FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE
SEMESTER: SEVENTH (C.B.S.)
BRANCH: COMPUTER TECHNOLOGY

Sr. No.	Subject	Workload				Credit				Marks				
										Theory		Practical		Total Marks
		L	P	T	Total	L	P	T	Total	Sess.	Univ.	Sess.	Uni.	
1 BECT401T	Compilers	4	-	1	5	4	-	1	5	20	80	-	-	100
2 BECT401P	Compilers Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
3 BECT402T	Artificial Intelligence	4	-	1	5	4	-	1	5	20	80	-	-	100
4 BECT402P	Artificial Intelligence Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
5 BECT403T	ELECTIVE-I	4	-	1	5	4	-	1	5	20	80	-	-	100
6 BECT404T	ELECTIVE-II	4	-	1	5	4	-	1	5	20	80	-	-	100
7 BECT405P	Project and Seminar	-	4	-	4	-	4	-	4	-	-	50	--	50
	Total	**16**	**8**	**4**	**28**	**16**	**6**	**4**	**26**	**80**	**320**	**100**	**50**	**550**

Elective I: Computational Intelligence, Advance Database Systems, Software Architecture, Digital Signal Processing

Elective II: Natural Language Processing, Advance Operating System, Architecture of Web Application, Wireless sensor Networks

FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE
SEMESTER: EIGHTH (C.B.S.)
BRANCH: COMPUTER TECHNOLOGY

Sr. No.	Subject	Workload				Credit				Marks				
		L	P	T	Total	L	P	T	Total	Theory		Practical		Total Marks
										Sess.	Univ.	Sess.	Uni.	
1 BECT406T	Data Warehousing and Mining	4	-	1	5	4	-	1	5	20	80	-	-	100
2 BECT406P	Data Warehousing and Mining Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
3 BECT407T	Cyber & Information Security	4	-	1	5	4	-	1	5	20	80	-	-	100
4 BECT407P	Cyber & Information Security Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
5 BECT408T	ELECTIVE-III	4	-	1	5	4	-	1	5	20	80	-	-	100
6 BECT409T	ELECTIVE-IV	4	-	1	5	4	-	1	5	20	80	-	-	100
7 BECT410P	Project	-	4	-	4	-	6	-	6	-	-	75	75	150
	Total	**16**	**8**	**4**	**28**	**16**	**8**	**4**	**28**	**80**	**320**	**125**	**125**	**650**

Elective III: Pattern Recognition, Parallel Computing, Bio Informatics, Web Data Management, Human Computer Interface

Elective IV: Computational Geometry, Cloud Computing, Digital Forensic, Cognitive Science, Digital Image Processing

BECT401T: Compilers

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction to Compilers: Compilers and translators, Phases of compiler design, cross compiler, Bootstrapping, Design of Lexical analyzer, LEX. Top down Parsing; LL(1) Parser, recursive descent parser.

UNIT II

Syntax Analysis: Specification of syntax of programming languages using CFG, Top-down parser, design of LL (1) parser, bottom up parsing technique, LR parsing, Design of SLR, CLR, LALR parsers, YACC.

UNIT III

Syntax directed translation: Study of syntax directed definitions & syntax directed translation schemes, implementation of SDTS, intermediate notations- postfix, syntax tree, TAC, translation of expressions, controls structures, declarations, procedure calls, Array reference.

UNIT IV

Code optimization: Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, Loop invariant computation, induction variable removal, Elimination of Common sub expression.

UNIT V

Code generation: Problems in code generation, Simple code generator, Register allocation and assignment, Code generation from DAG, peephole optimization.

UNIT VI

Storage allocation & Error Handling: Run time storage administration stack allocation, symbol table management, Error detection and recovery-lexical, syntactic and semantic.

TEXTBOOKS

1. Alfred V. Aho and Jeffery D. Ullman, “Principles of Compiler Design”, Narosa Pub. House, 1977.
2. Aho, Sethi, and Ullman, ”Compilers Principles Techniques and Tools”, Second Edition, Pearson education, 2008.
3. Vinu V. Das, ”Compiler Design using Flex and Yacc” PHI Publication, 2008.

BECT401P: Compilers lab: Practical based on above syllabus

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

BECT402T: Artificial Intelligence

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction to AI: Definition of AI, Early work in AI, Importance of AI and related fields, Task domains of AI systems, Intelligent agents, Generic architecture of intelligent agent.

Basics of problem solving**:** Defining the problem on a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search programs.

UNIT II

Heuristic search techniques: Generate and test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Means-ends analysis.

Knowledge Representation: Representation and mapping, Approaches and Issues. Introduction to proposition logic, Knowledge representation using predicate logic, Unification and resolution. Representing knowledge using rules, procedural Vs declarative knowledge, logic programming, forward Vs backward reasoning, matching.

UNIT III

Knowledge representation: Network representation schemes - Semantic networks, conceptual graphs, Conceptual dependency, Structured representation schemes – Frames, Scripts.

Statistical reasoning: Symbolic Vs Statistical reasoning, Nonmonontonic and monotonic reasoning, Probability and Bayes' theorem, Certainty factors and rule based systems, Baysian networks, introduction to fuzzy logic.

UNIT IV

Learning: General learning model, Types of learning - rote learning, learning by taking advice, learning by analogy, induction learning, learning by discovery.

Expert systems: Characteristic features of expert system, Architecture of expert system, Expert system shell, knowledge acquisition and validation, knowledge system building tools.

UNIT V

Natural Language Processing: Overview of linguistics, Grammer and languages, basic parsing techniques, semantic analysis and representation structures.

Game playing: Minimax search procedure, adding alpha-beta cutoffs.

UNIT VI

Artificial Neural Network: Introduction, Neural Network representation, neural learning, Knowledge representation in ANN, application of neural networks.

Genetic Algorithm: Motivation, GA cycle, genetic operators, GA based Machine Learning, illustrative example.

