ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
M.TECH INFORMATION TECHNOLOGY
(SPECIALIZATION IN MULTIMEDIA)
REGULATIONS – 2015
CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

I. To prepare students to excel in research and to succeed in Information Technology profession through global, rigorous post graduate education.
II. To provide students with a solid foundation in computing, communication and information technologies that is required to become a successful IT professional or a researcher in the field of computer science and information technology.
III. To train students with good computing and communication knowledge so as to comprehend, analyze, design, and create novel software products and communication protocols for the real-life problems.
IV. To inculcate students in professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate information technology issues to broader social context.
V. To provide student with an academic environment provides aware of excellence, leadership, and write ethical codes to follow guidelines, needed for a successful professional career

PROGRAMME OUTCOMES (POs):

On successful completion of the Programme,

1. Graduates will demonstrate knowledge of information technology, computer science and communication engineering.
2. Graduates will demonstrate an ability to identify, formulate and solve computing and communication problems.
3. Graduate will demonstrate an ability to design effective and useful software and carry out research in the fields of computing and communication.
4. Graduates will demonstrate an ability to implement a system, component or process as per needs and specifications.
5. Graduates will demonstrate an ability to implement the projects that require knowledge from any of the related fields.
6. Graduates will demonstrate an ability to design a system, component or process as per needs and specifications of the customers and society needs.
7. Graduates will acquire knowledge of mathematics, science and engineering.
8. Graduates will demonstrate an ability to identify, formulate and exhibit problem solving skills.
9. Graduates will demonstrate creative abilities to make applications exhibit more user friendliness by incorporating multimedia capabilities.
10. Graduates will demonstrate an ability to do research by designing and conducting experiments, analyze and interpret multimedia data individually as well as part of multimedia disciplinary teams.

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
I	✓		✓			✓	✓	✓	✓	✓
II	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
III			✓	✓	✓	✓		✓	✓	✓
IV				✓				✓	✓	✓
V				✓	✓	✓		✓	✓	✓

YEAR	SEMESTER	COURSE TITLE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
1	I	Advances in Databases		✓	✓		✓					
		Advanced Computer Architecture	✓			✓	✓					
		Advances in Data Structures and Algorithms		✓	✓	✓	✓	✓				
		Probability and Statistical Methods		✓	✓		✓					
		Advanced Computer Graphics and Animation						✓	✓		✓	✓
		Elective I										
		Data Structures Laboratory	✓	✓					✓			
	II	Advanced Java and Internet	✓		✓	✓	✓			✓		
		Data Science and Analytics	✓	✓	✓	✓	✓			✓		
		Network Engineering	✓	✓	✓	✓						
		3D Game Modeling and Rendering						✓	✓	✓	✓	✓
		Fundamentals Digital Image Processing						✓	✓	✓	✓	✓
		Elective II										
		Multimedia Tools Laboratory						✓	✓	✓	✓	✓

2	**III**	Audio and Video Processing						✓	✓	✓	✓	✓
		Wireless and Mobile Networks	✓	✓	✓	✓						
		Elective III										
		Elective IV										
		Audio & video Processing Lab				✓	✓				✓	✓
		Project Work Phase I							✓	✓	✓	✓
	IV	Project Work Phase II							✓	✓	✓	✓

UNIVERSITY DEPARTMENTS
ANNA UNIVERSITY: CHENNAI- 600 025
REGULATIONS – 2015
M.TECH INFORMATION TECHNOLOGY
(SPECIALIZATION IN MULTIMEDIA)
I TO IV SEMESTERS OF CURRICULA AND SYLLABI

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	IF7101	Advanced Computer Architecture	PC	3	3	0	0	3
2.	IF7102	Advances in Databases	PC	3	3	0	0	3
3.	IF7151	Advances in Data Structures and Algorithms	PC	3	3	0	0	3
4.	MA7159	Probability and Statistical Methods	FC	4	4	0	0	4
5.	MM7151	Advance Computer Graphics and Animation	PC	3	3	0	0	3
6.		Elective I	PE	3	3	0	0	3
PRACTICALS								
7.	IF7111	Data Structures Laboratory	PC	4	0	0	4	2
			TOTAL	**23**	**19**	**0**	**4**	**21**

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	IF7201	Advanced Java and Internet	PC	5	3	2	0	4
2.	IF7202	Data Science and Analytics	PC	5	3	2	0	4
3.	IF7204	Network Engineering	PC	3	3	0	0	3
4.	MM7201	3D Game Modeling and Rendering	PC	3	3	0	0	3
5.	MM7205	Fundamentals of Digital Image Processing	PC	3	3	0	0	3
6.		Elective II	PE	3	3	0	0	3
PRACTICALS								
7.	MM7212	Multimedia Tools Laboratory	PC	4	0	0	4	2
			TOTAL	**26**	**18**	**4**	**4**	**22**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	IF7302	Wireless and Mobile Networks	PC	3	3	0	0	3
2.	MM7301	Audio and Video Processing	PC	3	3	0	0	3
3.		Elective III	PE	3	3	0	0	3
4.		Elective IV	PE	3	3	0	0	3
PRACTICALS								
5.	MM7313	Audio and Video Processing Laboratory	PC	4	0	0	4	2
6.	MM7321	Project Work Phase I	EEC	0	0	0	12	6
			TOTAL	**16**	**12**	**0**	**16**	**20**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
PRACTICALS								
1.	MM7421	Project Work Phase II	EEC	0	0	0	24	12
			TOTAL	**0**	**0**	**0**	**24**	**12**

TOTAL NO. OF CREDITS: 75

(Project work must be carried out in the area of Specialization)

FOUNDATION COURSES (FC)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA7159	Probability and Statistical Methods	FC	4	4	0	0	4

PROFESSIONAL CORE (PC)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IF7101	Advanced Computer Architecture	PC	3	3	0	0	3
2.	IF7102	Advances in Databases	PC	3	3	0	0	3
3.	IF7111	Data Structures Laboratory	PC	4	0	0	4	2
4.	IF7151	Advances in Data Structures and Algorithms	PC	3	3	0	0	3
5.	IF7201	Advanced Java and Internet	PC	5	3	2	0	4
6.	IF7202	Data Science and Analytics	PC	5	3	2	0	4
7.	IF7204	Network Engineering	PC	3	3	0	0	3
8.	IF7302	Wireless and Mobile Networks	PC	3	3	0	0	3
9.	MM7151	Advanced Computer Graphics and Animation	PC	3	3	0	0	3
10.	MM7201	3D Game Modeling and Rendering	PC	3	3	0	0	3
11.	MM7203	Speech and Audio Processing	PC	3	3	0	0	3
12.	MM7205	Fundamentals of Digital Image Processing	PC	3	3	0	0	3
13.	MM7301	Audio and Video Processing	PC	3	3	0	0	3
14.	MM7212	Multimedia Tools Laboratory	PC	4	0	0	4	2
15.	MM7311	Audio & Video Processing Laboratory	PC	4	0	0	4	2

PROFESSIONAL ELECTIVES (PE)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IF7001	3G and 4G Wireless Networks	PE	3	3	0	0	3
2.	IF7002	Adhoc Mobile Wireless Networks	PE	3	3	0	0	3
3.	IF7003	Artificial Intelligence	PE	3	3	0	0	3
4.	IF7004	Building Internet of Things	PE	3	3	0	0	3
5.	IF7005	Compiler Design	PE	3	3	0	0	3
6.	IF7006	Cyber Forensics	PE	3	3	0	0	3
7.	IF7007	Data Warehousing and Data Mining	PE	3	3	0	0	3
8.	IF7008	Design of Software Agents	PE	3	3	0	0	3
9.	IF7010	E - Learning	PE	3	3	0	0	3
10.	IF7011	Grid Computing Technologies	PE	3	3	0	0	3
11.	IF7012	Information Retrieval	PE	3	3	0	0	3
12.	IF7013	Knowledge Engineering	PE	3	3	0	0	3
13.	IF7014	Machine Learning	PE	3	3	0	0	3
14.	IF7015	Open Source Technologies	PE	3	3	0	0	3
15.	IF7016	Semantic Web	PE	3	3	0	0	3
16.	IF7017	Social Network Analysis	PE	3	3	0	0	3
17.	IF7018	Soft Computing and Application	PE	3	3	0	0	3
18.	IF7020	Virtualization	PE	3	3	0	0	3
19.	IF7021	Mobile and Pervasive Computing	PE	3	3	0	0	3
20.	IF7022	Wireless and Sensor Networks	PE	3	3	0	0	3
21.	IF7071	Bio Informatics	PE	3	3	0	0	3
22.	IF7073	GPU Architecture and Programming	PE	3	3	0	0	3
23.	IF7077	Service Oriented Architecture	PE	3	3	0	0	3
24.	IF7451	Unix Internals	PE	3	3	0	0	3
MULTIMEDIA ELECTIVES								
25.	IF7072	Computer Vision	PE	3	3	0	0	3
26.	IF7074	Human Computer Interaction	PE	3	3	0	0	3
27.	MM7001	Big Data Analysis	PE	3	3	0	0	3
28.	MM7002	Biometrics	PE	3	3	0	0	3
29.	MM7003	Cloud Computing	PE	3	3	0	0	3

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
30.	MM7005	Media Security	PE	3	3	0	0	3
31.	MM7006	Multimedia Information Storage and Retrieval	PE	3	3	0	0	3
32.	MM7007	Software Development for Short Film Development	PE	3	3	0	0	3
33.	MM7008	Sound Engineering	PE	3	3	0	0	3
34.	MM7009	Virtual Reality	PE	3	3	0	0	3
35.	MM7072	Visualization Techniques	PE	3	3	0	0	3
36.	MM7203	Speech and Audio Processing	PE	3	3	0	0	3
37.	MM7252	Video Processing and Analytics	PE	3	3	0	0	3
38.	MM7351	Multimedia Compression Techniques	PE	3	3	0	0	3
Note: A minimum of 2 of 4 electives must necessarily be chosen from the list of **"Multimedia Electives"**								

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MM7321	Project Work Phase I	EEC	12	0	0	12	6
2.	MM7421	Project Work Phase II	EEC	24	0	0	24	12

IF 7101 ADVANCED COMPUTER ARCHITECTURE L T P C
3 0 0 3

OBJECTIVES:

- To understand the evolution of computer architecture.
- To understand the state-of-the-art in computer architecture.
- To understand the design challenges in building a system.

UNIT I PIPELINING AND ILP 11

Fundamentals of Computer Design - Measuring and Reporting Performance - Instruction Level Parallelism and Its Exploitation - Concepts and Challenges - Overcoming Data Hazards with Dynamic Scheduling – Dynamic Branch Prediction - Speculation - Multiple Issue Processors – Case Studies.

UNIT II THREAD-LEVEL PARALLELISM 8

Multi-threading – Multiprocessors - Centralized and Distributed Shared Memory Architectures – Cache Coherence Issues - Performance Issues – Synchronization Issues – Models of Memory Consistency .

UNIT III SIMD AND GPU ARCHITECTURES 8

SIMD Extensions for Multimedia – Graphics Processing Units – GPU Computational Structures – GPY ISA – GPU Memory Structures – Case Study.

UNIT IV MEMORY HIERARCHY DESIGN 9

Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations – Name Mapping Implementations - Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.

UNIT V INTERCONNECT AND STORAGE 9

Interconnection Networks – Buses, Crossbar and Multi-Stage Switches – Multi-Core Processor Architectures - Case Study. Warehouse- Scale Computers - Programming Models and Workloads – Storage Architectures – Physical Infrastructure – Case Study

TOTAL : 45 PERIODS

OUTCOMES:

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

- Compare and evaluate the performance of various architectures.
- Design sub-systems to meet specific performance requirements.
- Analyze the requirements of large systems to select and build the right infrastructure.

REFERENCES:

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A quantitative approach”, Morgan Kaufmann / Elsevier, Fifth edition, 2012.
2. Richard Y. Kain, “Advanced Computer Architecture a Systems Design Approach”, PHI, 2011.
3. Hwang, Kai, A. Ramachandran, and R. Purushothaman. Advanced computer architecture: parallelism, scalability, programmability. Vol. 199. New York: McGraw-Hill, 1993.

IF 7102 **ADVANCES IN DATABASES** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn the modeling and design of databases.
- To acquire knowledge on parallel and distributed databases and its applications.
- To study the usage and applications of Object Oriented and Intelligent databases.
- To understand the usage of Mobile Databases.
- To learn emerging databases such as XML, Cloud and Big Data.
- To acquire inquisitive attitude towards research topics in databases.

UNIT I PARALLEL AND DISTRIBUTED DATABASES 9

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Case Studies

UNIT II OBJECT AND OBJECT RELATIONAL DATABASES 9

Overview of Object Database concepts - Object-Relational features: Object Database extensions to SQL - The ODMG Object Model and the Object Definition Language ODL-Object Database Conceptual Design - Object Query Language OQL - Overview of C++ Language Binding in the ODMG Standard .

UNIT III INTELLIGENT DATABASES 9

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications- Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases- TSQL2- Deductive Databases-Recursive Queries in SQL- Spatial Databases- Spatial Data Types- Spatial Relationships- Spatial Data Structures-Spatial Access Methods- Spatial DB Implementation.

UNIT IV MOBILE DATABASES 9

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models -Concurrency Control - Transaction Commit Protocols

UNIT V EMERGING TECHNOLOGIES 9

Multimedia Databases-XML Databases: XML Schema- XML Query Languages- Storing XML in Databases-XML and SQL- Web Databases- Data Warehousing - Data Mining-Cloud Based Databases -Introduction to Big Data-Storage-Analysis.

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able,

- To develop in-depth understanding of relational databases and skills to optimize database performance in practice.
- To discuss and critique on each type of databases.
- To design faster algorithms in solving practical database problems.
- To implement intelligent databases and various data models.

REFERENCES:

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill, 2011.
2. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson Education/Addison Wesley, 2010.
3. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, “Advanced Database Systems”, Morgan Kaufmann publishers,2006.
4. Vijay Kumar, “Mobile Database Systems”, John Wiley & Sons, 2006.
5. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

IF 7151 ADVANCES IN DATA STRUCTURES AND ALGORITHMS L T P C
3 0 0 3

OBJECTIVES:

- To understand the usage of algorithms in computing.
- To learn and use hierarchical data structures and its operations
- To learn the usage of graphs and its applications.
- To select and design data structures and algorithms that is appropriate for problems. To study about NP Completeness of problems.

UNIT I ROLE OF ALGORITHMS IN COMPUTING 9

Algorithms – Algorithms as a Technology- Insertion Sort – Analyzing Algorithms – Designing Algorithms- Growth of Functions: Asymptotic Notation – Standard Notations and Common Functions- Recurrences: The Substitution Method – The Recursion-Tree Method

UNIT II HIERARCHICAL DATA STRUCTURES 9

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red-Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion -B-Trees: Definition of B-trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Fibonacci Heaps: structure – Mergeable-heap operations- Decreasing a key and deleting a node-Bounding the maximum degree.

UNIT III GRAPHS 9

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra's Algorithm; All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm;

UNIT IV ALGORITHM DESIGN TECHNIQUES 9

Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: An Activity-Selection Problem – Elements of the Greedy Strategy- Huffman Codes.

UNIT V NP COMPLETE AND NP HARD 9

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP- Completeness and Reducability – NP-Completeness Proofs – NP-Complete Problems

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of the course the student should be able to

- Design data structures and algorithms to solve computing problems.
- Design algorithms using graph structure and various string matching algorithms to solve real-life problems.
- Apply suitable design strategy for problem solving

REFERENCES:

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
2. Robert Sedgewick and Kevin Wayne, "ALGORITHMS", Fourth Edition, Pearson Education.
3. S.Sridhar,"Design and Analysis of Algorithms", First Edition, Oxford University Press. 2014
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Third Edition, Prentice-Hall, 2011.

MA 7159 PROBABILITY AND STATISTICAL METHODS L T P C
4 0 0 4

OBJECTIVES:

- To introduce the basic concepts of one dimensional and two dimensional Random Variables.
- To provide information about Estimation theory, Correlation, Regression and Testing of hypothesis.
- To enable the students to use the concepts of multivariate normal distribution and principle components analysis.

UNIT I ONE DIMENSIONAL RANDOM VARIABLES 9+3

Random Variables - Probability Function – Moments – Moment Generating Functions and Their Properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal Distributions – Functions of a Random Variable.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES 9+3

Joint Distributions – Marginal and Conditional Distributions – Functions of Two Dimensional Random Variables – Regression Curve – Correlation.

