**Revised syllabus of M.Sc. Information Technology Semester III and IV**
**(Based on Credit and grading system)**

**Semester III**

| Course Code | Course Nomenclature | Lectures | Credits | Practical Course | Hours | Credits | Total Credits |
|---|---|---|---|---|---|---|---|
| PSIT301 | Embedded Systems | 60 | 4 | PSIT3P1 | 60 | 2 | 6 |
| PSIT302 | Information Security Management | 60 | 4 | PSIT3P2 | 60 | 2 | 6 |
| Elective 1 | | 60 | 4 | Elective 1 | 60 | 2 | 6 |
| PSIT303a | Virtualization | | | PSIT3P3a | | | |
| PSIT303b | Artificial Neural Networks | | | PSIT3P3b | | | |
| Elective 2 | | 60 | 4 | Elective 2 | 60 | 2 | 6 |
| PSIT304a | Digital Image Processing | | | PSIT3P4a | | | |
| PSIT304b | Ethical Hacking | | | PSIT3P4b | | | |

**Semester IV**

| Course Code | Course Nomenclature | Lectures | Credits | Practical Course | Hours | Credits | Total Credits |
|---|---|---|---|---|---|---|---|
| PSIT401 | Artificial Intelligence | 60 | 4 | | | | 4 |
| PSIT402 | IT Infrastructure Management | 60 | 4 | | | | 4 |
| Elective 1 | | 60 | 4 | Elective 1 | 60 | 2 | 6 |
| PSIT403a | Intelligent Systems | | | PSIT4P3a | | | |
| PSIT403b | Real Time Embedded Systems | | | PSIT4P3b | | | |
| PSIT403c | Computer Forensics | | | PSIT4P3c | | | |
| Elective 2 | | 60 | 4 | Elective 2 | 60 | 2 | 6 |
| PSIT404a | Design of Embedded Control Systems | | | PSIT4P4a | | | |
| PSIT404b | Advanced Image Processing | | | PSIT4P4b | | | |
| PSIT404c | Cloud Management | | | PSIT4P4c | | | |
| PSIT405 | Project | | 2 | PSIT4P5 | | 2 | 4 |

| CLASS: M. Sc (Information technology) | | Semester - III | |
|---|---|---|---|
| COURSE: Embedded Systems (PSIT301) | | | |
| Periods per week<br>1 Period is 60 minutes | Lecture | 4 | |
| | TW/Tutorial/Practical | 4 | |
| | | | |
| | | Hours | Marks |
| Evaluation System | Theory Examination | 3 | 60 |
| | Internal | | 40 |
| | Practical | -- | 50 |

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|---|---|---|
| Unit – I | **Introduction**<br>What is an Embedded System, Embedded System Vs, General Computing System.<br>**The Typical Embedded System**<br>Core of Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware.<br>**Characteristic and quality attributes of Embedded System**<br>Characteristics of an Embedded System, Quality Attributes of Embedded System.<br>**Embedded product development life cycle**<br>What is EDLC, Why EDLC? Objectives of EDLC, Different Phases of EDLC. | **12 Lectures** |
| | | |
| Unit- II | **Hardware Software Co-design and Program Modelling**<br>Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Introduction to Unified Modelling Language (UML), Hardware Software Trade-offs.<br>**Embedded Hardware design and development**<br>Analog Electronic Components, Digital Electronic Components, Electronic design Automation (EDA) Tools, The PCB Layout design.<br>**Embedded Firmware design and development**<br>Embedded Firmware Design Approaches, Embedded Firmware Development Languages<br>**Real Time Operating System(RTOS)**<br>Operating System Basics, Types of Operating Systems, Device Drivers, How to choose an RTOS | **12 Lectures** |
| | | |
| Unit-III | **Memories and Memory Subsystem**<br>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 Lectures** |
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|---|---|---|
| Unit-IV | **Programming Concept and Embedded Programming in C/C++ and Java**<br>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 Lectures** |
| | | |
| Unit -V | **Trends in the Embedded Industry**<br>Processor trends in Embedded System, Embedded OS Trends, Development Language Trends, Introduction of PIC Family of Microcontrollers, Introduction of ARM Family of Microcontrollers,<br>Introduction of AVR Family of Microcontrollers. | **12 Lectures** |

