SYLLABUS OF INFORMATION TECHNOLOGY
RTM NAGPUR UNIVERSITY, NAGPUR
ACADEMIC SESSION: 2015-2016
SEVENTH AND EIGHTH SEMESTERS
## Absorption Scheme for New course (C.B.S.) to Old course of Seventh Semester

### B. E. (Information Technology)

<table>
<thead>
<tr>
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<tr>
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### As per Old course scheme of RTM, Nagpur University

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### As per New course (C.B.S.) scheme of RTM, Nagpur University

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**Members,**  
BOS (CE/IT)  

**Chairman,**  
BOS (CE/IT)
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Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Absorption Scheme for New course (C. B. S.) to Old course of Eighth Semester

B. E. (Information Technology)

As per Old course scheme of RTM, Nagpur University

As per New course (C. B. S.) scheme of RTM, Nagpur University

Members, BOS (CE/IT)  
Chairman, BOS (CE/IT)
# FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE
## SEMESTER: SEVENTH
### BRANCH: INFORMATION TECHNOLOGY

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**Elective I:**
- BEIT704T1: Mobile Computing
- BEIT704T2: Multimedia Systems
- BEIT704T3: Bio-informatics
- BEIT704T4: Compiler Design

**Elective II:**
- BEIT705T1: Software Testing and Quality Assurance
- BEIT705T2: Cluster and Grid Computing
- BEIT705T3: Digital Signal Processing
### FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE

#### SEMESTER: EIGHTH

#### BRANCH: INFORMATION TECHNOLOGY

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**Elective III:**
- BEIT803T1: Embedded Systems
- BEIT803T2: Digital Image Processing
- BEIT803T3: Pattern Recognition
- BEIT803T4: Machine Learning

**Elective IV:**
- BEIT804T1: Cyber Security
- BEIT804T2: Cloud Computing
- BEIT804T3: E-Commerce and Enterprise Resource Planning
- BEIT804T4: Wireless Sensor Networks
BEIT701T DATA WAREHOUSING AND MINING
(Theory Credit: 05)

Teaching Scheme: Examination Scheme:
Lecture: 4 Hours/week Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week Duration of University Exam. : 03 Hours

UNIT I:
Introduction to Data Warehousing:
Evolution of decision support systems, Failure of past decision support system, Operational v/s decision support systems, Data warehousing lifecycle, Architecture, Building blocks, Components of DW, Data Marts and Metadata

UNIT II:
Data Preprocessing:
Why preprocess the data?, Descriptive data summarization, Data cleaning, Data integration and transformation, Data reduction, Data Discretization and Concept Hierarchy Generation.

UNIT III:
OLAP Analytical Processing:
OLAP in Data warehouse, Demand for online analytical processing, need for multidimensional analysis, limitations of other analysis methods, OLAP definitions and rules, OLAP characteristics, major features and functions. OLAP models- ROLAP, MOLAP, HOLAP, Differentiation, Data cubes and operations on cubes

UNIT IV:
Introduction of Data Mining:
Motivation, Importance, Data Mining functionalities, KDD and Data Mining, Data Mining v/s Query tools, Interesting patterns, Architecture, Classification of Data Mining systems, Major issues from Data warehousing and Data Mining, Applications of Data Mining.

UNIT V:
Mining Frequent Patterns and Association:
Basic Concepts: Market Basket analysis, motivating example, Frequent Item sets, Closed Item sets and Association rules, Frequent Pattern Mining Efficient and Scalable Frequent Item set. Mining Methods: Apriori Algorithm, Generating Association rules from Frequent Item sets, mining various kinds of association rules.

UNIT VI:
Business Intelligence and Big Data:
BI-Defining Business Intelligence, Important factors in BI, BI Architecture, BI framework, Development of BI system, BI applications in Marketing, Logistics and Production, Retail Industry. Big Data: - Understanding the challenges of Big data, Big data meets hadoop. Hadoop: Meeting Big data challenges, Hadoop Ecosystem, Core components, developing applications with Hadoop.
Text Books:
1. Data Mining (Concepts and Techniques) - Han and Kamber
2. Data Mining and Business Intelligence - Shinde and Chandrashekhar, Dreamtech Press
3. Professional Hadoop Solutions - LUBLINSKY, Smith, Yakubovich, Wiley

Reference Books:
1. Introduction to Data Mining – Tan, Steinbach, Vipin Kumar, Pearson Education.
3. Data Warehousing in Real World - Anahory, Murray, Pearson Education.
4. Data Warehousing - Paulraj Ponniah

*****
BEIT701P DATA WAREHOUSING AND MINING
(Practical Credit: 01)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Duration of University Exam. : 02 Hours

Note:
1. Practicals are based on DATA WAREHOUSING AND MINING syllabus (subject code: BEIT701T)
2. Practicals have to be performed on any open source tool.
3. There should be at the most two practicals per unit

*****
UNIT I:
Introduction:
Need of information security, OSI security Architecture, Attacks, services, mechanism, Model of network security, Classical Encryption Techniques: Symmetric, Asymmetric, cipher model; substitution – Ceasor cipher, monoalphabetic, play fair; Transposition-Railfence, columnar; Steganography, S-DES, DES, TDES, AES; Block cipher principle, Mode, strength of DES.