TEXT BOOK:

1. E. Rich & K. Knight, S. B. Nair "Aritificial Intellegence", Tata McGraw Hill Publications, 2008.
2. D. W. Patterson, "Introduction to Artificial Intelligence and Expert System", PHI Pub., 1997.
3. K. Uma Rao, "Aritificial Intelligence and Neural Networks" Pearson Education, 2011.
4. David E. Goldberg, "Genetic Algorithms in search, optimization and machine learning",Pearson Education, 2002.

BECT402P: Artificial Intelligence lab: Practical based on above syllabus

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

BECT403T: Elective-I Computational Intelligence

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction to Computational Intelligence, Intelligence machines, Computational intelligence paradigms, Short history.

UNIT II

Rule-Based Expert Systems and Fuzzy Expert Systems, Rule-based expert systems, Uncertainty management, Fuzzy sets and operations of fuzzy sets, Fuzzy rules and fuzzy inference, Fuzzy expert systems, Case Studies.

UNIT III

Artificial Neural Networks, Fundamental neuro computing concepts: artificial neurons, activation functions, neural network architectures, learning rules, Supervised learning neural networks: multi-layer feed forward neural networks, simple recurrent neural networks, time-delay neural networks, supervised learning algorithms, Unsupervised learning neural networks: self-organizing feature maps , Radial basis function networks, Deep neural networks and learning algorithms.

UNIT IV

Evolutionary computation, Chromosomes, fitness functions, and selection mechanisms, Genetic algorithms: crossover and mutation, Genetic programming, Evolution strategies.

UNIT V

Swarm intelligent systems: Introduction, ant colony systems, development of ant colony systems, working of ant colony systems.

UNIT VI

Hybrid Intelligent Systems, Neural expert systems, Neuro-fuzzy systems, Evolutionary neural networks.

Text Books:

1. Andries P. Engelbrecht, “Computational Intelligence: An Introduction”, Wiley Publication.
2. Yegnanarayana B, “Artificial Neural Networks”, PHI, 2012.
3. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill, June 2011.
4. David E. Goldberg, “Genetic algorithms in search, optimization & Machine Learning”, Pearson Education, 1989.
5. Jang J. S. R., Sun C.T. and Mizutani E, “Neuro-Fuzzy and Soft computing”, Pearson Education 2003.
6. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.
7. Andries Engelbrecht, “Computational Intelligence: An Introduction”, Wielly India, 2007.

BECT403T: Elective-I Advanced Database Management Systems

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction to Distributed Databases, DDBMS architectures, Comparison of Homogeneous and Heterogeneous Databases, Concurrency control in distributed databases, Distributed query processing, Distributed data storage, Distributed transactions, Commit protocols, and Directory systems-LDAP.

UNIT II

Introduction to Parallel databases, Parallel database architecture, speedup, scale-up I/O parallelism, Comparison of Inter-query and Intra-query parallelism, parallel query evaluation, implementation issues of Parallel query evaluation.

UNIT III

Object-based databases: Complex data types, structured types and inheritance in SQL, table inheritance, array and multi-set types in SQL, object identity and reference types in SQL, Persistent programming languages, Object-oriented vs. Object-Relational.

UNIT IV

Introduction to XML, Structure of XML data, Document type definition, XML Document Schema, Querying and Transformation, XPATH, XSLT, XQUERY, API in XML, XML data storage, XML applications.

UNIT V

Introduction to Data warehouse, Data warehouse architecture, Creating and maintaining a warehouse, Multidimensional data model, OLAP and data cubes, Operations on cubes, pre-processing, Analysis of Data pre-processing.

UNIT VI

Security and integrity threats, Defence mechanisms, Statistical database auditing & control, Security issue based on granting/revoking of privileges, introduction to statistical database security. PL/SQL Security – Locks – types and levels of locks, Implicit locking, explicit locking.

Textbooks:

1. Korth, Sudarshan,Silberschatz, "Database System Concepts", MacGraw Hill Publication, 2013.
2. Elmasari , Navathe, "Fundamentals of Database Systems", Pearson, 2013.
3. Thomas Connolly, Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation & Management", Pearson, 2013.
4. Michale Gertz, Sushil Jajodia, "Handbook of Database Security, Applications and Trends", Springer, 2008.

BECT403T: Elective-I Software Architecture

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction to Software Architecture, Architecture Business Cycle, What is software architecture, software architecture requirements, Architecture structures and views, Documenting software architectures, Opportunities and Advances in software architectures.

UNIT II

Introduction to Quality Attributes, Need of quality attributes, Understanding quality attributes, architecture and quality attributes, achieving quality attributes. Case study of quality attributes in software architecture templates. Deriving Quality Attributes for software architectures

UNIT III

Design Patterns: history, principles and expectations. Study of a number of representative patterns like Singleton, Factory, Adaptor, Facade, Proxy, Iterator, Observer, Mediator, composite, Ways of using patterns. Case studies of patterns in software architecture

UNIT-IV

Introduction to Middleware, Middleware as infrastructure, Types of Middleware, RPC, Object brokers; CORBA: System Architecture, CORBA: Dynamic Service Selection and Invocation, Message oriented middleware. Specifications and Characteristics of Middleware Technologies. Recent advances in Middleware Technologies

UNIT-V

Introduction to three tier and n-Tier Web Architectures, XML, Client side technologies HTML, DHTML, Java Applets, Active X controls, DOM, AJAX. Need of Client side technology in multi-tier architectures Examples of three tier and n-tier architectures, client side technologies.

UNIT-VI

Need of server side technology in multi-tier architectures, Java Web Services, Server side technologies: JSP, SOA.

Text Book:

1. Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", Second Edition, Addison-Wesley Profession, 2003.
2. G. Alonso F. Casati, H. Kuno, V. Machiraju "Web Services Concepts, Architectures & Applications", Springers Publication, 2004.
3. Kongent Learning Solutions, "Java Sever Programming: Black Book ", Dreamtech Publications, 2014.

Reference Book:

1. James L. Weaver, Kevin Mukhar, "Beginning J2EE 1 .4: From Novice to Professional", Apress Publication, 2004.
2. Richard N. Taylor, Nenad, "Software Architecture Foundation Theory and practice", Wiley India, 2010.

