UNIT VI: [07 Hrs.]
Transport layer and security protocols, Open issues for future research : Energy preservation and efficiency; security challenges; fault-tolerance

Outcomes:
On completion of this course students will able to: ,
1.Know the wireless sensor network architectures
2.Get an overview of the various network level protocols for MAC, classification of MAC
3. Students will learn to program sensor network platforms using TinyOS, C, nesC, Mate .
4. Students will understand what research problems sensor networks pose

Text books:				
1	Protocols and Architectures for Wireless Sensor Networks.	June 2005	H. Karl and A. Willig. John	Wiley & Sons
2	Wireless Sensor Networks: Technology, Protocols, and Applications	March 2007	K. Sohraby, D. Minoli, and T. Znati. John	Wiley & Sons
3	Wireless Sensor Networks	Sept. 2006	C. S. Raghavendra, K. M. Sivalingam, and T. Znati	Springer Verlag
4	Wireless Sensor Networks: Architectures and Protocols	Aug. 2003	E. H. Callaway, Jr. AUERBACH	
5	Networking Wireless Sensors	Dec. 2005	B. Krishnamachari	Cambridge University Press

Reference books:				
1	Ad Hoc Wireless Networks: Architectures and Protocols	2004	C. Siva Ram Murthy and B. S. Manoj	Prentice Hall

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

IT1928	Software Architecture	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

OBJECTIVES: -

- Introduction to the fundamentals of software architecture.
- Software architecture and quality requirements of a software system
- Fundamental principles and guidelines for software architecture design, architectural styles, patterns, and frameworks.

UNIT I: [07HRS]
Software process and the role of modeling and analysis, software architecture, and software design. Software Modeling and Analysis: Analysis modeling and best practices, traditional best practice diagrams such as DFDs and ERDs,

UNIT II: [07HRS]
Software Architecture: architectural styles, architectural patterns, analysis of architectures, formal descriptions of software architectures, architectural description languages and tools, scalability and interoperability issues, web application architectures, case studies.

UNIT III: [06 HRS]
Software Design: design best practices, design patterns, design case studies, component technology, object oriented frameworks, distributed objects, interoperability standards, case studies., software quality

UNIT IV: [07 HRS]
UML diagrams and UML analysis modeling, analysis case studies, analysis tools, analysis patterns, documenting software architecture, reconstructing software architecture.

UNIT V: [06HRS]
Middleware components, programming models, implementation, systems qualities Moving from qualities to architecture and views Components and COTS.

UNIT VI: [06HRS]
Economics- Driven Architecture, Software product line, Software architecture future, case studies.

OUTCOMES : -

1. Design and understand software architecture for large scale software systems.
2. Recognize major software architectural styles, design patterns, and frameworks.
3. Describe a software architecture using various documentation approaches and architectural description languages.
4. Develop architectural alternatives for a problem and select among them.
5. Use well-understood paradigms for designing new systems.

Text Books:

1. M. Shaw; *Software Architecture Perspectives on an Emerging Discipline*, Prentice-Hall.
2. Len Bass, Paul Clements, Rick Kazman: *Software Architecture in Practice,* Pearson Education Asia.
3. Jan Bosch; *Design and Use of Software Architectures*, Addision-Wesley-Pearson Education
4. Christine Hofmeister, Robert Nord, Dilip Soni; *Aoolied Software Architecture,* Addision-Wesley-Pearson Education
5. Dikel, D.Met Al*; Software Architecture: Organizational Principles and Patterns*, Prentice Hall

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

IT1929	Cloud Computing	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Course Objectives:-

1. To understand cloud computing and to study existing cloud computing platforms like Amazon EC2,Platform as Service: Google App Engine, Microsoft Azure, etc.
2. To understand the data intensive computing and the map reduce model.
3. To understand the Cloud computing security architecture and security issues and challenges.
4. To understand the performance parameters of cloud computing platforms.