UNIT II:
Differential and linear Cryptanalysis, Blowfish, RC2, RC5, IDEA, CAST-128, Characteristic of advance symmetric block cipher, Euler function, Chinese remainder theorem, Discrete logarithm, confidentiality using conventional encryption, placement of encryption function traffic, confidentiality, key distribution, random number generator.

UNIT III:
Public key cryptography- principles, RSA algorithm, key management, Diffie-Hellman key exchange, elliptic curve cryptography, Message Authentication, hash function Authentication requirements, functions, codes, hash functions, Security of hash function and MACs, Hash and MAC algorithm, MD5, Message Digest algorithm.

UNIT IV:

UNIT V:
E-mail security-Pretty Good Privacy, S/MIME, data compression using ZIP, radix-64 conversion, PGP random number generation, IP Security-Overview, Architecture, authentication header, Encapsulating security payload, combining security association, key management.

UNIT VI:
Web Security requirements, secure socket layer and transport layer security, secure electronic transaction, network management security-basic concepts of SNMP, SNMP V1, community facility, SNMP V3; System security-intruders, viruses and worms and related threads firewall-design principles, trusted system, DOS.
Text Books:

Reference Books:

*****
BEIT702P  COMPUTER SYSTEM SECURITY
(Practical Credit: 01)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Duration of University Exam. : 02 Hours

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Note:

1. Practicals are based on COMPUTER SYSTEM SECURITY syllabus (subject code: BEIT702T)
2. There should be at the most two practicals per unit

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UNIT I:
History and Application of AI, the Turing Test approach, AI Problems and AI Techniques,
Defining problem as state space representation, Production system, Problem
caracteristics, monotonic and non-monotonic production systems, Solving problems by
searching-Toy problems, Real-World problems.

UNIT II:
Uniformed Search Strategies:
Breadth-first search, Depth-first search, Comparing uniformed search techniques.
Informed search strategies:
Generate-and-test, Hill climbing, best-first search, problem reduction, constraint
satisfaction, Mean-ends analysis.

UNIT III:
Knowledge Representation:
Issues in knowledge representation, Approaches to knowledge representation, introduction
to ontology
Logic and Inferences:
Formal logic, history of logic and knowledge, propositional logic, resolution method in
propositional logic.

UNIT IV:
Structural Knowledge Representation:
Frames, scripts, predicate logic, semantic network, example of knowledge representation
schemes, Truth maintenance system. Transition networks: RTN, ATN. Basic techniques of
NLP, application of NLP.

UNIT V:
Expert system:
Knowledge acquisition methods, knowledge engineering process, goals in knowledge
system development, basic architecture of expert system, problem domain versus
knowledge domain, Development of ES and life cycle of ES. Advantages of expert system,
structure of Rule based expert system, characteristics of conventional system and expert
system.

UNIT VI:
Statistical Reasoning:
Probability and Bayes theorem, Certainty factor, Dempster-Shafer theory, Fuzzy logic:
crisp sets, application of fuzzy logic.
Text Books:

Reference Books:
1. Fuzzy Logic with Engineering application (Third edition) Timothy J.Rose
ELECTIVE: I
BEIT704T1 MOBILE COMPUTING
(Theory Credit: 05)

Teaching Scheme:
Lecture: 4 Hours/week
Tutorial: 1 Hour/week

Examination Scheme:
Theory: T (U): 80 Marks T (I): 20 Marks
Duration of University Exam.: 03 Hours

UNIT I:
Introduction to Mobile Computing:
Wireless Communication and examples, Applications cellular communication (1G to 4G Networks), GSM (Mobile services, system architecture protocol, Localization and Calling, Handover, Security)

UNIT II:
Mobile Computing Architecture:
Internet the ubiquitous network, Architecture for Mobile Computing three tier architecture, Design consideration for Mobile Computing, Mobile Computing, Mobile Computing through Internet.

UNIT III:
Wireless LAN:

UNIT IV:
Mobility Management and Control:
Mobile agents, characteristics, requirement for Mobile Agent system, Platform (Aglet object Model, Agent Tcl architecture)

UNIT V:
Wireless Application Protocol:
WAP model, architecture, wireless datagram protocol, wireless transaction protocol, wireless session protocols.

UNIT VI:
Introduction to Android:
Layer android components, Mapping applications to process, Android development basics, Hardware tools, Android SDK features.
**Text Books:**

**Reference Books:**
1. Mobile Computing- Technology, Applications and services creation-Ashok K. Talukder, Roopa R. Yavagal, TMH.

******
ELECTIVE: I
BEIT704T2 MULTIMEDIA SYSTEMS
(Theory Credit: 05)

Teaching Scheme: Examination Scheme:
Lecture: 4 Hours/week Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week Duration of University Exam.: 03 Hours

UNIT I:
Introduction: Definition of multimedia, Multimedia Basics, Where to use Multimedia, Multimedia Elements, Multimedia Applications

UNIT II:
Hardware: Macintosh Versus Windows Platform, Connections, Memory and Storage Devices, Input Devices, Output Hardware, Communication Devices
Basic Software Tools: Text Editing, Word Processing, OCR Software, Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing, Sound Editing, Animation, Video, Digital Movie tools, Movie Editors, Compressing Movie Files
Making instant Multimedia: Linking Multimedia Object, office suites, word processors, spreadsheets, databases, presentation tools, power point
Multimedia authoring tools: Types of authoring tools, card and page based authoring tools, Icon based authoring tools, and Time based authoring tools.