UNIT III ESTIMATION THEORY 9+3

Unbiased Estimators – Method of Moments – Maximum Likelihood Estimation - Curve fitting by Principle of Least Squares – Regression Lines.

UNIT IV TESTING OF HYPOTHESES 9+3

Sampling Distributions - Type I and Type II Errors - Tests based on Normal, t,2 and F Distributions For Testing Of Mean, Variance And Proportions – Tests for Independence of Attributes and Goodness of Fit.

UNIT V MULTIVARIATE ANALYSIS 9+3

Random Vectors and Matrices - Mean Vectors and Covariance Matrices - Multivariate Normal Density and Its Properties - Principal Components: Population Principal Components - Principal Components from Standardized Variables.

TOTAL= 45+15=60 PERIODS

OUTCOMES:

- The course provides the basic concepts of Probability and Statistical techniques for solving mathematical problems which is useful in solving Engineering problems.

REFERENCES:

1. Jay L. Devore, “Probability and Statistics for Engineering and the Sciences”, Thomson and Duxbury, 2002.
2. Richard Johnson. ”Miller & Freund’s Probability and Statistics for Engineer”, Prentice Hall , Seventh Edition, 2007.
3. Richard A. Johnson and Dean W. Wichern, “Applied Multivariate Statistical Analysis”, Pearson Education, Fifth Edition, 2002.
4. Gupta S.C. and Kapoor V.K.”Fundamentals of Mathematical Statistics”, Sultan and Sons, 2001.
5. Dallas E Johnson et al., “Applied multivariate methods for data analysis”, Thomson and Duxbury press, 1998.

MM7151	ADVANCE COMPUTER GRAPHICS AND ANIMATION	L T P C 3 0 0 3

OBJECTIVES:

- To understand the basics of geometry processing.
- To understand the fundamentals of pipelined rasterization rendering of meshed objects and curved surfaces.
- To understand and work with advanced rendering methods such as radiosity.
- To design programs for advanced animation methods and
- To become proficient at graphics programming using OpenGL

UNIT I INTRODUCTION 9

Basics, Scope and Applications, Graphics Standards, Display systems, Image formation, Graphics Systems, Coordinate systems, Line-Drawing Algorithms, Parallel Line Algorithms, Circle drawing algorithms, Area Filling, Clipping Algorithms: Line and Polygon, Anti-aliasing.

UNIT II TRANSFORMATIONS 9

Affine Transformations (2D & 3D): Translation, Rotation, Scaling, Reflection and Shearing; Hierarchical Modeling & viewing: The Camera Transformation – Perspective, orthographic and Stereographic views;

UNIT III FRACTALS 9

Fractals and Self similarity – Peano curves – Creating image by iterated functions – Mandelbrot sets – Julia Sets – Random Fractals – Overview of Ray Tracing – Intersecting rays with other primitives – Reflections and Transparency – Boolean operations on Objects - its applications

UNIT IV ADVANCED RENDERING TECHNIQUE 12

Curves and Surfaces: Bezier, B-Splines and NURBS; Color models; Photorealistic rendering; Global Illumination; Ray tracing; Monte Carlo algorithm; Adding Surface texture- Texture Synthesis – Bump Mapping, Environmental mapping; Advanced Lighting and Shading,

UNIT V ANIMATION 9

Overview of Animation Techniques – Keyframing, Computer Animation; Motion capture and editing; forward/Inverse Kinematics; Deformation models; Facial animation. Raster methods – Design of animation sequences – animation techniques – Key-frame systems – motion specification – direct, dynamics – rigid body animation –– radiosity – collision detection – Graphics file format – Opengl animation procedures

TOTAL:45 PERIODS

OUTCOMES:

Upon completion of this course, the student will:

- Analyze the fundamentals of 2D and 3D computer graphics.
- Discuss the basic algorithms commonly used in 3D computer graphics.
- Describe advanced computer graphics techniques and applications.
- Analyze computer graphics and solid modelling techniques for various applications.

TEXT BOOKS:

1. Donald D. Hearn, M. Pauline Baker, Warren Carithers, "Computer Graphics with Open GL", 4th Edition, Prentice Hall, 2011.
2. Alan Watt and Mark Watt, "Advanced Animation and Rendering Techniques: Theory and Practice", Addison-Wesley, 1992
3. Foley, van Dam, Feiner, Hughes, "Computer Graphics Principles and Practice", Third Edition in C. Addison Wesley, 2014.
4. Edward Angel and Dave Shreiner, "Interactive Computer Graphics: A top-down approach with OpenGL", Sixth Edition Addison Wesley, 2012.
5. Rick Parent, "Computer Animation - Algorithms and Techniques", Third Edition Morgan Kaufman, 2012.

IF 7111 **DATA STRUCTURES LABORATORY** **L T P C**
0 0 4 2

OBJECTIVES:

- To acquire the knowledge of using advanced tree structures.
- To learn the usage of heap structures.
- To understand the usage of graph structures and spanning trees.

EXPERIMENTS:

1. Implementation of Merge Sort and Quick Sort-Analysis
2. Implementation of a Binary Search Tree
3. Red-Black Tree Implementation
4. Heap Implementation
5. Fibonacci Heap Implementation
6. Graph Traversals
7. Spanning Tree Implementation
8. Shortest Path Algorithms (Dijkstra's algorithm, Bellmann Ford Algorithm)
9. Implementation of Matrix Chain Multiplication
10. Activity Selection and Huffman Coding Implementation.

TOTAL: 60 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Design and implement basic and advanced data structures extensively.
- Design algorithms using graph structures
- Design and develop efficient algorithms with minimum complexity using design techniques.

IF 7201 **ADVANCED JAVA AND INTERNET** **L T P C**
3 2 0 4

OBJECTIVES:

- To understand the Java environment
- To learn Java application development using Swings and Middleware technology
- To explore advanced Java concepts
- To learn the Internet Programming

UNIT I JAVA BASICS AND ADVANCED FEATURES 9

JAVA basics - Inheritance - Inner Classes - Interfaces - New Interfaces - Streams - File and I/O - Threads - Packages - JAR files – Reflection – Ref objects – Logging - Concurrency utilities –JVM Tool Interface – Java VisualVM

UNIT II AWT, SWING AND MIDDLEWARES 9

AWT - Event Handling -SWING - Applets and Applications - JAVA Networking – Image I/O – Print Service - Collection Classes - JDBC - RMI – CORBA IDL – Scripting for the JAVA platform – Input method framework - JAVA beans

UNIT III ADVANCED JAVA CONCEPTS 9

Java management Extensions (JMX) – Java Native Interface (JNI) - JConsole - Java Mission Control (JMC) – Java Flight Recorder (JFR) – Java Platform Debugger Architecture (JPDA) – Java2D -

UNIT IV MARKUP LANGUAGES AND INTERNET PROGRAMMING 9

Hyper-Text Markup Language (HTML) – Cascading Style Sheets (CSS) – Extensible Markup Language (XML) and API – Java API for XML Processing (JAXP)– Extensible Style Sheet Language (XSL) – Document Type Definition (DTD) – XML schema – Document Object Model (DOM) Parser – SAX parser - JAXR – Java Architecture for XML binding (JAXB) – Java API for XML web services (JAX-WS) – Java Authentication and Authorization service (JAAS)

UNIT V INTERNET PROGRAMMING FRAMEWORKS 9

Servlet – JSP – Session management – Cookies – Java web start – Java plug-ins – Deployment, Plug-in and web start tools – Internationalization Tools – Internationalization of Applications - JAVA web security – Current Trends

TOTAL: 75 PERIODS

OUTCOMES:

Upon the completion of the course the student should be able

- To become familiar with the Java environment
- To develop Java application using Swings and Middleware technology
- To practice advanced Java concepts
- To work in the Internet frameworks

REFERENCES

1. Kogent Learning Solutions Inc, "JAVA 7 Programming Black Book", Dream Tech Press, 2010.
2. http://docs.oracle.com/javase/7/docs/

IF 7202 DATA SCIENCE AND ANALYTICS L T P C
3 2 0 4

OBJECTIVES:

- To know the fundamental concepts of data science and analytics
- To learn various techniques for mining data streams
- To learn Event Modelling for different applications.
- To know about Hadoop and Map Reduce procedure

UNIT I INTRODUCTION TO DATA SCIENCE AND BIG DATA 9

Introduction to Data Science – Applications - Data Science Process – Exploratory Data analysis – Collection of data – Graphical presentation of data – Classification of data – Storage and retrieval of data – Big data – Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II DATA ANALYSIS 9

Correlation – Regression – Probability – Conditional Probability – Random Variables – Analysis using Mean, Median, Mode, Standard Deviation, Skewness, Kurtosis- Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics –

UNIT III DATA MINING TECHNIQUES 9

Rule Induction - Neural Networks: Learning and Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods- Neuro-Fuzzy Modelling – Association rule mining – Clustering – Outlier Analysis – Sequential Pattern Mining – Temporal mining – Spatial mining – Web mining.

UNIT IV MINING DATA STREAMS 9

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT V FRAMEWORKS AND VISUALIZATION 9

MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – Cloud databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques – Social Network Analysis – Collective Inferencing – Egonets - Systems and Applications.

TOTAL:75 PERIODS

OUTCOMES:

Upon the completion of the course the student should be able to

- Work with big data platform and its analysis techniques.
- Design efficient algorithms for mining the data from large volumes.
- Model a framework for Human Activity Recognition
- Development with cloud databases

REFERENCES

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
3. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
4. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008**.**
5. Rachel Schutt, Cathy O'Neil, “Doing Data Science”, O'Reilly Publishers, 2013.
6. Foster Provost, Tom Fawcet, “Data Science for Business”, O'Reilly Publishers, 2013.
7. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications“, Wiley Publishers, 2014.
8. S. N. Sivanandam, S. N Deepa, “Introduction to Neural Networks Using Matlab 6.0”, Tata McGraw-Hill Education, 2006.

IF 7204 NETWORK ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To provide an introduction to the principles and practices of Network Engineering.
- To understand the architecture of the network devices.
- To learn QoS related methodologies.
- To explore the emerging technologies in network engineering.

UNIT I FOUNDATIONS OF NETWORKING 9

Communication Networks –Network Elements –Switched Networks and Shared media Networks – Probabilistic Model and Deterministic Model –Datagrams and Virtual Circuits –Multiplexing– Switching -Error and Flow Control –Congestion Control –Layered Architecture –Network Externalities –Service Integration.

UNIT II QUALITY OF SERVICE 9

Traffic Characteristics and Descriptors –Quality of Service and Metrics –Best Effort model and guaranteed Service Model –Limitations of IP networks –Scheduling and Dropping Policies for BE and GS models –Traffic Shaping Algorithms–End to End Solutions –Laissez Faire Approach – Possible improvements in TCP –Significance of UDP in Inelastic Traffic

UNIT III HIGH PERFORMANCE NETWORKS 9

Integrated Services Architecture –Components and Services –Differentiated Services Networks – Per Hop Behavior –Admission Control–MPLS Networks –Principles and Mechanisms –Label Stacking–RSVP–RTP/RTCP.

UNIT IV NETWORK DEVICE ARCHITECTURE 9

Network Devices –Switch–Router–Hardware Components-Software –Configuration–Routing Concepts-Static Routing –Dynamics Routing –Routing Information Protocol –Configuration –Open Shortest Path First Protocol –Configuration –Access Control List –Standard –Extended –Named. Multiplexers, Modems and Internet Access Devices –Switching and Routing Devices-Router Structure -Configuring EGP –RIP –OSPF –IS-IS-Hub -Bridges –Routers –Link Virtualization - Multicast Architecture.

UNIT V SOFTWARE DEFINED NETWORKING 9

Evolution of SDN -Control Plane - Control and data plane separation - Network Virtualization - Data Plane - Programming SDNs - Verification and Debugging - openflow networks.

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Explain the of the principles of network engineering.
- Knowledge of network engineering concepts and techniques.
- recent development in network engineering

REFERENCES:

1. Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education/PHI, 2009.
2. Larry L Peterson and Bruce S Davie, 'Computer Networks: A Systems Approach', Fifth Edition, Morgan Kaufman Publishers, 2012.
3. Jean Warland and Pravin Vareya, 'High Performance Networks', Morgan Kauffman Publishers, 2002
4. James Macfarlane," Network Routing Basics: Understanding IP Routing in Cisco Systems", Wiley edition 1 2006.
5. Wendell Odom and Rick McDonald, "Routers and Routing Basics CCNA 2 Companion Guide (Cisco Networking Academy)", Cisco press, 2006.
6. Thomas Nadeau , Ken Gray, "SDN - Software Defined Networks", O'reilly Publishers, 2013.

MM7201 3D GAME MODELING AND RENDERING L T P C
3 0 0 3

OBJECTIVES:

- Understand the basics of Computer Graphics.
- Understand the fundamentals of modeling and rendering.
- Understand and work with Gaming software's.
- Design real time games

UNIT I MATHEMATICS FOR MODELING 9

Vector tools and polar co-ordinates – Vectors fundamentals-Representations of key geometric objects – Intersection of lines, planes and polygons, clipping algorithms – 2D and 3D Affine transformation – 3D Viewing – 3D rendering pipeline - Camera movements - Introduction to OpenGL programming – Geometric transformation & viewing – projection & perspective transformation

UNIT II CHARACTER MODELING AND SHADING 9

Introduction – solid modeling – polyhedra – Extruded shapes – tessellation - Mesh approximation of smooth objects – Bezier Curves – B-splines – NURBS – Interpolation - Hierarchical and physical modeling –- curve & surface – Interactive graphics, Shading models – Flat shading – smooth shading – Reflections – Diffuse and secular reflection - Adding color - Antialiasing techniques – Dithering techniques - creating more shades and color – specular highlights – spotlight – blending – reflections – applying colors- real world lights- OpenGL

UNIT III GAME DESIGN PRINCIPLES 9

Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding, Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics

UNIT IV GAMING PLATFORMS AND FRAMEWORKS 9

Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DXStudio, Unity

UNIT V GAME DEVELOPMENT 9

Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the student will:

- Analyze the fundamentals of 2D and 3D animation
- Model a character with suitable actions.
- Analyze the game design principle.
- Discuss about gaming platforms and frame works.
- Design a interactive game.

REFERENCES:

1. F.S. Hill Jr., Stephen Kelly, “Computer Graphics Using OpenGL”, 3rd Edition, Persons Education/PHI Learning, 2007.
2. Donald Hearn , M. Pauline Baker, “ Computer Graphics with OpenGL”, 3rd Edition, Pearson Education, 2012.
3. David H. Eberly, “3D Game Engine Design, Second Edition: A Practical approach to Real-Time Computer Graphics” Morgan Kaufmann, 2nd Edition, 2006.
4. Jung Hyun Han, “3D Graphics for Game Programming”, Chapman and Hall/CRC, 1st edition, 2011.
5. Mike Mc Shaffrfy, “Game Coding Complete”, Third Edition, Charles River Media, 2009.
6. Jonathan S. Harbour, “Beginning Game Programming”, Course Technology PTR, 3rd edition, 2009.
7. Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, Prentice Hall 1st edition, 2006.
8. Roger E. Pedersen, “Game Design Foundations”, Edition 2, Jones & Bartlett Learning, 2009.
9. Scott Rogers, “Level Up!: The Guide to Great Video Game Design”, Wiley, 1st edition, 2010.

MM7205 FUNDAMENTALS OF DIGITAL IMAGE PROCESSING

L	T	P	C
3	0	0	3

LEARNING OBJECTIVES:

The student should be able to

- Learn about the basic concepts of digital image processing and various image transforms.
- Familiarize the student with the image enhancement techniques
- Expose the student to a broad range of image processing techniques and their applications.
- Appreciate the use of current technologies those are specific to image processing systems.
- Expose the students to real-world applications of image processing.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9

Introduction - Applications of Image Processing - Steps in image processing Applications - Digital imaging system- Sampling and Quantization - Pixel connectivity - Distance measures - Colour fundamentals and models - File Formats, Image operations.

UNIT II IMAGE ENHANCEMENT AND IMAGE RESTORATION 9

Image Transforms: Fast Fourier Transform and Discrete Fourier Transform. Image Enhancement in Spatial and Frequency domain - Gray level transformations - Histogram processing - Spatial filtering - Smoothing and sharpening - Frequency domain: Filtering in frequency domain. Image Restoration - Image degradation model - Noise modelling - Blur - Order statistic filters - Image restoration algorithms.