Unit I: [7 Hrs]
Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS, HAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS,HAAS.
Cloud computing platforms: Infrastructure as service: Amazon EC2,Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing

Unit II: [7 Hrs]
Introduction to Cloud Technologies, Study of Hypervisors, Compare SOAP and REST **Webservices, AJAX and mashups**-Web services: SOAP and REST, SOAP versus REST, AJAX: asynchronous 'rich' interfaces, Mashups: user interface services **Virtualization Technology**: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization

Multitenant software: Multi-entity support, Multi-schema approach, Multi-tenance using cloud data stores, Data access control for enterprise applications.

Unit III: [7 Hrs]
Data in the cloud: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo. Map-Reduce and extensions: Parallel computing, The map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Enterprise batch processing using Map-Reduce, Introduction to cloud development, Example/Application of MapReduce, Features and comparisons among GFS,HDFS etc, Map-Reduce model

Unit IV: [6 Hrs]
Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud
Cloud computing security architecture: Architectural Considerations- General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro-architectures; Identity Management and Access control-Identity management, Access control, Autonomic Security
Cloud computing security challenges: Virtualization security management- virtual threats, VM Security Recommendations, VM-Specific Security techniques,
Secure Execution Environments and Communications in cloud.

Unit V: [7 Hrs]
Issues in cloud computing, Implementing real time application over cloud platform
Issues in Intercloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment.
Cloud Middleware. Mobile Cloud Computing. Inter Cloud issues. A grid of clouds, Sky computing, load balancing, resource optimization, resource dynamic reconfiguration, Monitoring in Cloud

Unit VI: [6 Hrs]
Cloud computing platforms, Installing cloud platforms and performance evaluation
Features and functions of cloud platforms: Xen Cloud Platform, Eucalyptus, OpenNebula, Nimbus, TPlatform, Apache Virtual Computing Lab (VCL), Enomaly Elastic Computing Platform,

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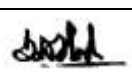
Dean (Acad. Matters)		Version	**1.00**	

Course Outcomes:-

At the end of the course student will be able to:-

1. explain the cloud computing concept and their advantages and applications.
2. explain the concept of data intensive computing and understand the map reduce model.
3. comprehend the Cloud computing security architecture and will have awareness about the security issues and challenges in the cloud environment.
4. To understand the performance parameters of cloud computing platforms.

Text Book:

1. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
2. Enterprise Cloud Computing by GautamShroff,Cambridge
3. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India

Reference Book:

1. Google Apps by Scott Granneman,Pearson
2. Cloud Security & Privacy by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O'REILLY)
3. Cloud Computing: A Practical Approach, Antohy T Velte, et.al McGraw Hill,
4. Cloud Computing Bible, Barrie Sosinsky, Wiley India
5. QoS–aware Clouds,Stefano Ferrettiet.al., 2010 IEEE 3rd International Conference on Cloud Computing

IT1930	Computer Vision	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Prerequisite:
Any course on Digital Image Processing and knowledge of any programming language. Exposure to MATLAB Image Processing Toolbox is desirable.

UNIT-I:
Introduction to Computer Vision, Image formation, geometric primitives and transformations, 2-D and 3-D transformations, photometric image formation, the digital camera

UNIT-II
Review of image segmentation, image representation and description, principal components for description, Texture and shape analysis, feature detection and matching

UNIT-III
Introduction to Video Processing, Dynamic scene analysis, Moving object detection and tracking

UNIT-IV
Recognition of image patterns, object recognition, face recognition, instance recognition, context and scene understanding

UNIT-V
Recent advancements in computer vision, additional applications

UNIT-VI
Study of MATLAB Computer Vision Toolbox, Implementing Computer Vision systems.

Books:
1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer, 2010
2. Tinku Acharya and A. K. Ray, Image Processing Principles and Applications, Wiley Interscience,2005.
3. Rafael C. Gonzalez & Richard E. Woods, “Digital Image Processing”, Third Edition, 2008, Pearson Education.

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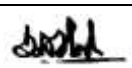
Dean (Acad. Matters)		Version	**1.00**	

IT1931	Cyber Forensics	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Objectives:-
1. Understand cyber world.
2. Enabling knowledge on attack profiles, investigation tools(windows &linux environment) and techniques
3. Critical analysis i.e. analysis of data to identify evidence recording timestamp,Identifying rogue processes.
4. Understand various Forensic tools and how to generate report .