UNIT III:
Images: Making Still Images, Bitmaps, 1 bit images, 8-bit gray level images, 8-bit color images, Dithering, 24 bit color images, Vector Drawing, Vector-Drawn Objects vs. Bitmaps, 3-D Drawing and Rendering, Color, Understanding Natural Light and Color, Computerized Color, Color Palettes, Color Look-up table.
Sound: The Power of Sound, Digital Audio, Making Digital Audio Files, MIDI Audio, MIDI vs. Digital Audio, Multimedia System Sounds, Adding Sound to Your Multimedia Project, Audio Recording, Keeping Track of Your Sounds, Audio CDs, Sound for Your Mobile, Sound for the Internet.
Animation: the Power of Motion, Principles of Animation, Animation by Computer, Animation Techniques.
UNIT IV:
Data Compression: Need for Data compression, General Data compression Scheme, Compression standards, Non-lossy compression for images, Lossy compression for Photographs and video, Hardware Vs Software Compression.

UNIT V:
Data and File Format Standards: Popular File Formats: RTF, RIFF, GIF, PNG, TIFF, MIDI, JPEG, JFIF, AVI, WAV, BMP, WMF, MIX, MPEG standards - TWAIN.
Multimedia Databases, Storage and Retrieval, Database Management systems, Database Organization and Transaction management for multimedia systems.

UNIT VI:
Designing and Producing: Designing, Designing the Structure, and Designing the User Interface, Producing, Tracking, Copyrights, Virtual reality designing and modeling (VRML).
The Internet and Multimedia: The Bandwidth Bottleneck, Internet Services, MIME Types, Multimedia on the Web, Web Page Makers and Site Builders, Plug-ins and Delivery Vehicles.
Delivering: Testing-Preparing for Delivery, File Archives, Delivering on CD-ROM, Delivering on DVD.

Text Books:
2. Fundamental of Multimedia - Ze-Nian Li & M. S. Drew ,PHI
3. Multimedia Systems Design - Prabhat k. Andleigh, Kiran Thakra

Reference Books:

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ELECTIVE: I
BEIT704T3 BIO-INFORMATICS
(Theory Credit: 05)

Teaching Scheme:
Lecture:  4 Hours/week
Tutorial:  1 Hour/week

Examination Scheme:
Theory: T (U): 80 Marks T (I): 20 Marks
Duration of University Exam.: 03 Hours

UNIT I:
Introduction:
Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary and reference systems, finding new type of data online.

UNIT II:
Molecular Biology and Bioinformatics:
Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, Overview of the bioinformatics applications.

UNIT III:
The Information Molecules and Information Flow:
Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, - Transcription, -Translation, Genes- the functional elements in DNA, Analyzing DNA,DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.

UNIT IV:
Perl:
Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, Understanding and Using Biological Databases, Java clients, CORBA, Introduction to biostatics.

UNIT V:
Nucleotide sequence data:
Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.

UNIT VI:
Biological data types and their special requirements:
Sequences, macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: alignments, regular expressions, hierarchies and graphical models.
Text Books:

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ELECTIVE: I
BEIT704T4 COMPILER DESIGN
(Theory Credit: 05)

Teaching Scheme: Examination Scheme:
Lecture: 4 Hours/week Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week Duration of University Exam. : 03 Hours

UNIT I:
Introduction To Compilers:
Compilers and translators, structure of realistic compiler, types of compilers, cross compiler, Bootstrapping, Compiler writing tools, Design of Lexical Analyzer, FLEX tool, Parser generator tool: YACC

UNIT II:
Syntax Analysis:
Specification of syntax of programming languages using CFG, Top-Down parser -predictive parser, recursive descent parser, design of LL(1) parser, Bottom-up parsing techniques, LR parsing algorithm, Design of SLR, LARL, CLR parsers, Examples on LL and LR parsers

UNIT III:
Syntax Directed Translation:
Study of syntax directed definition and syntax directed translation schemes, evaluation orders of SDD’s , implementation of SDTS, intermediate: postfix syntax tree, TAC, Translation of expression ,Control structures, declaration procedure calls and array reference

UNIT IV:
Storage Allocation And Error Handling:
Runtime Memory Management – Storage Organization, Storage allocation strategies, symbol table management and organization.
Error Detection And Recovery:
Lexical, syntactic, semantic errors, error recovery for LL and LR parsers

UNIT V:
Code Optimization: Principle sources of optimization, importance code optimization techniques, loop optimization, control flow analysis, data flow analysis, loop invariant compilation, induction variable removal, elimination of common Subexpression.

UNIT VI:
Code Generation: Problem in code generation, simple code generator, code generation algorithm, register allocation and assignment, code generation from DAG, heuristic ordering of DAGs, Labeling algorithm, peephole optimization
**Text Books:**
4. Compiler Construction: K. V. N. Sunitha, Pearson Education

**Reference Books:**
1. Principles of Compiler Design: V. Raghavan, TMH.

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UNIT I:
**Basic concepts of Testing:** Need of Testing, Basic concepts- errors, faults, defects, failures, objective of testing, central issue in testing, Testing activities, V-Model, Sources of information for test cases, Monitoring and Measuring Test Execution, Test tools and Automation, Limitation of Testing.

