

**SYLLABUS OF INFORMATION TECHNOLOGY**  
**RTM NAGPUR UNIVERSITY, NAGPUR**  
**ACADEMIC SESSION: 2015-2016**  
**SEVENTH AND EIGHTH SEMESTERS**

**Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur**  
**Absorption Scheme for New course(C.B.S.) to Old course of Seventh 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**

Sl. No	Sub Code	Subjects	Th/Pr	Subject Code	Subjects	Th/Pr
1	8IT47	Distributed Databases and Object Oriented Databases	Th	BEIT701T	Data Warehousing and Mining	Th
2	8IT47	Distributed Databases and Object Oriented Databases	Pr	BEIT701P	Data Warehousing and Mining	Pr
3	7IT43	Computer System Security	Th	BEIT702T	Computer System Security	Th
4	7IT41	Computer Network and Internet	Pr	BEIT702P	Computer System Security	Pr
5	7IT44	Elective-I Artificial Intelligence	Th	BEIT703T	Artificial Intelligence	Th
6	8IT51	Elective-II Mobile Communication	Th	BEIT704T1	Elective-I Mobile Computing	Th
7	7IT45	Elective-II Multimedia Systems	Th	BEIT704T2	Elective-I Multimedia Systems	Th
8	-----	-----	-----	BEIT704T3	Elective-I Bio-informatics	Th
9	-----	-----	-----	BEIT704T4	Elective-I Compiler Design	Th
10	-----	-----	-----	BEIT705T1	Elective-II Software Testing and Quality Assurance	Th
11	8IT51	Elective-II Parallel Processing	Th	BEIT705T2	Elective-II Cluster and Grid Computing	Th
12	7IT42	Digital Signal Processing	Th	BEIT705T3	Elective-II Digital Signal Processing	Th
13	-----	-----	-----	BEIT705T4	Elective-II Digital Forensic for Information Technology	Th
14	7IT46	Mini Project	Pr	BEIT706P	Seminar on Project	Pr
15	7IT42	Digital Signal Processing	Pr	-----	-----	-----
16	7IT44	Elective-I Operation Research	Th	-----	-----	-----
17	7IT44	Elective-I VLSI Design	Th	-----	-----	-----
18	7IT45	Elective-II Fuzzy System and Neural Networks	Th	-----	-----	-----
19	7IT45	Elective-II Digital Image Processing	Th	-----	-----	-----
20	7IT45	Elective-II CAD/CAM	Th	-----	-----	-----
21	7IT45	Elective-II Management Information Systems	Th	-----	-----	-----
22	7IT41	Computer Network and Internet	Th	-----	-----	-----

Members,  
BOS (CE/IT)

Chairman,  
BOS (CE/IT)

**Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur**  
**Absorbition 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**

Sl. No	Sub Code	Subjects	Th/Pr	Subject Code	Subjects	Th/Pr
1	-----	-----	-----	BEIT801T	Distributed Systems	Th
2	-----	-----	-----	BEIT801P	Distributed Systems	Pr
3	-----	-----	-----	BEIT802T	Gaming Architecture and Programming	Th
4	-----	-----	-----	BEIT802P	Gaming Architecture and Programming	Pr
5	8IT50	Elective-I Real Time Systems	Th	BEIT803T1	Elective-III Embedded Systems	Th
6	7IT45	Elective-II Digital Image Processing	Th	BEIT803T2	Elective-III Digital Image Processing	Th
7	8IT51	Elective-II Pattern Recognition	Th	BEIT803T3	Elective-III Pattern Recognition	Th
8	7IT45	Elective-II Fuzzy System and Neural Networks	Th	BEIT803T4	Elective-III Machine Learning	Th
9	-----	-----	-----	BEIT804T1	Elective-IV Cyber Security	Th
10	-----	-----	-----	BEIT804T2	Elective-IV Cloud Computing	Th
11	8IT49	E-Commerce	Th	BEIT804T3	Elective-IV E-Commerce and Enterprise Resource Planning	Th
12	8IT50	Elective-I Enterprise Resource Planning	Th			
13	8II50	Elective-I Fibre Optical Communication	Th	BEIT804T4	Elective-IV Wireless Sensor Networks	Th
14	8IT52	Project	Pr	BEIT805P	Project	Pr
15	8IT50	Elective-I Modelling and Simulation	Th	-----	-----	-----
16	8IT51	Elective-II Advanced Microprocessor	Th	-----	-----	-----
17	8IT51	Elective-II Parallel Processing	Th	-----	-----	-----
18	8IT47	Distributed Databases and Object Oriented Databases	Th	-----	-----	-----
19	8IT47	Distributed Databases and Object Oriented Databases	Pr	-----	-----	-----
20	8IT48	Web Technologies	Th	-----	-----	-----
21	8IT48	Web Technologies	Pr	-----	-----	-----
22	8IT51	Elective-II Mobile Communication	Th	-----	-----	-----

