SIES

College of Arts, Science & Commerce

RISE WITH EDUCATION

Sion (West), Mumbai – 400022.

(Autonomous)

Faculty: Science

Program: M.Sc.

Subject: INFORMATION TECHNOLOGY

Academic Year: 2018 – 2019

PART 2

Credit Based Semester and Grading Syllabi approved by Board of Studies in Information Technology to be brought into effect from June 2018.

Semester III

Course Code	Course Title	Credits
SIPSIT31	Embedded Systems	**4**
SIPSIT32	Information Security Management	**4**
Elective I (Select any one)		
SIPSIT33(a)	Virtualization	**4**
SIPSIT33(b)	Artificial Neural Networks	**4**
Elective II (Select any one)		
SIPSIT34(a)	Digital Image Processing	**4**
SIPSIT34(b)	Ethical Hacking	**4**
SIPSITP31	Embedded Systems Practical	**2**
SIPSITP32	Information Security Management Practical	**2**
Elective -I (Select any one)		
SIPSITP33(a)	Virtualization Practical	**2**
SIPSITP33(b)	Artificial Neural Networks Practical	**2**
Elective - II (Select any one)		
SIPSITP34(a)	Digital Image Processing Practical	**2**
SIPSITP34(b)	Ethical Hacking Practical	**2**
	TOTAL CREDITS	**24**

Embedded Systems

Learning Objective: To help students learn the basic working of a microcontroller system and its programming in assembly language and to provide them the experience to integrate hardware and software for microcontroller applications systems.

Learning Outcome: The learner will be able to understand and implement the attributes of Embedded Systems, Hardware Software Co-design along with embedded programming.

Theory Component:

M. Sc (Information Technology)	**Semester – III - SIPSIT31**
Course Name	**Embedded Systems**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	**Introduction** What is an Embedded System, Embedded System Vs General Computing System. **The Typical Embedded System** Core of Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware. **Characteristic and quality attributes of Embedded System** Characteristics of an Embedded System, Quality Attributes of Embedded System. **Embedded product development life cycle** What is EDLC, Why EDLC? Objectives of EDLC, Different Phases of EDLC	**12**
II	**Hardware Software Co-design and Program Modeling** Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Introduction to Unified Modeling Language (UML), Hardware Software Trade- offs. **Embedded Hardware design and development** Analog Electronic Components, Digital Electronic Components, Electronic design Automation (EDA) Tools, The PCB Layout design. **Embedded Firmware design and development** Embedded Firmware Design Approaches, Embedded Firmware Development Languages **Real Time Operating System(RTOS)**	**12**

	Operating System Basics, Types of Operating Systems, Device Drivers, How to choose an RTOS	
III	**Memories and Memory Subsystem** Introduction, Classifying Memory, A general Memory Interface, ROM Overview, Static RAM Overview, Dynamic RAM Overview, Chip Organization, A SRAM Design, A DRAM Design, The DRAM Memory Interface, The Memory Map, Memory Subsystem Architecture, Basic Concepts of Caching, Design a cache system, Dynamic Memory Allocation, Testing Memories.	**12**
IV	**Programming Concept and Embedded Programming in C/ C++ and Java** Software programming in Assembly Language (ALP) and in High-level Language 'C'., C program Elements: Header and Source Files and Pre-processor Directives, Program Elements: Macros and Functions, Program Elements: Types, Data Structures, Modifiers, Statements, Loops and Pointers, Object- Oriented Programming, Embedded Programming in C++, Embedded Programming in Java.	**12**
V	**Trends in the Embedded Industry** Processor trends in Embedded System, Embedded OS Trends, Development Language Trends, Introduction of PIC Family of Microcontrollers, Introduction of ARM Family of Microcontrollers, Introduction of AVR Family of Microcontrollers.	**12**

Books and References

Sr. No.	Title	Author/s	Publisher	Edition
1	Introduction to embedded systems	Shibu K. V	Tata McGraw- Hill	2nd Edition.
2	Embedded Systems Architecture, Programming and Design	Raj Kamal	Tata McGraw- Hill	2nd Edition.
3	Embedded Systems: A Contemporary Design Tool.	James K. Peckol	Wiley Edition	1st Edition

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research papers	Class Participation

Practical Component:

M. Sc (Information Technology)	**Semester – III - SIPSITP31**
Course Name	**Embedded Systems Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practical:

1 (Compulsory)	Study of hardware components 1. 8051 Microcontroller 2. Resistors (color code, types) 3. Capacitors 4. ADC, DAC 5. Operational Amplifiers 6. Transistors, Diode, Crystal Oscillator 7. Types of Relays 8. Sensors 9. Actuator 10. Types of connectors
2	WAP to blink an LED
3	WAP block transfer of data
4	WAP to serial data interface
5	WAP for the keypad and LCD interface
6	Implement mouse driver program using MSDOS interrupt
7	WAP to implement ADC0808 with 8051 microcontroller
8	WAP to simulate elevator functions
9	WAP to interface stepper motor controller
10	WAP to simulate traffic signals

Information Security Management

Learning Objective: This paper provides an overview of information systems security principles, practices, methods, and tools for organizational and institutional computing along the relationship between policy and security, the mechanisms used to implement policies, and the methodologies and technologies for assurance and vulnerability analysis and intrusion detection.

Learning Outcome: The student will be able to evaluate the legal, ethical, and professional issues in information security by differentiating between laws and ethics in information security, assessing ethical and professional issues relevant to information security

Theory Component:

M. Sc (Information Technology)	**Semester – III - SIPSIT32**
Course Name	**Information Security Management**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	Security Risk Assessment and Management: Introduction to Security Risk Management. Reactive and proactive approaches to risk management. Risk assessment, quantitative and qualitative approaches and asset classification - Security Assurance Approaches: Introduction to OCTAVE and COBIT approaches.	**12**
II	Security Management of IT Systems: Network security management. Firewalls, IDS and IPS configuration management. Web and wireless security management. General server configuration guidelines and maintenance. Information Security Management Information classification. Access control models, role-based and lattice models. Mandatory and discretionary access controls. Linux and Windows case studies. Technical controls, for authentication and confidentiality. Password management and key management for users. Case study: Kerberos	**12**
III	Key Management in Organizations: Public-key Infrastructure. PKI Applications, secure email case study (S/ MIME or PGP). Issues in public-key certificate issue and lifecycle management - Management of IT Security Infrastructure; Computer security log management, malware handling and vulnerability management programs. Specifying and enforcing security policies.	**12**