**Books / References**

| **Title** | **Author/s** | **Edition** | **Publisher** |
|---|---|---|---|
| Introduction to embedded systems | Shibu K. V | 2nd Edition | Tata McGraw-Hill |
| Embedded Systems Architecture, Programming and Design | Raj Kamal | 2nd Edition | Tata McGraw-Hill |
| Embedded Systems: A Contemporary Design Tool. | James K. Peckol | 1st Edition | Wiley Edition |

**Practicals (PSIT3P1):**

| | |
|---|---|
| 1 (Compulsory) | Study of hardware components<br>1. 8051 Microcontroller<br>2. Resistors (color code, types)<br>3. Capacitors<br>4. ADC, DAC<br>5. Operational Amplifiers<br>6. Transistors, Diode, Crystal Oscillator<br>7. Types of Relays<br>8. Sensors<br>9. Actuator<br>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 |

| CLASS: M. Sc (Information technology) | | Semester - III | |
|---|---|---|---|
| COURSE: Information Security Management (PSIT302) | | | |
| Periods per week<br>1 Period is 60 minutes | Lecture | 4 | |
| | TW/Tutorial/Practical | 4 | |
| | | | |
| | | Hours | Marks |
| Evaluation System | Theory Examination | 3 | 60 |
| | Internal | | 40 |
| | Practical | -- | 50 |

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|---|---|---|
| Unit – 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 Lectures** |
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| Unit- 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 Lectures** |
| | | |
| Unit-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 Lectures** |
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| Unit-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 Lectures** |
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| Unit -V | Computer forensics: techniques and tools. Audit Tools: NESSUS and NMAP. Information Security Standards and Compliance: Overview of ISO 17799 Standard. Legal and Ethical issues. | **12 Lectures** |

**Books / References**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| IT Security and Risk Management (Main reference) | Slay, J. and Koronios, A., | 2006 | Wiley |
| Incident Response and Computer Forensics. | Chris Prosise and Kevin Mandia, | 2003. | McGraw-Hill |
| Information Systems Security-Security Management, Metrics, Frameworks and Best Practices, | Nina Godbole | | Wiley, 2009 |
| Information Security Policies, Procedures, and Standards: Guidelines for Effective Information Security Management (Paperback) | | 1st edition | Auerbach, 2001 |

**Practicals (PSIT3P2):**

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.

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| **CLASS: M. Sc. (Information technology)** | | **Semester - III** | |
| **COURSE: Virtualization (PSIT303a) Elective 1** | | | |
| **Periods per week**<br>**1 Period is 60 minutes** | **Lecture** | **4** | |
| | **TW/Tutorial/Practical** | **4** | |
| | | | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | **3** | **60** |
| | **Internal** | | **40** |
| | **Practical** | **--** | **50** |

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|---|---|---|
| Unit – I | OVERVIEW OF VIRTUALIZATION<br><br>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 Lectures** |
| | | |
| Unit- II | SERVER CONSOLIDATION<br><br>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 Lectures** |
| | | |
| Unit-III | NETWORK VIRTUALIZATION<br><br>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<br><br>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 Lectures** |
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| Unit-IV | VIRTUALIZING STORAGE<br><br>SCSI- Speaking SCSI- Using SCSI buses – Fiber Channel – Fiber Channel Cables –Fiber Channel Hardware Devices – iSCSI | **12 Lectures** |

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|---|---|---|
| | Architecture – Securing iSCSI – SAN backup and recovery techniques – RAID – SNIA Shared Storage Model – Classical Storage Model – SNIA Shared Storage Model – Host based Architecture – Storage based architecture – Network based Architecture – Fault tolerance to SAN – Performing Backups – Virtual tape libraries. | |
| | | |
| Unit -V | 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 Lectures** |