Members,  
BOS (CE/IT)

Chairman,  
BOS (CE/IT)



**FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE**  
**SEMESTER: SEVENTH**  
**BRANCH: INFORMATION TECHNOLOGY**

Sr. No.	Subject Code	Subjects	Workload				Credit				Marks				
			L	P	T	Total Hrs/Week	L	P	T	Total	Theory		Practical		Total Marks
											Sess.	Univ.	Sess.	Univ.	
1	BEIT701T	Data Warehousing and Mining	4	-	1	5	4	-	1	5	20	80	-	-	100
2	BEIT701P	Data Warehousing and Mining	-	2	-	2	-	1	-	1	-	-	25	25	50
3	BEIT702T	Computer System Security	4	-	1	5	4	-	1	5	20	80	-	-	100
4	BEIT702P	Computer System Security	-	2	-	2	-	1	-	1	-	-	25	25	50
5	BEIT703T	Artificial Intelligence	4	-	1	5	4	-	1	5	20	80	-	-	100
6	BEIT704T	Elective -I	4	-	1	5	4	-	1	5	20	80	-	-	100
7	BEIT705T	Elective -II	4	-	1	5	4	-	1	5	20	80	-	-	100
8	BEIT706P	Seminar on Project	-	2	-	2	-	2	-	2	-	-	50	-	50
		<b>Total</b>	<b>20</b>	<b>6</b>	<b>5</b>	<b>31</b>	<b>20</b>	<b>4</b>	<b>5</b>	<b>29</b>	<b>100</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>650</b>

**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  
 BEIT705T4: Digital Forensic for Info. Tech.

**FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE**  
**SEMESTER: EIGHTH**  
**BRANCH: INFORMATION TECHNOLOGY**

Sr. No.	Subject Code	Subjects	Workload				Credit				Marks				
			L	P	T	Total Hrs/Week	L	P	T	Total	Theory		Practical		Total Marks
											Sess.	Univ.	Sess.	Univ.	
1	BEIT801T	Distributed Systems	4	-	1	5	4	-	1	5	20	80	-	-	100
2	BEIT801P	Distributed Systems	-	2	-	2	-	1	-	1	-	-	25	25	50
3	BEIT802T	Gaming Architecture and Programming	4	-	1	5	4	-	1	5	20	80	-	-	100
4	BEIT802P	Gaming Architecture and Programming	-	2	-	2	-	1	-	1	-	-	25	25	50
5	BEIT803T	Elective-III	4	-	1	5	4	-	1	5	20	80	-	-	100
6	BEIT804T	Elective-IV	4	-	1	5	4	-	1	5	20	80	-	-	100
7	BEIT805P	Project	-	4	-	4	-	4	-	4	-	-	75	75	150
		<b>Total</b>	<b>16</b>	<b>8</b>	<b>4</b>	<b>28</b>	<b>16</b>	<b>6</b>	<b>4</b>	<b>26</b>	<b>80</b>	<b>320</b>	<b>125</b>	<b>125</b>	<b>650</b>

**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:**

**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**

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**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.
2. Fundamentals of Data Warehouses, Jarke, Vassiliou, 2<sup>nd</sup> Edition, Springer.
3. Data Warehousing in Real World - Anahory, Murray, Pearson Education
4. Data Warehousing - Paulraj Ponniah