IV	Auditing and Business continuity Planning: Introduction to information security audit and principles of audit. Business continuity planning and disaster recovery. Case study: 9/11 tragedy. Backup and recovery techniques for applications and storage.	**12**
V	Computer forensics: techniques and tools. Audit Tools: NESSUS and NMAP. Information Security Standards and Compliance: Overview of ISO 17799 Standards. Legal and Ethical issues.	**12**

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	IT Security and Risk Management (Main reference)	Slay, J. and Koronios, A	Wiley		2006
2	Incident Response and Computer Forensics	Chris Prosise and Kevin Mandia	McGraw-Hill		2003
3	Information Systems Security - Security Management, Metrics, Frameworks and Best Practices	Nina Godbole	Wiley		2009
4	Information Security Policies, Procedures, and Standards: Guidelines for Effective Information Security Management (Paperback)		Auerbach	1st edition	2001

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research papers	Class Participation

Practical Component:

M. Sc (Information Technology)	**Semester – III - SIPSITP32**
Course Name	**Information Security Management Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practical:

1	Working with Sniffers for monitoring network communication (Ethereal)
2	Using open SSL for web server - browser communication
3	Using GNU PGP
4	Performance evaluation of various cryptographic algorithms
5	Using IP TABLES on Linux and setting the filtering rules
6	Configuring S/MIME for e-mail communication
7	Understanding the buffer overflow and format string attacks
8	Using NMAP for ports monitoring
9	Implementation of proxy based security protocols in C or C++ with features like confidentiality, integrity and authentication
10	Socket programming
11	Exposure to Client Server concept using TCP/IP, blowfish, Pretty Good Privacy.

Virtualization

Learning Objective: To learn how to use Cloud Services, implement Virtualization and Task Scheduling algorithms, apply Map-Reduce concept and build Private Clouds.

Learning Outcome: The learner will be able to analyze the Cloud computing setup with its vulnerabilities and applications using different architectures, design different workflows according to requirements and apply map reduce programming model, assess Cloud Storage systems and Cloud security.

Theory Component:

M. Sc (Information Technology)	**Semester – III - SIPSIT33(a)**
Course Name	**Virtualization**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	**Contents**	**No. of Lectures**
I	OVERVIEW OF VIRTUALIZATION Basics of Virtualization - Virtualization Types – Desktop Virtualization – Network Virtualization – Server and Machine Virtualization – Storage Virtualization – System-level or Operating Virtualization – Application Virtualization- Virtualization Advantages – Virtual Machine Basics – Taxonomy of Virtual machines - Process Virtual Machines – System Virtual Machines – Hypervisor - Key Concepts.	**12**
II	SERVER CONSOLIDATION 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.	**12**

III	NETWORK VIRTUALIZATION 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 - Data-Path Virtualization Layer 2: 802.1q - Trunking Generic Routing Encapsulation - IPsecL2TPv3 Label Switched Paths - Control-Plane Virtualization–Routing Protocols- VRF - Aware Routing Multi-Topology Routing.	**12**
IV	VIRTUALIZING STORAGE 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.	**12**
V	Blades and Virtualization — Building Blocks for Next- Generation Data Centers, Evolution of Computing Technology — Setting the Stage, Evolution of Blade and Virtualization Technologies, Blade Architecture, Assessing Needs — Blade System Hardware Considerations.	**12**

Books and References

Sr. No	Title	Author/s	Publisher	Year
1	Mastering_VMware_vSphere_5.5		Sybex Publication	
2	Configuring Windows Server Virtualization		Microsoft Press	
3	Citrix.XenServer.6.0.Administration. Essential.Guide		Packtpub.	Feb. 2007
4	Blade.Servers.and.Virtualization.		Wiley	
5	Virtualization: A Beginner's Guide			
6	Professional Xen Virtualization	William von Hagen	Wrox Publications	January 2008.

7	Virtualisation: From the desktop to the Enterprise	Chris Wolf, Erick M.Halter	APress	2005.
8	VMware and Microsoft Platform in the Virtual Data Center		Auerbach	2006
9	Network virtualization	Kumar Reddy, Victor Moreno	Cisco Press	July, 2006

Internal Evaluation: 40 Marks

20 Marks	**15 Marks**	**5 Marks**
Class Test	Analysis of research paper	Class Participation

Practical Component:

M. Sc (Information Technology)	**Semester – III - SIPSITP33(a)**
Course Name	**Virtualization Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practical:

1	Implement vmwareESXi for server virtualization
2	Implement XEN for server virtualization
3	Implement Hyper-V server virtualization
4	Manage vmwareESXi with vCentre server
5	Manage xen server Xen center
6	Understanding blade server with cisco UCS/HP eva simulator
7	Implement vlan concept with L2/L3 switches/nexus virtual switching
8	Simulating SAN with navisphere/netapps

Artificial Neural Networks

Learning Objective: Provide students with an understanding of the fundamental theory of neural networks and fuzzy systems. The objective is intended for students to apply neural networks and fuzzy systems to model and solve complicated practical problems such as recognition.

Learning Outcome: Learn basic neural network architecture, basic learning algorithms, Understand data pre and post processing .Learn training, verification and validation of neural network models. Design Engineering applications that can learn using neural networks.

Theory Component:

M. Sc (Information Technology)	**Semester – III - SIPSIT33(b)**
Course Name	**Artificial Neural Networks**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	The Brain Metaphor, Basics of Neuroscience, Artificial Neurons, Neural Networks and Architectures.	**12**
II	Geometry of Binary Threshold Neurons and Their Networks , Supervised Learning I: Perceptrons and LMS, Supervised Learning II: Backpropagation and Beyond	**12**
III	Neural Networks: A Statistical Pattern Recognition Perspective, Statistical Learning Theory, Support Vector Machines and Radial Basis Function Networks	**12**
IV	Dynamical Systems Review, Attractor Neural Networks, Adaptive Resonance Theory	**12**
V	Towards the Self-organizing Feature Map, Fuzzy Sets and Fuzzy Systems ,Evolutionary Algorithms	**12**

Books and References

Sr. No.	Title	Author/s	Publisher	Edition
1	Neural Networks, A Classroom Approach	Satish Kumar	McGraw Hill	2nd Edition
2	Artificial Neural Networks	Robert Schalkoff	McGraw Hill	
3	Introduction to Neural Networks using MATLAB	S Sivanandam, S Sumathi	McGraw Hill	

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research papers	Class Participation

Practical Component:

M. Sc (Information Technology)	**Semester – III - SIPSITP33(b)**
Course Name	**Artificial Neural Networks Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practical: All Practicals can be done using R / MATLAB.