**Books / References**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| Mastering_VMware_vSphere_5.5 | | | Sybex Publication |
| Configuring Windows Server Virtualization | | | Microsoft Press |
| Citrix.XenServer.6.0.Administration.Essential.Guide | | Feb.2007 | Packtpub. |
| Blade.Servers.and.Virtualization. | | | Wiley. |
| Virtualization:A Beginner's Guide | | | |
| Professional Xen Virtualization | William von Hagen | January, 2008. | Wrox Publications |
| Virtualization: From the Desktop to the Enterprise | Chris Wolf , Erick M. Halter | 2005. | APress |
| VMware and Microsoft Platform in the Virtual Data Center | | 2006 | Auerbach |
| Network virtualization | . Kumar Reddy, Victor Moreno | July, 2006 | Cisco Press |

**PSIT3P3a:** Practicals

1. Implement vmware ESXi for server virtualization
2. Implement XEN for server virtualization
3. Implement Hyper-V server virtualization
4. Manage vmware ESXi 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

| CLASS: M. Sc. (Information technology) | | Semester - III | |
|---|---|---|---|
| COURSE: Artificial Neural Networks (PSIT303b) Elective 1 | | | |
| Periods per week<br>1 Period is 60 minutes | Lecture | 4 | |
| | TW/Tutorial/Practical | 4 | |
| | | | |
| | | Hours | Marks |
| Evaluation System | Theory Examination | 3 | 60 |
| | Internal | | 40 |
| | Practical | -- | 50 |

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|---|---|---|
| Unit – I | The Brain Metaphor, Basics of Neuroscience, Artificial Neurons, Neural Networks and Architectures | **12 Lectures** |
| | | |
| Unit- II | Geometry of Binary Threshold Neurons and Their Networks , Supervised Learning I: Perceptrons and LMS, Supervised Learning II: Backpropagation and Beyond | **12 Lectures** |
| | | |
| Unit-III | Neural Networks: A Statistical Pattern Recognition Perspective , Statistical Learning Theory, Support Vector Machines and Radial Basis Function Networks | **12 Lectures** |
| | | |
| Unit-IV | Dynamical Systems Review, Attractor Neural Networks, Adaptive Resonance Theory | **12 Lectures** |
| | | |
| Unit -V | Towards the Self-organizing Feature Map, Fuzzy Sets and Fuzzy Systems , Evolutionary Algorithms | **12 Lectures** |

**Books / References**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| Neural Networks, A Classroom Approach | Satish Kumar | 2nd Edition | **McGraw Hill** |
| Artificial Neural Networks | Robert Schalkoff | | **McGraw Hill** |
| Introduction to Neural Networks using MATLAB | S Sivanandam,S Sumathi | | **McGraw Hill** |

**Practicals PSIT3P3b:**

| | |
|---|---|
| 1. | Show the functioning of Artificial Neural Networks<br>(Implement all the Hidden Layer Functions) |
| 2. | Demonstrate that non separable two input perceptron cannot be classified using<br>P=[-0.8 -0.8 0.3 1.0 0.7; -0.8 0.8 -0.4 -1.0 -0.7]; and<br>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. |

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| 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<br>• Centroid<br>• Bisector<br>• Middle of Maximum<br>• Smallest of Maximum<br>• Largest of Maximum |
| All Practicals can be done using R / MATLAB. | |