UNIT III MULTI RESOLUTION ANALYSIS AND COMPRESSION 9

Multi Resolution analysis: Image pyramids - Multi resolution expansion - Wavelet transforms Image compression: Fundamentals - Models - Elements of information theory - Error free compression - Lossy compression - Compression standards - Huffman coding - JPEG standard - MPEG standard.

UNIT IV IMAGE SEGMENTATION AND FEATURE EXTRACTION 9

Image Segmentation - Detection of discontinuities - Edge operators - Edge linking and boundary Detection - Thresholding - Region based segmentation. Image Features and Extraction - Image Features - Types of Features - Feature extraction - Texture - Feature reduction algorithms - PCA - Feature Description.

UNIT V IMAGE CLASSIFICATION AND APPLICATIONS OF IMAGE PROCESSING 9

Image classifiers - Bayesian Classification nearest neighbourhood algorithms - Support Vector Machines - Image Clustering Algorithms - Hierarchical and Partitional clustering algorithms. Case Studies in Image Security - Steganography and Digital watermarking - Visual effects and Digital compositing - Case studies in Medical Imaging and remote sensing.

TOTAL: 45 PERIODS

LEARNING OUTCOMES:

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

- Describe and explain basic principles of digital image processing.
- Assess the performance of image processing algorithms and systems.
- Design an application that uses different concepts of image processing.
- Apply and develop new techniques in the areas of image enhancement- restoration-segmentation-compression-wavelet processing and image morphology.
- Analyse the constraints in image processing when dealing with larger data sets.
- Apply the knowledge primarily obtained by studying examples and cases in other engineering disciplines.

REFERENCES:

1. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Third Edition. Pearson Education. 2009.
2. S.Sridhar, "Digital Image Processing", Oxford University Press, 2011.
3. Milan Sonka, Vaclav Hlavac and Roger Boyle. "Image Processing, Analysis and Machine Vision", Second Edition, Thompson Learning. 2007.
4. Anil K.Jain, 'Fundamentals of Digital Image Processing", PHI, 2011.
5. Sanjit K. Mitre. & Giovanni L. Sicuranza. "Non-Linear Image Processing". Elsevier. 2007.

MM7212	MULTIMEDIA TOOLS LABORATORY	L	T	P	C
		0	0	4	2

LEARNING OBJECTIVES:

The student should be able to

- Explore the various multimedia editing tools like Photoshop/EQV, Audacity, Garageband, imovie and Unity.
- Outline the structure of media processing tools.

EXPERIMENTS:

1. Image color/contrast balancing and Enhancement using Photoshop
2. Image compositing using Photoshop
3. Applying special effects using Photoshop
4. Music composing using Garage Band/ Audacity
5. Audio editing using Garage Band/Audacity
6. Video Preproduction works
   A. Storyboarding Concepts
   B. Animatics
7. Creation of 2D Animation using Flash/ Director
8. Creation of 3D Animation using 3dsmax/Maya/Unity
9. Video Editing using iMovie/ Final cut Pro/ Adobe Premiere
10. Mini Project

TOTAL: 60 PERIODS

LEARNING OUTCOMES:

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

- Manipulate the images and audio files using Photoshop and Audacity
- Implement small projects using Photoshop and Audacity
- Model and animate the small projects and give special effects using Unity
- Handle video editing works using Adobe Premiere.
- Create a motion video by using the tools learned.
- Create, edit advertisements using various relevant tools.

IF 7302 WIRELESS AND MOBILE NETWORKS L T P C
3 0 0 3

OBJECTIVES

- To become familiar with the prevailing wireless environment
- To understand 3G and 4G cellular networks
- To study about WiFi and WiMax standards
- To learn about the two types of ad hoc networks in practice
- To explore mobile computing architecture and mobile application development

UNIT I WIRELESS SCENARIO 9

Aspects of Mobility - Applications - Location Dependant Services - Mobile devices - Device Portability - WiFi Alliance - WiMax Forum - Bluetooth Technology - 3GPP - OMA - Ad hoc Networks - Satellites - Interoperability - Machine to Machine Communication - Differences between M2M and IoT - Wearable Computing

UNIT II 3G AND 4G CELLULAR NETWORKS 9

Evolution of Cellular Networks - IMT 2000 and UMTS - UMTS Architecture - User Equipment - RNS - UTRAN - Node B - RNC Functions - USIM - Protocol Stack - CS and PS domain - IMS Architecture – 3.5G and 3.9G - 4G LAN and Cellular Networks - LTE - Control plane - NAS and RRC - User plane - PDCP, RLC and NAC – Current Trends

UNIT III WIRELESS DATA NETWORKS 9

IEEE 802.11 WLAN – Architecture and Protocol Stack – Physical Layer, MAC Layer – CSMA/CA, Virtual Carrier Sensing, IFS, Fragmentation and Reassembly – Security – WEP, 802.1x Authentication – WiMax Networks – IEEE 802.16, Physical Layer – Building blocks – Reference Model

UNIT IV WIRELESS AD HOC NETWORKS 9

Principles of Ad hoc Networking – Ad hoc Networks in Practice - Sensor Networks - Data Centric computing , Geographic and Energy Aware Routing, In Network Processing, Data Aggregation, Data Dissemination – Bluetooth – Piconet and Scatternet – Protocol Stack

UNIT V MOBILE COMPUTING ARCHITECTURE 9

Three tier Architecture - Presentation Tier - Application Tier - Middleware , ICAP, Web Services - Data Tier - Database Middleware , Sync ML - Content Aware System - Client Context Manager - Composite Capabilities / Preferences Profile (CC/PP) - Policy and Security Managers - Pervasive Application Architecture with MVC Pattern - Secure Pervasive Access Architecture

TOTAL : 45 PERIODS

OUTCOMES

Upon completion of the course, the students should be able

- To have awareness of the existing wireless scenario
- To deploy 3G networks
- To design and implement wireless ad hoc networks
- To design and implement mobile applications efficiently

REFERENCES:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, “Mobile Computing Technology, Applications and Service Creation”, 2nd ed, Tata McGraw Hill, 2010.
2. Feng Zhao and Leonidas Guibas, ‘Wireless Sensor Networks’, Morgan Kaufmann Publishers, 2004.
3. Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson Education, 2013
4. Reza B'Far, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Cambridge Press University, 2009
5. Jochen Burthardt et al, ‘Pervasive Computing Technology and Architecture of Mobile Internet Applications’, Pearson Education, 2003.

6. Pattnaik Prasant Kumar and Mall Rajib, "Fundamentals of Mobile Computing", PHI, 2012
7. Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc and Sensor Networks Theory and Applications (2nd Edition), World Scientific Publishing, 2011.
8. Maciej Stasiak, Mariusz Glabowski, Arkadiusz Wisniewski, Piotr Zwierzkowski, "Wireless Networks: From GSM to LTE", John Wiley Publications, 2010
9. Reto Meier, Wrox Wiley, “Professional Android 2 Application Development”, 2010

MM7301	AUDIO AND VIDEO PROCESSING	L	T	P	C
		3	0	0	3

LEARNING OBJECTIVES:

The student should be able to

- Introduce the fundamental principles of Audio processing.
- Provide an overview of Audio enhancement and Audio compression techniques
- Review latest trends and future technologies in Audio processing.
- Introduce the fundamental concepts of Video processing.
- Cover the basics of Video Coding

UNIT I DIGITAL AUDIO 9

Basics of Digital Audio - Digitization of Sound- Auditory Perception - Sampling, Normalisation, Noise Reduction and Visualisation. Digital and Analog audio Recording, A/D and D/A Converter, Pitch Shifting and Time Stretching, Audio Data Reduction.

UNIT II MUSICAL SOUND SYNTHESIS AND MIDI 9

Acoustic Instruments, Sound Synthesis in Music, MIDI Principles - Hardware aspects, Structure of MIDI Messages, General MIDI, MIDI-to-Wav Conversion.

UNIT III STEREO AND SURROUND SOUND 9

Two-Channel Stereo - Principles of Loudspeaker and Microphone, Stereo and Loudspeaker Stereo, Two-Channel Signal Formats and Microphone techniques, Binaural Recording and Dummy Head Techniques, Surround Sound - Three Channel Stereo, Four Channel Surround, 5.1 Channel Surround, and other Multichannel Configurations. Surround Sound Systems, Matrix Surround Sound Systems, Dolby Digital, DTS, Ambisonics.

UNIT IV VIDEO FUNDAMENTALS 9

Basic concepts and Terminology- Analog video standards – Digital video basics – Analog-to Digital conversion – Colour representation and chroma sub sampling – Digital video formats and standards – Changing Video sampling rate and standards.

UNIT V MPEG VIDEO CODING 9

Basic Video coding and Audio Compression Techniques- Motion Detection- MPEG Video and audio Compression – Real-time video compression.

TOTAL: 45 PERIODS

LEARNING OUTCOMES

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

- Implement basic algorithms related to Audio acquiring and processing
- Analyse audio formats and analysis.
- Understand and implement algorithms for MIDI Processing
- Acquiring and analysis of Video
- Understand the concept of motion detection.
- Evaluate the performance of different Video Processing Algorithms

REFERENCES:

1. Francis Rumsey & Tim McCormick "Sound and Recording ", Sixth Edition, 2009, Focal Press, Elsevier Ltd.
2. Ian Mcloughlin "Applied Speech and Audio Processing with MATLAB Examples" Cambridge University Press, Cambridge, New York, 2009.
3. Oges Marques, Practical Image and Video Processing Using MATLAB, Wiley-IEEE Press, 2011.

MM7313	AUDIO AND VIDEO PROCESSING LABORATORY	L	T	P	C
		0	0	4	2

LEARNING OBJECTIVES:

The student should be able to

- Explore MATLAB, opencv and Processing Programming Language
- Explore Image Processing
- Explore audio processing and Analysis
- Explore Video Processing and analysis
- Explore Image and Audio Retrieval

EXERCISES:

1. Image Enhancement operations like manipulating Brightness and Contrast
2. To explore Image noise and Filters
3. To explore Image Transforms such as FFT and Wavelet
4. Designing MATLAB and OpenCV programs for Feature Extraction and Classification
5. Reading and Writing of Video
6. Video noise and Editing
7. Extraction and Frames and manipulation
8. Video Object Tracking
9. MATLAB audio Processing
10. Filter and Mask effects in audio
11. Music composition in MATLAB
12. Learning Processing for Visual Arts and animation

TOTAL: 60 PERIODS

LEARNING OUTCOMES

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

- Implement small projects using MATLAB for Image Processing.
- Know opencv and manipulate Images.
- Handle Video Processing using MATLAB and opencv.
- Know the basics of audio and music processing.
- Know the "Processing" Language for animation and visual effects.
- Develop a small project by using the languages and techniques learned.

IF 7001 **3G AND 4G WIRELESS NETWORKS** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn various generations of wireless and cellular networks.
- To study about fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications.
- To study about Wi MAX networks, protocol stack and standards.
- To understand about the emerging trends of smart phones and evolution of latest standards like DLNA, NFC and femtocells

UNIT I INTRODUCTION **9**

Introduction: History of Mobile Cellular Systems - First Generation - Second Generation - Generation 2.5 - Overview of 3G & 4G. 3GPP and 3GPP2 standards

UNIT II 3G NETWORKS **9**

Evolution from GSM, 3G Services and Applications - UMTS network structure - Core network - UMTS Radio access - HSPA – HSUPA- HSDPA- CDMA 1X – WCDMA

UNIT III 4G LTE **10**

LTE: Introduction, Radio interface architecture - Physical layer, Access procedures - System Architecture Evolution (SAE) - Communication protocols – Interfaces- LTE Advanced.

UNIT IV WIMAX NETWORKS **8**

Introduction to WiMax Networks– IEEE 802.16 – Frame Format – Protocols - OFDM – MIMO - IEEE 802.20 – Applications.

UNIT V DLNA & NFC REVOLUTION **9**

Introduction and Evolution - Applications of DLNA and NFC – DLNA Architecture and Protocol stack - Smart phone and NFC – Mobile Commerce and NFC – NFC tags –Security Issues – Femtocells from the network operators and user's point of view.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of the course the student should be able

- To appreciate the evolution of cellular networks.
- To deploy 3G Services.
- To explore the developments in 4G Networks.
- To implement Wi MAX networks, protocol stack and standards.

REFERENCES:

1. Juha Korhonen, "Introduction to 3G Mobile Communication", Artech House, 2003
2. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming , "3G Evolution HSPA and LTE for Mobile Broadband", Academic Press, 2008
3. Flavio Muratore, "UMTS Mobile Communication for the Future", John Wiley & Sons , 2001
4. Harri Holma and Antti Toskala, "HSDPA/HSUPAfor UMTS", Johan Wiley & Sons, 2006.
5. Martin Sauter, "3G & 4G & Beyond: Bringing Networks, Devices and the Web together", second edition, Wiley, 2013.

IF 7002 ADHOC MOBILE WIRELESS NETWORKS L T P C
3 0 0 3

OBJECTIVES:

- To learn about the issues in the design of ad hoc and wireless sensor networks
- To understand the working of protocols in different layers of ad hoc and sensor networks
- To expose the students to different aspects in ad hoc and sensor networks
- To understand various standards and applications in ad hoc and sensor networks

UNIT I FUNDAMENTALS 9

Introduction to ad hoc networks- Differences between cellular and ad hoc wireless networks-Challenges and issues in ad hoc networks-Introduction to WSN-Single node architecture-Network architecture- Localization and positioning-Operating systems for WSN.

UNIT II MAC AND LINK MANAGEMENT 9

Fundamentals of wireless MAC protocols- Classification of MAC protocols for ad hoc networks-MAC for WSN-Low duty cycle protocols and wakeup concepts- Contention and schedule based protocols-WSN link layer-Error control-Framing-Link management.

UNIT III ROUTING 9

Design issues of routing protocols for ad hoc networks- Classification of routing protocols-Proactive, Reactive and Hybrid routing protocols-Routing in WSN-Naming and addressing-Gossiping and agentbased unicast forwarding- Energy efficient unicast- Broadcast and multicast-Geographic routing-Data-centric and content-based networking.

UNIT IV TRANSPORT LAYER AND QoS 9

Challenges of transport layer protocol in wireless environments- TCP's challenges and design issues in ad hoc networks-Transport protocols for ad hoc networks-Transport control protocols for WSNs-Issues and challenges in providing QoS in ad hoc networks-Network layer QoS solutions-QoS Model-QoS in wireless sensor networks-Congestion control in network processing.

UNIT V STANDARDS AND APPLICATIONS 9

Wireless sensor network standards-Standards on wireless mesh networks-Applications of ad hoc and WSNs-Case study: Building military border area surveillance system, Forest fire detection system and tsunami early warning system with wireless sensor networks.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course students should be able to

- Identify different issues in wireless ad hoc and sensor networks
- To analyze the protocols developed for ad hoc and sensor networks
- To identify and discuss the standards and applications of ad hoc and sensor networks

REFERENCES:

1. SubirKumarSarkar, TGBasavaraju, C Puttamadappa,"Ad Hoc Mobile Wireless Networks", Auerbach Publications, 2008.
2. C.Siva Ram Murthy, B.S.Manoj, "Ad Hoc Wireless Networks- Architectures and Protocols", Pearson Education, 2004.
3. KazemSohraby, Daniel Minoli, TaiebZnati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley & Sons, 2007.
4. WaltenegusDargie,Christian Poellabauer, "Fundamentals of Wireless SensorNetworks", John Wiley & Sons, 2010.
5. Holger Karl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, 2005.

IF 7003 **ARTIFICIAL INTELLIGENCE** **L T P C**
3 0 0 3

OBJECTIVES:

- To provide a strong foundation of fundamental concepts in Artificial Intelligence.
- To enable Problem-solving through various searching techniques.
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning.
- To apply AI techniques primarily for machine learning, vision, and robotics.

UNIT I INTRODUCTION **9**

Introduction to Artificial Intelligence – Intelligent Agents – Agents and Environments - Good behavior – The Nature of Environments – Structure of Agents - Problem Solving - Problem Solving Agents – Agent Architectures and Hierarchical Control - Agents - Agent Systems – Hierarchical Control - Embedded and Simulated Agents - Acting with Reasoning

UNIT II SEARCHING TECHNIQUES **9**

Searching For Solutions – Uniformed Search Strategies - Avoiding Repeated States – Searching with Partial Information - Informed Search and Exploration – Informed Search Strategies – Heuristic Function – Local Search Algorithms and Optimistic Problems – Local Search in Continuous Spaces – Online Search Agents and Unknown Environments – Constraint Satisfaction Problems (CSP) – Backtracking Search and Local Search for CSPs – Structure of Problems - Adversarial Search – Games – Optimal Decisions in Games – Alpha-Beta Pruning – Imperfect Real-Time Decisions – Games that include an element of chance.