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**BEIT701P**

**DATA WAREHOUSING AND MINING**

**(Practical Credit: 01)**

**Teaching Scheme:**

**Practical: 2 Hours/week**

**Examination Scheme:**

**Practical: P (U): 25 Marks P (I): 25 Marks**

**Duration of University Exam. : 02 Hours**

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**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

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**BEIT702T**

**COMPUTER SYSTEM 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**

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**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 – Ceasar 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:**

Secure hash algorithm (SHA-1), RIPEMD-160, HMAC, digital signatures and Authentication protocol-digital signature, authentication protocol, digital signature standard. Network Security practices, authentication applications-Kerberos, x.509 directory authentication service, Kerberos encryption technique

**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:**

1. Forouzan, "Cryptography and Network Security", Tata-McGraw hill.
2. William Stallings, "Cryptography and Network Security: Principle and Practice", Fifth Edition, Pearson.
3. Atul Kahate, "Cryptography and Network Security", Tata-McGraw hill.

**Reference Books:**

1. Josef Pieprzyk, Thomas Hardjono, Jennifer Seberry, "Fundamentals of computer Security", Springer.

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**BEIT702P**

**COMPUTER SYSTEM SECURITY**

**(Practical Credit: 01)**

**Teaching Scheme:**

**Practical: 2 Hours/week**

**Examination Scheme:**

**Practical: P (U): 25 Marks P (I): 25 Marks**

**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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**BEIT703T**

**ARTIFICIAL INTELLIGENCE**

**(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**

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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 characteristics, 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:**

1. Artificial Intelligence (Third Edition) McGraw-Hill Elaine Rich, Kevin Knight.
2. A First course in Artificial Intelligence (McGraw-Hill) Deepak Khemani.
3. Artificial Intelligence A modern approach (Second Edition) Pearson, Stuart Russell, and Peter Norvig.

**Reference Books:**

1. Fuzzy Logic with Engineering application (Third edition) Timothy J.Rose

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**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**

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**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 through Internet.

**UNIT III:**

**Wireless LAN:**

Wireless LAN advantages, Applications, IEEE 802.11 standards, System Architecture, Protocol Architecture, Physical layer, Medium access control layer, MAC management roaming.

**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:**

1. Mobile Communications: 2<sup>nd</sup> Edition, Jochen Schiller, Pearson Education.
2. Wireless Communication-Principles and Practice-2nd Edition, Theodore S. Rappaport, PHI Publications

**Reference Books:**

1. Mobile Computing- Technology, Applications and services creation-Ashok K. Talukder, Roopa R. Yavagal, TMH.
2. Mobile Computing-Theory and Practice-Kumkum Garg-Pearson Publications

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**ELECTIVE: I**  
**BEIT704T2**

**MULTIMEDIA 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**

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**UNIT I:**

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

**Multimedia Systems Architecture:** Multimedia Workstation Architecture, High resolution Graphic displays, Multimedia Architecture Based on interface bus, Network architecture for Multimedia systems.

**Evolving Technologies For Multimedia Systems:** Hyper Speech, HDTV and UDTV, 3D Technologies and Holography, Virtual Reality, Video conferencing.

**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 , spread sheets, 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:**

**Text:** About Fonts and Faces, Using Text in Multimedia, Designing with Text, Hypermedia and Hypertext, The Power of Hypertext, Using Hypertext, Hypermedia Structures, Hypertext tools.

**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.

**Video:** Using Video, How Video Works and Is Displayed, Analog Video, Digital Video, Displays, Digital Video Containers, Codec, Video Format Converters, Obtaining Video Clips, Shooting and Editing Video.

#### **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.

**Compression Schemes and standards:**(Only Concepts of ) Binary image compression, Color, Gray Scale image compression, JPEG, video image compression, Multimedia Standards for Video, Requirements for Full-motion Video Compression, MPEG, Audio compression, Fractal compression, advantages / disadvantages.

#### **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.

**Multimedia Skills:** The Team, Project Manager, Multimedia Designer, Interface Designer, Writer, Video Specialist, Audio Specialist, Multimedia Programmer, Producer of Multimedia for the Web.

#### **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.

**Designing for the World Wide Web:** Developing for the Web, The Desktop Workspace and the Small, Device Workspace, Text for the Web, Images for the Web, GIF and PNG Images, JPEG Images, Clickable Buttons, Client-Side Image Maps, Sound for the Web, Animation for the Web, GIF89a - Video for the Web.