1	Show the functioning of Artificial Neural Networks (Implement all the Hidden Layer Functions)
2	Demonstrate that non separable two input perceptron cannot be classified using P=[-0.8 -0.8 0.3 1.0 0.7; -0.8 0.8 -0.4 -1.0 -0.7]; and Target T=[1 0 1 0 1]
3	Use perceptron learning rule to find final weights of a neural network using fixed input vectors and a fixed target vector.
4	Prediction using neural network.
5	Implement Radial Basis Function.
6	Implement Least Mean Square Algorithm.
7	Implement Support Vector Machine Algorithm.
8	Create and train a feed forward back propagation network with a supplied Input P and Target T.
9	Design a Hopfield network consisting of two neurons with two stable equilibrium points.
10	Perform defuzzification using the following methods • Centroid • Bisector • Middle of Maximum • Smallest of Maximum • Largest of Maximum

Digital Image Processing

Learning Objective: This paper describes basic principles of digital image processing, design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation) and assessment of the performance of image processing algorithms and systems.

Learning Outcome: The student will be able to analyze general terminology of digital image processing, examine various types of images, intensity transformations and spatial filtering, develop Fourier transform for image processing in frequency domain, evaluate the methodologies for image segmentation, restoration etc.

Theory Component:

M. Sc (Information Technology)	**Semester – III - SIPSIT34(a)**
Course Name	**Digital lmage Processing**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	**Introduction to image processing**, Example of fields that uses image processing, Steps of image processing, Components, Applications, Image sensors and image formats **Visual Preliminaries** Brightness adaptation and contrast, Acuity and contour, Texture and pattern discrimination, Shape detection and recognition, perception of colour, Computational model of perceptual processing, Image sampling and quantization, Basic relationships between pixels	**12**
II	**Intensity transformations** Introduction, Some basic intensity transformation functions, Histogram equalization, local histogram processing, Using histogram statistics for image enhancement. **Spatial filtering** Fundamentals of spatial filtering, Smoothing and Sharpening spatial filters, Combining spatial enhancement methods, Using fuzzy techniques for intensity transformations and spatial filtering	**12**
III	**Colour image processing** Colour fundamentals, Colour models, Pseudocolour image processing, Basic of full-colour image processing, Colour transformations, Smoothing and Sharpening, Image segmentation bases on colour, Noise in colour images, Colour image compression **Image Compression :** Fundamentals, Some basic methods, Digital image watermarking, Full motion video compression	**12**

IV	**Morphological Image Processing:** Introduction, Erosion and Dilation, Opening and Closing, The Hit- or-Miss transformation, Some basic morphological algorithms, Gray scale morphology **Segmentation** Fundamentals, Point, Line, and Edge detection, Thresholding, Region based segmentation, Segmentation using morphological watersheds, The use of motion in segmentation- Spatial techniques.	**12**
V	**Representation and Description** Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Relational Descriptors **Object Recognition** Patterns and pattern classes, Recognition based on decision theoretic methods, Structural methods	**12**

Books / References

Sr. No.	Title	Author/s	Publisher	Edition
1	Digital Image Processing	Gonzalez and Woods	Pearson Education	3rd Edition
2	Digital Image Processing and Analysis	Bhabatosh Chanda, Dwijesh Dutta Majumder	PHI	2nd Edition
3	Fundamentals of Digital Image Processing	Anil K. Jain	PHI	1st Edition

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research paper	Class Participation

Practical Component:

M. Sc (Information Technology)	**Semester – III - SIPSITP34(a)**
Course Name	**Digital lmage Processing Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practicals:

Note:

1. **All the practical can be done in C, C++, Java or Matlab, R**
2. **The use of built-in functions in image processing toolbox in Matlab except the following is not allowed. Imshow, Imread, Imdilate, Imerode**
3. **The use of all other built-in functions for matrix operations and mathematical operations are allowed.**
4. **Use grey level and color images or image matrices as input to all the programs.**

1		WAP to study the effects of reducing the quantization values and spatial Resolution
2		Image enhancement
	A	Thresholding
	B	Contrast adjustment
	C	Brightness adjustment
	D	Gray level slicing
3		Basic Transformations
	A	Log transformation
	B	Power law transformation
	C	Negation
4	A	Different Filters (LPF, HPF, Lapalcian, LOG etc.) To generate mask for LOG use the following formula. $h_g(n_1, n_2) = e^{-(n_1^2+n_2^2)/(2\sigma^2)}$ $h(n_1, n_2) = \frac{(n_1{}^2 + n_2{}^2 - 2\sigma^2)h_g(n_1, n_2)}{2\pi\sigma^6 \sum_{n_1}\sum_{n_2} h_g}$
	B	Write a program to apply a mask on the image.
		a. Accept the size of mask from the user. b. Check whether the mask is of odd size. c. The program should work for any high pass and low pass mask.

		d. Check the sum of all the elements of the mask. For low pass filter the sum should be one and zero for high pass filter. e. Compare the output for different size of masks.
5		a. Write a program to plot a Histogram.
		b. Write a program to apply Histogram equalization.
6		Write a program to apply Gaussian filter on an image. a. Write a code to generate a Gaussian mask and then apply the mask on the image. b. Accept the size of mask and the sigma value from the user to generate a mask. c. Use the following formula to generate Gaussian mask. $h_g(n_1, n_2) = e^{-(n_1^2 + n_2^2)/(2\sigma^2)}$ $h(n_1, n_2) = \frac{h_g(n_1, n_2)}{\sum_{n_1}\sum_{n_2} h_g}$
7		1.Apply following morphological operations on the image: a. Opening b. Closing c. Morphological gradient d. Top-hat transformation 2. Write a program for boundary detection.
8		1. WAP to show RGB planes 2. WAP to convert a. RGB to NTSC b. RGB to YCbCr c. RGB to CMY d. RGB to HIS
9		WAP to achieve Pseudo coloring

Ethical Hacking

Learning Objective: This module introduces the concepts of ethical hacking, different tools and techniques in Ethical Hacking and Security along with its application.

Learning Outcome: The student will be able to identify and analyze stages of ethical hacking and identify tools and techniques related to it.