UNIT III KNOWLEDGE AND REASONING **9**

Proposition Logic - First Order Predicate Logic – Unification – Forward Chaining -Backward Chaining - Resolution – Knowledge Representation - Ontological Engineering - Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information - Prolog Programming.

UNIT IV LEARNING **9**

Probability basics - Bayes Rule and its Applications - Bayesian Networks – Exact and Approximate Inference in Bayesian Networks - Hidden Markov Models - Forms of Learning - Supervised Learning - Learning Decision Trees – Regression and Classification with Linear Models - Artificial Neural Networks – Nonparametric Models - Support Vector Machines - Statistical Learning - Learning with Complete Data - Learning with Hidden Variables- The EM Algorithm – Reinforcement Learning

UNIT V AI PLANNING AND APPLICATIONS **9**

AI Planning – Planning with State - Space Search – Partial-Order Planning – Planning Graphs – Planning with Propositional Logic- Hierarchical Task Network Planning – Conditional Planning - AII applications – Language Models - Information Retrieval – Information Extraction - Machine Translation – Machine Learning - Symbol-Based – Machine Learning: Connectionist – Machine Learning - Social and Emergent –Robots

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Provides a basic exposition to the goals and methods of Artificial Intelligence.
- Study of the design of intelligent computational agents.
- The knowledge acquired through learning can be used both for problem solving and for reasoning
- Improves problem solving, reasoning, planning, natural language understanding, computer vision, automatic programming and machine learning.

REFERENCES:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Pearson Education / Prentice Hall of India, 2010.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Third Edition, Tata McGraw-Hill, 2010.
3. Bratko I, “Prolog Programming for Artificial Intelligence”, Addison-Wesley Educational Publishers Inc; Fourth Edition, 2011.
4. David L. Poole, Alan K. Mackworth, “Artificial Intelligence: Foundations of Computational Agents”, Cambridge University Press, 2010.
5. Ethem Alpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning series)”, The MIT Press; Second edition, 2009.
6. Patrick H. Winston. "Artificial Intelligence", Third edition, Pearson Edition, 2006.
7. Dan W.Patterson, “Introduction to Artificial Intelligence and Expert Systems”, PHI, 2006.
8. Nils J. Nilsson, “Artificial Intelligence: A new Synthesis”, Harcourt Asia Pvt. Ltd., 2000.

IF 7004 BUILDING INTERNET OF THINGS L T P C
3 0 0 3

OBJECTIVES :

- To understand the fundamentals of Internet of Things.
- To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To apply the concept of Internet of Things in the real world scenario

UNIT I FUNDAMENTALS OF IOT 9

Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs – IoT vs M2M.

UNIT II IOT DESIGN METHODOLOGY 9

IoT systems management – IoT Design Methodology – Specifications Integration and Application Development.

UNIT III BUILDING IOT WITH RASPBERRY PI 9

Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages – Web services -

UNIT IV BUILDING IOT WITH GALILEO/ARDUINO 9

Intel Galileo Gen2 with Arduino- Interfaces - Arduino IDE – Programming - APIs and Hacks

UNIT V CASE STUDIES and ADVANCED TOPICS 9

Various Real time applications of IoT- Connecting IoT to cloud – Cloud Storage for Iot – Data Analytics for IoT – Software & Management Tools for IoT

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of the course the student should be able to

- Design a portable IoT using Arduino/ equivalent boards and relevant protocols.
- Develop web services to access/control IoT devices.
- Deploy an IoT application and connect to the cloud.
- Analyze applications of IoT in real time scenario

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.
2. Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, 2014.
3. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.

IF 7005 **COMPILER DESIGN** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn the fundamentals of a translator
- To study about intermediate code generation
- To understand the memory handling
- To explore code optimization techniques

UNIT I FRONT END ANALYSIS 9

Modules and interfaces- Tools and software-Data structures for tree languages -Lexical Analysis - Parsing- Abstract Syntax-Semantic Analysis-Overview

UNIT II INTERMEDIATE CODE AND INSTRUCTION SELECTION 9

Activation Records -Stack frames -Translation to Intermediate Code -Intermediate representation trees-Translation into trees-Declarations - Basic Blocks and Traces-Canonical trees-Taming conditional branches-Instruction Selection- Algorithms for instruction selection

UNIT III LIVENESS ANALYSIS AND REGISTER ALLOCATION 9

Liveness Analysis-Solution of dataflow equations- Register Allocation-Coloring by simplification-Coalescing-Precolored nodes-Graph-coloring implementation-Register allocation for trees

UNIT IV DATAFLOW ANALYSIS AND LOOP OPTIMIZATIONS 9

Dataflow Analysis - Intermediate representation for flow analysis - Various dataflow analyses - Transformations using dataflow analysis - Speeding up dataflow analysis - Alias analysis - Loop Optimizations - Dominators - Loop-invariant computations - Induction variables - Array-bounds checks - Loop unrolling - Static Single-Assignment Form

UNIT V PIPELINING AND SCHEDULING 9

Converting to SSA form - Efficient computation of the dominator tree - Optimization algorithms using SSA - Arrays, pointers, and memory - The control-dependence graph - Converting back from SSA form - A functional intermediate form - Pipelining and Scheduling - Loop scheduling without resource bounds - Resource-bounded loop pipelining - Branch prediction

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, students will be able

- To explain the fundamentals of a translator
- To implement intermediate code generation
- To devise the memory handling techniques
- To design code optimization techniques

REFERENCES:

1. Andrew W. Appel and Jens Palsberg, "Modern Compiler implementation in Java", Cambridge University Press, 2004.
2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers. Principles, Techniques, and Tools", Second Edition, Pearson Education,2008.
3. Keith Cooper and Linda Torczon, " Engineering a Compiler", Second Edition, Morgan Kaufmann Publishers, 2012.
4. Steven S. Muchnick," Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
5. Charles N. Fischer, Ron K. Cytron and Richard J. LeBlanc Jr. "Crafting A Compiler", Pearson Education, 2009.
6. Randy Allen and Ken Kennedy, "Optimizing compilers for modern architectures", Morgan Kaufmann Publishers, 2002.

IF 7006 **CYBER FORENSICS** **L T P C**
3 0 0 3

OBJECTIVES:

- To study the fundamentals of computer forensics.
- To have an overview of techniques for Data Recovery and Evidence Collection.
- To study various threats associated with security and information warfare.
- To study the tools and tactics associated with cyber forensics.

UNIT I INTRODUCTION 7

Computer Forensics Fundamentals – Types of Computer Forensics Technology – Types of Vendor and Computer Forensics Services.

UNIT II COMPUTER FORENSICS EVIDENCE AND CAPTURE 8

Data Recovery – Evidence Collection and Data Seizure –Duplication and Preservation of Digital Evidence – Computer Image Verification and Authentication.

UNIT III COMPUTER FORENSIC ANALYSIS 10

Discover of Electronic Evidence – Identification of Data – Reconstructing Past Events Fighting against Macro Threats – Information Warfare Arsenal – Tactics of the Military–Tactics of Terrorist and Rogues – Tactics of Private Companies.

UNIT IV INFORMATION WARFARE 10

Arsenal – Surveillance Tools- Hackers and Theft of Components- Contemporary computer Crime Identity Theft and Identity Fraud-Organized Crime & Terrorism Avenues Prosecution and Government Efforts- Applying the First Amendment to Computer Related Crime-The Fourth Amendment and Other Legal Issues.

UNIT V COMPUTER FORENSIC CASES 10

Developing Forensic Capabilities- Searching and Seizing Computer Related Evidence-Processing Evidence and Report Preparation - Future Issues.

TOTAL:45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- To apply the concepts of computer forensics.
- To handle threats associated with security and information warfare.
- To design tools and tactics associated with cyber forensics.

REFERENCES:

1. John R. Vacca, “Computer Forensics: Computer Crime Scene Investigation, Volume1, CengageLearning, 2005.
2. Marjie T Britz , “Computer Forensics and Cyber Crime: An Introduction, 3/E, Pearson Education,2013.
3. Marie-Helen Maras, “Computer Forensics: Cybercriminals, Laws, and Evidence”, Jones & BartlettPublishers, 2011.
4. Chad Steel, “Windows Forensics”, W iley India, 2006.Majid Yar, “Cybercrime and Society”, Sag ePublications, 2006.Robert M Slade, “Software Forensics”, Tata Mc Graw Hill, 2004.

IF 7007 DATA WAREHOUSING AND DATA MINING L T P C
3 0 0 3

OBJECTIVES:

- To Understand Data mining principles and techniques and Introduce DM as a cutting edge
- business intelligence.
- To expose the students to the concepts of Data warehousing Architecture and Implementation.
- To study the overview of developing areas – Web mining, Text mining and ethical aspects of Data mining.
- To identify Business applications and Trends of Data mining.

UNIT I DATA WAREHOUSE 8

Data Warehousing - Operational Database Systems vs Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP operations – Data Warehouse Architecture – Indexing – OLAP queries & Tools.

UNIT II DATA MINING & DATA PREPROCESSING 9

Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

UNIT III ASSOCIATION RULE MINING 8

Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint – Based Association Mining.

UNIT IV CLASSIFICATION & PREDICTION 10

Classification vs Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT V CLUSTERING 10

Cluster Analysis - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to:

- Evolve Multidimensional Intelligent model from typical system.
- Discover the knowledge imbibed in the high dimensional system.
- Evaluate various mining techniques on complex data objects.

REFERENCES:

1 Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”,Second Edition, Elsevier, Reprinted 2011.

2 K.P. Soman, Shyam Diwakar and V. Ajay, “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.

3 G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition

IF 7008 **DESIGN OF SOFTWARE AGENTS** **L T P C**
3 0 0 3

OBJECTIVES:

To understand:

- The background of an agent
- The reasoning aspect of agents
- The communication and cooperation of agents
- The application of agent and decision making of multi-agent

UNIT I INTRODUCTION AND INTELLIGENT AGENTS 9

Agents as a paradigm for software engineering - Agents as a tool for understanding human societies- Intelligent Agent: Agents and Objects - Agents and Expert Systems - Agents as Intentional Systems - Abstract Architectures for Intelligent Agents - How to Tell an Agent What to Do.

UNIT II REASONING 9

Deduction reasoning agent - Agents as theorem provers - Agent oriented programming - Practical reasoning agent - Means end reasoning- Implementation - Procedural reasoning system- Reactive agent - Hybrid agent

UNIT III COMMUNICATION AND COOPERATION 9

Software tools for ontology - OWL - XML - KIF - Speech acts - Cooperative Distributed Problem Solving - Task Sharing and Result Sharing - Result Sharing - Combining Task and Result Sharing - Handling Inconsistency - Coordination - Multiagent Planning and Synchronization.

UNIT IV METHODOLOGIES AND APPLICATIONS 9

Agent-Oriented Analysis and Design - Pitfalls of Agent Development - Mobile Agents - Applications: Agents for Workflow and Business Process Management - Agents for Distributed Sensing - Agents for Information Retrieval and Management - Agents for Electronic Commerce - Agents for Human--Computer Interfaces - Agents for Virtual Environments - Agents for Social Simulation - Other applications

UNIT V MULTIAGENT DECISION MAKING 9

Multiagent Interactions - Making Group decisions - Forming coalitions - Allocating Scarce Resources - Bargaining - Arguing - Logical Foundations

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student will be able

- To analyze agent based computing
- To design the reasoning aspects of agents
- To implement communication and cooperation of agents
- To implement multi-agent systems.

REFERENCES:

1. An Introduction to MultiAgent Systems (second edition) by Michael Wooldridge, 2009.
2. Artificial Intelligence: A Modern Approach, Third Edition by Stuart Russell and Peter Norvig, 2010.

IF 7010 **E - LEARNING** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn the basics of e - learning
- To understand the design issues in E - Content creation
- To study about interactive E - Learning
- To learn managing E - Content

UNIT I INTRODUCTION 9

Developing e-learning-E-learning approaches-E-learning components-Synchronous and asynchronous e-learning-Quality of e-learning-Blended learning-Need to develop an e-learning course-The activities, The team, The technology-work flow to produce and deliver e-learning content

UNIT II DESIGNING AN E-LEARNING CONTENT/COURSE 9

Identifying and organizing course content-Needs analysis-Analysing the target audience-Identifying course content-Defining learning objectives-Defining the course sequence-Defining instructional, media, evaluation and delivery strategies-Defining instructional methods, Defining the delivery strategy, Defining the evaluation strategy

UNIT III CREATING INTERACTIVE CONTENT 9

Preparing content-Creating storyboards-Structure of an interactive e-lesson-Techniques for presenting content-Integrating media elements-Courseware development-Authoring tools-Types of authoring tools-Selecting an authoring tool

UNIT IV MANAGING AND EVALUATING LEARNING ACTIVITIES 9

Course delivery and evaluation-Components of an instructor led or facilitated course-Planning and documenting activities-Facilitating learners' activities-Using communication tools for e-learning-Learning platforms-Proprietary vs. open-source LMS

UNIT V MANAGEMENT AND IMPLEMENTATION OF E-LEARNING 9

Collaborative learning-Moodle and other open-source solutions-E-learning methods and delivery formats-Evaluating the impacts of e-learning

TOTAL:45 PERIODS

OUTCOMES:

At the end of the course, the student will be able

- To appreciate the basics of e - learning
- To create the E - Content
- To implement interactive E - Learning
- To manage E - Content

REFERENCES:

1. Clark, R. C. and Mayer, R. E. (2011) eLearning and the Science of Instruction. 3rd edition.
2. Means, B., Toyama, Y., and Murphy, R. (2010) Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies.
3. Crews, T. B., Sheth, S. N., and Horne, T. M. (2014) Understanding the Learning Personalities of Successful Online Students. Educause Review. Jan/Feb 2014.

IF 7011 GRID COMPUTING TECHNOLOGIES L T P C
3 0 0 3

OBJECTIVES:

- To understand Grid Architecture.
- To understand different types of grids.
- To know Grid standards.
- To acquire the knowledge of Grid computing in various areas.

UNIT I INTRODUCTION 9

Parallel and Distributed Computing - Cluster Computing - Grid Computing Anatomy and Physiology of Grid - Web and Grid Services.

UNIT II FRAMEWORK 9

Architecture – Implementation of Grid Architecture – Grid Services OGSI, OGSA, WSRF – Grid Resource and Service Management –Resource Management Framework – Service Negotiation and Acquisition Protocol – Layers of Grid Computing – Building Reliable Services - Grid Monitoring – Sensors and Sensor Management - Grid Security – WS Security – GSI.

UNIT III DATA AND KNOWLEDGE GRID 9

Data Source – Collective Data Services - Data Management – Collective Data Management – Federation Services – Representing Knowledge – Processing Knowledge - Knowledge Oriented Grid.

UNIT IV GRID MIDDLEWARE 9

List of Globally Available Toolkits – GT3 – Architecture Details – Grid Service Container – OGSI Implementation – Security Infrastructure - System Level Services – Hosting Environments- Programming Model.

UNIT V APPLICATIONS 9

Scientific – Medical – Bioinformatics – Federated Computing – ERM – Multiplayer Games - Collaborative Science – Case Study.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to,

- Create Grid Middleware architecture.
- Explain the services offered by grid.
- To utilize grid for various applications.

REFERENCES

1. Ian Foster, Carl Kesselman, “The Grid 2: Blueprint for a New Computing Infrastructure”, Elsevier Series, Second edition, 2006.
2. Srikumar Venugopal, Krishna Nadiminti, Hussein Gibbins and Rajkumar Buyya, “Designing a Resource Broker for Heterogeneous Grids, Software: Practice and Experience”, Wiley Press, New York, USA, 2008.
3. Fran Berman, Geoffrey Fox, Anthony J.G. Hey, “Grid Computing: Making the Global Infrastructure a Reality”, Wiley, 2003.
4. Maozhen Li, Mark Baker, “The Grid: Core Technologies”, Wiley, 2005.

IF 7012 **INFORMATION RETRIEVAL** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the basics of Information Retrieval with pertinence to modeling, Query operations and indexing.
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of Information Retrieval giving emphasis to Multimedia IR, Web Search.
- To understand the concepts of digital libraries.