BECT403T: Elective-I Digital Signal Processing

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Unit I

Introduction: Basic elements of DSP and its requirement, Advantages of Digital over analog signal processing, sampling theorem, sampling process and reconstruction of sampling data. Discrete time signals & systems: Discrete time signals & systems, classification of discrete time signals and systems, LTI systems, linear convolution, Cross Correlation, Autocorrelation.

Unit II

Z- Transforms: The Z-transform: Definition, properties of the region of convergence for the Z-transform, Ztransform properties, Inverse Z-transform, Parseval's theorem, unilateral Z-transform.

Unit III

Discrete and Fast Fourier Transforms: Definition and properties of DFT, IDFT, Relation between DFT and Z–Transform, Radix- 2 FFT algorithms, Linear filtering methods based on DFT, circular convolution, Frequency analysis of discrete time signals using DFT, Gortzel algorithm.

Unit IV

IIR Filter Design & Realization: Filter design methods – Approximation of derivatives, Impulse invariance, bilinear transformation, characteristics & designing of Butterworth, Chebyshev filters, frequency transformations, IIR filter structures-Direct form I-II, transpose form, parallel form, cascade, Lattice and Lattice-ladder structures.

Unit V

FIR Filter Design & Realization: Symmetric and antisymmetric FIR filters, Linear phase FIR filter, design of FIR filters using windows (Rectangular, Bartlett, Hanning, Hamming & Blakman), frequency sampling method, FIR differentiators, FIR filter structures.

Unit VI

Multirate DSP: Introduction, Decimation by factor D, Interpolation by factor I, Sampling rate conversion by rational factor I/D, Sub band coding of speech signals and its applications, introduction to wavelet & wavelet transform, Introduction to DSP architecture TMS 320.

Text Books:

1. J.G. Proakis, D.G. Manolakis "Digital Signal Processing: Principles, algorithms and applications", Pearson Education, 2007.
2. A.V. Oppenheim, R.W. Schafer, "Discrete Time Signal Processing", Pearson Education, 2014.
3. Rabiner Gold " Theory and Application of DSP", PHI, 1975.

Reference books:

1. E. C. Ifeachar, B. W. Jarvis, "Digital signal processing- A practical approach", Second Edition, Pearson Education, 2002.
2. Sanjit K. Mitra, "Digital Signal Processing A Computer based approach", Fourth Edition, McGraw Hill Education, 2013.
3. S. Salivahanan, A Vallavaraj, C. Gnanapriya, "Digital Signal Processing", 2nd Edition, McGraw Hill, 2011.

BECT404T: Elective II Natural Language Processing

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Unit I

Introduction: NLP tasks in syntax, semantics, and pragmatics, Key issues &Applications such as information extraction, question answering, and machine translation, the problem of ambiguity, the role of machine learning, brief history of the field.

Unit II

N-gram Language Models : Role of language models, Simple N-gram models, Estimating parameters and smoothing, Evaluating language models, Part Of Speech Tagging and Sequence Labeling Lexical syntax, Hidden Markov Models, Maximum Entropy models.

Unit III

Syntactic parsing: Grammar formalisms and tree banks, Efficient parsing for context-free grammars (CFGs), Statistical parsing and probabilistic CFGs (PCFGs), Lexicalized PCFGs.

Unit IV

Semantic Analysis: Lexical semantics and word-sense disambiguation, Compositional semantics, Semantic Role labeling and Semantic Parsing.

Unit V

Information Extraction (IE): Named entity recognition and relation extraction, IE using sequence labeling, automatic summarization Subjectivity and sentiment analysis.

Unit VI

Machine Translation (MT): Basic issues in MT, Statistical translation, word alignment, phrase-based translation, and synchronous grammars.

Text Books:

1. D. Jurafsky and R. Martin, “Speech and Language Processing”, Second Edition, Pearson Publication, 2014.
2. Terence Parr, “Language Implementation Patterns”, Pragmatic Bookshelf, 2011.

Reference Books:

1. James Allen, “Natural Language Understanding”, Second Edition, Addison Wesley, 2007.
2. Akshar Bharati, Vineet Chaitanya, and Rajeev Sangal, “NLP: A Paninian Perspective”, Prentice Hall, 1994.

BECT404T: Elective-II Advance Operating System

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Unit I

Fundamentals: Introduction, Models and Features, Concept of Distributed Operating system, Issues in Design of a Distributed Operating System.

Foundations of Distributed System: Limitations of Distributed Systems, Lamports logical clocks, Vector clocks, Causal ordering of messages, Global state recording, Cuts of a Distributed Computation, Termination Detection.

Unit II

Distributed Mutual Exclusion: Requirement of Mutual Exclusion Algorithm, Non Token Based Algorithm, Token Based Algorithms, Comparative Performance Analysis.

Unit III

Distributed Deadlock Detection: Introduction, Deadlock Handling strategies in Distributed System, Centralized and Distributed Deadlock Detection Algorithms.

Agreement protocols: Introduction, System Model, Classification of Agreement Problems, Solutions to the Byzantine Agreement Problem.

Unit IV

Distributed File system: Introduction to Distributed File System, Architecture, and Mechanism for Building Distributed File System.

Distributed Shared Memory: General Architecture of DSM systems, Algorithm for Implementing DSM, Memory coherence and Coherence Protocols.

Unit V

Distributed Scheduling: Introduction, Issues in Load Distributing, Components of a Load Distributing Algorithm, Load Distributing Algorithms, Requirements for Load Distributing Task Migration, Issues in Task Migration.

Unit VI

Failure Recovery: Recovery in concurrent systems, Consistent set of Checkpoints, Synchronous check pointing and Recovery, Asynchronous check pointing and Recovery.

Fault Tolerance: Introduction, Commit Protocols, Static Voting Protocol, Dynamic Voting Protocol.