UNIT II:
**Unit Testing:** Concepts of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing, Debugging, Unit Testing in Extreme Programming, Tools for Unit Testing.

UNIT III:
**Control Flow Testing:** Outline of Control Flow Testing, Control Flow Graphs, Path in Control Flow Graph, Path selection criteria, All path coverage criteria, Statement coverage, Path coverage, Predicate coverage criteria, Generating Test input, Examples of Data selection.

UNIT IV:
Data Flow and System Integration Testing: Introduction Data flow testing, Data flow graph, Data flow testing criteria, Comparison of Data flow test selection criteria. Fundamentals of System Integration: Types of interfaces and interface errors, System integration testing, Software and Hardware integration, Test plan, Off-the-shelf component integration and testing.

UNIT V:
System Test Categories and Test Design: Taxonomy of system test, Basic Test, Functionality test, Robustness test, Performance test, Scalability test, Stress test, Load and Stability test, Reliability test, Regression test, Documentation Test. Test Design: Test cases, Necessity of test case documentation, Test case design methods, Functional specification based test case design, Use case bases, Application based test case design, Level of test execution.

UNIT VI:
Text Books:

Reference Books:

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ELECTIVE: II
BEIT705T2 CLUSTER AND GRID COMPUTING
(Theory Credit: 05)

Teaching Scheme:
Lecture: 4 Hours/week
Tutorial: 1 Hour/week

Examination Scheme:
Theory: T (U): 80 Marks T (I): 20 Marks
Duration of University Exam.: 03 Hours

UNIT I:

UNIT II:
Cluster Technology for High Availability, Performance Models and Simulation, Process Scheduling, Load Sharing and Load Balancing, Distributed Shared Memory, Case Studies of Cluster Systems: Beowulf, COMPaS, NanOS and PARAM

UNIT III:
Introduction to Grid Architecture, Characterization of Grid, and Grid related standard bodies, Grid types, Topologies, Components and Layers, Comparison with other approaches.

UNIT IV:
System Infrastructure, Traditional paradigms for distributed computing, Web Services, Grid standards: OGSA and WSRF, Introduction to Globus Toolkit 3 and GT 4

UNIT V:

UNIT VI:

Text Books:
2. The Grid (Chapter 1,2,3,4,5) Core Technologies by Maozhen Li, Mark Baker (John Wiley and Sons)
3. Cloud Computing for Dummies (Chapter 6,7) by Judith Hurwitz, R.Bloor, M. Kanfman, F. Halper (Wiley India Edition)
4. Cloud Security and Privacy (Chapter 8) by Tim Malhar, S.Kumaraswamy, S.Latif (SPD,O’REILLY)
**Reference Books:**

1. A networking Approach To Grid Computing by Daniel Minoli (Chapter 1) (John Wiley and Sons, INC Publication)
6. In search of clusters (2nd ed.), Gregory F. Pfister, IBM, Austin, TX, Prentice-Hall

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ELECTIVE: II
BEIT705T3 DIGITAL SIGNAL PROCESSING
(Theory Credit: 05)

Teaching Scheme: Examination Scheme:
Lecture: 4 Hours/week Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week Duration of University Exam.: 03 Hours

UNIT I:
Basic elements of DSP and its requirement, advantage of digital over analog signal processing, Discrete time Signals and Systems, Classification of discrete time Systems, Response of LTI System to various inputs, Sampling Theorem, sampling process and reconstruction , Linear Convolution, Correlation(Auto and Cross).

UNIT II:
Z-Transform: Definition, Properties of Z-Transform, ROC's of Finite length and Infinite length Signals, Theorem of Z-Transform (Initial value and Final value Theorem), system function of LTI system, Relation of Z-Transform with Laplace and Fourier Transform.

UNIT III:
Frequency Domain description of signal and system, Definition of Fourier transform and properties of Fourier transform, inverse Fourier transform, Definition of discrete Fourier transform and properties of DFT, inverse IDFT, DFT's of typical time signals, Circular Convolution using DFT and IDFT.

UNIT IV:
Design of IIR filter from Analog filter using approximation of derivative, Impulse Invariance, Bilinear Transformation, IIR filter structure: Direct-I, Direct-II, parallel and cascade form

UNIT V:
Design of FIR Filter based on Windows: Rectangular, Hamming, Hanning, Bartlett and blackman Window. FIR filter structure: Direct and cascade form

UNIT VI:
**Text Books:**

**Reference Books:**

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ELECTIVE: II
BEIT705T4 DIGITAL FORENSIC FOR INFORMATION TECHNOLOGY
(Theory Credit: 05)

Teaching Scheme:
Lecture: 4 Hours/week
Tutorial: 1 Hour/week
Examination Scheme:
Theory: T (U): 80 Marks T (I): 20 Marks
Duration of University Exam.: 03 Hours

UNIT I:
Digital Forensics Fundamentals: What is Digital forensics?, Use of Digital forensics in law enforcement, computer forensics assistance, to human resources/employment proceedings, benefits of professional forensics methodology, steps taken by Digital forensics specialists Cyber Crimes: Definition, motives, and classification of cyber crimes. Modus operandi of cyber crime, types of cyber crimes,