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| **CLASS: M. Sc. (Information technology)** | | | **Semester - III** | |
| **COURSE: Digital Image Processing (PSIT304a) Elective 2** | | | | |
| **Periods per week**<br>**1 Period is 60 minutes** | | **Lecture** | **4** | |
| | | **TW/Tutorial/Practical** | **4** | |
| | | | | |
| | | | **Hours** | **Marks** |
| **Evaluation System** | | **Theory Examination** | **3** | **60** |
| | | **Internal** | | **40** |
| | | **Practical** | **--** | **50** |
| Unit – I | **Introduction to image processing**, Example of fields that uses image processing, Steps of image processing, Components, Applications, Image sensors and image formats<br>**Visual Preliminaries**<br>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 Lectures** |
| Unit- II | **Intensity transformations**<br>Introduction, Some basic intensity transformation functions, Histogram equalization, local histogram processing, Using histogram statistics for image enhancement,<br>**Spatial filtering**<br>Fundamentals of spatial filtering, Smoothing and Sharpening spatial filters, Combining spatial enhancement methods, Using fuzzy techniques for intensity transformations and spatial filtering | | | **12 Lectures** |
| Unit-III | **Colour image processing**<br>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<br>**Image Compression** | | | **12 Lectures** |

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

**Books / References**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| Digital Image Processing | Gonzalez and Woods | **3rd Edition** | **Pearson Education** |
| Digital Image Processing and Analysis | Bhabatosh Chanda, Dwijesh Dutta Majumder | **2nd Edition** | **PHI** |
| Fundamentals of Digital Image Processing | Anil K. Jain | **1st Edition** | **PHI** |

**Practicals PSIT3P4a:**

**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 |

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|---|---|---|
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| 4 | | Different Filters (LPF,HPF, Lapalcian, LOG etc.)<br>To generate mask for LOG use the following formula.<br>$h_g(n_1, n_2) = e^{-(n_1^2+n_2^2)/(2\sigma^2)}$<br>$h(n_1, n_2) = \frac{(n_1{}^2 + n_2{}^2 - 2\sigma^2)h_g(n_1, n_2)}{2\pi\sigma^6 \sum_{n_1}\sum_{n_2} h_g}$ |
| | A | Write a program to apply a mask on the image. |
| | | a. Accept the size of mask from the user.<br>b. Check whether the mask is of odd size.<br>c. The program should work for any high pass and low pass mask.<br>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.<br>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.<br>a. Write a code to generate a Gaussian mask and then apply the mask on the image.<br>b. Accept the size of mask and the sigma value from the user to generate a mask.<br>c. Use the following formula to generate Gaussian mask.<br>$h_g(n_1, n_2) = e^{-(n_1^2+n_2^2)/(2\sigma^2)}$<br>$h(n_1, n_2) = \frac{h_g(n_1, n_2)}{\sum_{n_1}\sum_{n_2} h_g}$ |
| | | |
| 7 | | d. Apply following morphological operations on the image:<br>a. Opening<br>b. Closing<br>c. Morphological gradient<br>d. Top-hat transformation<br>2. Write a program for boundary detection. |
| | | |
| 8 | | 1.WAP to show RGB planes<br>2. WAP to convert<br>a. RGB to NTSC<br>b. RGB to YCbCr<br>c. RGB to CMY<br>d. RGB to HIS |
| 9 | | WAP to achieve Pseudo coloring |

| CLASS: M. Sc. (Information technology) | | Semester – III | |
|---|---|---|---|
| **COURSE: Ethical Hacking (PSIT304b) Elective 2** | | | |
| **Periods per week**<br>**1 Period is 60 minutes** | **Lecture** | **4** | |
| | **TW/Tutorial/Practical** | **4** | |
| | | | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | **3** | **60** |
| | **Internal** | | **40** |
| | **Practical** | **--** | **50** |

| | | |
|---|---|---|
| Unit–I | Introduction to Ethical Hacking, Footprinting and Reconnaissance, Scanning Networks, Enumeration | **12 Lectures** |
| | | |
| Unit–II | System Hacking, Trojans and Backdoors, Viruses and Worms, Sniffing | **12 Lectures** |
| | | |
| Unit–III | Social Engineering, Denial of Service, Session Hijacking, Hacking Webservers | **12 Lectures** |
| | | |
| Unit–IV | Hacking Web Applications, SQL Injection, Hacking Wireless Networks, Hacking Mobile Platforms | **12 Lectures** |
| | | |
| Unit–V | Evading IDS, Firewalls and Honeypots, Buffer Overflows, Cryptography, Penetration Testing | **12 Lectures** |