Unit I : Introduction : [06 HRS]
Review of TCP/IP and TCP, IP Header analysis, Introduction to Cyber World, Cyber attacks and cyber security

Unit II : [07HRS]
Information warfare and cyber terrorism, Types of cyber attacks, Cyber Crime and Digital Fraud ,Overview of Types of computer forensics i.e. Media Forensics, Network forensics (internet forensics), Machine forensic, Email forensic (e-mail tracing and investigations).

Unit III : [07HRS]
Live Data collection and investigating windows environment: windows Registry analysis, Gathering Tools to create a response toolkit, Obtaining volatile Data, Computer forensics in windows environment, Log analysis and event viewer, File auditing, identifying rogue machines, hidden files and unauthorized access points.

Unit IV : [06HRS]
Live Data collection and investigating Linux environment : /Proc file system overview , Gathering Tools to create a response toolkit.

Unit V : [07HRS]
Handling Investigations: Log Analysis (Network, host, user logging details), Recording incident time/date stamps, Identifying rogue processes, unauthorized access points, unauthorized user/group accounts,

Unit VI : [07HRS]
Forensic tools and report generation: Recovery of Deleted files, Analyzing network traffic, sniffers, Ethical Hacking , Hardware forensic tools like Port scanning and vulnerability assessment tools like Nmap , Netscan etc . Password recovery (tools like John the ripper, L0phtcrack, and THC-Hydra), Mobile forensic tools and analysis of called data record Template for computer forensic reports.

Outcomes:-
On completion of this course students will able to:
- Apply the knowledge and understanding of computer security to identify security weaknesses and propose solutions;
- correctly isolate computer systems for investigation and use of various investigation tools.
- Document and present gathered information for follow-up.

Text Books:
1. Mandia, K., Prosise, C., Pepe, M., *Incident Response & Computer Forensics.* 2nd edition. Tata-McGraw Hill,
2. Bill Nelson, Amelia Phillips**,** Frank Enfinger, and Chris Steuart , Guide to Computer Forensics and Investigations, 2nd edition, , Thomson Learning.

Reference Books:
1. Eoghan Casey ,Digital Evidence and Computer Crime, 2nd Edition , academic Press File System Forensic Analysis by Brian Carrier , addition Wesley
2. Harlan Carvey Windows Forensic Analysis DVD Toolkit (Book with DVD-ROM), Syngress Publication
3. Steve Bunting , EnCE: The Official EnCase Certified Examiner Study Guide, 2nd Edition , Sybex Publication

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
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IT1932	Internet Routing Design	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

COURSE OBJECTIVES:

1. To Study of different routing protocol and routing algorithms.
2. To Study router architecture and analysis of network algorithms.
3. To Learn about the quality of service and various routing and traffic engineering.

UNIT I: [07HRS]
Networking and Network Routing: An Introduction : Addressing and Internet Service: An Overview, Network Routing, IP Addressing, Service Architecture, Protocol Stack Architecture, Router Architecture, Network Topology, Architecture, Network Management Architecture, Public Switched Telephone Network.

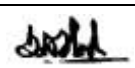
UNIT II: [08HRS]
Routing Algorithms : Shortest Path and Widest Path**:** Bellman–Ford Algorithm and the Distance Vector Approach, Dijkstra's Algorithm, Widest Path Algorithm, Dijkstra- Based Approach, Bellman–Ford-Based Approach, *k*-Shortest Paths Algorithm. OSPF and Integrated IS-IS **:** OSPF: Protocol Features, OSPF Packet Format, Integrated IS-IS, Key Features, comparison
BGP **:** Features ,Operations, Configuration Initialization, phases, Message Format. IP Routing and Distance Vector Protocol Family **:**RIPv1 and RIPv2

UNIT III: [07HRS]
Routing Protocols: Framework and Principles : Routing Protocol, Routing Algorithm, and Routing Table, Routing Information Representation and Protocol Messages, Distance Vector Routing Protocol, Link State Routing Protocol, Path Vector Routing, Protocol, Link Cost.
Internet Routing and Router Architectures : Architectural View of the Internet, Allocation of IP Prefixes and AS Number, Policy-Based Routing, Point of Presence, Traffic Engineering Implications, Internet Routing Instability. Router Architectures**:** Functions, Types, Elements of a Router, Packet Flow, Packet Processing: Fast Path versus Slow Path, Router Architectures