UNIT II:
Computer Forensics Evidence Capture: Data recovery defined, data backup and recovery, the role of backup in data recovery, the data recovery solution Evidence Collection and Data Seizure: evidence, collection options, obstacles, types of evidence, the rules of evidence, volatile evidence, general procedure, collection and archiving, methods of collection, artifacts, collection steps controlling contamination: the chain of custody, Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools

UNIT III:
Duplication and Preservation of Digital Evidence: Preserving the digital crime scene computer evidence processing steps, legal aspects of collecting and preserving computer forensic evidence, Computer Forensics Analysis and Validation: Determining what data to collect and analyze, validating forensic data, addressing data, hiding techniques, and performing remote acquisitions

UNIT IV:
Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private sector incident scenes, processing law enforcement crime scenes, preparing for a search securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case

UNIT V:
E-mail Investigations: Exploring the role of e-mail in investigations, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools, Cell phone and mobile device forensics: Understanding mobile device forensics, understanding Acquisition procedures for cell phones and mobile devices, files present in SIM card, device data, external memory dump, evidences in memory card, operators systems, Android forensics: Procedures for handling an android device, imaging android USB mass
storage devices, logical and physical techniques

UNIT VI:
Working with Windows and DOS Systems: Understanding file systems, exploring Microsoft file structures, examining NTFS disks, understanding whole disc encryption, windows registry, Microsoft startup tasks, MSDOS startup tasks, virtual machines, Current Forensic Tools: Evaluating computer forensic tool needs, computer forensic software Tools, computer forensic hardware tools, validating and testing forensic software

Text Books:

Reference Books:

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BEIT706P SEMINAR ON PROJECT
(Practical Credit: 02)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Practical: P (U): 00 Marks P (I): 50 Marks

Note:

1. The topic of Seminar on project should be assigned to the students in the group of maximum five students based on recent trends in Information Technology and allied branches.

2. Senior faculty members should work as guide.

3. The research paper publication / presentation in reputed national and international journals / conferences should be given some weightage while evaluation.

4. Seminar reports should be written using technical research writing tools (e.g. Latex) and submitted to the department for internal evaluation.

5. The project should be carried out up to design phase during this semester.

6. The same project has to be considered and extended for eighth semester project head (BEIT805P).

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UNIT I:

UNIT II:

UNIT III:
Processes And Synchronization: Threads, code migration, clock synchronization, logical clocks, global state, Election algorithms, mutual exclusion, Distributed transaction.

UNIT IV:
Distributed Deadlock Detection: System model, Resources vs. communication deadlocks, deadlock prevention, avoidance, detection and resolution, Centralized deadlock detection, distributed deadlock detection, path pushing and edge chasing algorithm

UNIT V:
Distributed Shared Memory: Introduction, General architecture of distributed shared memory, Design and implementation, Issues of DSM, Granularity, structure of shared memory space, consistency models, thrashing, advantages of DSM

UNIT VI:
Distributed File System: Introduction, Desirable features of good distributed file system, file models, file accessing, sharing, caching methods, file replication, fault tolerance, Case Study: CORBA(CORBA RMI and Services)

Text Books:
BEIT801P  DISTRIBUTED SYSTEMS  
(Practical Credit: 01)

Teaching Scheme:  
Practical: 2 Hours/week

Examination Scheme:  
Duration of University Exam. : 02 Hours

Note:
1. Practicals are based on DISTRIBUTED SYSTEMS syllabus (subject code: BEIT801T)
2. There should be at the most two practicals per unit

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BEIT802T  GAMING ARCHITECTURE AND PROGRAMMING
(Theory Credit: 05)

Teaching Scheme:  Examination Scheme:
Lecture:  4 Hours/week  Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial:  1 Hour/week  Duration of University Exam. : 03 Hours

UNIT I:

UNIT II:

UNIT III:

UNIT IV:
Design Practices: Smart & naked pointers, using memory correctly, Game scripting languages, Building your game: Creating a project, source code repositories and version control, Building the game and scripts, User interface programming and input devices: Getting the Device State, Working with the Mouse (and Joystick), Working with the Keyboard, User Interface Components, More Control Properties.

UNIT V:
2D Drawing and DirectX: 2D Drawing and DirectX, Basic 2D Drawing Concepts, Drawing Text, Working with Sprites, Graphics File Formats, Initialization and the Main Loop: Initialization, Some C++ Initialization Pitfalls, Initializing your Game, the Main Loop, Stick the Landing: A Nice Clean Exit.

UNIT VI:
Text Books:
1. Game Architecture and Programming, Shankarmani, Jain, Sinha, Wiley Publication, India

Reference Books:
3. “Game Architecture and Design”, Andrew Rollings and Dave Morris

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GAMING ARCHITECTURE AND PROGRAMMING
(Practical Credit: 01)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Duration of University Exam. : 02 Hours

Note:
1. Practicals are based on GAMING ARCHITECTURE AND PROGRAMMING syllabus (subject code: BEIT802T)
2. Students are suggested to choose at least One game idea, possibly:
   1. Single player (Puzzle, Educational, Strategy etc.)
   2. Multiplayer (Adventure, fighting, sports etc.)