Text Books:

1. Mukesh Singhal, NiranjanG, Shivaratri, "Advanced concepts in operating systems: Distributed, Database and Multiprocessor operating systems", TMH, 2001.
2. Coulouris, Dollimore, Kindberg , "Distributed Systems Concepts and Design", Pearson Education, 2011.

Reference Books:

1. Andrew S. Tanenbaum, "Distributed operating system", Pearson education, 2003.

BECT404T: Elective-II Architecture of Web Application

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Web Architecture and Framework: Basic Web Architecture, Web Server, Application Server, Web development framework, TCP/IP Architecture, TCP/IP Application Services.

UNIT II

HTTP, HTML & its roots: Uniform Resource Locator, fundamentals of http, information through header, evolution of http protocol, standard generalized markup language, html rendering.

UNIT III

XML & Introduction to Web server: Core XML, XHTML, XSL, Basic operation of web servers, mechanism for dynamic content recovery, Server configuration, Server security

UNIT IV

Overview of browser functionality: Architecture Considerations, Processing flow in Browser, Processing HTTP Request, Processing HTTP Responses, Cookie coordination, Privacy & P3P.

UNIT V

Active Browser Pages: Java Script, Cascading Style Sheets, DHTML, AJAX, CGI scripts and clickable maps

UNIT VI

Internet Telephoning, Virtual reality over the web, Intranet and Extranet, Firewall Design Issues.

Text Books:

1. Leon Shklar & Rich Rosen, "Web Application Architecture Principles, Protocols & Practices", 2nd Edition, John Wiely & Sons, 2009.

Reference book

1. Alex X. Liu, "Firewall Design and Analysis", World Scientific Publishing, Vol. 4., 2010.
2. Nancy J. Yeager, Rebert E.McGrath, "Web Server Technology", Morgan Koufmann Publication, 1996.
3. Peter Morville and Louis Rosenfeld, "Information Architecture for the World Wide Web", 3rd Edition, O'Reilly Publication, 1998.

BECT404T: Elective-II Wireless Sensor Network

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction, Sensor network application, Factors influencing sensor network design: Fault tolerance, Scalability, Production cost, Operating environment, sensor network topology, hardware constraints, transmission media and power consumption. Sensor network communication architecture, Characteristics, Technical Challenges, and Design Directions

UNIT II

Models for Programmability in Sensor Networks:Introduction, Differences between Sensor Networks and Traditional, Data Networks, Aspects of Efficient Sensor Network Applications, Need for Sensor Network Programmability, Major Models for System-Level Programmability: Database Model, Active Sensor Model, Active Networks, Mobile Agents, Frameworks for System: Level Programmability, Directed Diffusion with In-Network Processing, Cougar, Tiny DB, SQTL, Smart Messages, Spatial Programming, Mate, Sensor ware, Magnet OS, DFuse.

UNIT III

Routing Techniques: Motivation and Design Issues in WSN Routing, Routing Challenges in WSNs, Routing Protocols in WSNs: Flat Routing, Hierarchical Routing, Adaptive Routing, Multipath Routing, Query-Based Routing, Negotiation-Based Protocols

UNIT IV

Communication Protocol for WSN: Introduction, Applications/Application Layer Protocols: Sensor Network Applications, Application Layer Protocols, Localization Protocols, Time Synchronization Protocols.

UNIT V

Transport Layer Protocols: Event-to-Sink Transport, Sink-to-Sensors Transport, Network Layer Protocols, Data Link Layer Protocols: Medium Access Control, Error Control

UNIT VI

Security and Privacy Protection in WSN: Introduction, Unique Security Challenges in Sensor Networks and Enabling Mechanisms: Security-Related Properties, System-Level Security, Mobile, Code, Metering, Security Architectures: Cell-Based WSNs, Ad Hoc Sensor Networks, Privacy Protection: Principle of Minimal Generalization, Privacy of Location Information.

REFERENCE BOOKS:

1. Mohammad Ilyas and Imad Mahgoub, "Handbook of Sensor Networks: Compact Wireless and Wired sensing systems", CRC Press, 2005.
2. C. S. Raghavendra, Krishna M. Sivalingam and TaiebZnati, "Wireless Sensor Networks", Springer, 2005.
3. Anna Hac, "Wireless Sensor Network Designs", John Wiley & Sons Ltd., 2003.

BECT406T: Data Warehousing & Mining

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction: Evolution of data warehousing, Characteristics, Operational database systems and data warehouse (OLTP & OLAP), Multidimensional data models, Data warehouse architecture, OLAP Operations., Design and construction of data warehouses.

UNIT II

Fundamentals of data mining, Data mining functionalities, Classification of data mining systems, Data mining task primitives, Integration of data mining systems with data warehouse, Major issues and challenges in data mining, Data preprocessing- need for processing, data cleaning, integration, transformation, data reduction. Discretisation and concept hierarchy generation, data mining application areas.

UNIT III

Classification: Introduction, Decision tree, Building decision tree- tree induction algorithm, Split algorithm based on information theory, Split algorithm based on gini index, Decision tree rules, naive based methods.

Clustering: Cluster analysis, Desired features, Types of data in cluster analysis, Computing distance. Categorizations of major clustering methods – Partitioning methods (K-means, EM), Hierarchical methods (agglomerative, divisive).

UNIT IV

Mining frequent patterns and Association Rules**:** Market basket analysis**,** Frequent item sets and association rules, Apriori algorithm, FP growth algorithm, Improving efficiency of Apriori and FP growth algorithms.

UNIT V

Web Data Mining: Introduction, Graph properties of web**,** Web content mining, Web structure mining, Web usage mining, Text mining, Visual web data mining, Temporal and Spatial data mining.

UNIT VI

Big data Analytics: Introduction to the Big Data problem. Current challenges, Trends, and applications, Technologies for big data management. Big data technology and tools, Map-Reduce paradigm and the Hadoop.

TEXT BOOK:

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.
2. A. K. Pujari, "Data Mining Techniques", Second Edition, University press, 2013.
3. Jason Bell, "Machine Learning for Big Data: Hands-on for Developers and Technical Professionals, Wiley India Publications, 2013.