Theory Component:

M. Sc (Information Technology)	**Semester – III - SIPSIT34(b)**
Course Name	**Ethical Hacking**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	Introduction to Ethical Hacking, Footprinting and Reconnaissance, Scanning Networks, Enumeration	**12**
II	System Hacking, Trojans and Backdoors, Viruses and Worms, Sniffing	**12**
III	Social Engineering, Denial of Service, Session Hijacking, Hacking Webservers	**12**
IV	Hacking Web Applications, SQL Injection, Hacking Wireless Networks, Hacking Mobile Platforms	**12**
V	Evading IDS, Firewalls and Honeypots, Buffer Overflows, Cryptography, Penetration Testing	**12**

Books / References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Ethical Hacking Review Guide	Kimberly Graves	Wiley Publishing		
2	Ethical Hacking	Ankit Fadia	Macmillan India Ltd	2nd Edition	2006
3	Insider Computer Fraud	Kenneth C.Brancik	Auerbach Publications Taylor & Francis Group		2008

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research papers	Class Participation

Practical Component:

M. Sc (Information Technology)	**Semester – III - SIPSITP34(b)**
Course Name	**Ethical Hacking Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practicals

1	Using the tools for whois, traceroute, email tracking, google hacking.
2	Using the tools for scanning network, IP fragmentation, war dialing countermeasures, SSL Proxy, Censorship circumvention.
3	Using NETBIOS Enumeration tool, SNMP Enumeration tool, LINUX/ UNIX. Enumeration tools, NTP Enumeration tool, DNS analyzing and enumeration tool.
4	Using System Hacking tools
5	Study of backdoors and Trojan tools
6	Study of sniffing tools
7	Study of Denial of Service attack tools
8	Study of Hijacking tools
9	Study of webserver attack tools
10	Study of SQL injection and Web server tools
11	Study of wireless hacking tools
12	Using cryptanalysis tool.
13	Study of different security tools.

Semester IV

Course Code	Course Title	Credits
SIPSIT41	Artificial Intelligence	**4**
SIPSIT42	IT Infrastructure Management	**4**
Elective 1 (Select any one)		
SIPSIT43(a)	Intelligent Systems	**4**
SIPSIT43(b)	Real Time Embedded Systems	**4**
SIPSIT43(c)	Computer Forensics	**4**
Elective 2 (Select any one)		
SIPSIT44(a)	Design of Embedded Control Systems	**4**
SIPSIT44(b)	Advanced Image Processing	**4**
SIPSIT44(c)	Cloud Management	**4**
SIPSIT45	Project Report	**2**
Elective 1 (Select any one)		
SIPSITP43(a)	Intelligent Systems Practical	**2**
SIPSITP43(b)	Real Time Embedded Systems Practical	**2**
SIPSITP43(c)	Computer Forensics Practical	**2**
Elective 2 (Select any one)		
SIPSITP44(a)	Design of Embedded Control Systems Practical	**2**
SIPSITP44(b)	Advanced Image Processing Practical	**2**
SIPSITP44(c)	Cloud Management Practical	**2**
SIPSITP45	Project Implementation	**2**
	TOTAL CREDITS	**24**

Artificial lntelligence

Learning Objective: The objective of the course is to present an overview of Artificial Intelligence (AI) principles and approaches, develop a basic understanding of the building blocks of AI and implement an AI system in a team environment.

Learning Outcome: The student will be able to design a knowledge based system, analyze important historical and current trends addressing artificial intelligence.

Theory Component:

M. Sc (Information Technology)	**Semester – IV - SIPSIT41**
Course Name	**Artificial lntelligence**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	**Introduction:** AI,Components of AI,History of AI, Salient Points, Knowledge and Knowledge Based Systems, AI in Future, Applications. **Logic and Computation:** Classical Concepts, Computational Logic, FOL, Symbol Tableau, Resolution, Unification, Predicate Calculus in Problem Solving, Model Logic, Temporal Logic. **Heuristic Search:** Search-Based Problems, Informed Search, Water Jug Problem, TSP, Branch and Bound Method, TSP Algorithm. **[Reference I]**	**12**
II	**Game Playing:** AND/OR Graph, Minimax Problem, Alpha-Beta Search, Puzzle Solving, AI versus Control Robot. **Knowledge Representation:** Structure of an RBS, Merit, Demerit and Applicability of RBS, Semantic Nets, Frames, Conceptual Graphs, Conceptual Dependency, Scripts. **Automated Reasoning:** Default Logic, Problem for Default Reasoning, Closed World Assumption, Predicate Completion, Circumscription, Default Reasoning, Model Based Reasoning, Case Based Reasoning, Reasoning Models, Multimodels, Multimodal Reasoning. **[Reference I]**	**12**
III	**Probabilistic Reasoning:** Bayes Theorem, Bayesian Network, Dempster and Shafer Theory of Evidence, Confidence Factor, Probabilistic Logic. **Knowledge Acquisition:** Knowledge Acquisition process, Automatic Knowledge Acquisition, Machine Learning, Induction, Analogical Reasoning, Explanation-Based Learning, Inductive Learning, Knowledge Acquisition Tools. **[Reference I]**	**12**

IV	**Planning:**Necessity of planning, Planning Agents, Planning generating schemes, Non-hierarchical planning, Hierarchical planning, Script-based planning, Oppurtunistic planning, Algorithm for planning, planning representation with STRIPS an example. **Constraint Satisfaction Problem:** Constraints and Satisfiabillity, Basic search strategies for solving CSP, Representation of CSP problem, Examples of constraint satisfaction problem. **[Reference II]**	**12**
V	**Knowledge-Based Systems:** Structure of an Expert System, Expert Systems in different Areas, Expert System Shells, Comparison of Expert Systems, Comparative View, Ingredients of Knowledge-Based Systems, Web-based Expert Systems. **[Reference I]** **Prolog:** Prolog programming features, Syntax, Syntax of Rules, LIST, Structure, Some Solutions using TURBO PROLOG. **[Reference II]**	**12**

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Artificial Intelligence	R. B. Mishra	PHI	EEE	
2	Artificial Intelligence & Soft Computing for Beginners	Anandita Das Bhattacharjee	SPD		
3	Artificial Intelligence	E.Rich and K.Knight	TMH		2002
4	Artificial Intelligence: A Modern Approach	S.Russel, P.Norvig	Pearson Education		2002

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research paper	Class Participation

lT lnfrastructure Management

Learning Objective: The course will provide an overview of the management of infrastructure both at the individual and network level, knowledge on the inspection, durability and maintenance of structures, details of asset management for structures and networks of structures.

Learning Outcome: The student will be able to define and discuss the key components of information and knowledge management infrastructure, analyze and discuss issues related to information and knowledge management infrastructure.