UNIT I INTRODUCTION 9

Introduction - Goals and history of IR - The impact of the web on IR - The role of artificial intelligence (AI) in IR – Basic IR Models Boolean and vector space retrieval models – Ranked Retrieval – Text similarity metrics –TF IDF (term frequency/inverse document frequency) weighting - Cosine Similarity.

UNIT II PREPROCESSING 9

Basic Tokenizing - Indexing and Implementation of Vector Space Retrieval - Simple tokenizing – stop word removal and stemming – Inverted Indices –Efficient processing with sparse vectors – Query Operations and Languages - Relevance feedback – Query expansion – Query languages.

UNIT III METRICS 9

Experimental Evaluation of IR Performance metrics Recall, Precision and F measure – Evaluations on benchmark text collections - Text Representation - Word statistics – Zipf's law – Porter stemmer - Morphology – Index term Selection using thesauri -Metadata and markup languages- Web Search engines – spidering – metacrawlers – Directed spidering – Link analysis shopping agents.

UNIT IV CATEGORIZATION AND CLUSTERING 9

Text Categorization and Clustering - Categorization algorithms - Naive Bayes – Decision trees and nearest neighbor- Clustering algorithms - Agglomerative clustering – k Means – Expectation Maximization (EM) - Applications to information filtering – Organization and relevance feedback.

UNIT V EXTRACTION AND INTEGRATION 9

Recommender Systems - Collaborative filtering - Content based recommendation of documents and products - Information Extraction and Integration - Extracting data from text – XML – semantic web – Collecting and integrating specialized information on the web.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Build an Information Retrieval system using the available tools.
- Identify and design the various components of an Information Retrieval system.
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.
- Analyze the Web content structure.
- Design an efficient search engine.

REFERENCES:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze," Introduction to Information Retrieval" , Cambridge University Press, 2008.
2. Ricci, F. Rokach, L. Shapira, B. Kantor, P.B. "Recommender Systems Handbook", 1st Edition, 2011.
3. Brusilovsky, Peter, "The Adaptive Web Methods and Strategies of Web Personalization", Springer, 2007.

IF 7013 KNOWLEDGE ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To understand knowledge representation and reasoning techniques.
- To understand the application of knowledge representation and reasoning in actions and planning.

UNIT I INTRODUCTION 9

Data, information and knowledge. Model of an intelligent system. Models of knowledge representations.

UNIT II REPRESENTATION 9

Semantic representations: semantic networks, frames; Frame/script systems; Conceptual dependency and conceptual graphs. Ontologies.

UNIT III COMPUTATIONAL LOGIC 9

Proposition and predicate logic - reasoning about knowledge - Temporal reasoning.

UNIT IV DEFAULTS, UNCERTAINTY 9

Default Logic - Inference under uncertainty - Bayesian techniques, Fuzzy reasoning, Case-based reasoning, Description logic.

UNIT V ACTIONS 9

Actions - Situational calculus - Frame problem - Complex actions - Planning - STRIPS - Planning as reasoning - Hierarchical and Conditional Planning.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student will be able

- To implement knowledge representation and reasoning techniques.
- To apply knowledge engineering for the development of intelligent applications

REFERENCES:

1. Simon Kendal and Malcolm Creen, An introduction to Knowledge Engineering, Springer; 2007
2. S. Russell and P. Norvig, Artificial Intelligence, A Modern Approach. Third edition, Pearson Education, 2010.
3. Ronald Brachman, Hector Levesque “Knowledge Representation and Reasoning", The Morgan Kaufmann Series in Artificial Intelligence, 2004.
4. Johan van Benthem, Hans van Ditmarsch, Jan van Eijck and Jan Jaspars, Logic in Action, A new introduction to Logic, Available in http://www.logicinaction.org/, 2014.

IF 7014 MACHINE LEARNING L T P C
3 0 0 3

OBJECTIVES:

- To understand the concepts of machine learning.
- To appreciate supervised and unsupervised learning and their applications.
- To understand the theoretical and practical aspects of Probabilistic Graphical
- Models.
- To appreciate the concepts and algorithms of reinforcement learning.
- To learn aspects of computational learning theory.

UNIT I INTRODUCTION 9

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 9

Linear Models for Classification - Discriminant Functions - Probabilistic Generative Models - Probabilistic Discriminative Models - Bayesian Logistic Regression - Decision Trees -Classification Trees - Regression Trees – Pruning - 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 III UNSUPERVISED LEARNING 9

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.

UNIT IV PROBABILISTIC GRAPHICAL MODELS 9

Directed Graphical Models - Bayesian Networks - Exploiting Independence Properties – From Distributions to Graphs - Examples - Markov Random Fields - Inference in Graphical Models - Learning –Naive Bayes Classifiers - Markov Models – Hidden Markov Models – Inference – Learning- Generalization – Undirected graphical models - Markov Random Fields- Conditional Independence Properties - Parameterization of MRFs - Examples - Learning – Conditional Random Fields (CRFs) - Structural SVMs.

UNIT V ADVANCED LEARNING 9

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.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- To implement a neural network for an application of your choice using an available tool.
- To implement probabilistic discriminative and generative algorithms for an application of your choice and analyze the results.
- To use a tool to implement typical clustering algorithms for different types of applications.
- To design and implement an HMM for a sequence model type of application
- To identify applications suitable for different types of machine learning with suitable justification.

REFERENCES:

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2006
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012
3. Ethem Alpaydin, “Introduction to Machine Learning”, Prentice Hall of India, 2005
4. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
5. Hastie, Tibshirani, Friedman, “The Elements of Statistical Learning” (2nd ed)., Springer, 2008
6. Stephen Marsland, “Machine Learning –An Algorithmic Perspective”, CRC Press, 2009

IF 7015 **OPEN SOURCE TECHNOLOGIES** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce open technologies
- To develop applications using python
- To provide an exposure to open hardware

UNIT I INTRODUCTION **9**

Need for free and open source software – Overview of linux – Distributions Development environment tools and systems - using collaborative version control system - FOSS practices - programming guidelines

UNIT II SYSTEM ADMINISTRATION **9**

GNU andlinux installation – Boot process, Commands Using bash features, The man pages - files and file systems - Partitions - Processes - Graphical environment - Installing software - git commands

UNIT III PYTHON **9**

Conditionals/Loops - Functions - List - Strings - Recursion - tuples - Classes - Inheritance

UNIT IV DJANGO **9**

Introduction to Django - templates - models - forms - deploying django - caching - Integrating with legacy databases and applications – security

UNIT V OPEN SOURCE HARDWARE **9**

Raspberry pi - Arduino – building embedded applications with raspberry pi and arduino- open source 3-d printing

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the internal structure of linux
- Write desktop and web applications using python
- Design for extendibility and code reuse
- To develop applications for open source hardware

REFERENCES:

1. Jesús M. González-Barahona, JoaquínSeoanePascual, Gregorio Robles, Introduction to Free Software, Free Technology Academy, Europe, 2009 (http://ftacademy.org/materials/fsm/1#1).
2. Introduction to Linux – A Hands on Guide, URL:http://tldp.org/guides.html
3. Rute's User tutorial and exposition, URL:http://rute.2038bug.com/index.html.gz
4. Allen B. Downey, Think Python, O'Reilly Publications, 2011.
5. Adrian Holovaty, Jacob Kaplan–Moss, The Definitive Guide to Django: Web Development Done Right, Apress, 2009
6. http://sixrevisions.com/resources/git-tutorials-beginners/
7. Charles Bell, Beginning Sensor Networks with Arduino and Raspberry Pi, Apress, 2013.
8. J Pearce, Open-Source Lab - How to Build Your Own Hardware and Reduce Research Costs, Elsevier, 2014.

IF 7016 **SEMANTIC WEB** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn the importance of semantic web.
- To understand various semantic knowledge representation strategies.
- To learn the concepts of ontology.
- To learn the ontology related tools.

UNIT I INTRODUCTION 9

The Future of the Internet: Introduction - The Syntactic Web - The Semantic Web - How the Semantic Web Will Work. Ontology in Computer Science - Defining the Term Ontology - Differences among Taxonomies - Thesauri - and Ontologies, Classifying Ontologies - Web Ontologies, Web Ontology Description Languages - Ontology - Categories - and Intelligence.

UNIT II SEMANTIC KNOWLEDGE REPRESENTATION 9

Knowledge Representation in Description Logic – Introduction - An Informal Example - The Family of Attributive Languages - Inference Problems. RDF and RDF Schema – Introduction- XML Essentials- RDF- RDF Schema-A Summary of the RDF/RDF Schema Vocabulary. OWL Introduction-Requirements for Web Ontology Description Languages- Header Information-Versioning- and Annotation Properties- Properties- Classes- Individuals- Data types- A Summary of the OWL Vocabulary.

UNIT III RULE LANGUAGES 9

Rule Languages – Introduction - Usage Scenarios for Rule Languages – Datalog – RuleML – SWRL - TRIPLE. Semantic Web Services – Introduction - Web Service Essentials - OWL-S Service Ontology - An OWL-S Example.

UNIT IV ONTOLOGY DEVELOPMENT 9

Methods for Ontology Development – Introduction - Uschold and King Ontology Development Method - Toronto Virtual Enterprise Method – Methontology - KACTUS Project Ontology Development Method – Lexicon -Based Ontology Development Method - Simplified Methods Ontology Sources – Introduction – Metadata - Upper Ontologies Other Ontologic of Interest - Ontology Libraries.

UNIT V SOFTWARE TOOLS 9

Semantic Web Software Tools – Introduction - Metadata and Ontology Editors – Reasoners - Other tools. Software Agents – Introduction - Agent Forms - Agent Architecture - Agents in the Semantic web Context. Semantic Desktop – Introduction - Semantic Desktop Metadata - Semantic Desktop Ontologies - Semantic Desktop Architecture - Semantic Desktop Related Applications. Ontology Application in Art – Introduction - Ontologies for the Description of Works of Art - Metadata Schemas for The Description of Works of Art - Semantic Annotation of Art Images.

TOTAL:45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Compare conventional web with semantic web.
- Analyze and design semantic knowledge representation modes.
- Construct ontology using different tools.
- Use semantic web services with web applications.

REFERENCES:

1. Karin K. Breitman, Marco Antonio Casanova and Walter Truszowski, “Semantic Web Concepts: Technologies and Applications”, Springer.
2. Heiner Stuckenschmidt, Frank van Harmelen,” Information Sharing on the Semanting Web,” Springer.
3. Grigoris Antoniou, Frank Van,”Semantic Web Primer”,
4. Rudi Studer, Stephan Grimm, Andrees Abeker,”Semantic Web Services: Concepts, Technologies and Applications”, Springer
5. John Davis, Dieter Fensal, Frank Van Harmelen,J. Wiley ,”Towards the Semantic Web: Ontology Driven Knowledge Management”.

IF 7017 SOCIAL NETWORK ANALYSIS L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the concept of semantic web and related applications.
- Learn knowledge representation using ontology.
- Understand human behavior in social web and related communities.
- Learn visualization of social networks.

UNIT I THE SEMANTIC WEB AND SOCIAL NETWORKS 9

Introduction to Semantic Web: Limitations of current Web – Development of Semantic Web - Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis.

UNIT II SEMANTIC TECHNOLOGY FOR SOCIAL NETWORK ANALYSIS 9

Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks-Ontology-based knowledge Representation –Resource Description Framework – Web Ontology Language-Modeling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals – Ontological representation of social relationships - Aggregating and reasoning with social network data

UNIT III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS 9

Detecting communities in social networks – Definition of community – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms – Tools for detecting communities - social network infrastructures and communities – Decentralized online social networks – Challenges of DOSN’s - General Purpose DOSNs

UNIT IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES 9

Understanding and predicting human behaviour for social communities – User data management, Inference and Distribution – Enabling new human experiences – The Technologies - Privacy in online social networks – Trust in online environment – Trust models based on subjective logic – Trust network analysis – Trust transitivity analysis – Combining trust and reputation – Trust derivation based on trust comparisons.

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS 9

Graph theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing online social networks, Visualizing social networks with matrix-based representations – Matrix and Node-Link Diagrams – Hybrid representations – Applications – Cover networks – Community welfare -Collaboration networks – Co-Citation networks.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

- Develop semantic web related applications.
- Represent knowledge using ontology.
- Predict human behaviour in social web and related communities.
- Visualize social networks.

REFERENCES:

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2. BorkoFurht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.
3. GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
4. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.
5. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.
6. John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.

IF 7018 SOFT COMPUTING AND APPLICATION L T P C

3 0 0 3

OBJECTIVES:

- To understand the concept and applications of fuzzy logic, neural networks, genetic algorithms and hybrid systems.

UNIT I INTRODUCTION AND FUZZY LOGIC 9

Introduction to Soft Computing - Components of Soft Computing - Importance of Soft Computing - Fuzzy Set Theory - Different types of fuzzy set Membership Functions - Fuzzy Set theoretic operations - Fuzzy Rules and Fuzzy Reasoning - Fuzzy Inference Systems.

UNIT II NEURAL NETWORKS 9

Basic concepts of neural networks - Supervised Learning, Unsupervised Learning - Neural network architectures - Learning methods - Architecture of a back propagation network.

UNIT III GENETIC ALGORITHMS 9

Basic concepts of genetic algorithms - encoding - genetic modeling -Evolutionary Strategies - Optimization techniques

UNIT IV HYBRID SYSTEMS 9

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling - Integration of neural networks, fuzzy logic and genetic algorithms.

UNIT V APPLICATIONS 9

Applications of Fuzzy Logic - Applications of Neural Network - Application of Genetic Algorithm - Applications in Image processing- Applications in Data mining - Applications in other domains.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able

- To implement the concept and applications of fuzzy logic, neural networks, genetic algorithms and hybrid systems.

REFERENCES:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2003.
2. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1995.
3. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Edn., 2003.
4. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.
5. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, 1997.

IF 7020 VIRTUALIZATION L T P C
3 0 0 3

OBJECTIVES:

- To understand the concept of virtualization.
- To understand the various issues in virtualization.
- To familiarize themselves with the types of virtualization.
- To compare and analyze various virtual machines products.

UNIT I OVERVIEW OF VIRTUALIZATION 10

Basics of Virtualization - Virtualization Types – Desktop Virtualization – Network Virtualization – Server and Machine Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization-Virtualization Advantages - Virtual Machine Basics – Taxonomy of Virtual Machines - Process Virtual Machines - System Virtual Machines – Hypervisor - Key Concepts.

UNIT II SERVER CONSOLIDATION 8

Hardware Virtualization – Virtual Hardware Overview - Sever Virtualization – Physical and Logical Partitioning - Types of Server Virtualization – Business cases for Sever Virtualization – Uses of Virtual server Consolidation – Planning for Development –Selecting server Virtualization Platform.

UNIT III NETWORK VIRTUALIZATION 10

Design of Scalable Enterprise Networks - Virtualizing the Campus WAN Design – WAN Architecture - WAN Virtualization - Virtual Enterprise Transport Virtualization–VLANs and Scalability - Theory Network Device Virtualization Layer 2 - VLANs Layer 3 VRF Instances Layer 2 - VFIs Virtual Firewall Contexts Network Device Virtualization – DataPath Virtualization Layer 2: 802.1q - Trunking Generic Routing Encapsulation - IPsec L2TPv3 Label Switched Paths - Control-Plane Virtualization–Routing Protocols- VRF - Aware Routing Multi-Topology Routing.

UNIT IV VIRTUALIZING STORAGE 8

SCSI- Speaking SCSI- Using SCSI buses – Fiber Channel – Fiber Channel Cables –Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI – SAN backup and recovery techniques – RAID – SNIA Shared Storage Model – Classical Storage Model – SNIA Shared Storage Model – Host based Architecture – Storage based architecture – Network based Architecture – Fault tolerance to SAN – Performing Backups – Virtual tape libraries.

UNIT V VIRTUAL MACHINES PRODUCTS 9

Xen Virtual machine monitors- Xen API – VMware – VMware products - VMware Features – Microsoft Virtual Server – Features of Microsoft Virtual Server.

TOTAL:45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Create a virtual machine and to extend it to a virtual network.
- Discuss on various virtual machine products.
- Compile all types of virtualization techniques and utilize them in design of virtual machines.