UNIT IV: [07HRS]
Analysis of Network Algorithms : Network Bottleneck, Network Algorithmics, Strawman solutions, Thinking Algorithmically, Refining the Algorithm, Cleaning up, Characteristics of Network Algorithms. IP Address Lookup Algorithms : Impact, Address Aggregation , Naïve Algorithms, Binary , IP Packet Filtering and Classification : Classification, Classification Algorithms, Naïve Solutions

UNIT V: [07HRS]
Quality of Service Routing : QoS Attributes, Adapting Routing: A Basic Framework. Update Frequency, Information Inaccuracy, and Impact on Routing, Dynamic Call Routing in the PSTN, Routing Protocols for QoS Routing, QOSPF: Extension to OSPF for QoS Routing, ATM PNNI.

UNIT VI: [07HRS]
Routing and Traffic Engineering : Traffic Engineering of IP/MPLS Networks, VPN Traffic Engineering, Problem Illustration: Layer 3 VPN, LSP Path Determination: Constrained Shortest Path Approach, Layer 2 VPN Traffic Engineering, Routing/Traffic Engineering for Voice Over MPLS.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

COURSE OUTCOMES:
After Completion of this course students will be able to:

1. Analyze and design network architecture.
2. Demonstrate different network topology with diff. algorithms
3. Prove the basic of MPLS /VPN network engineering.
4. State and explain Quality of service routing

Books :

1. Network Routing: Algorithms, Protocols, and Architectures Deepankar Medhi and Karthikeyan Ramasamy (Morgan Kaufmann Series in Networking)

2. Network Algorithmics: An Interdisciplinary Approach to Designing Fast Networked Devices George Varghese (Morgan Kaufmann Series in Networking)

IT1933	Embedded Systems Design	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

OBJECTIVES: -

- Define processes involved in design of an embedded system
- Partition the hardware and software for a given specification of an embedded system
- Provide an overview about technologies, products and applications relevant for ARM-based embedded systems design

UNIT – 1: [07HRS]

Embedded Design Life Cycle: Introduction, Product Specification, Hardware/software partitioning, Iteration and Implementation, Detailed hardware and software design, Hardware/Software integration, Product Testing and Release, Maintaining and upgrading existing products. Selection Process: Packaging the Silicon, Adequate Performance, RTOS Availability, Tool chain Availability, Other issues in the Selection process, partitioning decision: Hardware/Software Duality, Hardware Trends, Asics and Revision Costs**.**

UNIT - 2: [07HRS]

Embedded Processor And Computing Platform : ARM processor- processor and memory organization, Data operations, Flow of Control, SHARC processor- Memory organization, Data operations, Flow of Control, parallelism with instructions, CPU Bus configuration, ARM Bus, SHARC Bus, Memory devices, Input/output devices, Component interfacing, designing with microprocessor development and debugging, Design Example : Alarm Clock.

UNIT- 3: [07HRS]

Programming Embedded Systems :Program Design: Design Patterns for Embedded Systems , Models of Program, Control and Data flow Graph, Programming Languages: Desired Language Characteristics, Introduction to Object Oriented Programming, Data Typing, Overloading and Polymorphism, Control, Multi-tasking and Task Scheduling, Timing Specifications Run-time Exception handling .

UNIT 4: [07HRS]

Development Environment: The Execution Environment, Memory Organization, System Startup. Special Software Techniques: Manipulating the Hardware, Interrupts and Interrupt service Routines (ISRs), Watchdog Times, Flash Memory, Design Methodology. Basic Tool Set: Host – Based Debugging, Remote Debuggers and Debug Kernels, ROM Emulator, Logic Analyzer.