Theory Component:

M. Sc. (lnformation technology)	**Semester – IV - SIPSIT42**
Course Name	**lT lnfrastructure Management**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	**Introduction:** The four perspectives (attributes) of IT service management, benefits of IT service management, business and IT alignment, What is ITIL?, What are services?, Service Management as a practice,The concept of Good Practice, Concept of a Service, Concept of Service Management, Functions and Processes, The process model and the characteristics of processes. **The Service Lifecycle:** Mapping the Concepts of ITIL to the Service Lifecycle, How does the Service Lifecycle work? **Service Strategy:** Objectives, Creating Service Value, Service Packages and Service Level Packages, Service Strategy Processes, Service Portfolio Management, Financial Management, Demand Management, Service Strategy Summary, Interfaces with the Service Design Phase, Interfaces with the Service Transition Phase, Interfaces with the Service Operation Phase, Interfaces with the Continual Service Improvement Phase, Service Strategy Service Scenario, Overall Service Strategy, Service Portfolio Management Considerations, Financial Management Considerations	**12**
II	**Service Design:** Objectives, Major Concepts, Five Major Aspects of Service Design, Service Design Packages, Service Design Processes, Service Level Management, Supplier Management, Service Catalogue Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security Management, Service Design Scenario, Service Level Management Considerations, Capacity Management Considerations, Availability Management Considerations, Information Security Management Considerations,	**12**

	Service Catalogue Management Considerations, ITSCM Considerations, Supplier Management Considerations	
III	**Service Transition:** Objectives, Service Transition Processes, Knowledge Management, Service Asset and Configuration Management, Change Management, Release and Deployment Management, Service Validation and Testing, Service Transition Summary, Service Transition Scenario, Knowledge Management Considerations, Service Asset and Configuration Management Considerations, Change Management Considerations, Release and Deployment Management Considerations, Service Validation and Testing Considerations	**12**
IV	**Service Operation:** Objectives, Major Concepts, Service Operation Functions, The Service Desk, Technical Management, IT Operations Management, Application Management, Service Operation Processes, Event Management, Incident Management, Problem Management, Request Fulfillment, Access Management, Service Operation Summary, Service Operation Scenario, Functions, Processes	**12**
V	**Continual Service Improvement:** Objectives, Major Concepts Continual Service Improvement Processes, Service Level Management, Service Measurement and Reporting , CSI (7 Step) Improvement Process, Continual Service Improvement Summary, Continual Service Improvement Scenario, Service Level Management Service Measurement and Reporting, CSI Process	**12**

Books and References

Sr. No.	Title	Author/s	Publisher	Edition
1	ITIL V3 Foundation Complete Certification Kit			
2	Foundations of IT Service Management – The Unofficial ITIL v3 Foundations Course	Brady Orand		2nd Edition
3	ITIL v3 Foundation Exam, The Study Guide	Arjen de Jong Axel Kolthof Mike Pieper Ruby Tjassing Annelies van der Veen TienekeVerheijen	**Van Harren**	

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research paper	Class Participation

lntelligent Systems

Learning Objective: To introduce students to some of the fast growing and fascinating research areas in Intelligent Systems Technologies and to help them gain knowledge of neural networks, fuzzy systems etc.

Learning Outcome: The learner will have an in-depth understanding of the application of established engineering methods to complex engineering problem solving.

Theory Component:

M. Sc (Information Technology)	**Semester – IV - SIPSIT43(a)**
Course Name	**lntelligent Systems**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	**Intelligent Agents:** Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, Structure of Agents, Problem Solving by searching: Problem-Solving Agents Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed Search and exploration: Informed (Heuristic) Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, Searching with Nondeterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environments	**12**
II	**Games:** Optimal Decisions in Games, Alpha—Beta Pruning, Imperfect Real-Time Decisions, Stochastic Games, Partially Observable Games, State-of-the-Art Game Programs **Constraint Satisfaction, Constraint Propagation:** Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems **Logical Agents:** Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic **First-Order Logic:** Representation Revisited, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic, Inference in First- Order Logic, Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution	**12**

III	**Planning:** Classical Planning, Algorithms for Planning as State- Space Search, Planning Graphs, Other Classical Planning Approaches, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multiagent Planning **Uncertain Knowledge and Reasoning:** Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, The Wumpus World Revisited, **Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks, Relational and First-Order Probability Models, Approaches to Uncertain Reasoning, **Probabilistic reasoning over time**: Inference in Temporal Models, Hidden Markov Models, Kalman Filters, Dynamic Bayesian Networks, Keeping Track of Many Objects	**12**
IV	**Simple Decision Making:** Combining Beliefs and Desires under Uncertainty, The Basis of Utility Theory, Utility functions, Multiattribute Utility Functions, Decision Networks. **Complex Decision Making:** Sequential Decision Problems, Value Iteration, Policy Iteration, Partially Observable MDPs, Decisions with Multiple Agents. **Game Theory Knowledge in Learning:** Review of Forms and types of Learning, Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming,	**12**
V	**Statistical and Reinforced Learning:** Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: The EM Algorithm, Reinforcement Learning, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Applications of Reinforcement Learning **Natural Language Processing:** Language Models, Text Classification, Information Retrieval, Information Extraction. **Robotics:** Introduction, Robot Hardware, Robotic Perception, Planning to Move, Planning Uncertain Movements, Moving, Robotic Software Architectures, Applications.	**12**

Books and References

Sr.No	Title	Author/s	Edition	Publisher
1	Artificial Intelligence: A Modern Approach	Staurt Russell, Peter Norvig	3rd Edition	Pearson Education
2	Artificial Intelligence: Structures and Strategies for Complex Problem solving	George F.Luger		Pearson Education
3	Artificial Intelligence	Patrick Winston		Pearson Education

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research paper	Class Participation

Practical Component:

M. Sc (Information Technology)	**Semester – IV - SIPSITP43(a)**
Course Name	**lntelligent Systems Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practicals : All Practicals can be done using C++/ R / MATLAB.

1.	Write a program using C/C++/Java for implementing the Depth First Search Algorithm. And also write the algorithm for the same.
2.	Write a program using C/C++/Java for implementing the Breadth First Search Algorithm.
3.	Apply domain specific heuristic to generate possible solution for the AI problems using. Greedy Best First Search.
4.	Implement the mechanism A^* algorithm.
5.	Implement Recursive Breadth First Search.
6.	Generate succession nodes and check possibility of finding solutions of the specified problems using: i. Steepest Ascent Hill Climbing ii. Simulated Annealing
7.	Optimize the search strategy for the suggested problems using: i. Mini-max algorithm. ii. Alpha Beta Pruning.
8.	Find a solution to map-coloring as a constraint satisfaction problem using: Forward checking.
9.	Show the Implementation of Bayesian Network Classification.
10.	Show the application of Hidden Markov Model.