REFERENCES:

1. William von Hagen, "Professional Xen Virtualization", Wrox Publications, January, 2008.
2. Chris Wolf , Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", APress 2005.
3. Kumar Reddy, Victor Moreno, "Network virtualization", Cisco Press, July, 2006.
4. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
5. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

IF7021 MOBILE AND PERVASIVE COMPUTING L T P C

3 0 0 3

OBJECTIVES:

- To understand the basics of Mobile Computing and Personal Computing.
- To learn the role of wireless networks in Mobile Computing and Pervasive Computing.
- To study about the underlying wireless networks.
- To understand the architectures of mobile and pervasive applications.
- To become familiar with the pervasive devices and mobile computing platforms.

UNIT I INTRODUCTION 9

Differences between Mobile Communication and Mobile Computing – Contexts and Names – Functions – Applications and Services – New applications – Making legacy applications mobile enabled – Design considerations – Integration of Wireless and Wired Networks – Standards bodies – Pervasive Computing – Basics and Vision – Principles of Pervasive Computing – Categories of Pervasive devices

UNIT II 3G AND 4G CELLULAR NETWORKS 9

Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – User Equipment – Radio Network Subsystem – UTRAN – Node B – RNC functions – USIM – Protocol Stack – CS and PS Domains – IMS Architecture – Handover – 3.5G and 3.9G a brief discussion – 4G LAN and Cellular Networks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC and MAC – WiMax IEEE 802.16d/e – WiMax Internetworking with 3GPP

UNIT III SENSOR AND MESH NETWORKS 9

Sensor Networks – Role in Pervasive Computing – In Network Processing and Data Dissemination – Sensor data bases – Data management in wireless mobile environments – Wireless Mesh Networks – Architecture – Mesh routers – Mesh clients – Routing – Cross Layer Approach – Security aspects of various layers in WMN – Applications of Sensor and Mesh networks

UNIT IV CONTEXT AWARE COMPUTING 9

Adaptability – Mechanisms for Adaptation - Functionality and Data – Transcoding – Location Aware Computing – Location Representation – Localization Techniques – Triangulation and Scene Analysis – Delaunay Triangulation and Voronoi graphs – Types of context – Role of Mobile middleware – Adaptation and agents – Service Discovery middleware

UNIT V APPLICATION DEVELOPMENT 9

Three tier architecture - Model View Controller Architecture - Memory Management – Information Access Devices – PDAs and Smart Phones – Smart cards and Embedded Controls – J2ME – Programming for CLDC – GUI in MIDP – Application Development ON Android and iPhone

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course the student should be able

- To deploy 3G networks.
- To develop suitable algorithms for 4G networks.
- To use sensor and mesh networks to develop mobile computing environment.
- To develop mobile computing applications based on the paradigm of context aware computing.

REFERENCES:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, “Mobile Computing: Techno logy, Applications and Service Creation”, 2nd ed, Tata McGraw Hill, 2010.
2. Reto Meier, “Professional Android 2 Application Development”, Wrox Wiley,2010.
3. Pei Zheng and Lionel M Li, ‘Smart Phone & Next Generation Mobile Computing’, Morgan Kaufmann Publishers, 2006.
4. Frank Adelstein et al, ‘Fundamentals of Mobile and Pervasive Computing’, TMH, 2005
5. Jochen Burthardt et al, ‘Pervasive Computing: Technology and Architecture of Mobile Internet Applications’, Pearson Education, 2003
6. Feng Zhao and Leonidas Guibas, ‘Wireless Sensor Networks’, Morgan Kaufmann Publishers, 2004
7. Uwe Hansmaan et al, ‘Principles of Mobile Computing’, Springer, 2003
8. Reto Meier, “Professional Android 2 Application Development”, Wrox Wiley,2010.
9. Stefan Poslad, “Ubiquitous Computing: Smart Devices, Environments and Interactions”, Wiley, 2009.

IF7022 WIRELESS AND SENSOR NETWORKS L T P C

3 0 0 3

OBJECTIVES:

- To understand the basics of Ad-hoc & Sensor Networks.
- To learn various fundamental and emerging protocols of all layers.
- To study about the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks.
- To understand the nature and applications of Ad-hoc and sensor networks.
- To understand various security practices and protocols of Ad-hoc and Sensor Networks

UNIT I 9

Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issues in Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for TCP over Ad-Hoc Networks.

UNIT II **9**

Routing in Ad-Hoc Networks- Introduction-Topology based versus Position based Approaches-Proactive, Reactive, Hybrid Routing Approach-Principles and issues – Location services - DREAM – Quorums based location service – Grid – Forwarding strategies – Greedy packet forwarding – Restricted directional flooding- Hierarchical Routing- Other routing protocols

UNIT III **9**

Introduction – Architecture - Single node architecture – Sensor network design considerations – Energy Efficient Design principles for WSNs – Protocols for WSN – Physical Layer : Transceiver Design considerations – MAC Layer Protocols – IEEE 802.15.4 Zigbee – Link Layer and Error Control issues - Routing Protocols – Mobile Nodes and Mobile Robots - Data Centric & Contention Based Networking – Transport Protocols & QOS – Congestion Control issues – Application Layer support.

UNIT IV **9**

Sensor Management - Topology Control Protocols and Sensing Mode Selection Protocols - Time synchronization - Localization and positioning – Operating systems and Sensor Network programming – Sensor Network Simulators

UNIT V **9**

Security in Ad-Hoc and Sensor networks – Key Distribution and Management – Software based Anti-tamper techniques – water marking techniques – Defense against routing attacks - Secure Adhoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols - SPINS

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- To conversant with Ad-hoc and sensor networks, protocols and standards.
- To establish a Sensor network environment for different type of applications

REFERENCES:

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition), World Scientific Publishing, 2011.
2. Holger Karl, Andreas willig, Protocols and Architectures for Wireless Sensor Networks, John Wiley & Sons, Inc .2005.
3. C.Siva Ram Murthy and B.S.Manoj, “Ad Hoc Wireless Networks – Architectures and Protocols”, Pearson Education, 2004.
4. C.K.Toh, “Ad Hoc Mobile Wireless Networks”, Pearson Education, 2002.
5. Erdal Çayırcı , Chunming Rong, “Security in Wireless Ad Hoc and Sensor Networks”, John Wiley and Sons, 2009
6. Waltenegus Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks Theory and Practice”, John Wiley and Sons, 2010
7. Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication: In Wired and Wireless Networks", Springer, 2006

IF 7071 **BIOINFORMATICS** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn bio-informatics algorithms

UNIT I **9**

What is Bio-Informatics – Overview- Major databases in Bio Informatics- Molecular biology – Central DogmaData retrieval tools – gene structure - Prokaryotic and Eukaryotic Genomes – Sequence Assembly – Gene mapping – Physical maps – cloning — the genetic material — chemical bonds – molecular biology tools – genomic information content.

UNIT II **9**

DNA: working with single DNA sequence : removing vector sequences- verifying restriction maps – PCR design – GC content – counting words – internal repeats – protein coding regions – ORFing – Genomescan Protein: predicting properties – primary structure analysis – transmembrane segments – PROSITE patterns – interpreting scanprosite results- finding domains – CD server results – pfscan results. – Alignment of Pair of Sequences

UNIT III **9**

Phylogenetics – phylogenetic trees –Parsimony – ancestral sequences – strategies for faster searches – consensus trees – tree confidence – comparison of phylogenetic methods – molecular phylogenie. Dot matrix – using scoring matrices – PAM matrices – BLOSUM. - Working with FASTA – Algorithm – output – E-values – Histogram. Working with BLAST – algorithm – output – services – gapped BLAST- PSIBLAST – comparison of FASTA and BLAST. - Multiple sequence alignment - Criteria for Multiple sequence alignment – applications – choosing the right sequences; FASTA, ClustalW, TCoffee methods

UNIT IV **9**

interpreting multiple sequence alignment – getting in right format – converting formats – using Jalview – preparing for publication. - Protein Classification & Structure Prediction - Structure of amino acids – primary structure – secondary structure – folds and motifs – alpha and beta helix – structure based protein classification – protein structure Data bases – folding problem – PROPSEARCH – primary structure analysis and prediction – secondary structure analysis and prediction – motifs – profiles – patterns and fingerprints

UNIT V **9**

Drug Discovery – components – process – Perspectives – Numeric considerations – Algorithms – Hardware – Issues – Protein structure – AbInitio Methods – Heuristic methods – Systems Biology – Tools – Collaboration and Communications – standards - Issues – Security – Intellectual property

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of this course the student should be able

- To design and implement bio-informatics algorithms

REFERENCES

1. Arthur M. Lesk, “Introduction to Bioinformatics”, Second Edition, Oxford University Press, 2005.
2. T. K. Attwood, D. J. Parry-Smith, and S. Phukan, “Introduction to Bioinformatics”, Pearson Education, 1999.
3. Vittal R. Srinivas, “Bioinformatics – A Modern Approach”, Prentice-Hall of India Pvt. Ltd., 2005
4. S.C Rostogi , Mendiratta, P.Rasogi, “ BioInformatics: methods and applications”,second edition, PHI 2006.
5. Jean Mickel Clavere & Cadrienotredom “Bio Informatics– A beginners guide” Wiley DreamTech, 2003.
6. T.K. Attwood and D.J Perry Smith, “ Introduction to Bio Informatics”, Pearson Education, 1st Edition, 2001.

IF 7073 GPU ARCHITECTURE AND PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

- To understand the architecture of GPUs in order to program them effectively.
- To program using GPU programming frameworks.
- To optimize multimedia applications to run on GPUs.

UNIT I GPU ARCHITECTURES 9

Parallel Processors – Classification – Performance – Multimedia SIMD Architectures. GPU – NVIDIA Case Study – GPU Computational Structures – ISA – Memory Structures.

UNIT II GPU COMPUTING AND CUDA 9

Introduction – Parallel Programming Languages and models – Evolution of Graphic pipelines – GPGPUs - CUDA Program Structure – Device memories – Data Transfer – Kernel Functions

UNIT III CUDA DETAILS 9

CUDA Threads – Thread Organization – Synchronization & Scalability – CUDA memories – Performance – Imaging Case study

UNIT IV OPENCL BASICS 9

OpenCL Standard – Kernels – Host Device Interaction – Execution Environment – Memory Model – Basic OpenCL Examples.

UNIT V OPENCL CONCURRENCY & EXECUTION MODEL 9

OpenCL Synchronization – Kernels – Fences – Barriers – Queueing – Global Synchronization – Memory Consistency – Events – Host side memory model – Device Side memory Model – Case study

TOTAL:45 PERIODS

OUTCOMES:

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

- Design multimedia applications using GPUs.
- Write Programs for GPUs using CUDA / OpenCL.
- Optimize programs to run on massively parallel architectures.

REFERENCES:

1. David B. Kirk, Wen-mei W. Hwu, “Programming massively parallel processors”, Morgan Kauffman, 2010.
2. B.R. Gaster, L. Howes, D.R. Kaeli, P. Mistry, D. Schaa, “ Heterogeneous computing with OpenCL”, Morgan Kauffman, 2012.
3. John L. Hennessey and David A. Patterson, “Computer Architecture –
4. A quantitative approach”, Morgan Kaufmann / Elsevier, 5th edition, 2012.
5. J. Sanders and E. Kandrot**,** “CUDA by Example: An Introduction to General-Purpose GPU Programming”, Addison Wesley, 2010.
6. Wen–mei W. Hwu, “GPU Computing Gems”, Morgan Kaufmann / Elsevier, 2011

IF 7077 SERVICE ORIENTED ARCHITECTURE L T P C
3 0 0 3

OBJECTIVES:

- To learn SOA fundamentals
- To understand SOAD
- To study about service composition
- To explore RESTful services and SOA security

UNIT I SOA FUNDAMENTALS 9

SOA – Services – Loose Coupling – The Enterprise service bus – Service Classification – Business process management – SOA and the organization – SOA and the organization - SOA in context – Message exchange patterns – SOA life cycle – Versioning – Web services

UNIT II SERVICE-ORIENTED ANALYSIS AND DESIGN 9

SOA Terminology and Concepts - REST Design Constraints and Goals - RESTful Service-Orientation - Service Contracts with REST - Service-Orientation and REST Service-Oriented Analysis and Design with REST - Mainstream SOA Methodology - Analysis and Service Modeling with REST - Service-Oriented Design with REST

UNIT III SERVICE COMPOSITION 9

Service Composition with REST - Fundamental Service Composition with REST - Advanced Service Composition with REST - Service Composition with REST Case Study - Design Patterns for SOA with REST - Service Versioning with REST - Uniform Contract Profiles

UNIT IV RESTFUL SERVICES AND THE RESOURCE-ORIENTED ARCHITECTURE 9

Introducing the Simple Storage Service - Object-Oriented Design of S3 - URIs - Addressability - Statelessness - Representations - Links and Connectedness - The Uniform Interface - Resource Design - Turning Requirements into Read-Only Resources - Service Implementation - Web service case studies - Connect Resources to Each Other - Controller Code - Model Code

UNIT V SOA TRANSACTION AND SECURITY 9

SOA and performance - SOA and security – Service Management - Model driven service deployment – Establishing SOA and SOA governance

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student will be able

- To appreciate SOA fundamentals
- To implement SOAD
- To compose the web services
- To deploy RESTful services and SOA security

REFERENCES

1. Nicolai M.Josuttis, SOA in design - The art of distributed system design, O'REILLY publication, 2007.
2. Raj Balasubramanian, Benjamin Carlyle, Thomas Erl, Cesare Pautasso, "SOA with REST - Principles, Patterns & Constraints for building Enterprise solutions with REST" , Prentice Hall/PearsonPTR , 2012.
3. Leonard Richardson and Sam Ruby, RESTful Web Services, O'REILLY publication,2007.

IF 7451 **UNIX INTERNALS** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the design of the UNIX operating system.
- To become familiar with the various data structures used.
- To learn the various low-level algorithms used in UNIX.

UNIT I OVERVIEW 9

General Overview of the System - History – System structure – User perspective –Operating system services – Assumptions about hardware - Introduction to the Kernel - Architecture of the UNIX operating system – Introduction to system concepts - The Buffer Cache - Buffer headers – Structure of the buffer pool – Scenarios for retrieval of a buffer– Reading and writing disk blocks – Advantages and disadvantages of the buffer cache.

UNIT II FILE SUBSYSTEM 9

Internal representation of files - Inodes – Structure of a regular file – Directories –Conversion of a path name to an Inode – Super block – Inode assignment to a new file – Allocation of disk blocks.

UNIT III SYSTEM CALLS FOR THE FILE SYSTEM 9

Open – Read – Write – File and record locking – Adjusting the position of file I/O – Lseek – Close – File creation – Creation of special files – Changing directory – root – owner - mode – stat and fstat – Pipes – Dup – Mounting and unmounting file systems – link – unlink.

UNIT IV PROCESSES 9

Process states and transitions – Layout of system memory – The context of a process –Saving the context of a process – Manipulation of the process address space – Sleep - Process Control - Process creation – Signals – Process termination – Awaiting process termination – Invoking other programs – user id of a process – Changing the size of a process - Shell – System boot and the INIT process– Process Scheduling.

UNIT V MEMORY MANAGEMENT AND I/O 9

Memory Management Policies - Swapping – Demand paging - The I/O Subsystem -Driver Interface – Disk Drivers – Terminal Drivers**.**

TOTAL:45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able

- To analyze the internals of the unix operating system.
- To make use of the various data structures
- To implement various low-level algorithms used in UNIX.

REFERENCES:

1. Maurice J. Bach, “The Design of the Unix Operating System”, First Edition,Pearson Education, 1999.
2. B. Goodheart, J. Cox, “The Magic Garden Explained”, Prentice Hall of India,1986.
3. S. J. Leffler, M. K. Mckusick, M. J. .Karels and J. S. Quarterman., “The Design and Implementation of the 4.3 BSD Unix Operating System”, Addison Wesley, 1998.

IF 7072 **COMPUTER VISION** **L T P C**
3 0 0 3

OBJECTIVES:

- To provide knowledge about computer vision algorithms
- To understand the basic concepts of camera calibration, stereoscopic imaging and higher level image processing operations
- To familiarize the student with the image processing facilities in Matlab and its equivalent open source tools like OpenCV
- To appreciate the use of compute vision in Industrial applications and to understand the role of computer vision
- To understand and implement more advanced topics in current research literature

UNIT I FUNDAMENTALS OF VISION 9

Image Formation and Representation, Intensity and Range Images – Camera models – Camera parameters – Camera models – Light and colour – Image Noise – Image Filtering (spatial domain) - Mask-based filtering - Image Smoothing , Sharpening.

