SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				
							End Sem	Class Work	Sessional Work	End Sem	Total Credit
IT48052	INFORMATION SECURITY	3	-	2	3	1	70	30	60	40	4

Prerequisite: Computer Networks

COURSE OUTCOME: The student should be able to –

CO1 Define the needs of security. Illustrate different types of Firewalls. Illustrate the work of VPN.
CO2 Compare and contrast classical encryption techniques. Explain DES and AES Algorithms.
CO3 Define public key encryption. Describe the keys management. Define Kerberos.
CO4 Illustrate Digital Signature & Digital Envelope.
CO5 Classify different types of hacking techniques. Experiment with different sniffing tools. Describe Trojans and viruses.
CO6 Describe security Protocols like IP Security, PGP and SSL .Illustrate vulnerabilities of Linux, Windows and language.

THEORY
Course Content

Unit1: Introduction to Information Security: security needs, security trends, security attacks, security services, security mechanisms. Security technologies, Firewalls: types of firewalls, configuration of firewalls, Virtual Private Network.

Unit2: Symmetric ciphers: classical encryption techniques, substitution techniques, transposition techniques, steganography, block ciphers, Feistel cipher, Data Encryption Standard, strength of DES, triple DES, AES, block cipher modes of operation.

Unit3: Public key encryption and hash functions: public key cryptography, RSA algorithm, key management, Diffie-Hellman key exchange, message authentication and hash functions, digital signatures and authentication protocols, Kerberos, Digital envelope and Digital Certificates.

Unit4: Trends in Internet crime: historical hacking techniques, denial of service attacks, flood attacks, distributed DOS, spoofing, spoofing tools, sniffers, sniffer programs, detection and protection against sniffer. Virus: types and phases, worms, Trojan horses, infamous Trojans, detection and prevention of Trojans.

Unit5: Introduction to IP security: architecture, authentication header and ESP. Web security: Secure Socket Layer and Transport Layer Security. Email security: PGP, Vulnerabilities: vulnerability detection, language vulnerabilities, window vulnerabilities, Linux vulnerabilities

Text Books

1. William Stallings, "Cryptography and Network Security" 5th edition ,Pearson Education.
2. Atul Kahate. "Cryptography and Network Security" 3rd edition Tata McGraw-Hill.
3. NIIT, " Hacking Tools and Techniques and Incident Handling", Prentice Hall of India.

Reference Books

Douglas R. Stinson; Cryptography Theory and Practice; 2nd Edition, Chapman & Hall/CRC

ASSESSMENT TOOLS :
Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments**,** Quiz**,** Attendance
Indirect assessment: Course End Survey

PRACTICAL'S

List of Experiments:

1. Implementation of various symmetric key algorithms.
2. Implementation of various asymmetric key algorithms.
3. Implementation of Algorithm types and modes (Electronic Code Book (ECB), Cipher Block Chaining (CBC), Cipher Feedback (CFB), Output Feedback (OFB)).
4. Study of Pretty Good Privacy open source security tool for e mail security.
5. Implementation of digital certificates.
6. Study of IP Tables.
7. Implementation of Key Management Algorithms.
8. Implementation of Brute Force Attack.
9. Study of Wireshark
10. Implementation of various open source security tools (nmap, iptables, pretty good privacy, Snort, LC5, OpenVPN, TrueCrypt, THC Hydra).

ASSESSMENT TOOLS:
Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test
Indirect assessment: Course End Survey, External Examinar Feedback

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES (H-3, M-2, L-1, or '-'):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	-	2	-	-	-	-	-	-	-	3	-	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	3	-	-	-
CO3	3	3	-	1	-	-	-	-	-	-	-	3	-	-	2
CO4	1	2	2	-	-	-	-	-	-	-	-	2	-	-	2
CO5	2	-	2	-	-	-	-	-	-	-	-	3	-	-	2
CO6	2	2	2	1	-	-	-	-	-	-	-	3	-	-	2

SHRI G.S. INSTITUTE OF TECHNOLOGY SCIENCE, INDORE
INFORMATION TECHNOLOGY DEPARTMENT

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				Total credit
							End Sem	Class Work	Sessional Work	End Sem	
IT48001	ARTIFICIAL INTELLIGENCE	3	-	-	3	-	70	30	-		3

COURSE OBJECTIVES:

This course is intended to

1. Gain a historical perspective of AI and its foundations.
2. Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
3. Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4. Experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool.
5. Experiment with a machine learning model for simulation and analysis.
6. Explore the current scope, potential, limitations, and implications of intelligent systems.

Course OutComes:

Upon successful completion of course students will be able to-

CO1 Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.

CO2 Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

CO3 Describe how to build simple knowledge-based systems.

CO4 Apply knowledge representation, reasoning, and machine learning techniques to real world problems

CO5 Apply Game playing techniques in the given problem.

CO6 Demonstrate fundamental understanding of fuzzy sets operations and properties, fuzzy rules and fuzzy reasoning in the given problem.

THEORY

Course Content

Unit 1: Artificial Intelligence (AI): The AI Problems, The Underlying Assumption, What is An AI Techniques, Characteristics of AI applications, Problem Solving, state space Search and Control Strategies, General problem solving, production systems, forward and backward chaining, exhausive searches: depth first search, breadth first search, Depth limited search, uniform cost search.

Unit 2: Heuristic Search Techniques, Generate and Test, Hill climbing, branch and bound technique, best first search & A* algorithm, AND-OR graphs, problem reduction & AO* algorithm, constraint satisfaction problems, Means-ends analysis.

Unit 3: Knowledge Representation: Representations and Mappings, Approaches To Knowledge Representation, issues, First Order Predicate logic, conversion to clause form, resolution, unification algorithm, forward and backward reasoning, Semantic Nets, Conceptual Dependency, frames and scripts.