Real-time Embedded Systems

Learning Objective: The objectives are to study the introduction of the real-time systems, the computing and communication required for the real-time embedded systems.

Learning Outcome: The learner will be able to present the mathematical model of the system, develop real-time algorithm for task scheduling and work on design and development of protocols related to real-time communication.

Theory Component:

M. Sc. (lnformation technology)	**Semester – IV - SIPSIT43(b)**
Course Name	**Real-time Embedded Systems**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	**Introduction-** What is Real Time System, Application of real time system, A Basic Model of Real time system, Characteristics of Real Time System,Safety and Realibility, Types of Real Time Task, Timing Constraints,Modeling Timing Constraints. **Embedded Operating Systems:** Fundamental Components, Example: Simple Little Operating System **Caches:**The Memory Hierarchy and Cache Memory, Cache Architecture,Cache Policy	**12**
II	**Exception and Interrupt Handling** Exception Handling, Interrupts, Interrupt Handling Schemes **Firmware** Firmware and Bootloader, Example: Sandstone **Memory Management** Moving from an MPU to an MMU, How Virtual Memory Works, Details of the ARM MMU, Page Tables, The Translation Lookaside Buffer, Domains and Memory Access Permission, The Caches and Write Buffer.	**12**
III	**Real Time Task Scheduling** Types of real time task and their characteristics, Task Scheduling, Clock driven scheduling, Hybrid Schedulers, Event Driven Scheduling, Earliest Deadline first scheduling, Rate Monotic Algorithm. **Handling Resource Sharing and Dependencies** Resource sharing among real time task, Priority Inversion, Prioroty inheritance protpcol, Highest locker protocol, prioroty ceiling protocol, Different types of priority inversion under PCP, Important features of	**12**

	PCP, Resource sharing Protocol, Handling Task Dependencies.	
IV	**Real Time Communication** Basic Concept, Real Time Communication in Lan, Soft/Hard Real Time communication in a Lan, Bounded Access Protocol for Lans, Performance comparison, Real time communication over Packet Switched networks, QoS framework, Routing, Resource reservation, Rate Control, QoS Model-Integrated services and Differentiated Services.	**12**
V	**Real Time Databases** Concept and Example of real time databases, Real time databases application design issues, Characteristics of temporal data, Concurrency control in real-time databases. Case study on commercial real time databases.	**12**

Books / References

Sr.No	Title	Author/s	Edition	Publisher
1	Real-Time Systems: Theory and Practice.	Rajib Mall	First	Pearson Publication
2	ARM system developer's guide: designing and optimizing system. (Ch-8,Ch-9,Ch-12, Ch-14)	software/Andrew N. Sloss, Dominic Symes, Chris Wright.	First	Elsevier Publication
3	Embedded Systems Design	S. Heath	Second	Newnes Publication
4	Real-Time Systems: Theory and Practice.	Rajib Mall	First	Pearson Publication

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research paper	Class Participation

Practical Component:

M. Sc (Information Technology)	Semester – IV - SIPSITP43(b)
Course Name	**Real-time Embedded Systems Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practicals:

1) Schedule a task periodically; after 5 min xyz task has to perform (Hint JITTER).
2) Schedule a task non periodically; no specific time stamp is set for any task.
3) Shared resources management using SEMAPHORE.
4) Shared resources management using MUTEX.
5) Implement scheduling algorithm FIFO.
6) Implement scheduling algorithm ROUND ROBIN.
7) Implement scheduling algorithm RATE MONOTONIC.
8) Implement Inter process communication (IPC) using NAMED PIPES.
9) IPC using simple PIPES.
10) IPC using MAIL BOXES.
11) Using Client Socket & Server Socket (UDP/TCP) maintain data received from client node.
12) Small demonstration of Kernel Level & User Level Communications

Computer Forensics

Learning Objective: To provide students with a comprehensive overview of collecting, investigating, preserving, and presenting evidence of cyber crime and to introduce topics of forensic data examination of computers and digital storage media.

Learning Outcome: The learner will be able to understand the importance of a systematic procedure for investigation of data found on digital storage media , understand the file system storage mechanisms and use tools for faithful preservation of data on disks for analysis.

Theory Component:

M. Sc (Information Technology)	**Semester – IV - SIPSIT43(c)**
Course Name	**Computer Forensics**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	Computer Forensics and Investigation Processes, Understanding Computing Investigations, The Investigator's Office and Laboratory, Data Acquisitions.	**12**
II	Processing Crime and Incident Scenes, Working with Windows and DOS Systems, Current Computer Forensics Tools.	**12**
III	Macintosh and Linux Boot Processes and File Systems, Computer Forensics Analysis, Recovering Graphics Files.	**12**
IV	Virtual Machines, Network Forensics, and Live Acquisitions, E- mail Investigations, Cell Phone and Mobile Device Forensics	**12**
V	Report Writing for High-Tech Investigations, Expert Testimony in High-Tech Investigations, Ethics and High-Tech Investigations.	**12**

Books / References

Sr.No	Title	Author/s	Edition	Publisher
1	Guide to Computer Forensics and Investigations	Bell Nelson, Amelia Phillips, Christopher Steuart	4th Edition	Cengage Learning

2	Computer Forensics A Pocket Guide	Nathan Clarke		I.T G.vernance Publishing
3	Computer Forensics: Computer Crime Scene Investigation	John R. Vacca	2nd Edition	Charles River Media

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research papers	Class Participation

Practical Component:

M. Sc (Information Technology)	**Semester – IV - SIPSITP43(c)**
Course Name	**Computer Forensics Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practicals:

1. File System Analysis using The Sleuth Kit
2. Using Windows forensics tools
3. Using Data acquisition tools
4. Using file recovery tools
5. Using Forensic Toolkit (FTK)
6. Forensic Investigation using EnCase
7. Using Steganography tools
8. Using Password Cracking tools
9. Using Log Capturing and Analysis tools
10. Using Traffic capturing and Analysis tools
11. Using Wireless forensics tools
12. Using Web attack detection tools
13. Using Email forensics tools
14. Using Mobile Forensics software tools
15. Writing report using FTK

Design of Embedded Control Systems

Learning Objective: To enable students to design, describe, validate and optimise embedded electronic systems in different industrial application areas.