**Delivering:** Testing-Preparing for Delivery, File Archives, Delivering on CD-ROM, Delivering on DVD.

#### **Text Books:**

1. Multimedia: Making It Work By Tay Vaughan Eighth Edition, TMH
2. Fundamental of Multimedia - Ze-Nian Li & M. S. Drew ,PHI
3. Multimedia Systems Design - Prabhat k. Andleigh, Kiran Thakra
4. Multimedia Systems - John F. Koegel Buford

#### **Reference Books:**

1. Computer Graphics Multimedia and Animation - Malay K. Pakhira PHI, New Delhi - Second edition.
2. Principles of Multimedia by Ranjan Parekh - 2<sup>nd</sup> Edition TMH.
3. Computer Graphics and Multimedia - Anirban Mukhapathyay, Aruop Chattopadhyay - Vikas Publishing Ltd - Second Edition
4. Multimedia Technology and Applications- David Hillman Galgotia Publications Pvt Ltd.- Second Edition

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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**

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**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 biostatistics.

**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:**

1. O'Reilly, "Developing Bio informatics computer skills", Indian Edition's publication.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics concepts, skills & Applications", CBS Publishers.
3. Rashidi, Hooman and Lukas K. Buehler, "Bioinformatics Basic Applications" CRC Press.
4. "Bioinformatics" , Addison Wesley, Stephen Misner & Stephen Krawetz, "Bioinformatics- Methods & Protocols"

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**ELECTIVE: I**  
**BEIT704T4**

**COMPILER DESIGN**  
**(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**

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**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:**

1. Principle of compiler Design: Alfred V. Aho and Jeffery D. Ullman, Narosa Pub.
2. Compilers Principles, Techniques, and Tools: Alfred Aho, Ravi Sethi, J. D. Ullman, 2<sup>nd</sup> Edition, Pearson
3. Principles and Practice of Compiler Writing: Aho, Sethi and Ullman, Addison Wesley.
4. Compiler Construction: K. V. N. Sunitha, Pearson Education
5. Compiler Design: O.G. Kakde, 4<sup>th</sup> Edition, University Science Press.

**Reference Books:**

1. Principles of Compiler Design: V. Raghavan, TMH.
2. Fundamentals of Compiler Design: A. K. Pandey, S. K. Kataria and Sons, N. Delhi

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**ELECTIVE: II**  
**BEIT705T1**

**SOFTWARE TESTING AND QUALITY ASSURANCE**  
**(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**

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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:**

**Acceptance Testing and Software Quality:** Types of acceptance testing, Acceptance criteria, Acceptance test plan and execution, Special Tests: Client server testing, Web application testing and Mobile application testing, fire view of software quality, ISO-9126 quality characteristics, ISO-9000:2000 software quality standard, ISO - 9000:2000

fundamentals.

**Text Books:**

1. Software Testing and Quality Assurance by Kshirsager Naik and Priyadarshini Tripathi (Wiley)
2. Software Testing Concepts and Tools by Nageswara Rao Pusuluri (Dream Tech Press)
3. Software Testing Principles, Techniques and tools, 1<sup>st</sup> Edition, by M. G. Limaye McGraw Hills

**Reference Books:**

1. "Foundations of Software Testing" 2E by Aditya P. Mathur , Pearson Education
2. Effective Methods for Software Testing- William E Perry, (Wiley). 2. Software Testing Tools by Dr. K. V. K. K. Prasad (Dream Tech)

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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**

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**UNIT I:**

Introduction to Cluster Computing, Cluster Middleware: An Introduction, Early Cluster Architecture and High Throughput Computing Clusters, Networking, Protocols and I/O for Clusters, Setting Up and Administering a Cluster

**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:**

Semantic Grid and Autonomic Computing , Metadata and Ontology in semantic Web , Semantic Web Services, Layered Structure of Semantic Grid , Semantic Grid Activities , Autonomic Computing

**UNIT VI:**

Basic Services: Grid Security, Grid Monitoring, GMA, Review criteria overview of Grid Monitoring system – Autopilot. Grid Scheduling and Resource Management: Scheduling Paradigms, working of Scheduling