Unit 4: Game Playing: Overview, MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.

Unit 5: Fuzzy Sets: fuzzy sets operations and properties, MF formulation and parameterization, fuzzy rules and fuzzy reasoning, fuzzy inference systems, fuzzy models. Introduction to genetic algorithm.

Text Books

1. Rich & Knight , "Artificial Intelligence" ,2nd Edition,Tata Mcgraw Hill.
2. Rajsekaran and Pai, "Neural Network and Fuzzy Logic", 2nd Edition,Prentice Hall of India.

Reference Books

1. Russel & Norvig, "Artificial Intelligence",2nd Edition ,Pearson Education.
2. Patterson, "Introduction to AI and expert System",2nd Edition, Prentice Hall of India.
3. S.N. Sivananadan & S.N. Deepa, "Principles of Soft Computing", 1st Edition,Wiley India.

ASSESSMENT TOOLS :

Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments**,** Quiz**,** Attendance

Indirect assessment: Course End Survey

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES (H-3, M-2, L-1, or '-'):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	–	–	–	–	–	–	–	–	–	–	–	-	-	-
CO2	3	–	–	–	–	–	–	–	–	–	–	–	2	-	2
CO3	3	–	–	–	–	1	–	–	–	–	–	–	-	-	2
CO4	3	2	3	–	3	3	3	–	–	–	–	3	2	2	3
CO5	3	3	3	2	2	2	–	–	–	–	–	2	1	2	3
CO6	3	3	3	3	–	–	–	–	–	–	–	–	2	2	3
Average	3	2.3	3	2.5	2.5	2.5	3	-	-	-	-	2.5	1.75	2	3

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				
							End Sem	Class Work	Sessional Work	End Sem	Total Credit
IT48051	**DATA MINING AND WAREHOUSING**	**3**	**-**	**2**	3	**1**	70	30	**40**	**60**	**4**

PRE-REQUISITES: Fundamentals knowledge of programming and mathematics.

COURSE OBJECTIVES:
1. To introduce students to the basic concepts and techniques of Data Mining, data warehousing and knowledge discovery process.
2. Provide the student with an understanding of the concepts of data warehouse architectures, OLAP concepts.
3. Describe the data mining tasks and study their well-known techniques.

COURSE OUTCOMES:
CO1 Explain the KDD process and data mining functionalist.
CO2 Apply data preprocessing techniques.
CO3 Design the data warehouse schema for given scenario, so that it can be able to solve problem
CO4 Describe various data mining algorithms to solve real time problem.
CO5 Apply various data mining algorithm for given data set.
CO6 Explain the decision support systems, applications of data mining and data warehouse and recent trends in Data mining.

THEORY:
COURSE CONTENTS:

UNIT 1: Data Mining Concepts :Introduction, Data mining and knowledge discovery, Types of Databases for data mining, Basic data mining functionalities, Data mining primitives, Data Mining Query Language(DMQL), Major issues in data mining, Data Preprocessing: Data cleaning, Data integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT 2: Data Warehousing: Basic concepts, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Design and Implementation, Online Analytical Processing (OLAP) Systems: Basic concepts, OLAP queries, Types of OLAP Servers, OLAP Operations, etc.

UNIT 3: Association Analysis: Association rule mining, Apriori Algorithm, Generating Association Rules from Frequent Itemsets, Improving the efficiency of Apriori, FP Growth algorithm. Classification: By Decision Tree Induction, Bayesian Classification, By Backpropagation, Prediction.

UNIT 4: Cluster analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods: K-Means and K-Medoids, Partitioning Methods in Large Databases: K- Medoids to CLARANS, Outlier analysis, Mining the World Wide Web.

UNIT 5: Decision Support System: Definition, Application, Characteristics, Capabilities, Components & Classification. Applications and Trends in Data mining, Discoveries along time, Study of existing Data mining, Warehousing and OLAP products.

TEXT BOOKS RECOMMENDED:

1. Jiawei Han, MichelineKamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publisher.
2. Turban and Aronson, "Decision Support Systems and Intelligent Systems", 7th ed., Pearson Education.

REFERENCE BOOKS:

1. Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining and OLAP: Basic Concepts of Data Mining", TMH.
2. R. J. Roiger& M. W. Geatz, "Data Mining: A Tutorial Based Primer", Pearson Education.
3. Kargupta, "Data Mining: Next Generation Challenges and Future Directions", PHI.
4. Hand, Mannila and Smyth, "Principles of Data Mining", PHI.

ASSESSMENT TOOLS:
Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments**,** Quiz**,** Attendance
Indirect assessment: Course End Survey

PRACTICALS:

LAB ASSIGNMENTS:

1. Using the pandas library for loading and manipulating data
2. Types of data you may encounter and how to treat them accordingly
3. Statistical concepts of mean, median, mode, standard deviation, and variance
4. Probability density functions and probability mass functions
5. Types of data distributions and how to plot them
6. Understanding percentiles and moments
7. Using the matplotlib package to plot graphs
8. Understanding covariance and correlation to determine the relationship between data
9. Understanding conditional probability with examples
10. Understanding Bayes' theorem and its importance
11. Linear regression and its implementation in Python
12. Polynomial regression, its application and examples
13. Multivariate regression and how to implement it in Python
14. Concept of K-means clustering
15. The concept of k-nearest neighbors and implementation of KNN for prediction
16. Dimensionality reduction and principal component analysis
17. Example of PCA with the Iris dataset

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test

Indirect assessment: Course End Survey, External Examinar Feedback

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES (H-3, M-2, L-1, or '-'):