BECT406P: Data Warehousing & Mining: Practical based on above syllabus

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

BECT407T: Cyber and Information Security

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Need of Information Security: Legal, Ethical and Professional Issues Attributes of security- authentication, access control, confidentiality, authorization, integrity, non-reproduction.

OSI Security Architecture: attacks, services and mechanisms. Security Attacks, Security services, A model of Internetwork Security.

Conventional Encryption: Classical Encryption Techniques and Problems on classical ciphers, Security architecture.

UNIT II

Introduction to Secret key and Cryptography: Block Cipher Principle: Stream ciphers and block cipher, Block cipher design principles, modes of operation, Encrypt given messages using DES, Triple DES, IDEA, AES Problems on cryptography algorithms.

Confidentiality Using Conventional Encryption: Key Distribution.

UNIT III

Introduction to Public key and Cryptography: Principles of Public-Key Cryptosystem, RSA algorithm, Ket Management, Diffie Hellman Key Exchange, Encrypt given messages using ECC.

Introduction to Number Theory: Prime and Relative Prime numbers, Modular Arithmetic, Fermat's and Euler's Theoram, Euclids Algorithm, the Chinese Remainder Theorem.

UNIT IV

Message Authentication and Hash Functions: Authentication Requirements and Functions, Hash Functions and their Security, MD5 Message Digest Algorithm, Kerberos.

Key Management: Digital Certificates-Certificate types, X.509 Digital Certificate format, Digital Certificate in action, Public Key Infrastructure-Functions, PKI Architecture, Certificate Authentication.

UNIT V

Firewall: Firewall Functionality, Policies and Access Control Policies, Firewall Types.

Intrusion Prevention and Detection: Prevention vs Detection, Types of Intrusion Detection System- Anomaly versus Signature based IDS, Host-based versus Network-based IDS, DDoS Attack Prevention/ Detection, Malware Detection-Worm Detection, Worm Signature Extraction, Virus Detection.

UNIT VI

Software Vulnerability: Phishing, Buffer Overflow, Cross-site Scripting (XSS), SQL Injection.

Electronic Payment: Payment Types, Enabling Technologies-Smart Cards and Smart Phones, Cardholder Present E-Transaction-Attacks, Chip Card Transactions, Payment over Internet-Issues and Concerns, Secure Electronic Transaction, Online Rail Ticket Booking.

Electronic Mail Security: Pretty Good Privacy, S/MIME

Text Book:

1. William Stallings, "Cryptography and network security, principles and practices", Pearson Education, 2013.
2. Bernard Menezes, “Network Security and Cryptography”, Cengage Learning, 2010.

Reference Books:

1. Nina Godbole, “Information System Security”, Wiley India Publication, 2008.

2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network security, private communication in a public world", Second Edition, Prentice Hall, 2002.
3. Christopher M. King, Curtis Patton and RSA press, "Security architecture, Design Deployment and Operations", McGraw Hill Publication, 2001.
4. Robert Bragge, Mark Rhodes, Heithstraggberg "Network Security, The Complete Reference", Tata McGraw Hill Publication, 2004.

BECT407P: Cyber and Information Security: Practical based on above syllabus

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

BECT408T: Elective-III Pattern Recognition

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction: Statistical Decision Theory, Image Processing and Analysis, Probability- Probabilities of events, random variables, joint distribution & densities.

UNIT II

Moments of random variables, estimation of parameters from samples, minimum risk estimators.

UNIT III

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

UNIT V

Component Analysis and dimension reduction: Principal Component Analysis, Fisher Linear Discriminant, Locally Linear Embedding.

UNIT V

Feature Generation Introduction Basis Vectors and images, The Karhunen- Loeve Transform, The Singular Value Decomposition, Independent Component Analysis, The Discrete Fourier Transform, The Haar Transform.

UNIT VI

Clustering- Introduction, hierarchical clustering, partition clustering.

TEXTBOOKS:

1. Earl Gose, Richard Johnsonbaugh, Steve Jost, “Pattern Recognition with Image Analysis”, PHI Pubulication, 1996.

2. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, Second Edition, John Wiley, 2000.

REFERENCE BOOKS:

1. Sergios Theodoridis, Konstantinos Koutroumbas, “Pattern Recognition”, Elsevier Fourth Edition, 2011.

BECT408T: Elective-III Parallel Computing

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Parallel Processing Architectures: Parallelism in sequential machines, Abstract model of parallel computer, Multiprocessor architecture, Pipelining, Array processors.

Programmability Issues:An overview, Operating system support, Types of operating systems, Parallel programming models, Software tools

UNIT II

Data Dependency Analysis**:** Types of dependencies loop and array dependences, Loop dependence analysis, Solving diophantine equations, Program transformations

Shared Memory Programming: General model of shared memory programming, Process model under UNIX

UNIT III

Algorithms for Parallel Machines**:** Speedup, Complexity and cost, Histogram computation, Parallel reduction, Quadrature problem, Matrix multiplication, Parallel sorting algorithms, Solving linear systems, Probabilistic algorithms

UNIT IV

Message Passing Programming:Introduction, Model, Interface, Circuit satisfiability, Introducing collective, Benchmarking parallel performance Parallel Programming languages: Fortran90, nCUBE C, Occam, C-Linda

UNIT V

Debugging Parallel Programs:Debugging techniques, Debugging message passing parallel programs, Debugging shared memory parallel programs

Memory and I/O Subsystems: Hierarchical memory structure, Virtual memory system, Memory allocation and management, Cache allocation and management, Cache memories and management, Input output subsystems

UNIT VI

Other Parallelism Paradigms:Data flow computing, Systolic architectures, Functional and logic paradigms, Distributed shared memory

Performance of Parallel Processors:Speedup and efficiency, Amdahl's law, Gustafson-Barsis's law, Karf-Flatt metric, Isoefficiency metric

Text Books:

1. Hawang Kai and Briggs F. A., "Computer Architecture and Parallel Processing", McGraw Hill, 1993.
2. Jorden H. F. and Alaghaband G., "Fundamentals of Parallel Processing", Prentice Hall, 2002.
3. M. J. Quinn, "Parallel Programming in C with MPI and OpenMP", McGraw Hill, 2003.