**Books / References**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| Ethical Hacking Review Guide | Kimberly Graves | | **Wiley Publishing** |
| Ethical Hacking | Ankit Fadia | 2nd Edition | Macmillan India Ltd, 2006 |
| Insider Computer Fraud | Kenneth C.Brancik | 2008 | Auerbach Publications Taylor & Francis Group, |
| | | | |

**PSIT3P4b:** 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.

| CLASS: M. Sc. (Information technology) | | Semester - IV | |
|---|---|---|---|
| **COURSE: Artificial Intelligence (PSIT401)** | | | |
| **Periods per week**<br>**1 Period is 60 minutes** | **Lecture** | **4** | |
| | **TW/Tutorial/Practical** | **4** | |
| | | | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | **3** | **60** |
| | **Internal** | | **40** |
| | **Practical** | **--** | **50** |

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|---|---|---|
| Unit – I | **Introduction:** AI, Components of AI, History of AI, Salient Points, Knowledge and Knowledge Based Systems, AI in Future, Applications.<br>**Logic and Computation:** Classical Concepts, Computational Logic, FOL, Symbol Tableau, Resolution, Unification, Predicate Calculus in Problem Solving, Model Logic, Temporal Logic.<br>**Heuristic Search:** Search-Based Problems, Informed Search, Water Jug Problem, TSP, Branch and Bound Method, TSP Algorithm. **[Reference I]** | **12 Lectures** |
| Unit- II | **Game Playing:** AND/OR Graph, Minimax Problem, Alpha-Beta Search, Puzzle Solving, AI versus Control Robot.<br>**Knowledge Representation:** Structure of an RBS, Merit, Demerit and Applicability of RBS, Semantic Nets, Frames, Conceptual Graphs, Conceptual Dependency, Scripts.<br>**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.<br>**[Reference I]** | **12 Lectures** |
| Unit-III | **Probabilistic Reasoning:** Bayes Theorem, Bayesian Network, Dempster and Shafer Theory of Evidence, Confidence Factor, Probabilistic Logic.<br>**Knowledge Acquisition:** Knowledge Acquisition process, Automatic Knowledge Acquisition, Machine Learning, Induction, Analogical Reasoning, Explanation-Based Learning, Inductive Learning, Knowledge Acquisition Tools.<br>**[Reference I]** | **12 Lectures** |
| Unit-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.<br>**Constraint Satisfaction Problem:** Constraints and Satisfiabillity, Basic search strategies for solving CSP, Representation of CSP problem, Examples of constraint satisfaction problem.<br>**[Reference II]** | **12 Lectures** |
| Unit –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]**<br>**Prolog:** Prolog programming features, Syntax, Syntax of Rules, LIST, Structure, Some Solutions using TURBO PROLOG. **[Reference II]** | **12 Lectures** |

**Books / References**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| Artificial Intelligence | R. B. Mishra | **EEE** | **PHI** |
| Artificial Intelligence & Soft Computing for Beginners | Anandita Das Bhattacharjee | | **SPD** |
| Artificial Intelligence | E.Rich and K.Knight | **2002** | **TMH** |
| Artificial Intelligence: A Modern Approach | S.Russel, P.Norvig | **2002** | **Pearson Education** |

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|---|---|---|---|
| **CLASS: M. Sc. (Information technology)** | | **Semester – IV** | |
| **COURSE: IT Infrastructure Management (PSIT402)** | | | |
| **Periods per week**<br>**1 Period is 60 minutes** | **Lecture** | **4** | |
| | **TW/Tutorial/Practical** | **4** | |
| | | | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | **3** | **60** |
| | **Internal** | | **40** |
| | **Practical** | **--** | **50** |