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	1	1	-	-	-	-	-	-	-	-	1	3	1	3
CO2	3	3	2	3	3	1	-	-	-	-	-	1	3	2	3
CO3	3	3	2	3	3	2	1	-	-	1	-	1	3	2	3
CO4	3	3	2	3	3	2	1	-	-	1	-	1	3	2	3
CO5	3	3	2	3	3	2	1	-	-	1	-	1	3	2	3
CO6	1	1	3	-	1	1	-	-	-	-	-	1	3	2	3

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
INFORMATION TECHNOLOGY DEPARTMENT

Elective-I

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				Total Credit
							Theory		Practical		
							End Sem	Class Work	End Sem	Sessional Work	
IT48201	ADVANCED COMPUTER ARCHITECTURE	3	-	2	3	1	70	30	40	60	4

PRE-REQUISITES: Principles of digital electronics, Microprocessor & Microcontroller

COURSE OBJECTIVES:

1. To make students know about the Parallelism concepts in Programming.
2. To give the students an elaborate idea about the different memory systems and buses.
3. To introduce the advanced processor architectures to the students.
4. To make the students know about the importance of multiprocessor and multicomputer.
5. To study about data flow computer architectures.

COURSE OUTCOMES:

CO1 Demonstrate concepts of parallelism in hardware/software.
CO2 Discuss memory organization and mapping techniques.
CO3 Describe architectural features of advanced processors.
CO4 Interpret performance of different pipelined processors.
CO5 Explain data flow in arithmetic algorithms
CO6 Development of software to solve computationally intensive problems

Course Content

Unit1: Overview and history of Computer Architecture, issues in performance metrics and evaluating computer designs, Instruction set design, Memory System Design, RISC, CISC, SISD, SIMD, and MIMD architectures, Multi-core architecture.

Unit2: Implementation issues of the data/control path: Building a Data path, An overview of pipelining, Pipelined data path and control, Performance: I/O performance reliability measures and benchmarks, cost analysis, I/O systems.

Unit3: Shared-Memory Multiprocessors, Cache Coherence, Memory Consistency, memory technology, memory hierarchy, L1, L2, L3 memories, virtual memory management, Snooping Protocols, Protocol Design Tradeoffs, Synchronization, and Implications on Software.

Unit4: Parallel Architectures, convergence of parallel architectures and fundamental design issues, Instruction level parallelism, Limits on instruction level parallelism, Multiprocessor and thread level parallelism, detailed analysis of high-performance, fault-tolerant computer systems.

Unit5: Trends in designing next generation systems, Multiprocessors and clusters, Multi-core Architecture, Clusters and other message passing multiprocessors, Hardware multi-threading, parallelisms and advanced instruction parallelisms.

Text Books

1. John L. Hennessey and David A. Patterson, "Computer architecture – A quantitative approach", 4th edition, Morgan Kaufmann / Elsevier Publishers, .
2. John Hays, "Computer Architecture and Organization" 3rd edition, McGraw-Hill.
3. K Hwang and Briggs "Computer Architecture and Parallel Processing", 4th edition, TMH.

Reference Books

1. Michael J. Flynn, "Computer Architecture- Pipelined and parallel processor design" 3rd edition, Jones and Bartlett Publishers.
2. David E. Culler, Jaswinder Pal Singh, "Parallel computing architecture: A hardware/software approach" , Morgan Kaufmann /Elsevier Publishers

ASSESSMENT TOOLS:
Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments**,** Quiz**,** Attendance
Indirect assessment: Course End Survey

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES (H-3, M-2, L-1, or '-'):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	-	-	-	-	-	-	-	-	-	1	1
CO2	2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
CO3	2	1	1	1	-	-	-	-	-	-	-	-	-	1	1
CO4	3	2	2	2	-	-	-	-	-	-	-	-	-	1	1
CO5	1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
CO6	3	2	2	2	-	-	-	-	-	-	-	-	-	2	2

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
INFORMATION TECHNOLOGY DEPARTMENT

Elective-I

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				Total Credits
							End Sem	Class Work	Sessional Work	End Sem	
IT48225	ADVANCED COMPUTER NETWORKS	3	-	2	3	1	70	30	40	60	4

PRE-REQUISITES: Basic understanding of Computer Networks.

COURSE OBJECTIVES:
This course is intended to teach the:
1. Principles of Network applications.
2. Socket programming with TCP and UDP.
3. The infrastructure for network management.
4. Transport-layer services and principles of congestion control.
5. Internet Protocol and Routing in the Internet.

COURSE OUTCOMES: After completion, of course, students will be able to:
CO1 Extend the knowledge of computer networks course to advance networking concepts.
CO2 Study the TCP/IP protocols as being used in real world the internet.
CO3 Describe the working of realistic and efficient network applications and their architecture.
CO4 Explain the working of network management in real world for large infrastructure network.
CO5 Compute the efficiency of various protocols through simulations and modelling.
CO6 Operate the various protocols through simulators or on text-beds.

THEORY:
COURSE CONTENTS:

UNIT 1: Introduction: review of computer networks, TCP/IP protocol stack, addressing, routing. Network Programming: review of socket programming, programming various TCP/IP protocols. Introduction to IPv6.

UNIT 2: Introduction to optical networks, Advanced network layer concepts: intra: AS routing in the Internet, RIP, OSPF, Inter-autonomous system routing: BGP, broadcast and multicast routing, Content Addressable Networks, DHT, Pastry, IPV6 Addressing, Network Simulation.

UNIT 3: Advanced concepts in transport layer protocols, Review of TCP and UDP Basics, Connection management, TCP state transition diagram, delayed acknowledgement, Nagel's algorithm, window size advertisement, sliding windows, TCP timeout and retransmission, flow control, congestion control, multipath TCP,TCP Pacing and TCP low priority.