**Text Books:**

1. Grid and Cluster Computing, Prabhu C.S.R, PHI Learning Private Limited
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)
2. Cloud Computing: A Practical Approach by J. Vette, Toby J. Vette, Robert Elsenpeter (Tata McGraw Hill)
3. Distributed and Cloud Computing, First Edition, Geoffrey C. Fox, Kai Hwang, Jack J. Dongarra, Elsevier India Pvt. Ltd.-New Delhi
4. Distributed Systems: Principles and Paradigms, Second Edition, Andrew S. Tanenbaum, Maarten Van Steen, Person Education
5. High Performance Cluster Computing: Architectures and Systems, Vol. 1, Prentice Hall
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:**

**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**

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**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.

**Inverse Z-Transform:** Power Series expansion, Partial fraction Expansion method causality and stability.

**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:**

**Introduction to FFT algorithm:** Decimation in Time-FFT algorithm, Decimation in Frequency-FFT algorithm, Inverse FFT algorithm, Discrete Cosine Transform.

**Text Books:**

1. J. G. Proakis, Manolakis " Digital Signal Processing : Principle, Algorithms and applications, Pearson Education
2. A. V. Oppenheim, R. W. Schafer, "Discrete Time Signal Processing ", Pearson Education

**Reference Books:**

1. S. Salivahanana, A Vallaraj, C, Ganapriya" Digital Signal Processing", McGraw Hill

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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**

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**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:**

1. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics by John Sammons, Edition 1, Published by Elsevier February 24, 2012, ISBN: 978-1-59749-661-2

**Reference Books:**

1. Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.
2. Nelson B, Phillips A, Enfinger F, Stuart C., "Guide to Computer Forensics and Investigations, 2<sup>nd</sup> ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.

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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**

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**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 upto 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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**BEIT801T**

**DISTRIBUTED 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**

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**UNIT I:**

**Introduction:** Distributed Computing Models, Software Concepts, Hardware Concepts, The Client-Server model, Issues in design of a distributed operating system.

**UNIT II:**

**COMMUNICATION:** Introduction to Message Passing, Advantages and features of message passing, Message format, Message Buffering, Remote Procedure Call, Extended RPC Models, Remote Object Invocation, Message Oriented Communication.

**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:**

1. Andrew Tanenbaum, Maarten Van Steen, "Distributed System- Principals Paradigm", PHI Publication.
2. Singhal and Shivratri, "Advanced Concept in Operating Systems", McGraw Hill.



**BEIT801P**

**DISTRIBUTED SYSTEMS**

**(Practical Credit: 01)**

**Teaching Scheme:**

**Practical: 2 Hours/week**

**Examination Scheme:**

**Practical: P (U): 25 Marks P (I): 25 Marks**

**Duration of University Exam. : 02 Hours**

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**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:**

**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**

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**UNIT I:**

**Core Design:** What Is a Game? Games Aren't Everything. Games Mean Gameplay. Creating the Game Spec. Example Game Spec, Initial Design: The Beginning. Hardware Abstraction. The Problem Domain. Thinking in Tokens.

**UNIT II:**

**Use of Technology:** The State of the Art. Blue-Sky Research. Reinventing the Wheel. Use of Object Technology, Building Bricks: Reusability in Software, Initial Architecture Design: The Birth of Architecture. The Tier System. Architecture Design.

**UNIT III:**

**Development:** The Development Process. Code Quality. Coding Priorities. Debugging and Module Completion. The Seven Golden Gambits. The Three Lead Balloons. GAME PROGRAMMING: Technologies: Display, Mixing 2D and 3D, DirectX, User Interface code, Resource caching, the main loop.

**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:**

**Loading and Caching Game Resources:**

Art and Sound Formats, Resource Files, Data Compression, IPac: A Resource File Builder, the Resource Cache, World Design and Cache Prediction, 3D Graphics and 3D Engines: 3D Graphics Pipeline, Setting Up a Project, Using a Scene Graph, 3D Middleware Review, Rolling Your Own 3D Engine.