References:

1. Shasikumar M., "Introduction to Parallel Processing", PHI, 2006.
2. Wilson G. V., "Practical Parallel Programming", MIT Press, 1996.
3. D. E. Culler, J. P. Singh, A. Gupta, "Parallel Computer Architecture", Morgan Kaufman, 1998.

BECT408T: Elective-III Bioinformatics

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction To Bioinformatics**:** Scope of bioinformatics, elementary commands and protocols, FTP, Telnet, HTTP, primer on information theory.

UNIT II

Introduction To Homology**:** Introduction to homology (with special mention to Charles Darwin, Sir Richard Owen, Willie Henning, Alfred Russel Wallace).

UNIT III

Special Topics In Bioinformatics**:** DNA mapping and sequencing, Map alignment, large scale sequencing methods, Shotgun and Sanger method.

UNIT IV

Sequence Alignment And Dynamic Programming**:** Heuristic alignment algorithms, Global sequence alignments- Needleman-Wunsch algorithm, Smith-Waterman algorithm - local sequence alignments, Amino acid substitution matrices- PAM and BLOSUM.

UNIT V

Primary Database And Their Use**:** Introduction to biological databases, organization and management of databases, Searching and retrieval of information from the World Wide Web, Structure databases - PDB (Protein Data Bank), Molecular Modeling Databases (MMDB), primary databases- NCBI, EMBL, DDBJ.

Secondary Databases**:** Introduction to secondary databases- organization and management of databases Swissprot, PIR, KEGG.

UNIT VI

Biochemical Data Bases**:** Introduction to biochemical databases, organization and management of databases,KEGG, EXGESCY, BRENDA, WIT.

TEXT BOOKS:

1. Hooman H. Rashidi, Lukas K. Buehler, "Bioinformatics Basics, Applications in Biological Science and Medicine", Second Edition, CRC Press, 2005.
2. David W. Mount, "Bioinformatics Sequence and Genome Analysis", Second Edition, Cold Spring Harbor Laboratory Press, 2005.

REFERENCE BOOKS:

1. Harshawardhan P. Bal, "Bioinformatics Principles and Applications", Tata McGraw Hill, 2005.
2. Cynthia Gibbas, Per Jamberk, "Developing Bioinformatics Skills", Cold Spring Harbor Laboratory Press, 2001.
3. C. Stan Tsai, "An Introduction to Computational Biochemistry", John Wiley & Sons, 2002.

BECT408T: Elective-III Web Data Management

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction: Modeling Web Data, Database Technology and Web Applications, Semistructured data, Web Data Management with XML, XML and syntax, XML Data Model, XLink, and XPointer.

UNIT II

XPath and XQuery:- Regular Path Expressions, XPath Basics, XPath steps and expressions, Path evaluations, axes, node tests, predicates, XQuery Syntax , FLWOR expression, advanced features, XUpdate.

UNIT III

Automata on ranked trees, unranked trees, XML Schema, other schema languages, Graph semistructured data, graph bisimulation, data guides, XML query evaluation, XML identifiers, XML evaluation techniques

UNIT IV

Ontologies, Querying and Data Integration: RDF, RDF Schema, OWL, Description Logic, Querying data through ontologies, Querying RDF data, querying through RDFS

UNIT V

Building Web scale applications: Web search, web crawlers, web information retrieval, Web graph mining and hot topics in web search, Distributed systems, failure management, Required properties of a distributed system, P2P networks,

UNIT VI

Dstributed Access Structure: Hash-based structures, distributed indexing, Distributed computing with MapReduce & PIG, Large Scale Data Management with HADOOP: Installing and Running HADOOP, Running MAPREDUCE Jobs, PIG LATIN, Scripts Running in Cluster Mode.

Text Book:

1. S. Abiteboul, I. Manolescu, P. Rigaux, M. Rousset and P. Senellart, Web Data Management, Cambridge University Press, 2012.

Reference Books :

1. S. Abiteboul, P. Buneman and D. Suciu, "Data on the Web: From Relational to Semistructured Data to XML", Morgan Kaufman Publisher, 1999.
2. Athena Vakali, George Pallis, "Web Data Management Practices: Emerging Techniques and Technologies", IGI Publication 2006.
3. W3C web site.

BECT408T: Elective-III Human Computer Interface

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Unit I

Introduction: Importance of user Interface: definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface - popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user - Interface popularity, characteristics- Principles of user interface.

Unit II

Design process: Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business junctions.

Unit III

Screen Designing: Design goals: Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, Visually pleasing composition - amount of information -focus and emphasis - presentation information simply and meaningfully - information retrieval on web -statistical graphics - Technological consideration in interface design.

Unit IV

Windows: New and Navigation schemes selection of window, selection of devices based and screen based controls. Components: text and messages, Icons and increases - Multimedia, colors, uses problems, choosing colors.

Unit V

Software tools: Specification methods, interface, Building Tools. Components - text and messages, Icons and increases - Multimedia, colors, uses problems, choosing colors.

Unit VI

Interaction Devices: Keyboard and function keys, pointing devices, speech recognition digitization and generation - image and video displays drivers.

Text Books:

1. Wilbert O Galitz, “The essential guide to user interface design”, Second Edition, Wiley Dream Tech., 2002.
2. Ben Shneidermann, “Designing the user interface”, Third Edition; Pearson Education, 2009.

Reference Books:

1. Alan Dix, et.al, “Human - Computer Interaction”, Third Edition, Pearson Education, 2003.
2. Prece, Rogers and Sharps, “Interaction Design”, 3rd Edition, Wiley Dream Tech., 2011.
3. Soren Lauesen, “User Interface Design”, Pearson Education, 2005.
4. D.R.Olsen, “Human -Computer Interaction”, First Edition; Cengage Learning, 2009.