UNIT 4: Network management: general structure of network management, infrastructure for network management,Internet standard network management framework: SNMP protocol, Structure of Management Information, Management Information Base, SNMP protocol operations and transport mappings, Software Defined Networking (SDN) and Openflow.

UNIT 5: Protocols for real-time interactive applications: RTP, RTP packet header fields, RTP control protocol, Session Initiation Protocol, Scheduling mechanisms: FIFO, RR and Weighted Fair Queuing, Policing: the leaky bucket, IntServ model, DiffServ model, MPLS, Reservation Protocol (RSVP): operation, reservation style and message format.

TEXT BOOKS RECOMMENDED:

1. James F. Kurose and Keith W Ross, "Computer Networking: A top-down approach featuring the internet", 3rd Edition, Pearson Education.
2. W. Richard Stevens and G. Gabrani, "TCP/IP illustrated vol.1, the protocols", 2nd Edition Pearson Education.
3. William Stallings, "Computer Networks", Pearson Education.

REFERENCE BOOKS:

1. Andrew S. Tenonbaum "Computer Networks", 4th Edition, Prentice Hall of India
2. .Peterson and Davie "Computer Networks: A Systems Approach" 2nd Edition

ASSESSMENT TOOLS :

Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments**,** Quiz**,** Attendance

Indirect assessment: Course End Survey

PRACTICALS:

LAB ASSIGNMENTS:

1. Installation of Wireshark.
2. Using Wireshark to explore Http Protocol.
3. Using Wireshark to take a closer look at the client side of DNS after HTTP protocol.
4. Implementing Socket Programming.
5. Using Wireshark trace files for NAT Protocol.
6. Analyze NAT protocol using NET-SIM.
7. Analyze OSPF protocol using NET-SIM.
8. Analyze IGMP protocol using NET-SIM.
9. Analyze TCP Window Scaling using NET-SIM.
10. Design a simple scenario using NET-SIM.

ASSESSMENT TOOLS:
Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test
Indirect assessment: Course End Survey, External Examinar Feedback

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES (H-3, M-2, L-1, or '-'):

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	1	-	-	-	-	-	-	-	-	-	1	3	1	2
CO2	2	2	2	1	1	-	-	-	-	-	-	1	3	2	2
CO3	2	2	2	3	3	-	-	-	-	-	-	1	3	2	2
CO4	1	1	2	3	1	-	-	-	-	-	-	1	3	2	2
CO5	3	3	3	2	2	-	-	-	-	-	-	1	3	2	2
CO6	1	1	1	1	1	-	-	-	-	-	-	1	3	2	2

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY

Elective-I

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				
							End Sem	Class Work	Sessional Work	End Sem	Total Credit
IT-48226	Computer Graphics & Multimedia	3	-	2	3	1	70	30	40	60	4

Prerequisite: C/C++ Programming Language

COURSE OBJECTIVES:

1. This Course provides an introduction to the principles of computer graphics. In particular, the course will consider methods for modeling 2-D objects and how it generates photorealistic renderings on color raster graphics devices. The emphasis of the course will be placed on understanding how the various elements that like algebra, geometry, algorithms and data structures interact in the design of graphics.
2. This course provides an idea on hardware system architecture for computer graphics. This includes, but it is not limited to: graphics pipeline, fame buffers, and graphic co – processors.
3. To give idea about basic building blocks of multimedia and a study about how these blocks together with the current technology and tools

COURSE OUTCOMES:

CO1 Students will be able to describe the fundamental algorithms used in computer graphics and to some extent be able to compare and evaluate them.

CO2 Students will be able to work and interact, through hands-on experiences, to design, develop, and modify electronically generated imaginary using a wide range of sophisticated graphical tools and techniques.

CO3 Students will be able to summarize different hidden surface elimination algorithms and shading techniques used in computer graphics and digital media production

CO4 Students will be able to explain about the technology necessary for creating multimedia content for the web, video, DVD, 2D and 3D graphics, Sound and programming.

CO5 Students can apply the knowledge, techniques, skills and modern tools to become successful professionals in communication and media industries.

CO6 Render projected objects to naturalize the scene in 2D view and use of illumination models for this.

THEORY

Course Content

Unit I : Computer Graphics Application: Introduction to Computer Graphics, Application of Computer Graphics. Computer Display for Graphics Output: Flat-Panel Displays, Raster Scan Systems, Random Scan Systems, Storage tube displays, refreshing, flickering, interlacing, color monitors, display processors resolution. Graphics Input Devices: Keyboards, Mouse, Trackball and Spaceball, Joysticks, Data Glove, Digitizers, Image Scanners, Touch Panels, Light Pens. Scan conversion techniques, image representation,

Unit II : Points & lines, Line drawing algorithms, Digital Differential Analyzer algorithm, Bresenham's line algorithm, Circle generation algorithm, Bresenham's circle generation algorithm, Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Unit III : 2D & 3D Co-ordinate system, Translation, Rotation, Scaling, Reflection Inverse transformation, Composite transformation, world coordinate system, Viewing pipeline, Window to viewport co-ordinate, parallel and perspective projection, Representation of 3D object on 2D screen. Point Clipping. Line Clipping Algorithms, Polygon Clipping algorithms, Introduction to Hidden Surface elimination, Basic illumination model, diffuse reflection, specular reflection, phong shading, Gourand shading ray tracing, color models like RGB, YIQ, CMY, HSV etc.

Unit IV : An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases, Multimedia components, Multimedia Hardware, SCSI, IDE, MCI, Multimedia -Tools, presentation tools, Authoring tools.

Unit V : Compression & Decompression – Multimedia Data & File Format standards :- TIFF, MIDI, JPEG, DIB, MPEG,RTF, – Multimedia I/O technologies - Digital voice and audio – Video image and animation–Full motion video – Storage and retrieval technologies.