UNIT II IMAGE FEATURES 9

Image Features – Point and Line Detection – Hough Transform – Edge Detection – Corner Detection – Harris Detector – Textures - Deformable Contours – Features Reduction – Principal Component analysis – Feature Descriptors – SIFT and SURF.

UNIT III CAMERA CALIBRATION AND STEREO GEOMETRY 9

Camera Parameters – Intrinsic and Extrinsic parameters – Direct Parameter Calibration – Extraction from Projection matrix, Stereopsis – Correspondence Problem –RANSAC and Alignment - Epipolar Geometry

UNIT IV MOTION DETECTION AND SHAPE FROM CUES 9

Motion field of rigid objects – Notation of Optical flow – Estimating motion field – Estimation Motion Field – Horn and Schunck algorithm – Lucas and Kanade Algorithm – Using and Evaluation of Motion field – Shape from Shading and shape from Texture Modelbased Vision, smooth surfaces and their outlines, Aspect graphs and Range data**.**

UNIT V HIGH LEVEL VISION 9

Interpretation trees, Invariants – Appearance and Shape based Classification – 3D object modeling – Matching from Intensity Data – Matching from Range Data – Visual Recognition – AdaBoost and Random Decision Forests.

TOTAL : 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Implement basic computer vision algorithms
- Familiar with the use of MATLAB and OpenCV environment
- Design and implement industrial applications that incorporates different concepts of medical Image Processing
- Critically analyze different approaches to implement mini projects in industrial environment.

REFERENCES:

1.Introductory Techniques for 3-D Computer Vision, Prentice Hall, 1998.
2.Concise Computer Vision: An Introduction into Theory and Algorithms, ReinhardKlette, 2014, Springer-Verlag London
3.Computer Vision: Algorithms and Applications Richard Szeliski, Springer International, 2011.
4.Computer Vision: a Modern Approach , David Forsyth and Jean Ponce, Prentice Hall, 2009.
5.Multiple View Geometry in Computer Vision, Richard Hartley and Andrew Zisserman, Cambridge, 2001.
6.E.R.Davies,"Computer and Machine Vision",Elserier,4th edition, 2012

IF 7074 **HUMAN COMPUTER INTERACTION** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn the principles and fundamentals of human computer interaction (HCI)
- To analyze HCI theories, as they relate to collaborative or social software.
- To Establish target users, functional requirements, and interface requirements for a given computer application.
- To understand user interface design principles, and apply them to designing an interface.
- To learn user interface designs through usability inspection and user models
- To know the applications of multimedia on HCI.

UNIT I DESIGN PROCESS **9**

Humans – Information process – Computer – Information Process – Differences and Similarities between them – Need for Interaction – Models – Ergonomics – Style – Context – Paradigms – Designing of Interactive systems – Usability – Paradigm shift – Interaction design basics – Design Process – Scenarios – Users need –Complexity of design

UNIT II DESIGN AND EVALUATION OF INTERACTIVE SYSTEMS **9**

Software Process – Usability engineering – Issue based Information systems – Iterative design practices – Design rules – maximum usability – Principles – Standards and guidelines – design patterns – Programming Tools – Windowing systems – Interaction tool kit – User Interface management system – Evaluation techniques – evaluation design – Evaluating implementations – Observational Methods

UNIT III MODELS **9**

Universal design principles – Multimodal systems – User Support – Presentation and Implementation Issues – types – requirements – approaches – Cognitive model – Hierarchical model – Linguistic model – physical and device models – Sociotechnical models – Communication and Collaboration models – Task models – Task analysis and design

UNIT IV EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS OF HCI **9**

Basic Design structure – Single independent variable – multiple independent variable – factorial design – split-plot design – random errors – experimental procedure – Statistical analysis – T tests – Analysis of Variance test – Regression – Chi-Square test – Survey – Probabilistic sampling – Non-probabilistic sampling – developing survey questions

UNIT V THEORIES **9**

Dialogue notations and design – Dialogue need – dialogue design notations – Graphical – Textual - representing dialogue – formal descriptions – Dialogue analysis – System models – Interaction models – relationship with dialogue – Formalisms – Formal notations – Interstitial behavior – Virtual reality – Modeling rich interaction – Status Event analysis – Properties – Rich contexts – Sensor-based systems – Groupware – Applications – Ubiquitous computing – Virtual reality

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to

- Interpret the contributions of human factors and technical constraints on human– computer interaction.
- Evaluate the role of current HCI theories in the design of software.
- Apply HCI techniques and methods to the design of software.
- Categorize and carefully differentiate various aspects of multimedia interfaces.
- Design and develop issues related to HCI for real application.

REFERENCES:

1. Human Computer Interaction, 3rd Edition Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Prentice Hall, 2004.
2. Research Methods in Human-Computer Interaction , Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Wiley, 2010.
3. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

MM7001 BIG DATA ANALYTICS L T P C
3 0 0 3

OBJECTIVES:

- To understand the applications using Map Reduce Concepts.
- To learn to use various techniques for mining data stream.
- To understand the various search methods and visualization techniques.
- To learn to analyze the big data using intelligent techniques.

UNIT I INTRODUCTION TO BIG DATA 8

Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II MINING DATA STREAMS 9

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT III HADOOP 10

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS-Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

UNIT IV HADOOP ENVIRONMENT 9

Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation - Hadoop Configuration-Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenance-Hadoop benchmarks- Hadoop in the cloud

UNIT V FRAMEWORKS 9

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

TOTAL : 45 PERIODS

OUTCOMES:

Work with big data platform

- The students will be able to Analyze the HADOOP and Map Reduce technologies associated with big data analytics
- Design efficient algorithms for mining the data from large volumes.
- Analyze the big data analytic techniques for useful business applications.
- Explore on Big Data applications Using Pig and Hive
- Discuss the fundamentals of various big data analysis techniques

REFERENCES:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Tom White “ Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012
4. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
5. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
6. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007
7. Pete Warden, “Big Data Glossary”, O’Reilly, 2011.
8. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.
9. Da Ruan,Guoquing Chen, Etienne E.Kerre, Geert Wets, Intelligent Data Mining, Springer,2007
10. Paul Zikopoulos ,Dirk deRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corrigan , Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications, 2012
11. Michael Minelli (Author), Michele Chambers (Author), Ambiga Dhiraj (Author) , Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses,Wiley Publications,2013
12. Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications, 2011

MM7002 BIOMETRICS L T P C

3 0 0 3

OBJECTIVES:

- To understand the basic ideas and principles in biometrics
- To understand the basic concepts of statistical data analysis for validating the biometrics projects
- To familiarize the student with the image processing facilities in Matlab and its equivalent open source tools like OpenCV
- To appreciate the use of biometrics Industrial applications and to understand the role of biometrics in modern security environment
- To understand and implement more advanced topics in current research literature
- To understand the role of multi-biometrics

UNIT I BIOMETRICS FUNDAMENTALS 9

Introduction – Benefits of biometric security – Verification and identification – Basic working of biometric matching – Accuracy – False match rate – False non-match rate – Failure to enroll rate – Derived metrics – Layered biometric solutions.

UNIT II FINGER AND FACIAL SCAN 9

Finger scan – Features – Components – Operation (Steps) – Competing finger Scan technologies – Strength and weakness. Types of algorithms used for interpretation. Facial Scan - Features – Components – Operation (Steps) – Competing facial Scan technologies–Strength-weakness.

UNIT III IRIS AND VOICE 9

Iris Scan - Features – Components – Operation (Steps) – Competing iris Scan technologies – Strength and weakness. Voice Scan - Features – Components – Operation (Steps) – Competing voice Scan (facial) technologies – Strength and weakness.

UNIT IV PHYSIOLOGICAL BIOMETRICS 9

Other physiological biometrics – Hand scan – Retina scan – AFIS (Automatic Finger Print Identification Systems) – Behavioral Biometrics – Signature scan - keystroke scan. Multimodalities and combining biometrics for improving performance.

UNIT V BIOMETRICS APPLICATION DEVELOPMENT 9

Biometrics Application – Biometric Solution Matrix – Bio privacy – Comparison of privacy factor in different biometrics technologies – Designing privacy sympathetic biometric systems. Biometric standards – (BioAPI , BAPI) – Biometric middleware. Biometrics for Network Security. Statistical measures of Biometrics.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon Completion of the course, the students should be able to
- Implement basic biometrics related algorithms
- Familiar with the use of MATLAB and its equivalent open source environments
- Design and implement industrial applications that incorporates different concepts of biometrics
- Critically analyze different approaches to implement mini projects in industrial environment and in security related projects

TEXT BOOKS :

1. Biometrics – Identity Verification in a Networked World – Samir Nanavati, Michael Thieme, Raj Nanavati, John WILEY and Sons, 2002.
2. Introduction to Biometrics, by Anil K. Jain, Arun A. Ross and Karthik Nandakumar, Springer, 2011
3. Biometric Systems: Technology, Design and Performance Evaluation, by James L. Wayman, Anil K. Jain, Davide Maltoni, and Dario Maio, Springer, 2004.
5. Handbook of Face Recognition, by Stan Z. Li and Anil K. Jain, 2005.

MM7003 CLOUD COMPUTING L T P C
3 0 0 3

OBJECTIVES :

- To understand the concept of cloud and utility computing
- To understand the various issues in cloud computing
- To familiarise themselves with the lead players in cloud
- To appreciate the emergence of cloud as the next generation computing paradigm
- To be able to set up a private cloud

UNIT I INTRODUCTION 8

Evolution of Cloud Computing –System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture -IaaS – On-demand provisioning – Elasticity in cloud – Egs of IaaS providers - PaaS – Egs. Of PaaS providers - SaaS – Egs. Of SaaS providers – Public , Private and Hybrid clouds.

UNIT II VIRTUALIZATION 9

Basics of virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Desktop virtualization – Server Virtualization.

UNIT III CLOUD INFRASTRUCTURE 9

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

UNIT IV PROGRAMMING MODEL 10

Parallel and Distributed programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open nebula, OpenStack.

UNIT V SECURITY IN THE CLOUD 9

Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security.

TOTAL = 45 PERIODS

OUTCOMES:

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Explain the core issues of cloud computing such as security, privacy and interoperability
- Choose the appropriate technologies, algorithms and approaches for the related issues

TEXT BOOKS :

1. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things by Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Morgan Kaufmann Publishers, 2012.
2. Cloud Computing: Implementation, Management, and Security by John W.Rittinghouse and James F.Ransome : CRC Press 2010

REFERENCES:

1. Cloud Computing, A Practical Approach by Toby Velte, Anthony Velte, Robert Elsenpeter: TMH, 2009
2. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice (O'Reilly)) by George Reese: O'Reilly
3. James E. Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.
4. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, “Grid and Cloud Computing – A Business Perspective on Technology and Applications”, Springer.

MM7005 MEDIA SECURITY L T P C
3 0 0 3

OBJECTIVES:

- To understand the standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand security issues those arise in communication systems and web services.

UNIT I BASICS OF CRYPTOGRAPHY 8

Classical Cryptography-The Shift Cipher, The Substitution Cipher, The Affine Cipher Cryptanalysis Techniques - Encryption Evaluation metrics - Histogram Deviation - orthogonal Frequency Division Multiplexing - OFDM model - OFDM Limitations.

UNIT II DIGITAL WATERMARKING 12

Digital Watermarking - Digital Steganography - Differences between Watermarking and Steganography - A Brief History of Watermarking – Classification in Digital Watermarking - Least-Significant-Bit Substitution - Discrete Fourier Transform (DFT) - Discrete Cosine Transform - Discrete Wavelet Transform - Random Sequence Generation - The Chaotic Map - Error Correction Code - Set Partitioning in Hierarchical Tree

UNIT III DIGITAL WATERMARKING TECHNIQUES 8

Spatial-Domain Watermarking - Frequency-Domain Watermarking - The Fragile Watermark - The Robust Watermark - Watermarking Attacks and Tools - Image Processing Attacks - Geometric Transformation -Cryptographic Attack Protocol Attacks - Watermarking Tools

UNIT IV INTRODUCTION TO DIGITAL STEGANOGRAPHY 7

Types of Steganography - Applications of Steganography - Embedding Security and Imperceptibility - Examples of Steganographic Software

UNIT V STEGANALYSIS 10

An Overview - The Statistical Properties of Images - The Visual Steganalytic System - IQM-Based Steganalytic System - Learning Strategies -The Frequency-Domain Steganalytic System - An Overview of the GA-Based Breaking Methodology -The GA-Based Breaking Algorithm - Complexity Analysis

TOTAL : 45 PERIODS

OUTCOMES:

- The students would have understood the basic security algorithms required by any computing system.
- The students may be now aware of the security challenges and issues that may arise in any system.
- The students will now be able to design any secure system.

REFERENCES

1. Digital Watermarking and Steganography: Fundamentals and Techniques, Frank Shih, CRC Press, 2014.
2. Image Encryption: A Communication Perspective, Fathi E. Abd El-Samie, HossamEldin H. Ahmed, Ibrahim F. Elashry, Mai H. Shahieen, Osama S. Faragallah, El-Sayed M. El-Rabaie, Saleh A. Alshebeili, CRC Press, 2013.
3. Douglas R. Stinson ,“CRYPTOGRAPHY THEORY AND PRACTICE ”, Third Edition, Chapman & Hall/CRC, 2006
4. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, First Edition, 2006.

MM7006 MULTIMEDIA INFORMATION STORAGE AND RETRIEVAL L T P C
3 0 0 3

OBJECTIVES:

- To introduce the basics of multimedia information storage technology, techniques for analysis, representation and retrieval that is commonly used in industry.
- To compare and contrast information retrieval models and internal mechanisms such as Boolean, Probability, and Vector Space Models.
- To outline the structure of queries and media elements.
- To critically evaluate Multimedia retrieval system effectiveness and improvement techniques

UNIT I FUNDAMENTAL MEDIA UNDERSTANDING 9

Introduction – Media Types – Media Understanding – Description of Audio, Visual spectral and Video - Storage networks, storage medium.

UNIT II TEXT RETRIEVAL AND MUSIC 9

Text Information retrieval: Information retrieval system-catalog and indexing – automatic indexing – term clustering – User search Techniques- Information Visualization- Fundamentals - Instantaneous Features - Intensity - Tonal Analysis - Musical Genre, Similarity and Mood

UNIT III IMAGE RETRIEVAL 9

content-based image retrieval; techniques; feature extraction; integration; similarity; feature in INDEXING; interactive retrieval; MPEG-7 standard

UNIT IV VIDEO RETRIEVAL 9

Content Based Video Retrieval - Video Parsing – Video abstraction and Summarization– Video Content Representation, Indexing and retrieval –Video Browsing Schemes–Example of Video Retrieval Systems

UNIT V RETRIEVAL METRICS AND MODERN IR 9

Average recall and average precision - Harmonic mean - Evaluation of a search engine – Relevance Issue – Kappa Measure – Quality versus Quantity, possible factors which influence outcome of a search – Grandfield Experimental Study. Introduction- parallel IR – Distributed IR – trends and research Issue.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of the course the student can able to

- Learn the basics of multimedia information storage technology, techniques for analysis, representation and retrieval that is commonly used in industry.
- Compare and contrast information retrieval models and internal mechanisms such as Boolean, Probability, and Vector Space Models.
- Outline the structure of queries and media elements.
- Critically evaluate Multimedia retrieval system effectiveness and improvement techniques.

REFERENCES:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze," Introduction to Information Retrieval" , Cambridge University Press, 2008
2. Ricci, F.; Rokach, L.; Shapira, B.; Kantor, P.B. (Eds.), Recommender Systems Handbook. 1st Edition., 2011,
3. Brusilovsky, Peter et.al. The Adaptive Web: Methods and Strategies of Web Personalization. Berlin: Springer, 2007.

MM7007 SOFTWARE DEVELOPMENT FOR SHORT FILM DEVELOPMENT L T P C
3 0 0 3

OBJECTIVES:

- Students will be guided by the faculty, in a step by step procedure in making a
- Documentary of their topic.
- At the end of the course, students will produce a documentary as part of their assessment.

UNIT I GRAMMAR OF DOCUMENTARIES 9

Origins and History of Documentary Films – Introduction to Narrative and Non-narrative Filmmaking – Elements of documentaries – Aesthetics & Authorship – Documentary theory & Issue of representation, types of documentaries – Approaches in Science – Nature filmmaking – Ethnographic Documentary filmmaking – Creative approaches – Case Studies.