UNIT 5: [07HRS]

Buffers and testing of embedded systems: Testing: Why Test? When to Test? Which Test? When to Stop? Choosing Test cases, Testing Embedded Software, Performance Testing Maintenance and Testing, Buffering and Other Data Structures: What is a buffer? Linear Buffers, Directional Buffers, Double Buffering, Buffer Exchange, Linked Lists, FIFOs, Circular Buffers, Buffer Under run and Overrun, Allocating Buffer Memory, Memory Leakage. Memory and Performance Trade-offs.

UNIT 6: [07HRS]

Networks : Distributed Embedded Architecture- Hardware and Software Architectures, Networks for embedded systems- I2C, CAN Bus, SHARC link ports, Ethernet, Myrinet, Internet, Network-Based design-Communication Analysis, system performance Analysis, Hardware platform design, Allocation and scheduling, Design Example: Elevator Controller.

OUTCOMES : -

1. Complete design of an embedded system with functional requirements for hardware and software components including processor, networking components, and sensors, along with applications, subsystem interfaces, networking, and middleware.
2. Appreciate engineering issues in the development of embedded software, such as the importance of addressing the user's concerns, working with limited resources, maintainability, and dependability.
3. Identification and synthesis of solutions for embedded system problems
4. Analysis, design and testing of systems that include both hardware and software.

BOOKS

1. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2001.
2. Vahid and Tony Givargi, Embedded System Design: A Unified Hardware/Software Introduction, John Wiley & Sons, 2000.Networking)
3. Embedded System Design – Introduction to Processes, Tools, Techniques, Arnold S Burger, CMP Books
4. Embedded Systems Design by Steve Heath, Newnes

IT1934	Managing Information Systems	L=3	T=0	P=0	Credits=6

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 hrs

Unit-I: [7 Hrs]
Introduction to Information systems, the information system strategy triangle, business strategy frameworks, overview of organizational strategies, information systems strategy, strategic use of information resources, evolution of information resources, information resources as strategic tools, strategic alliances, risks, case studies.

Unit-II: [6 Hrs]
Organizational Impacts of Information Systems Use, information age organizations, IT and organizational design, IT and management control systems, virtual organizations, virtual teams, IT and the design of work, job design framework, gaining acceptance for IT-induced change, case studies.

Unit-III: [7 Hrs]
IT and changing business processes, silo perspective vs. business process perspective, the tools for change, integrated supply chains, enterprise systems, IT architecture and infrastructure, from vision to implementation, the leap from strategy to architecture to infrastructure, other managerial considerations, case studies.

Unit-IV: [7 Hrs]
Doing business on the internet, overview of internet, framework of E-commerce, threats on internet, E-learning, Web blogs, using information ethically, control of information, normative theories of business ethics, emerging issues in the ethical governance of information systems, security and controls, ethics and internet, case studies.

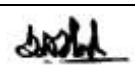
UNIT-V: [7 Hrs]
Understanding MIS organization, information system organization processes, manager's expectations from IS department, organizing and controlling IS processes, Funding IT department, cost of IT, IT portfolio management, valuing IT investments, monitoring IT investments, option pricing, case studies.

UNIT-VI: [7 Hrs]
Project and project management, IT project management, project measurement, project elements, IT project development methodologies, managerial influences, managing project risks, open sourcing, knowledge management, types of knowledge management projects, caveats for managing knowledge, Intellectual Property Rights (IPR) - Copyrights, Patents, Trade Secrets, Piracy, Cyber Law - IT Bill, Relevance of The Companies Act, The Consumer Protection Act, Indian Copyright Act, digital millennium copyright act, case studies.

Text Books:
1. Managing and Using Information Systems by Keri Pearson and Carol Saunders, Wiley India, 2006.
2. IT Project Management by Joseph Phillips, Tata McGraw-Hill 2003, Edition.

Reference Books:

1. Resisting Intellectual Property - Halbert, Taylor & Francis Ltd, 2007.
2. Cyber Law Simplified by VivekSood, Tata McGraw Hill.
3. Information Technology Project Management - S. A. Kelkar, PHI, 2005

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	**1.00**	

IT1935	Project Phase – I	L= 0	T = 0	P = 14	Credits = 14

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

SEMESTER IV

IT1936	Project Phase – II	L= 0	T = 0	P = 20	Credits = 20

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	