BECT409T: Elective IV: Computational Geometry

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction of Computational Geometry: Convex Hulls, Degeneracies and Robustness, Application Domains, Line Segment Intersection Thematic Map Overlay: Line Segment Intersection, The Doubly-Connected Edge List, Computing the Overlay of Two, Subdivisions, Boolean Operations.

UNIT II

Polygon Triangulation Guarding an Art Gallery: Guarding and Triangulations, Partitioning a Polygon into Monotone Pieces, Triangulating a Monotone Polygon, **Linear Programming** Manufacturing with Molds: The Geometry of Casting, Half-Plane Intersection, Incremental Linear Programming, Randomized Linear Programming.

UNIT III

Orthogonal Range Searching Querying a Database: 1-Dimensional Range Searching, Kd-Trees, Range Trees, Higher-Dimensional Range Trees, General Sets of Points, Fractional Cascading. Point Location: Point Location and Trapezoidal Maps, A Randomized Incremental Algorithm, Dealing with Degenerate Cases, Tail Estimate.

UNIT IV

Voronoi Diagrams The Post Office Problem: Definition and Basic Properties, Computing the Voronoi Diagram, Voronoi Diagrams of Line Segments, Farthest-Point Voronoi Diagrams. Arrangements and Duality Supersampling in Ray Tracing**:** Computing the Discrepancy, Duality, Arrangements of Lines.Levels and Discrepancy.

UNIT V

Delaunay Triangulations Height Interpolation: Triangulations of Planar Point Sets, The Delaunay Triangulation, Computing the Delaunay Triangulation, The Analysis, A Framework for Randomized Algorithms. More Geometric Data Structures Windowing: Interval Trees, Priority Search Trees, Segment Trees.

UNIT VI

Convex Hulls Mixing Things: The Complexity of Convex Hulls in 3-Space, Computing Convex Hulls in 3-Space, The Analysis, Convex Hulls and Half-Space Intersection, Voronoi Diagrams. Binary Space Partitions The Painter's Algorithm: Definition of BSP Trees, BSP Trees and the Painter's Algorithm, Constructing a BSP Tree, The Size of BSP Trees in 3-Space, BSP Trees for Low-Density Scenes.

Text Book

1. Mark de Berg, Otfried Cheong, Marc van Kreveld and Mark Overmars, "Computational Geometry Algorithms and Applications", Third Edition, Springer-Verlag, 2008.

Reference Books

1. J. O'Rourke, "Computational Geometry in C", Second Edition, Cambridge Univ. Press, 1998.
2. B. Casselman, "Mathematical Illustrations: A Manual of Geometry and PostScript", Springer-Verlag, 2005.
3. K. Mulmuley, "Computational Geometry: An Introduction Through Randomized Algorithms", Prentice Hall, 1994.

BECT409T: Elective IV: Cloud Computing

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Unit I

Introduction to Cloud Computing: Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Properties, Characteristics & Disadvantages of Cloud Computing, Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing. Legal issues when using cloud models, challenges in cloud computing.

Unit II

Cloud Computing Architecture**:** Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services, Service Models (XaaS), Infrastructure as a Service (IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), Deployment Models: Public cloud, Private cloud, Hybrid cloud, Community cloud.

Unit III

Big Data Analysis, Hadoop and Map Reduce: Introduction, Clustering Big Data, Classification of Big Data, Hadoop MapReduce Job Execution, Hadoop scheduling, Hadoop cluster setup, configuration of Hadoop, starting and stopping Hadoop cluster.

Unit IV

Security in Cloud: Cloud Security Challenges, Infrastructure Security, Network level security, Host level security, Application level security, data privacy, data security, application security, virtual machine security, Identity Access Management, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations.

Unit V

Application Development using C#: Understand object oriented concepts in C#.NET, Creation of UI and event handling, web page creation using ASP.NET, ADO.NET architecture, implementation of data seta, using ADO.NET in console application, using ADO.NET in web application.

Unit VI

Creating Cloud Application using Azure: Creating simple cloud application, configuring an application, creating virtual machine, deployment of application to Windows Azure Cloud, using Azure Storage Services, using Azure Table Service, deployment of application to the production environment.

Text Books:

1. Mcohen K. Hurley, "Google Compute Engine", O'Reilly Edition, 2014 .
2. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wile, 2011.
3. Arshdeep Bahga, Vijay Madisetti, "Cloud Computing, A Hands-on Approach", Universities Press, 2013.
4. R. J. Dudley, N. A. Duchene, "Microsoft Azure: Enterprise Application Development", Packt Publication, 2010.

Reference Books:

1. B. M. Harwani, "Cloud Computing using Windows Azure ", Arizona Business Alliance Publication, 2014.

2. J. W. Rittinghouse, J. F. Ransome, "Cloud Computing, Implementation, Management and Security", CRC Press, 2009.

BECT409T: Elective-IV Digital Forensics

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction & evidential potential of digital devices - Key developments, Digital devices in society, Technology and culture, Comment, Closed vs. open systems, evaluating digital evidence potential.

UNIT II

Device Handling & Examination Principles: Seizure issues, Device identification, Networked devices, Contamination, Previewing, Imaging, Continuity and hashing, Evidence locations.

UNIT III

A seven element security model, A developmental model of digital systems, Knowing, Unknowing, Audit and logs , Data content, Data context. Internet & Mobile Devices The ISO / OSI model, The internet protocol suite, DNS, Internet applications, Mobile phone PDAs, GPS, Other personal technology.

UNIT IV

Introduction to Computer Forensics, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources /Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps Taken by Computer Forensics Specialists, Who Can Use Computer Forensic Evidence?, Case Histories, Case Studies.

UNIT V

Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised, Internet Tracing Methods 65.

UNIT VI

Homeland Security Systems, Occurrence of Cyber Crime, Cyber Detectives, Fighting Cyber Crime with Risk Management

Techniques, Computer Forensics Investigative Services, Process Improvement Forensic Course Content, Case Histories.