Text Books

1."Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson education.
2."Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc Graw hill edition

Reference Books

1. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
2. "Procedural elements for Computer Graphics", David F Rogers, Tata Mc Graw hill, 2nd edition. "Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.

3. "Principles of Computer Graphics", Shalini, Govil-Pai, Springer.
4. "Computer Graphics", Steven Harrington, TMH
5. Computer Graphics, F. S. Hill, S. M. Kelley, PHI.
6. Computer Graphics, P. Shirley, Steve Marschner & Others, Cengage Learning.
7. Computer Graphics & Animation, M. C. Trivedi, Jaico Publishing House.
8. An Integrated Introduction to Computer Graphics and Geometric Modelling, R.Goldman, CRC Press, Taylor & Francis Group.
9. Computer Graphics, Rajesh K.Maurya, Wiley India.
10. Computer Graphics, Atul P. Godse,Technical Publications

ASSESSMENT TOOLS :
Direct assessment: End-Sem Examination, Mid-Term Test,Class Assignments**,** Quiz**,** Attendance
Indirect assessment: Course End Survey

PRACTICAL'S

List of Experiments:

1. Write a program to implement DDA line drawing algorithm.
2. Write a program to implement Bresenhames' line drawing algorithm.
3. Write a program to implement Bresenhames' circle drawing algorithm.
4. Write a program to draw an ellipse using Bresenhames' algorithm.
5. Write a program to perform various transformations on line, square & rectangle.
6. Write a program to implement Cohen Sutherland line clipping algorithm.
7. Write a program to implement Liang-Bersky line clipping algorithm.
8. Write a program to implement Cohen-Sutheland polygon clipping algorithm to clip a polygonwith a Pattern.
9. Write a program to convert a color given in RGB space to it's equivalent CMY color space.
10. Study of various Multimedia file formats:-RTF, MIDI, GIF, JPEG, MPEG, TIFF etc.
11. Write a program to implement JPEG compression scheme for still images.
12. Write a program to perform Packbits compression & decompression.
13. Write a short program to create a TIFF file using bitmap segments and text files as the TIFF Filecomponents.
14. Write a program to convert a BMP file into either JPEG or GIF file.

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES (H-3, M-2, L-1, or '-'):

	Program Outcomes												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	1	2	-
CO3	2	-	1	-	3	-	-	-	-	-	-	-	2	-	-
CO4	2	2	-	2	-	1	-	-	-	-	-	-	-	-	-
CO5	1	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO6	1	2	-	-	-	-	-	-	-	-	-	-	1	-	-

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Elective-I

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				
							End Sem	Class Work	Sessional Work	End Sem	Total Credit
IT-48202	Parallel Distributed Algorithms	3	-	0	3	0	70	30	40	60	4

Pre-requisites: Java, Data Structures, Operating System

COURSE OBJECTIVES:

This course covers general introductory concepts in the design and implementation of distributed systems, covering all the major branches such as Cloud Computing, Grid Computing, Cluster Computing, Supercomputing, and Many-core Computing.

COURSE OUTCOMES:

CO1 To reason about ways to parallelize a problem and be able to evaluate a parallel platform for a given problem.

CO2 To understand and explore the concepts with programming with MPI.

CO3 To demonstrate the general concepts on Cloud computing, grid computing, and peer-to-peer systems.

CO4 To become familiar with evaluation of online social networks and their potential.

CO5 To understand and explore the concepts with programming with MPI MapReduce/Hadoop.

CO6 To become familiar with implementation of distributed systems & all branches of Cloud computing.

THEORY

Course Content

Unit I- Introduction: The power and potential of parallelism:

The power and potential of parallelism, purpose of using parallelism, different parallel architecture, Reasoning about performance of parallel programs.

Unit II : Data, Task Parallelism and Java Multithreading

Introduction of data and task parallelism, Independent parallelism, Introduction to Java multithreading, Fork-join parallelism, Analyze fork and join parallelism, parallel prefix, parallel pack.

Unit III : Mutual exclusion, Deadlocks and Parallel Computational Models

Concurrency, STM, Mutual exclusion, locks, Deadlocks, race condition, Read/write locks, condition variables, Flynn's Taxonomy, PRAM, EREW, CREW, ERCW, CRCW, Simulating CRCW, CREW and EREW, PRAM algorithms. Parallel Programming Models, PVM, MPI Paradigms

Unit IV : Parallel Algorithms and Programming Languages

Parallel Programming Language, Brent's Theorem, Simple parallel programs in MPI environments, Parallel algorithms on network, Addition of Matrices, Multiplication of Matrices., Parallel quick sort, Synchronizing shared data structure, Shared memory

Unit V : Distributed System Model and Cases

Distributed system models, Inter process communication, Message passing, Message passing algorithm, Distributed synchronization, Consistency, replication, Cluster computing, MapReduce, Distributed storage, Wide area computing, Distributed hash table, Peer-to-peer systems.

Text Books

1. "A. Grama, A. Gupta, G. Karypis and V. Kumar. Introduction to Parallel Computing (2nd edition), Addison Wesley (2002), ISBN 0-201-64865-2.
2. H. El-Rewini and T.G. Lewis. Distributed and Parallel Computing, Manning (1997), ISBN 0-13-795592-8.
3. I. Foster. Designing and Building Parallel Programs, Addison Wesley (1995), ISBN 0-201-57594-9.