**Text Books:**

1. Game Architecture and Programming, Shankarmani, Jain, Sinha, Wiley Publication, India
2. Fundamentals of Game Design, 3<sup>rd</sup> Edition, Ernest Adams, Pearson Publication

**Reference Books:**

1. Game Theory: An Introduction, E. N. Barron, Wiley Student Edition.
2. ActionScript 3.0 Game Programming University, 2<sup>nd</sup> Edition, Gary Rosenzweig, Pearson Education.
3. "Game Architecture and Design", Andrew Rollings and Dave Morris
4. "Professional Game Programming" Mike McShaffry, Dreamtech Press.

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**BEIT802P**

**GAMING ARCHITECTURE AND PROGRAMMING**

**(Practical Credit: 01)**

**Teaching Scheme:**

**Practical: 2 Hours/week**

**Examination Scheme:**

**Practical: P (U): 25 Marks P (I): 25 Marks**

**Duration of University Exam. : 02 Hours**

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**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. PlayCanvas
  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**

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**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:**

Architecture of the kernel, Tasks and Task Scheduler, Threads , ISR, Multiprocessing and Multitasking, Semaphore and Shared Data, Mutex, Mailboxes, Message Queue, Events, Pipes, Timers, Signals, Memory Management, RTOS Task Scheduling Models, Interrupt Latency, Response of the task, OS Security issues, Introduction to Android.

**UNIT IV:**

**Devices and Communication:**

Serial Communication devices, Parallel device port, Buses: I<sup>2</sup>C, UART, USART, CAN Bus, Devices: Wireless Devices, Timer and Counting Devices, Watch Dog Timer, Real Time Clock, Network Embedded System.

**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.
4. An Embedded Software Primer by David E. Simon (Pearson Edu. Asia).
5. 8051 Microcontroller and Embedded System by Muhammad Ali Mazidi, Janice Mazidi, Janice Gillispie Mazidi, Pearson Edition.
6. Embedded / Real Time Systems: Concepts, Design and Programming (Black Book) By Dr. K. V. K. K. Prasad Dreamtech Press.
7. Embedded Systems Engineering, C. R. Sarma, University Press.

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**ELECTIVE: III**

**BEIT803T2**

**DIGITAL IMAGE PROCESSING**

**(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**

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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**

Image Restoration - degradation model, unconstrained restoration - Lagrange multiplier and constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

**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:**

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson Education, Third Edition, 2008.
2. Anil K. Jain, Fundamentals of Digital Image Processing', Pearson 2002.

**Reference Books:**

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
3. D. E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, Digital Image Processing' , John Wiley, New York, 2002
5. Milan Sonka et al, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999,

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**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**

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**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:**

**Hidden Markov model and Support Vector Machine:** State machine, Hidden Markov model, Training, Classification, Support vector machine, Feature Selection.

**UNIT VI:**

**Recent Advances:**

Fuzzy logic, Fuzzy Pattern Classifier, Pattern classification using genetic algorithms, Case study using Fuzzy pattern classifier and perception

**Text Books:**

1. M. Narasimha Murthy and V. Susheela Devi, "Pattern Recognition", Springer 2011
2. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Ed., Academic Press, 2009.
3. Robert J. Schalkoff, "Pattern Recognition Statistical, Structural and Neural Approaches", John Wiley and Sons Inc., New York, 1992.
4. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

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**ELECTIVE: III**  
**BEIT803T4**

**MACHINE LEARNING**  
**(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**

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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:**

Linear Models for Classification, Discriminate Functions, Single layer neural network, linear reparability, general gradient descent, perception learning algorithm, multi-Layer perception: two-layers universal approximations, back propagation learning, important parameters, Margin of a classifier, dual perception algorithm, learning non-linear hypotheses with perception.

**UNIT III:**

**Unsupervised Learning:** Clustering, K-means, EM, Mixtures of Gaussians, The EM Algorithm in General, Model selection for latent variable models, high-dimensional spaces, The Curse of Dimensionality, Dimensionality Reduction, Factor analysis, Principal Component Analysis, Probabilistic PCA, Independent components analysis. Neural Networks, Feed-forward Network Functions, Error Back, propagation, Regularization , Mixture Density and Bayesian Neural Networks, Kernel Methods, Dual Representations , Radial Basis Function Networks. Ensemble methods, Bagging, Boosting

**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:**

**Support Vector Machine (SVM):** Kernel functions, implicit non-linear feature space, theory, zero-Bayes, realizable infinite hypothesis class, finite covering, margin-based bounds on risk, maximal margin classifier. Machine learning assessment and Improvement: Statistical model selection, structural risk minimization, bootstrapping, bagging, boosting.