TEXT BOOKS:

1. Angus M. Mashall, "Digital Forensics", Second Edition, Wiley- Blackwell, John Wiley & Sons Ltd Publication, 2008.
2. John R. Vacca, "Computer forensics: Computer Crime Scene Investigation", Second Edition, Charles River Media, Firewall, 2009.

REFERENCES:

1. Michael G. Noblett; Mark M. Pollitt, Lawrence A. Presley, "Recovering and Examining Computer Forensic Evidence", 2010.
2. Leigland R. "A Formalization of Digital Forensics", 2004.
3. Geiger M, "Evaluating Commercial Counter-Forensic Tools", 2005

BECT409T: Cognitive Science

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction of Cognitive Science:Representation, Computation, Interdisciplinary Perspective, In Depth: Categories of Mental Representation, Minds On Exercise: Analogical Reasoning.

UNIT II

Introduction to philosophy: Philosophical Approach: Enduring Questions, Philosophy, Mind-Body Problem, Flavors of Monism, Flavors of Dualism, Functionalism, Free Will–Determinism Debate, Knowledge Acquisition Problem, Mystery of Consciousness, Mind as an Emergent Property, Consciousness and Neuroscience, Consciousness and Artificial Intelligence, Overall Evaluation of the Philosophical Approach , In Depth: Dennett's Multiple Drafts Theory of Consciousness, Minds On Exercise: Decision Making.

UNIT III

Psychological Approach: A Profusion of Theories Psychology, Psychology and the Scientific Method, Mental Atoms, Mental Molecules, and a Periodic Table of the Mind: Voluntarist Movement, Structuralism, Functionalism, Whole Is Greater Than the Sum of Its Parts: Mental Physics and the Gestalt Movement, Mini-Minds: Mechanism and sychoanalytic Psychology, Mind as a Black Box: Behaviorist Approach, Overall Evaluation of the Psychological Approach, In Depth: Insight Learning, Minds On Exercise: Introspection.

UNIT IV

Cognitive Approach I: History, Vision, and Attention: Some History First: Rise of Cognitive Psychology, Cognitive Approach: Mind as an Information Processor, Modularity of Mind, Theories of Vision and Pattern Recognition, Theories of Attention, Evaluating the Model-Building Approach, In Depth: Biederman's Recognition-by-Components Theory of Pattern Recognition, Minds On Exercise: Silhouettes and Object Constancy.

UNIT V

Cognitive Approach II: Memory, Imagery, and Problem Solving:Types of Memory, Memory Models, Visual Imagery, Problem Solving, Overall Evaluation of the Cognitive Approach, In Depth: Search in Working Memory, Minds On Exercise: Memory Effects.

UNIT VI

Neuroscience Approach: Mind as Brain : Neuroscience Perspective, Methodology in Neuroscience, Small Picture: Neuron Anatomy and Physiology, Big Picture: Brain Anatomy, Neuroscience of Visual Object Recognition, Neuroscience of Attention, Neuroscience of Memory, Neural Substrates of Long-Term Memories, Neuroscience of Executive Function and Problem Solving, Overall Evaluation of the Neuroscience Approach, In Depth: Binding and Neural Synchrony, Minds On Exercise: Neural Functions.

Text Book

1. Jay Friendenberg, Gordon Silverman, "Cognitive Science An Introduction to the Study of Mind", first edition, Sage publications, 2006.

Reference Books

1. Paul Thagard, "The Cognitive Science of Science Explanation, discovery, and Conceptual Change", MIT Press, 2012.
2. Robert Cummins, Denise Dellarosa Cummins, "Minds, Brains, and Computers: An Historical Introduction to the Foundation of Cognitive Science", First Edition, Wiley Blackwell, 2000.
3. Carolyn P. Sobel, Paul Li, "The Cognitive Sciences: An interdisciplinary Approach", se cond edition, SAGE publication, 2013.

BECT409T: Elective-IV Digital Image Processing

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction: Fundamental Steps in Image Processing, Elements of DIP systems, Elements of Visual Perception, Fundamentals of Image processing, Image formation in the Eye, A Simple Image Model, Sampling and Quantization, Some Basic Relationships between Pixels, representing image in digital form, Zooming and Shrinking of image.

UNIT II

Image Enhancement in the Spatial Domain: Introduction to Spatial and Frequency methods, Basic Gray Level Transformations, Histogram Equalization, Histogram Processing, Local Enhancement, Image Subtraction, Image Averaging, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

UNIT III

Image Enhancement in the frequency Domain: Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering, Implementation

UNIT IV

Image Compression and Morphological processing. Introduction to image compression and its need, Compression models, Elements information theory, Error free compression, Lossy compression, Introduction to morphological processing, Dilation and Erosion, Opening and closing , Some basic morphological algorithm (Boundary extraction, Region filling, Convex hull, Skeleton)

UNIT V

Image Segmentation: Point Detection, Line Detection, Edge Detection, Gradient Operator, Edge Linking and Boundary Detection, Thresholding, Region-oriented Segmentation.

UNIT VI

Image Representation: Chain Codes, Polygonal Approximations, Signatures, Boundary Segments, Skeleton of a Region. Description: Boundary Descriptors, Shape Numbers, Fourier Descriptors, Regional Descriptors, Simple Descriptors, Topological Descriptors, introduction to image file formats: TIFF, JPEG, BMP, etc.

Text Books

1. Rafael C. Gonzalez and Richard, E. Woods, "Digital Image Processing", Third Edition, Prentice Hall, 2007.
2. Jayaraman, S. Esakkirajan, T. Veerakumar, "Digital Image Processing", Tata McGrawHill, 2009.

Reference Books

1. Kenneth R. Castleman, "Digital Image Processing", Pearson, 2006.
2. Rafeal C. Gonzalez, Richard E. Woods, Steven Ed dins, "Digital Image Processing using MATLAB", Pearson Education, 2004.
3. William K. Pratt, "Digital Image Processing", John Wiley, 2002.
4. D. E. Dudgeon and R. M. Mersereau, "Multidimensional Digital Signal Processing", Prentice Hall Professional Technical Reference, 1990.