Reference Books

1. Kai Hwang and Zhiwei Xu. Scalable Parallel Computing, McGraw Hill (1998), ISBN 0-07-031798-4.
2. Michael J. Quinn. Parallel Programming in C with MPI and OpenMP, McGraw Hill (2003), ISBN 0-07-282256-2.
3. Barry Wilkinson and Michael Allen. Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers (2nd Edition),• Prentice Hall PTR (2005), ISBN 0-13-140563-2

ASSESSMENT TOOLS :
Direct assessment: End-Sem Examination, Mid-Term Test,Class Assignments**,** Quiz**,** Attendance
Indirect assessment: Course End Survey

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES (H-3, M-2, L-1, or '-'):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	-	-	-	-	-	-	-	-	-	1	1
CO2	3	2	1	2	-	-	-	-	-	-	-	-	-	1	1
CO3	2	1	2	1	-	-	-	-	-	-	-	-	-	1	1
CO4	2	1	2	2	-	-	-	-	-	-	-	-	-	1	1
CO5	1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
CO6	3	2	2	2	-	-	-	-	-	-	-	-	-	2	2

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Elective-II

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				Total Credit
							Theory		Practical		
							End Sem	Class Work	End Sem	Sessional Work	
IT48330	CLOUD COMPUTING	3	-	2	3	1	70	30	60	40	4

PRE-REQUISITES: Basic knowledge of Computer Network, Operating System.

COURSE OBJECTIVE: The objective of this course is to provide a comprehensive and in-depth understanding of Cloud Computing concepts, technologies, architecture, and applications through the introduction and research of reducing Cloud Computing fundamental issues, technologies, applications, and implementations.

COURSE OUTCOMES: After the successful completion of the course, Students will be able to

CO1 Explain the core concepts of Cloud Computing.
CO2 Illustrate the requirements for shifting from a traditional computing to Cloud computing.
CO3 Discover about the fundamental technologies that underpins cloud computing.
CO4 Associate the Virtualization Technology with cloud.
CO5 Explain the security aspects of cloud computing and importance of disaster management.
CO6 Choose the appropriate service provider for cloud services.

THEORY:
COURSE CONTENTS:

UNIT 1: Introduction: Historical Development, Vision of Cloud Computing, Characteristics of cloud computing as per NIST, Cloud services requirements, Cloud and dynamic infrastructure, Components, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud.

UNIT 2: Cloud Computing Architecture: Cloud Reference Model, Types of Clouds, Cloud Interoperability & Standards, Scalability and Fault Tolerance, Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management. Cloud Offerings: Cloud Analytics, Testing Under Control, Virtual Desktop Infrastructure.

UNIT 3: Cloud Management & Virtualization Technology: Resiliency, Provisioning, Asset management, Concepts of Map reduce, Cloud Governance, High Availability and Disaster Recovery. Virtualization: Fundamental concepts of compute, Storage, Networking, desktop and application virtualization. Virtualization benefits, server virtualization, Block and file level storage virtualization, Hypervisor management software, Infrastructure Requirements, Virtual LAN (VLAN) and Virtual SAN (VSAN) and their benefits.

UNIT 4: Cloud Security: Cloud Information security fundamentals, Cloud security services, Design principles, Secure Cloud Software Requirements, Policy Implementation, Cloud Computing Security Challenges, Virtualization Security Management, and Cloud Computing Security Architecture.

UNIT 5: Market Based Management of Clouds, Federated Clouds/Inter Cloud: Characterization & Definition, Cloud Federation Stack, Third Party Cloud Services. Case study: Google App Engine, Microsoft Azure, Hadoop, Amazon, Aneka.

TEXT BOOKS RECOMMENDED:

1. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi , "Mastering Cloud Computing",TMH.
2. Kumar Saurabh, "Cloud Computing" , 2nd Edition , Wiley Publication.
3. Barrie Sosinsky, " Cloud Computing Bilble" , Wiley Publication.

REFERENCE BOOKS:

1. Krutz , Vines, "Cloud Security" , Wiley Publication.
2. Velte, "Cloud Computing- A Practical Approach" ,Tata McGrawHill.
3. Judith Hurwitz, R.Bloor, M.Kanfman,F.Halper, "Cloud Computing for Dummies",Wiley Publication.

ASSESSMENT TOOLS :

Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments**,** Quiz**,** Attendance

Indirect assessment: Course End Survey

PRACTICAL:

Lab Assignments:

Assignments 1:

- Write the complete steps for hosting your bio-data website from public deployment model like google drive also write the website address hosted by individual.

Assignments 2:

- Define the term virtualization." Create a virtual machine instance using virtual box or VMware and install the windows operating system on Linux computer and vice versa. Enumerate all the steps involve in the creation of a virtual machine instance.

Note: Create a Google Cloud Provider (GCP) account and complete the following tasks.

Assignments 3:

- Create Virtual Machine Instance using cloud navigation console and install nginx web server on it and perform server testing.

Assignments 4:

- Create Virtual Machine Instance using gcloud command and install nginx web server on it and perform server testing.

Assignments 5:

- Create Google kubernetes engine cluster using gcloud then assign an application on cluster and test it then delete the cluster.

Assignments 6:

Note: Download Docker Desktop from www.docker.com and create an account on docker.com to generate a Docker ID and conduct the following tasks.

- Create a docker image file for installation of python 3.6 along with necessary library file require for running an application for loading image from image folder placed on user desktop.
- Create a docker image for the installation of nginx web server on linux environment.