Then work on both the ideas covering following aspects:
1. Feasibility and Design
2. Planning for each stage with objective to achieve.
3. Technical Architecture
4. Component building
5. Integration and testing
6. Complexity level
7. Review (This can taken from other students of same class or junior class).

3. Following are the Open Source Game Engine Tools recommended for implementation.
   1. GDevelop
   2. PlayConvas
   3. Unity
   4. Aleph One
   5. Adventure Game Studio
   6. Crystal Space
   7. Delta 3D
   8. Game Play 3D and many more

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ELECTIVE: III
BEIT803T1 "EMBEDDED SYSTEMS"
(Theory Credit: 05)

Teaching Scheme:
Lecture: 4 Hours/week
Tutorial: 1 Hour/week

Examination Scheme:
Theory: T (U): 80 Marks T (I): 20 Marks
Duration of University Exam.: 03 Hours

UNIT I:
Introduction to Embedded System:
Introduction, Embedded system vs General computing system, History of embedded system, Processor embedded into a system, Embedded hardware units and devices in a system, Embedded software in a system, examples in a embedded system, Embedded SoC, Complex system design and processors, Design process in ES, Formalization of system design, Classification of Es, Skills required in Embedded system design, Characteristics and quality attributes of Embedded system.

UNIT II:
Embedded System Design:
Hardware and Software design, Co-design, Embedded Software development Tools: In Circuit Emulators, Cross compilers, cross assemblers and tool chain, linker locator, Address resolution, PROM programmer, Rom Emulator. Memories: EPROM, PROM, Flash.

UNIT III:
RTOS for Embedded System:

UNIT IV:
Devices and Communication:

UNIT V:
Programming for Embedded System:
Software programming in assembly language (ALP) and High Level language 'C', C program element: Header and Source Files, Preprocessor Directives, Macros and Functions, Data Types, Data Structures, Modifiers, Statements, Loops and Pointers, Object Oriented Programming, Embedded Programming in C++, Embedded Programming in Java.
UNIT VI:
Microcontroller 8051:
Introduction, Architecture, Memory Management, Addressing Modes and Instruction Sets, I/O Ports, Timers/Counters, Routing Interface with OS, Wireless Communication Protocol, Routing Methodologies

Text Books:
1. Embedded System Architecture, Programming and Design by Raj Kamal, 3rd Edition TMH.
2. Introduction to Embedded System by Shibu K. V. 3rd Edition TMH.
3. The 8051 Microcontroller Based Embedded System By Manish K. Patel TMH.

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ELECTIVE: III
BEIT803T2 DIGITAL IMAGE PROCESSING
(Theory Credit: 05)

Teaching Scheme:          Examination Scheme:
Lecture: 4 Hours/week     Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week     Duration of University Exam.: 03 Hours

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UNIT I:
DIGITAL IMAGE FUNDAMENTALS
Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT II:
IMAGE ENHANCEMENT
Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra harmonic mean filters, Homomorphic filtering, Color image fundamentals - RGB, HSI models, Color image enhancement.

UNIT III:
IMAGE RESTORATION

UNIT IV:
IMAGE SEGMENTATION
Edge detection, Edge linking via Hough transform, Thresholding, Region based segmentation, Region growing, Region splitting and merging, Segmentation by morphological watersheds, basic concepts, Dam construction, and Watershed segmentation algorithm.

UNIT V:
IMAGE COMPRESSION
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG

UNIT VI:
FEATURE EXTRACTION
Representation, Topological Attributes, Geometric Attributes Description, Boundary-based Description, Region-based Description, Relationship, Object Recognition, Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching.
Text Books:

Reference Books:
ELECTIVE: III
BEIT803T3 PATTERN RECOGNITION
(Theory Credit: 05)

Teaching Scheme:  
Lecture: 4 Hours/week  
Tutorial: 1 Hour/week

Examination Scheme:  
Theory: T (U): 80 Marks T (I): 20 Marks  
Duration of University Exam. : 03 Hours

UNIT I:
Pattern Classifier: Overview of Pattern recognition, Discriminant functions, supervised learning, parametric estimation, Maximum Likelihood Estimation,

UNIT II:
Bayes Classifier: Bayesian parameter Estimation, Problems with Bayes approach, Pattern classification by distance functions, Minimum distance pattern classifier.

UNIT III:
Clustering: Clustering for unsupervised learning and classification Clustering concept, C Means algorithm, Hierarchical clustering, Graph theoretic approach to pattern Clustering, Validity of Clusters.

UNIT IV:
Feature Extraction and Structural Pattern Recognition: KL Transforms, Feature selection through functional approximation, Binary selection, Elements of formal grammars, Syntactic description, stochastic grammars, Structural representation.