## **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
2. Ethem Alpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005

### **Reference Books:**

1. Christopher Bishop, "Pattern Recognition and Machine Learning" Springer, 2006
2. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
3. Stephen Marsland, "Machine Learning –An Algorithmic Perspective", CRC Press, 2009

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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**

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**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, Pronography offenses, software piracy, Computer Sabotage, email bombing, mail bombs, usenet NewsGroup as a source of cyber crimes, computer network intrusion, password sniffing, credit card 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, phishing, 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 advertent 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:**

1. Naina Godbole, Sunil Belapure, "Cyber Security - Understanding Cybercrime, Computer forensic and legal perspective", Wiley India Pvt. Ltd.

#### **Reference Books:**

1. Thomas J. Mowbray, "Cyber security Managing systems- Conducting, Testing and Investigating Intrusion", Wiley

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**ELECTIVE: IV  
BEIT804T2**

**CLOUD 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**

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**UNIT I:**

**Defining Cloud Computing:** Cloud computing in a nutshell, cloud type - NIST Model, cloud cube model, deployment model, service model, Characteristics of cloud computing, cloud computing stack, open stack.

**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, Madiseti, University Press,
4. "Mastering Cloud Computing", Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Tata McGraw Hill.

**Reference Books:**

1. "Cloud Computing - A practical approach for learning and implementation", A. Shrinivasan, J. Suresh; Pearson
2. "Cloud Computing - Fundamentals, Industry approach and trends", Rishabh Sharma; Wiley India Pvt. Ltd.

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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**

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**UNIT I:**

Introduction to electronics-commerce: The scope of E-COM, definition of E-COM, E-COM and trade cycle, electronic market, electronic data interchange, internet commerce, E-Commerce in perspective, the value chain, supply chains. Electronic Commerce Software: What kind of software solutions do you need? Marketing smarts, hosting services, basic packages, midrange package, enterprise solutions for large firms.

**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:**

Electronics payment system: The basics of electronic payment systems. Electronics cash, electronics wallets, smart cards, credit and charge cards. The environment of electronic commerce: international legal, ethical and tax issues: International nature of electronic commerce, the legal environment of electronic commerce, taxation and E-COM, business plans for implementing E-COM: Planning the E-Commerce project, managing electronic commerce implementation.

**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:**

The Business Module: Business Modules of an ERP package, Finance, Manufacturing Human Resources, Plant maintenance, Materials Management, Quality management Sales and Distribution, Case study for Architecture and integration of SAP ERP, ERP PRESENT AND FUTURE :-ERP and e-Commerce, ERP Internet and WWW, ERP and E-Business



**Text Books:**

1. E-Commerce by David Whitely (McGraw Hill Pub.)
2. Electronics-Commerce by Gary P. Schneider and James T. Perry. (COURSE TECHNOLOGY Thomson Learning)
3. Alexis Leon, "ERP Demystified", Tata McGraw Hill, New Delhi, 2000
4. E-business and E-commerce management strategy, implementation and practice, 5<sup>th</sup> Edition, Dave Chaffey, Pearson Education
5. Enterprise Resource Planning by Parag Diwan and Sunil Sharma (Pentagon Press.)

**Reference Books:**

1. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", PHI, New Delhi, 2003
2. Business on the net by K. N. Agarwal, A. Lal, Deekjha Agarwal (Macmillan Pub.)
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)**

**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**

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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:**

1. Kazem Sohraby, Daniel Minoli, Taieb Znati, "Wireless Sensor Networks Technology, Protocols & Application", Wiley Student Edition
2. Jun Zheng, Abbas Jamalipour, "Wireless Sensor Network, A Network Perspective", Wiley Student Edition.

**References Books:**

1. Walteneus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks, Theory and Practice", Wiley Student Edition.

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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**

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**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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