Learning Outcome: The learner will acquire knowledge of and be able to use tools for the development and debugging of programs implemented on microcontrollers.

Theory Component:

M. Sc (Information Technology)	**Semester – IV - SIPSIT44(a)**
Course Name	**Design of Embedded Control Systems**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	**Introduction to microcontrollers** Microprocessors and microcontrollers, History, Embedded vs external memory devices, 8-bit and 16-bit microcontrollers, RISC and CISC processors, Harvard and Von Neumann architectures, Commercial microcontroller devices. Industrial applications. **Design with Atmel microcontrollers** Architecture overview of Atmel 89C51, Pin description of 89C51, Using flash memory devices Atmel 89CXX, Power saving options.	**12**
II	**PIC Microcontrollers** Overview, PIC16C6X/7X, Reset actions, Oscillators, Memory organization, PIC16C6X/7X instructions, Addressing modes, I/O ports, Interrupts PIC16C61/71, PIC16C61/71 timers, PIC16C 71 ADC, **PIC16F8XX Flash microcontrollers** Introduction, pin diagram, status registers, options_reg registers, power control registers, PIC16F8 program memory, PIC16F8 data memory, Data EEPROM, Flash program EEPROM, Interrupts PIC16F877, I/O ports, Timers **More about PIC microcontrollers** Introduction, Capture/compare/PWM modules in PIC16F877, Master synchronous serial port (MSSP) module, USART, ADC	**12**
III	**ARM Embedded Systems** The RISC Design Philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. **ARM Processor Fundamentals** Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions, Architecture Revisions**,** ARM Processor Families	**12**

IV	**Introduction to the ARM Instruction Set** Data Processing Instructions, Branch Instructions, Load-Store Instructions, Software Interrupt Instruction, Program Status Register Instructions, Loading Constants, ARMv5E Extensions, Conditional Execution **Introduction to the Thumb Instruction Set** Thumb Register Usage, ARM-Thumb Interworking, Other Branch Instructions, Data Processing Instructions, Single- Register Load-Store Instructions, Multiple-Register Load-Store Instructions, Stack Instructions, Software Interrupt Instruction.	**12**
V	**Writing and Optimizing ARM Assembly Code** Writing Assembly Code, Profiling and Cycle Counting, Instruction Scheduling, Register Allocation, Conditional Execution, Looping Constructs, Bit Manipulation, Efficient Switches, Handling Unaligned Data	**12**

Books / References

Sr.No	Title	Author/s	Edition	Publisher
1	Microcontrollers theory and applications (UnitI and II)	Ajay Deshmukh	First	Tata McGraw Hill
2	ARM system developer's guide: designing and optimizing system. (Unit III to V)	Andrew N Sloss, Dominic Symes, Chris Wright.	First	Elsevier Publication

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research papers	Class Participation

Practical Component:

M. Sc (Information Technology)	Semester – IV - SIPSITP44(a)
Course Name	**Design of Embedded Control Systems Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practicals:

1. Interfacing of LED, relay, Push Button
2. Sending and Receive Data Serially to/from PC.
3. Interfacing Wireless Module using ASK and FSK
4. Interfacing PC Keyboard.
5. Interfacing with EEPROM using I2C BUS.
6. Using a Watchdog Timer.
7. Using an External RTC.
8. Design a 4 bit binary counter.
9. DC Motor Control using PWM module.
10. Interfacing of temperature sensor.
11. Interfacing a 7 segment display.
12. Scrolling text message on LED dot matrix display

Advanced lmage Processing

Learning Objective: To describe and explain basic principles of digital image processing,design and implement algorithms that perform basic image processing (e.g., noise removal and image enhancement) and assess the performance of image processing algorithms and systems.

Learning Outcome: The student will be able to examine various types of images, intensity transformations and spatial filtering, develop Fourier transform for image processing in frequency domain and evaluate the methodologies for image segmentation, restoration etc.

Theory Component:

M. Sc (Information Technology)	**Semester – IV - SIPSIT44(b)**
Course Name	**Advanced lmage Processing**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	**Enhancement in Frequency domain** Introduction, 2-D Discrete Fourier Transform, Properties of Fourier transform, Basic filtering in the frequency domain, Smoothing and Sharpening filters, FFT algorithm. Discrete cosine transform (DCT), KL (PCT) transform, HAAR, Basics of wavelets. **Remote Sensing** Introduction (Passive and Active sensing), Electromagnetic remote sensing process, Physics of radiant energy, Energy source and its characteristics, Atmospheric interactions with electromagnetic radiation, Energy interaction with Earth's surface materials.	**12**
II	**Microwave Remote Sensing** Introduction, The Radar principle, Factors affecting microwave measurements, Radar wavebands, Side looking airborne (SLAR) systems, Synthetic Aperture Radar (SAR), Polarimetric SAR (PolSAR), Interaction between microwaves and Earth's surface, Interpreting SAR images, Geometric characteristics. **Remotes Sensing Platforms and Sensors** Introduction, Satellite system parameters, Spatial Resolution, Spectral Resolution, Radiometric Resolution, Temporal resolution, Imaging sensor systems (thermal, multispectral and microwave imaging), Earth resources satellites, Meteorological satellites, Satellites carrying microwave sensors, OCEASAT-1, IKONOS, Latest trends in remote sensing platforms and sensors (weather, land observation and marine satellites).	**12**

III	**Image Analysis** Introduction, Visual interpretation, Elements of visual interpretation, Digital processing, Pre-processing, Enhancement, Transformations, Classification, Integration, Classification accuracy assessment. **Applications** Introduction, Agriculture, Forestry, Geology, Hydrology, Sea Ice, Land cover, Mapping, Oceans and Costal.	**12**
IV	**Medical Image Processing** Various modalities of medical imaging, Breast cancer imaging, Mammographic imaging, Ultrasound imaging, Magnetic resonance imaging (MRI), Breast thermograph imaging, Problems with medical images. Image enhancement, Spatial domain methods, Frequency domain methods, Other modalities of medical imaging, Radiography, Positron emission tomography (PET), Computed tomography angiography (CTA), Echocardiogram.	**12**
V	**Feature Extraction and Statistical Measurement** Selection of features, Shape related features, Shape representation, Bounding box, Shape matrix, Moments of region and shape, Co-occurrence matrix, Principle feature analysis (PFA), Fourier descriptors, Snake boundary detection, Snake algorithm, Texture analysis, Texture features, Feature extraction using discrete Fourier transform, wavelet transform, Gabor filters for texture analysis, Breast tissue detection, Analysis of tissue structure.	