UNIT V:

UNIT VI:
Recent Advances:
Fuzzy logic, Fuzzy Pattern Classifier, Pattern classification using genetic algorithms, Case study using Fuzzy pattern classifier and perception

Text Books:

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UNIT I:
Introduction:
Machine Learning, Machine Learning Foundations, Overview, applications, Types of machine learning, basic concepts in machine learning, Examples of Machine Learning, Applications, Linear Models for Regression, Linear Basis Function Models, The Bias, Variance Decomposition, Bayesian Linear Regression, Bayesian Model Comparison

UNIT II:
Supervised Learning:

UNIT III:

UNIT IV:
Instance-Based Learning:
Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability Machine, Machine learning concepts and limitations: Learning theory, formal model of the learnable, sample complexity, learning in zero-bayes and realizable case, VC-dimension, fundamental algorithm independent concepts, hypothesis class, target class, inductive bias, Occam’s razor, empirical risk, limitations of inference machines, approximation and estimation errors, Tradeoff.

UNIT V:
UNIT VI:
Advanced Learning:
Sampling, Basic sampling methods, Monte Carlo, Reinforcement Learning, K-Armed Bandit-Elements, Model-Based Learning, Value Iteration, Policy Iteration. Temporal Difference Learning, Exploration Strategies, Deterministic and Non-deterministic Rewards and Actions, Eligibility Traces, Generalization, Partially Observable States, the Setting-Example, Semi - Supervised Learning. Computational Learning Theory: Mistake bound analysis, sample complexity analysis, VC dimension. Occam learning, accuracy and confidence boosting

Text Books:
1. Machine Learning – Tom M. Mitchell, - MGH

Reference Books:

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ELECTIVE: IV
BEIT804T1 CYBER SECURITY
(Theory Credit: 05)

Teaching Scheme:
Lecture: 4 Hours/week
Tutorial: 1 Hour/week

Examination Scheme:
Theory: T (U): 80 Marks T (I): 20 Marks
Duration of University Exam.: 03 Hours

UNIT I:
Introduction: Cyber Crime; definitions, An origin of the Word, cyber crime - and information security, who are criminals? classification of cyber crimes; email spoofing, spamming, cyber defamation, internet time theft, salami attack or salami technique, data diddling, forgery, web jacking, news group spam or crimes emanating from usenet NewsGroup, Industrial spying or Industrial Espionage, hacking, online fraud, Pornography offenses, software piracy, Computer Sabotage, email bombing, mail bombs, usenet NewsGroup as a source of cyber crimes, computer network intrusion, password sniffing, credit crad fraud, identity theft.

UNIT II:
Introduction, categories of cyber crime, how criminals plan the attack: Reconnaissance, passive and active attacks, scamming/scrutinizing gathered information, attack (Gaining and maintaining the system access, Social engineering, classification of social engineering, cyber stalking, types of stalkers, cases reported on cyber stalking, how stalking works? Real life incidents of cyber stalking, cyber cafe and cyber crimes, fuel for cyber crimes, Botnet, attack vector, cloud computing: why cloud computing? types of services, cyber crime and cloud computing.

UNIT III:
Cyber crime: Mobile and wireless devices: Introduction proliferation of mobile and wireless devices trained in mobility, credit card fraud in mobile and wireless computing era - types and technique of credit card fraud, security challenges posed by mobile devices, registry selling for mobile devices, authentication service security - cryptographic security for mobile devices, LDAP security for handheld mobile computing devices, RAS security for mobile devices, Media player control security, networking API security for mobile computing applications, attacks on mobile phone - mobile phone theft, mobile viruses, mishing, vishing, hacking Bluetooth mobile devices, security implications for organizations, managing diversity and proliferation of hand-held devices, unconventional or stealth storage devices threats through cost and stolen devices. Protecting data on lost devices educating the laptop user, organizational measures of handling mobiles, device related security issues, organizational security policies and measures in mobile computing era.

UNIT IV:
Tools and methods used in Cyber crime: Introduction proxy servers and anonymizers phishing, password cracking - online attacks, offline attacks, strong, weak and random password, random password, key loggers and spywares: s/w key loggers hardware key loggers, anti loggers, spywares, virus and worms, types of virus, Trojan horse and
backdoors: backdoors, protection from Trojan horse, steganography, DoS and DDos attacks, SQL injection buffer overflow, attacks on wireless networks.

UNIT V:
**Phishing and Identity theft:** Introduction, phishing - methods of phishing, phishing techniques, spear phishing, types of phishing scams, phishing toolkit and spy phishing, phishing counter measures, Identity theft (ID theft) - Personally Identifiable Information (PII), types of identity theft, techniques of ID theft, Identity theft: counter measures, how to efface your Identity.

UNIT VI:
**Cybercrime AND Cyber-security:** The legal perspectives - Introduction, cybercrime and the legal landscape around the world, why do we need cyber laws: Indian context, The Indian Act, challenges of Indian law and cyber crime scenario in India, consequences of not adverting the weakness in Information Technology ACT, digital signature and the Indian ACT, Amendments to the Indian ACT, cybercrime and punishment, cyber laws, technology and student: Indian Scenario.

**Text Books:**

**Reference Books:**

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ELECTIVE: IV
BEIT804T2  CLOUD COMPUTING
(Theory Credit: 05)

Teaching Scheme:        Examination Scheme:
Lecture:  4 Hours/week   Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial:  1 Hour/week   Duration of University Exam. : 03 Hours

UNIT I:

UNIT II:
Understanding Services and Virtualization Technology:
Understanding services and applications, defining Infrastructure as a Service (IaaS), Platform as a service, Software as a Service, Identity as a Service, Compliance as a Service, Using virtualization technologies, Load balancing and virtualization, understanding Hypervisors, understanding machine Imaging, porting applications, Salesforce.com versus Force.com, SaaS versus PaaS.