UNIT II DEVELOPING THE STORY – PREPRODUCTION 9

Understanding story, story basics, finding the story – Developing story ideas, story structure, time on screen, researching for documentaries, kinds of information, finding people as sources, information management, choosing a subject – Visual scope and visual evidence, permissions, funding, pitching your ideas – Proposals, elements of proposals, resources for writing proposals, attracting funding – Ethics in documentary filmmaking.

UNIT III SHOOTING THE STORY – PRODUCTION 9

Treatment, unscripted and scripted documentaries, planning, and collecting the material – adapting the script, ways to tell a story – Interviews, recce, use of talents, re-enactments, reconstruction & docudrama. Choosing the team, bringing together right people, working together, getting the right camera & equipments, camerawork, producing, directing, directing the crew. Shooting, lighting, location sound, problems & issues.

UNIT IV BUILDING THE STORY – POST PRODUCTION 9

Building the story in the editing table, working with an editor – Crafting the story, Finding your style – The paper edit, reviewing the footage, assembling of rushes, editing the footages, applying effects, transition – Adding sound effects and music, special effects dubbing, rerecording – Narration – Voiceover, using Music, titles and graphics – Colour exposure and colour correction – Credits & acknowledgements.

UNIT V PROJECT – PRACTICE & SCREENING 9

Project involving the production and direction of an individually or group authored documentary film, accompanied by a research dossier, a proposal and a treatment. The students will also ensure the exhibition of their films for reviews

TOTAL: 45 PERIODS

OUTCOMES:

- At the end of the course, students will be able to gain adequate skills to produce a documentary for broadcast.
- Students will be able to apply principles of factual program production in their future productions

TEXTBOOKS:

1. Genevieve Jolliffe and Andrew Zinnes. The Documentary Film Makers Handbook: A Guerilla Guide, Continuum International Publishing Group, New York, 2006.
2. Louise Spence and Vinicius Navarro. Crafting Truth: Documentary Form and Meaning, Rutgers University Press, New Brunswick, N.J., 2011.
3. Andy Glynne. Documentaries and How to Make Them, Kamera Books, Harpenden, Herts, 2012.

REFERENCES:

1. Barry Hampe. Making Documentary Films and Videos: A Practical Guide to Planning, Filming, and Editing Documentaries, Henry Holt and Company, 2007.
2. Alan Rosenthal. Writing, Directing, and Producing Documentary Film, SIU Press, 2007.
3. Clifford Thurlow. Making Short Films: The Complete Guide from Script to Screen (2nd Edition), Oxford International Publishers, 2008.
4. Michael Rabiger. Directing the Documentary, Focal Press, 2004.
5. James R. Martin. Create Documentary Films, Videos, and Multimedia: A Comprehensive Guide to Using Documentary Storytelling Techniques for Film, Video, the Internet and Digital Media Nonfiction Projects (Films Cinema), Real Deal Press, 2010.

MM7008 SOUND ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

Implement the Standards in the real world service creations.
To know about new generation set-top boxes, hand-held devices, and PC add-in cards.
Understand MPEG-2 System Standards.

UNIT I INTRODUCTION TO BROADCASTING 9

Frequency bands – Propagation and Modulation- Radio and Television Transmission System- Transmitting Antennas and Systems - RF System Maintenance – Test Equipments – Audio Test and Measurements – Video Signal Measurement and Analysis.

UNIT II DATA BROADCASTING 9

Introduction to data Broadcasting- Data Broadcasting system overview and Architecture- Mpeg 2 Transport Basics- Data Categorization- Service Description Frame work – Synchronized Streaming Encapsulation – Data Piping Protocol.

UNIT III DESIGN AND INSTALLATION OF VIDEO AND AUDIO SYSTEMS 9

Basics Of Television - Analog Video Fundamentals – Digital Video Fundamentals – Analog Audio fundamentals - Digital Audio Fundamentals – Data Multiplexing – Transition to DTD.

UNIT IV AUDIO VIDEO STREAMING 9

Introduction to streaming media – Video Encoding – Audio Encoding – Preprocessing –Stream Serving – Web Casting –Media Players- Applications for Streaming Media – Content Distribution.

UNIT V ALGORITHMS AND INTERFACES 9

Color Introduction to Luma and Chroma – Introduction to Component SDTV – Introduction to HDTV – Digital Video Interfaces – Filtering And Sampling – Image Digitization and Reconstructions – Perceptions and Visual Activity – DeInterlacing – DV Compressions - Digital television Standards.

TOTAL : 45 PERIODS

OUTCOMES:

Upon successful completion of this course, students will be able to:

- Work with big data platform and its analysis techniques.
- Design efficient algorithms for mining the data from large volumes.
- Work with surveillance videos for analytics.
- Design optimization algorithms for better analysis and recognition of objects in a scene.
- Model a framework for Human Activity Recognition.

TEXT BOOKS:

1. The technology of video and audio streaming 2nd edition David Austerberry 2005 ELSEVIER focal press
2. Data Broadcasting – Understanding the ATCS Data Broadcasting Standerds – Richards.S Chernock, Regis J.cainon, Micheal A. Dolan, John R.Mick JR Tata McGraw Hill -2001
3. Digital Video And HDTV Algorithm and Interfaces – Charles Poynton – Morgan Kaufman Publishers – 2007

REFERENCES:

1 standard Handbook of Broadcast Engineering – Jerry C. Whitaker – Mcgraw Hill Publications 2005
2.Digital Television Fundamentals - Design and Installtion of Video and Audio Systems - Mcgraw Hill Publications – Michael Robin And Michel Poulin - Second Edition, 2000.

MM7009 VIRTUAL REALITY L T P C
3 0 0 3

OBJECTIVES:

- To impart the fundamental aspects, principles of virtual reality technology
- To gain knowledge about applications of virtual reality

UNIT I INTRODUCTION 9

Introduction to Virtual Reality – Definition – Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality - Components of VR System - Input Devices – 3D Position Trackers -Performance Parameters – Types of Trackers - Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices. Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System.

UNIT II VR ARCHITECTURE 9

Computing Architectures of VR – Rendering Principle – Graphics and Haptics Rendering –PC Graphics Architecture – Graphics Accelerators – Graphics Benchmarks – Workstation Based Architectures – Sun Blade 1000 Architecture – SGI Infinite Reality Architecture – Distributed VR Architectures – Multipipeline Synchronization – Collocated Rendering Pipelines – Distributed Virtual Environments.

UNIT III VR MODELING 9

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.

UNIT IV VR PROGRAMMING 9

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D - GHOST – People Shop – Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society.

UNIT V VR APPLICATIONS 9

Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization.

TOTAL: 45 PERIODS

OUTCOMES:

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

- To Discuss the basic concepts of Virtual reality
- Develop the Virtual Reality applications in different areas
- Design of various modeling concepts.
- To expose the concept of Virtual Reality Programming with toolkits.

REFERENCES:

1. Grigore C. Burdea, Philip Coiffet, “Virtual Reality Technology”, 2nd Edition, Wiley India, 2006.
2. John Vince, “Introduction to Virtual Reality”, Springer-Verlag Ltd., 2004.
3. William R.Sherman, Alan B.Craig :Understanding Virtual Reality – Interface, Application, Design”,The Morgan Kaufmann Series, 2003.

MM7072 VISUALISATION TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To understand the importance of data visualization.
- To know the different types of visualization techniques.
- To create various visualizations

UNIT I INTRODUCTION 9

Introduction – Issues – Data Representation – Data Presentation – Common Mistakes in design.

UNIT II FOUNDATIONS FOR DATA VISUALIZATION 9

Visualization stages – Experimental Semiotics based on Perception Gibson‘s Affordance theory – A Model of Perceptual Processing – power of visual perception-Types of Data-visualization and data objects.

UNIT III COMPUTER VISUALIZATION 9

Non-Computer Visualization – Computer Visualization: Exploring Complex Information Spaces – Fisheye Views – Applications – Comprehensible Fisheye views – Fisheye views for 3D data – Interacting with visualization

UNIT IV MULTIDIMENSIONAL VISUALIZATION 9

One Dimension – Two Dimensions – Three Dimensions – Multiple Dimensions – Trees – Web Works – Data Mapping: Document Visualization – Workspaces.

UNIT V CASE STUDIES 9

Small interactive calendars – Selecting one from many – Web browsing through a key hole – Communication analysis – Archival analysis

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able

- To Compare various visualization techniques.
- Design creative visualizations.
- Apply visualization over different types of data.

TEXT BOOKS:

1. Colin Ware, “Information Visualization Perception for Design” Margon Kaufmann Publishers, 2004, 2nd edition.
2. Robert Spence “Information visualization – Design for interaction”, Pearson Education, 2 nd Edition, 2007
3. Stephen Few, “Information Dashboard Design-The Effective Visual Communication of Data”: O'Reilly Media Publisher,1st Edition 2006

REFERENCE:

1. Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, “Readings in Information Visualization Using Vision to think”, Morgan Kaufmann Publishers.

MM7203 SPEECH AND AUDIO PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To provide an introduction to the fundamental principles and techniques in Audio processing.
- To provide an overview of Audio enhancement
- To provide details about Audio compression techniques
- To review latest trends and future technologies in speech processing.

UNIT I DIGITAL AUDIO 9

Basics of Digital Audio - Digitization of Sound, Quantization and Transmission, Auditory Perception, Electroacoustics, Mixers; Basic audio processing - Sampling, Normalisation, Noise Reduction, audio processing, Analysis window sizing, Visualisation: Digital Audio Principles - Digital and Analog Recording, A/D and D/A Converter, Direct Stream Digital (DSD), Resolution of an Audio Signal, Pitch Shifting and Time Stretching, Audio Data Reduction.

UNIT II SPEECH PROCESSING 9

Speech - Speech production, Characteristics of speech, Speech understanding; Speech communications - Quantisation, Parameterisation, Pitch models, Analysis-by-synthesis; Speech Technologies - Speech Coding, Text-to-Speech Synthesis, Early Knowledge-Based Text-to-Speech (TTS) Synthesis, Unit-Selection Synthesis, Statistical Parametric Synthesis, Speech Recognition.

UNIT III MUSICAL SOUND SYNTHESIS AND MIDI 9

Acoustic Instruments, Sound Synthesis in Music,MIDI Principles - Hardware aspects, Structure of MIDI Messages, General MIDI, MIDI-to-Wav Conversion, Scalable Polyphonic MIDI (SPMIDI), RMID and XMF Files, SAOL and SASLin MPEG 4 Structured Audio, MIDI over USB, MIDI over IEEE 1394.

UNIT IV STEREO AND SURROUND SOUND 9

Two-Channel Stereo - Principles of Loudspeaker Stereo and Binaural or Headphone Stereo,Loudspeaker Stereo Over Headphones and Vice Versa, Two-Channel Signal Formats and Microphone techniques, Binaural Recording and ‘Dummy Head’ Techniques, Spot microphones and Two-Channel Panning Laws.Surround Sound - Three Channel Stereo, Four Channel Surround, 5 .1-Channel Surround,and other Multichannel Configurations. Surround Sound Systems, Matrixed Surround Sound Systems Digital Surround Sound Formats, Dolby Digital, DTS,Ambisonics, Surround Sound Monitoring, Surround Sound Recording Techniques, Multichannel Panning Techniques.

UNIT V MPEG Audio Compression and formats 9

Basic Audio Compression Techniques- ADPCM in Speech Coding, G.726ADPCM, Vocoders;MPEG Audio Compression - Psychoacoustics, MPEG Audio. Digital Audio Formats and Interchange - Audio File Formats for Digital and Disk formats, Interconnecting Digital Audio Devices

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Implement basic algorithms related to Audio Compression.
- Analyze audio compression formats.
- Critically analyze the role of surround sound in modern technologies.

TEXT BOOKS

1. Francis Rumsey & Tim McCormick "Sound and Recording ", Sixth Edition, Year 2009, Focal Press, Elsevier Ltd.
2. Ian Mcloughlin "Applied Speech and Audio Processing With MAT LAB Examples" Cambridge University Press, Cambridge, New York, Melbour, Year 2009.
3. Ville Pulkki and Matti Karjalainen "Communication Acoustics an Introduction to Speech, Audio and Psychoacoustics", John Wiley & Sons Ltd, Year 2015.
4. Ze-NianLiandMarkS.Drew "Fundamentals of Multimedia", PHI Learning Pvt. Ltd, Year 2010.

MM7252 VIDEO PROCESSING AND ANALYTICS L T P C
3 0 0 3

OBJECTIVES:

- To have a better knowledge about videos
- To enrich students with data analytics
- To understand the video content analysis
- To expose the student to various applications and case studies of Video analytics.

UNIT I VIDEO FUNDAMENTALS 9

Basic concepts and Terminology-Monochrome Analog video – Color in Video – Anlog video standards – Digital video basics – Analog-to Digital conversion – Color representation and chroma sub sampling – Digital video formats and standards Video sampling rate and standards conversion.

UNIT II VIDEO SEGMENTATION AND VIDEO FEATURES 9

Fundamentals of Motion Estimation – Optical flow - Pixel Video Features - colour, shape features, Textural features - Feature selection and Dimensionality Reduction .

UNIT III INTRODUCTION TO ANALYTICS 9

Big-Data - Descriptive data analysis - Analytic Processes and Tools - Regression - Classification - Clustering algorithms - Validation - Multimodal approach to Image and Video data mining - Probabilistic semantic mode - Model based annotation and video mining.

UNIT IV VIDEO CONTENT ANALYSIS AND ANALYTICS 9

Introduction- Detecting Shot Boundaries in Video – Parsing a Video into Semantic Segments – Video Indexing and Abstraction for Retrievals – Affective Video Content Analysis - Automatic Video Trailer Generation - Video database - Video categorization - Video query categorization

UNIT V EMERGING TRENDS 9

Object Segmentation and Tracking in the Presence of Complex Background – Video Inpainting – Video Summarization – Forensic video analysis

TOTAL:45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

- Discuss video processing fundamentals
- Analyze video features
- Formulate various application of video processing

REFERENCES:

1. Oges Marques, Practical Image and Video Processing Using MATLAB, Wiley-IEEE Press, 2011.
2. Michael Berthold, David J.Hand, Intelligent Data Analysis, Springer, 2007.
3. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.

MM7351 MULTIMEDIA COMPRESSION TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic ideas of compression algorithms related to multimedia components – Text, speech, audio, image and Video.
  To understand the principles and standards and their applications with an emphasis on underlying technologies, algorithms, and performance.
- To appreciate the use of compression in multimedia processing applications
- To understand and implement compression standards in detail

UNIT I FUNDAMENTALS OF COMPRESSION 9

Introduction To multimedia – Graphics, Image and Video representations – Fundamental concepts of video, digital audio – Storage requirements of multimedia applications – Need for compression – Taxonomy of compression Algorithms - Elements of Information Theory – Error Free Compression – Lossy Compression

UNIT II TEXT COMPRESSION 9

Huffman coding – Adaptive Huffman coding – Arithmetic coding – Shannon-Fano coding – Dictionary techniques – LZW family algorithms.

UNIT III IMAGE COMPRESSION 9

Image Compression: Fundamentals –– Compression Standards – JPEG Standard – Sub-band coding – Wavelet Based compression – Implementation using Filters – EZW, SPIHT coders – JPEG 2000 standards – JBIG and JBIG2 standards.

UNIT IV AUDIO COMPRESSION 9

Audio compression Techniques – μ law, A-Law companding – Frequency domain and filtering – Basic sub-band coding – Application to speech coding – G.722 – MPEG audio – progressive encoding – Silence compression, Speech compression – Formant and CELP vocoders.

UNIT V VIDEO COMPRESSION 9

Video compression techniques and Standards – MPEG video coding: MPEG-1 and MPEG-2 video coding: MPEG-3 and MPEG-4 – Motion estimation and compensation techniques – H.261 Standard – DVI technology – DVI real time compression – Current Trends in Compression standards.

TOTAL :45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Implement basic compression algorithms familiar with the use of MATLAB and its equivalent open source environments
- Design and implement some basic compression standards
- Critically analyze different approaches of compression algorithms in multimedia related mini projects.

REFERENCES

1. Khalid Sayood: Introduction to Data Compression", Morgan Kauffman Harcourt India, Third Edition, 2010.
2. David Solomon, "Data Compression – The Complete Reference", Fourth Edition, Springer Verlog, New York, 2006.
3. Yun Q.Shi, Huifang Sun, "Image and Video Compression for Multimedia Engineering, Algorithms and Fundamentals", CRC Press, 2003.
4. Mark S. Drew, Ze-Nian Li, "Fundamentals of Multimedia", PHI, 2009.