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test

Indirect assessment: Course End Survey, External Examinar Feedback

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES (H-3, M-2, L-1, or '-'):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	-	-	3	2	-	-	2	2	2	2
CO2	1	2	3	2	3	-	-	3	2	-	-	3	3	3	2
CO3	1	2	3	2	3	-	-	3	3	1	1	3	3	3	3
CO4	1	1	1	2	2	-	-	-	-	-	-	2	2	3	2
CO5	2	2	2	2	2	-	-	-	-	-	-	1	2	2	2
CO6	1	2	2	2	2	-	-	-	-	-	-	1	3	3	2

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Elective-II

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				Total Credit
							End Sem	Class Work	Sessional Work	End Sem	
IT-48301	Soft Computing	3	-	2	3	1	70	30	60	40	4

PRE-REQUISITES:

COURSE OBJECTIVES:

1. Learn the concepts of Artificial Neural Networks, Fuzzy logic, Genetic Algorithm-based systems.
2. Understand the concepts of feed forward neural networks.
3. Understand the feedback neural networks.
4. Understand the concept of fuzziness involved in various systems.
5. Understand the ideas about genetic algorithm.
6. Understand the FLC and NN toolbox

COURSE OUTCOMES:

CO1 Analyze various Soft Computing techniques, Neural network architectures & their real time applications.

CO2 Understand and apply feed forward neural networks

CO3 Develop feedback neural networks

CO4 Identify fuzziness involved in various systems

CO5 Apply ideas about genetic algorithm

CO6 Apply FLC and NN toolbox

Course Content

Unit I: Introduction to Neural Network:

Concept, biological neural network, evolution of artificial neural network, McCulloch-Pitts neuron models, Learning (Supervise & Unsupervised) and activation function, Models of ANN-Feed forward network and feedback network, Learning Rules Hebbian, Delta, Perceptron Learning and Windrow-Hoff, winner take all.

Unit II: Supervised Learning:
Perceptron learning,- Single layer/multilayer, linear Separability, Adaline, Madaline, Back propagation network, RBFN. Application of Neural network in forecasting, data compression and image compression.

Unit III: Unsupervised learning:
Kohonen SOM (Theory, Architecture, Flow Chart, Training Algorithm) Counter Propagation (Theory , Full Counter Propagation NET and Forward only counter propagation net), ART (Theory, ART1, ART2). Application of Neural networks in pattern and face recognition, intrusion detection, robotic vision.

Unit IV: Fuzzy Set:
Basic Definition and Terminology, Set-theoretic Operations, Member Function, Formulation and Parameterization, Fuzzy rules and fuzzy Reasoning, Extension Principal and Fuzzy Relations, Fuzzy if-then Rules, Fuzzy Inference Systems. Hybrid system including neuro fuzzy hybrid, neuro genetic hybrid and fuzzy genetic hybrid, fuzzy logic controlled GA. Application of Fuzzy logic in solving engineering problems.

Unit V: Genetic Algorithm:
Introduction to GA, Simple Genetic Algorithm, terminology and operators of GA (individual, gene, fitness, population, data structure, encoding, selection, crossover, mutation, convergence criteria). Reasons for working of GA and Schema theorem, GA optimization problems including JSPP (Job shop scheduling problem), TSP (Travelling salesman problem), Network design routing, timetabling problem. GA implementation using MATLAB.

Text Books

- S.N. Shivnandam, "Principle of soft computing", Wiley.
- S. Rajshekaran and G.A.V. Pai, "Neural Network , Fuzzy logic And Genetic Algorithm", PHI.

Reference Books

- Jack M. Zurada, "Introduction to Artificial Neural Network System" JAico Publication.
- Simon Haykins, "Neural Network- A Comprehensive Foudation"
- Timothy J.Ross, "Fuzzy logic with Engineering Applications", McGraw-Hills 1.

List of Experiment:-

- Form a perceptron net for basic logic gates with binary input and output.
- Using Adaline net, generate XOR function with bipolar inputs and targets.

- Calculation of new weights for a Back propagation network, given the values of input pattern, output pattern, target output, learning rate and activation function.
- Construction of Radial Basis Function Network.
- Use of Hebb rule to store vector in auto associative neural net.
- Use of ART algorithm to cluster vectors.
- Design fuzzy inference system for a given problem.
- Maximize the function y =3x2 + 2 for some given values of x using Genetic algorithm.
- Implement Travelling salesman problem using Genetic Algorithm.
- Optimization of problem like Job shop scheduling using Genetic algorithm.

ASSESSMENT TOOLS :
Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments**,** Quiz**,** Attendance
Indirect assessment: Course End Survey

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES (H-3, M-2, L-1, or '-'):

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	3	1	-	-	-	-	-	-	-	-	1	3	-
CO2	2	2	3	1	-	-	-	-	-	-	-	-	1	3	-
CO3	2	2	3	1	-	-	-	-	-	-	-	-	1	3	-
CO4	1	1	2	2	-	-	-	-	-	-	-	-	1	3	-
CO5	2	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO6	2	2	3	2	-	-	-	-	-	-	-	-	1	3	-

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Elective-II

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				Total Credit
							End Sem	Class Work	Sessional Work	End Sem	
IT-48302	Internet of Things (IoT)	3	-	2	3	1	70	30	60	40	4

PRE-REQUISITES: C/C++ Programming, Digital Electronics

COURSE OBJECTIVE:

The objective of this course is to provide an understanding of the technologies and the standards relating to the Internet of Things and to develop skills on IoT technical planning.

COURSE OUTCOMES:

- **CO1** Understand Internet of Things and its hardware and software components
- **CO2** Interface I/O devices, sensors & communication modules
- **CO3** Analyze data from various sources in real-time and take necessary actions in anintelligent fashion
- **CO4** Remotely monitor data and control devices
- **CO5** Develop real life IoT based projects
- **CO6** Understand the MQTT Protocol

Course Content

Unit I IoT definition, Characteristics, IoT conceptual and architectural framework, Components of IoT ecosystems, Physical and logical design of IoT, IoT enablers, Modern day IoT applications, M2M communications, IoT vs M2M, IoT vs WoT, IoT reference architecture, IoT Network configurations, IoT LAN, IoT WAN, IoT Node, IoT Gateway, IoT Proxy, Review of Basic Microcontrollers and interfacing.