UNIT III:
Using Cloud Platform:
Using Google web services, using Amazon web services, using Microsoft cloud services, Aneka integration of private and public cloud

UNIT IV:
Cloud Migration:
Broad approaches to migration, seven steps model of migration, mobbing applications to the cloud, Applications in the cloud, Application in cloud API

UNIT V:
Cloud Security and Storage:
Securing the cloud, securing data, working with cloud based storage - measuring the digital universe, provisioning cloud storage, Exploring cloud back-up solutions

UNIT VI:
Cloud Computing Tools and Future Cloud:
Open source cloud computing platform - Eucalyptus, Open Nebula, Programming in the cloud Map Reduce Dryad. Future cloud - Future trends in cloud computing, defining the mobile market, using Smart phones with the cloud.
Text Books:
1. "Cloud Computing Bible", Barrie Sosinsky; Wiley India Pvt. Ltd.
2. "Cloud Computing - Principals and Paradigms", Rajkumar Buyya, James Broberg, Andrzej Goscinski; Wiley India Pvt. Ltd.
3. Cloud Computing, A Hands on Approach, Bahga, Madisetti, University Press,

Reference Books:

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ELECTIVE: IV
BEIT804T3 E-COMMERCE AND ENTERPRISE RESOURCE PLANNING
(Theory Credit: 05)

Teaching Scheme:
Lecture: 4 Hours/week
Tutorial: 1 Hour/week

Examination Scheme:
Theory: T (U): 80 Marks T (I): 20 Marks
Duration of University Exam.: 03 Hours

UNIT I:

UNIT II:
Business to Business Electronics-commerce: Inter-organizational transactions, electronics markets, electronic data interchange (EDI), EDI-technology, EDI and business, inter organizational e-com. Business to consumer electronic commerce: consumer trade transactions, the elements of e-commerce– elements, e-visibility, the e-shop, online payment, delivering the goods, after sales service, internet e-com security, a website evolution mode.

UNIT III:

UNIT IV:
Introduction to ERP: ERP: An Overview, Enterprise – An Overview, ERP architecture, ERP 2 tier and 3 tier Architecture, Benefits of ERP, Risks of ERP, ERP and Related Technologies, Business Process Reengineering (BPR), Data Warehousing, Data Mining, OLAP, SCM, CRM

UNIT V:
ERP Implementation Lifecycle, Implementation Methodology, ERP project Teams, Vendors, Consultants and Users, Contracts with Vendors, Consultants and Employees, Project Management and Monitoring , Success and Failure Factors of an ERP Implementation.

UNIT VI:
Text Books:
1. E-Commerce by David Whitely (McGrew Hill Pub.)
2. Electronics-Commerce by Gary P. Schneider and James T. Perry. (COURSE TECHNOLOGY Thomson Learning)
5. Enterprise Resource Planning by Parag Diwan and Sunil Sharma (Pentagon Press.)

Reference Books:
3. The Architecture of SAP ERP: Understand how successful software works by Jochen Boeder, Bernhard Groene

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ELECTIVE: IV
BEIT804T4 WIRELESS SENSOR NETWORKS
(Theory Credit: 05)

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<th>Teaching Scheme:</th>
<th>Examination Scheme:</th>
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<tr>
<td>Lecture: 4 Hours/week</td>
<td>Theory: T (U): 80 Marks T (I): 20 Marks</td>
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<tr>
<td>Tutorial: 1 Hour/week</td>
<td>Duration of University Exam.: 03 Hours</td>
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UNIT I:
Introduction to wireless Sensor Network:
Network Characteristics, Network application, Network design challenges, Sensor network architectural elements, WSN standards, IEEE 802.15.4, Zig-bee.

UNIT II:
Basic Wireless Sensor Technology:
Sensor node structures, Sensor network architecture, Classification of WSN, Protocol Stack for WSN.

UNIT III:
Medium Access Control:
Fundamental MAC Protocol, MAC design for WSN, S-MAC, DS-MAC, MS-MAC, Traffic adaptive medium access, Self organizing MAC.

UNIT IV:
Routing in WSN:
Data dissemination and gathering, Routing challenges and design issues in WSN, Routing strategies, Flooding and it's variants, Low energy adaptive clustering, Geographical routing.

UNIT V:
Transport Protocol:
Traditional transport protocol, Transport protocol design, Authenticity: Message authentication code, Signature, Authenticating public key, Broadcast and Multicast authentication.

UNIT VI:
Network Management and Operating System for WSN:
Traditional network management models, network management design issues, Example of management architecture: MANNA, Operating system design issues, Operating System: Tiny OS, Mate OS, Magnet OS.
Text Books:

References Books:

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BEIT805P PROJECT (Practical Credit: 04)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Practical: P (U): 75 Marks P (I): 75 Marks
Duration of University Exam. : 02 Hours

Note:

1. The topic of the project decided in seventh semester should be considered and extended to implementation and testing phases.

2. The research paper publication / presentation in reputed national and international journals / conferences should be given some weightage while evaluation.

3. The project report should be written using technical research writing tools (e.g. Latex) and submitted to the department for internal as well as external evaluation.

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