Books / References

Sr.No	Title	Author/s	Edition	Publisher
1	Text Book of Remote Sensing and Geographical Information Systems	M. Anji Reddy	4th edition	BS publication
2	Remote Sensing and Image Interpretation	Lillesand, T.M. and Kiefer, R.W.	6th edition	John Wiley and Sons Inc.
3	Medical Image Processing Concepts and Applications	Sinha, G.R., Patel, BhagwatiCharan		PHI
4	Digital Image Processing	Gonzalez and Woods	3rd edition	Pearson
5	Digital Image Processing and Analysis	Bhabatosh Chanda, Dwijesh Dutta Majumder	2nd edition	PHI

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research papers	Class Participation

Practical Component:

M. Sc (Information Technology)	**Semester – IV - SIPSITP44(b)**
Course Name	**Advanced lmage Processing Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practicals:

Note:

1. **All the practical can be done in C, C++, Java or Matlab, PolSARPro, Nest, ImageJ, R and ENVI**
2. **Satellite images can be downloaded from**
    a. **http://bhuvan3.nrsc.gov.in/bhuvan/bhuvannew/bhuvan2d.php**
    b. **http://landsat.usgs.gov/Landsat_Search_and_Download.php**
    c. **http://uavsar.jpl.nasa.gov/**
    d. **http://airsar.jpl.nasa.gov/**
3. **Medical images can be downloaded from http://www.barre.nom.fr/medical/samples/**

1	Apply DFT on Image
2	WAP for implementing LPF 1. Ideal LPF on square image 2. Butterworth filter 3. Gaussian filter
3	WAP for implementing HPF 1. Ideal HPF on square image 2. Butterworth filter 3. Gaussian filter
4	1. WAP for high boost filtering on square image 2. WAP for homomorphic filtering on square image
5	Acquire satellite/medical image and apply pre-processing techniques to improve the quality of image (use different low pass filters and compare the results)
6	Apply different image enhancement techniques (to improve contrast, brightness, sharpness) on satellite image
7	Apply different supervised classification techniques to classify the satellite image (minimum distance, maximum likelihood, decision tree, ANN)
8	Apply different clustering algorithms (K-means, ISODATA)
9	Apply compression and decompression algorithm on image (Huffman coding, Arithmetic encoding, LZW encoding)
10	Apply DCT and PCA on image.

Cloud Management

Learning Objective: This course focuses on learning emerging issues related to Cloud computing technology. Understand big data analysis tools and technique, the underlying principle of cloud virtualization, cloud storage, data management and data visualization.

Learning Outcome: The student will be able to develop and deploy cloud application using popular cloud platforms, design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud and explain and identify the techniques of big data analysis in cloud.

Theory Component:

M. Sc (Information Technology)	**Semester – IV- SIPSIT44(c)**
Course Name	**Cloud Management**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	**Contents**	**No. of Lectures**
I	Virtualized Data Center Architecture: Cloud infrastructures; public, private, hybrid. Service provider interfaces; Saas, Paas, Iaas. VDC environments; concept, planning and design, business continuity and disaster recovery principles. Managing VDC and cloud environments and infrastructures	**12**
II	Storage Network Design: Architecture of storage, analysis and planning. Storage network design considerations; NAS and FC SANs, hybrid storage networking technologies (iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing, host system design considerations IP-SAN: Introduction, iSCSI—components of iSCSI, iSCSI host connectivity, topologies for iSCSI connectivity, iSCSI discovery, iSCSI names, iSCSI session, iSCSI PDU, ordering and numbering, iSCSI security and error handling, FCIP—FCIP topology, FCIP performance and security, iFCP—iFCP topology, iFCP addressing and routing,iFCPgateway architecture, FCOE architecture.	**12**
III	Cloud Management: System Center 2012 and Cloud OS, Provisioning Infrastructure: Provisioning Infrastructure with Virtual Machine Designing, Planning and Implementing. Managing Hyper-V Environment with VMM 2012. Provisioning self-service with AppController, AppController essentials, Managing Private, Public, Hybrid clouds. AppControllercmdlets.	**12**

IV	Managing and maintaining with Configuration Manager 2012, Design, Planning, Implementation, Administration, Distributing Applications, Updates, Deploying Operating Systems, Asset Management and reporting. Backup and recovery with Data Protection Manager. Design, Planning, Implementation and Administration.	**12**
V	Implementing Monitoring: Real-time monitoring with Operations Manager, Proactive monitoring with Advisor, Operations Design, Planning, Implementation, Administration, Monitoring, Alerting, Operations and Security reporting. Building private clouds: Standardisation with service manager, Service Manager 2012: Design, Planning, Implementing, Incident Tracking, Automation with orchestrator, System Orchestrator 2012: Design, Planning, Implementing. Windows Azure Pack.	

Books / References

Sr. No	Title	Author/s	Edition	Publisher
1	Introducing Microsoft System Center 2012, Technical Overview	Mitch Tulloch, Symon Perriman and Symon Perriman		**Microsoft**
2	Microsft System Center 2012 Unleashed	Chris Amaris, Rand Morimoto, Pete Handley, David E. Ross, Technical Edit by Yardeni		Pearson Education
3	The.Official.VCP5.Certification.Guide		Aug 2012	VMware.Press
4	VCAP5-DCD Official Cert Guide			VMware.Press
5	Automating vSphere with VMware vCenter Orchestrator			
6	VMware Private Cloud Computing with vCloud Director			
7	Managing and optimizing VMWare VSphere deployment			
8	Storage Networks: The Complete Reference	Robert Spalding		
9	Storage Networking Protocol Fundamentals	James Long		
10	Storage Networking Fundamentals: An Introduction to Storage Devices, Subsystems, Applications, Management, and Filing Systems	Marc Farley		

Internal Evaluation: 40 Marks

20 Marks	15 Marks	5 Marks
Class Test	Analysis of research paper	Class Participation

Practical Component:

M. Sc (Information Technology)	**Semester – IV - SIPSITP44(c)**
Course Name	**Cloud Management Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practicals

1. Managing Hyper –V environment with SCVVM 2012
2. Provisioning Self-service with AppController
3. Managing Private Cloud with AppController
4. Using Data Protection Manager for Backup and Recovery
5. Using Operations Manager for real-time monitoring
6. Using Advisor for proactive monitoring
7. Using Service Manager to standardize
8. Using Orchestrator for automation
9. Implementing Windows Azure Pack
10. Using Configuration Manager 2012 for managing and maintaining