Unit II Define Sensor, Basic components and challenges of a sensor node, Sensor features, Sensor resolution; Sensor classes: Analog, Digital, Scalar, Vector Sensors; Sensor Types, bias, drift, Hysteresis error, quantization error; Actuator; Actuator types: Hydraulic, Pneumatic, electrical, thermal/magnetic, mechanical actuators, soft actuators

Unit III Basics of IoT Networking, IoT Components, Functional components of IoT, IoT serviceoriented architecture, IoT challenges, 6LowPAN, IEEE 802.15.4, ZigBee and its types,

RFID Features, RFID working principle and applications, NFC (Near Field communication), Bluetooth, Wireless Sensor Networks and its Applications

Unit IV MQTT, MQTT methods and components, MQTT communication, topics and applications, SMQTT, CoAP, CoAP message types, CoAP Request-Response model, XMPP, AMQP features and components, AMQP frame types

Unit V IoT Platforms, Arduino, Raspberry Pi Board, Other IoT Platforms; Data Analytics for IoT, Cloud for IoT, Cloud storage models & communication APIs, Attacks in IoT system, vulnerability analysis in IoT, IoT case studies: Smart Home, Smart framing etc.

Text Books

1. Vijay Madisetti, Arshdeep Bahga, "İnternet of Things, A Hands on Approach", UniversityPress
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: Apractical Approach", ETI Labs
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies,Platforms, and Use Cases", CRC Press
4. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi

Reference Books

1. Adrian McEwen, "Designing the Internet of Things", Wiley
2. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill
3. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media

List of Experiment:-

1. Exercise on Eclipse IoT Project.
2. Experiments on few Eclipse IoT Projects.
3. Any Experiment on architecture of Iot Toolkit.
4. Exercise on smart object API Gateway service reference implementation in IoT Toolkit.
5. Experiment on HTTP-to-CoAP semantic mapping Proxy in IoT Toolkit.
6. Experiment on Gate way as a service deployment in IoT Toolkit.
7. Experiment on application framework and embedded software agents for IoT Toolkit.
8. Excercise on working principle of Rasberry Pi.
9. Experiment on connectivity of Rasberry Pi with existing system components.

ASSESSMENT TOOLS:
Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments**,** Quiz**,** Attendance
Indirect assessment: Course End Survey

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES (H-3, M-2, L-1, or '-'):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	1	-
CO2	-	2	3	2	-	-	-	-	-	-	-	-	1	1	-
CO3	-	2	2	-	-	-	-	-	-	-	-	-	1	1	-
CO4	1	2	3	-	-	-	-	-	-	-	-	-	1	2	-
CO5	-	-	3	-	-	-	-	-	-	-	-	-	1	-	-
CO6	1	2	1	-	-	-	-	-	-	-	-	-	1	1	-

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Elective-II

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				Total Credit
							End Sem	Class Work	Sessional Work	End Sem	
IT-48303	Advanced Operating System	3	-	2	3	1	70	30	60	40	4

PRE-REQUISITES: Operating System

COURSE OBJECTIVE:

1. Reviewing the basic concepts of operating systems.
2. Learning more advanced concepts of operating systems, including computer networks and system security.
3. Understanding the unique design requirements of different applications on operating systems, and corresponding solutions.
4. Leading an engineering project with research components by working with undergraduate students.
5. Knowing the state-of-the-art research on operating systems.
6. Critical thinking while reading research papers.

COURSE OUTCOMES:

CO1 Hands-on experience with the development of a specific system on an operating system. By analyzing a research problem with scientific methods, the students will focus on system development, including system design, implementation, performance analysis and evaluation.

CO2 Designing the evaluation plan to test the developed system in a comprehensive way.

CO3 Learning the recent development of Operating Systems and understanding the new techniques that advance the start-of-the-art of Operating Systems.

CO4 Identifying the major research challenges in current research of Operating Systems; Accomplishing a project and write the project results with high standard

CO5 Working in a team and presenting the results by oral presentation.

CO6 Identify the problem statement from reputed journals/research papers.

Course Content

Unit I Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. Theoretical Foundations: Inherent Limitations of a Distributed System, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

Unit II Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms, Non-Token – Based Algorithms: Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm, Token-Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Singhal's Heurisric Algorithm, Raymond's Heuristic Algorithm.

Unit III Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

Unit IV Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures Multi Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling, Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

Unit V Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration, Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues.

Text Books

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, Tata McGraw-Hill Edition 2001

Reference Books

1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007

List of Experiment:-

1. Study of different Distributed System Architectures.
2. Study of Mutual Exclusion Algorithms.
3. Study of Lamport's Algorithm.
4. Study of Ricart-Agrawala Algorithm.
5. Study of Maekawa's Algorithm.
6. Write a program for Suzuki-Kasami's Broadcast Algorithm.
7. Write a program for Singhal's Heurisric Algorithm.
8. Write a program for Raymond's Heuristic Algorithm.
9. Study of Web Service Programming.
10. Implement Network File System (NFS).

ASSESSMENT TOOLS:

Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments**,** Quiz**,** Attendance

Indirect assessment: Course End Survey

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES (H-3, M-2, L-1, or '-'):

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	-	-	-	-	-	-	-	-	-	-	-	1	3	-
CO2	-	2	3	1	-	-	-	-	-	-	-	-	2	1	-
CO3	-	3	2	-	-	-	-	-	-	-	-	-	1	1	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-	3	2	-
CO5	-	-	3	-	-	-	-	-	-	-	-	-	1	-	-
CO6	1	2	1	-	-	-	-	-	-	-	-	-	2	1	-