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|---|---|---|
| Unit – 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.<br>**The Service Lifecycle:** Mapping the Concepts of ITIL to the Service Lifecycle, How does the Service Lifecycle work?<br>**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 Lectures** |
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| Unit- 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 | **12 Lectures** |

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|---|---|---|
| | Considerations, Availability Management Considerations, Information Security Management Considerations, Service Catalogue Management Considerations, ITSCM Considerations, Supplier Management Considerations | |
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| Unit-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 Lectures** |
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| Unit-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 Lectures** |
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| Unit –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 Lectures** |

**Books / References**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| **ITIL V3 Foundation Complete Certification Kit** | | | |
| **Foundations of IT Service Management - The Unofficial ITIL® v3 Foundations Course** | Brady Orand | **2nd Edition** | |
| **ITILv3 Foundation Exam, The Study Guide** | Arjen de Jong<br>Axel Kolthof<br>Mike Pieper<br>Ruby Tjassing<br>Annelies van der Veen<br>Tieneke Verheijen | | **Van Harren** |

| CLASS: M. Sc. (Information technology) | | Semester – IV | |
|---|---|---|---|
| **COURSE: Intelligent Systems (PSIT403a)** | | | |
| **Periods per week**<br>**1 Period is 60 minutes** | **Lecture** | **4** | |
| | **TW/Tutorial/Practical** | **4** | |
| | | | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | **3** | **60** |
| | **Internal** | | **40** |
| | **Practical** | **--** | **50** |

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|---|---|---|
| Unit – I | Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, Structure of Agents<br>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 Lectures** |
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| Unit- II | Games: Optimal Decisions in Games, Alpha—Beta Pruning, Imperfect Real-Time Decisions, Stochastic Games, Partially Observable Games, State-of-the-Art Game Programs<br>Constraint Satisfaction, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems<br>Logical Agents: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic<br>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 Lectures** |
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| Unit-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<br>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,<br>Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Exact Inference in | **12 Lectures** |

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|---|---|---|
| | Bayesian Networks, Approximate Inference in Bayesian Networks, Relational and First-Order Probability Models, Approaches to Uncertain Reasoning,<br>Probabilistic reasoning over time: Inference in Temporal Models, Hidden Markov Models, Kalman Filters, Dynamic Bayesian Networks, Keeping Track of Many Objects | |
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| Unit-IV | Simple Decision Making: Combining Beliefs and Desires under Uncertainty, The Basis of Utility Theory, Utility functions, Multiattribute Utility Functions, Decision Networks,<br>Complex Decision Making: Sequential Decision Problems, Value Iteration, Policy Iteration, Partially Observable MDPs, Decisions with Multiple Agents: Game Theory<br>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 Lectures** |
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| Unit –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.<br>Robotics: Introduction, Robot Hardware, Robotic Perception, Planning to Move, Planning Uncertain Movements, Moving, Robotic Software Architectures, Applications. | **12 Lectures** |

**Books / References**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| Artificial Intelligence: A Modern Approach | Staurt Russell, Peter Norvig | **3rd Edition** | **Pearson Education** |
| Artificial Intelligence: Structures and Strategies for Complex Problem Solving | George F. Luger | | **Pearson Education** |
| Artificial Intelligence | Patrick Winston | | **Pearson Education** |

**Practicals (PSIT4P3a):**

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|---|---|
| 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.<br>i. Greedy Best First Search. |
| 4. | Implement the mechanism $A^*$ algorithm. |

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| 5. | Implement Recursive Breadth First Search. |
| 6. | Generate succession nodes and check possibility of finding solutions of the specified problems using:<br>i. Steepest Ascent Hill Climbing<br>ii. Simulated Annealing |
| 7. | Optimize the search strategy for the suggested problems using:<br>i. Mini-max algorithm.<br>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. |
| All Practicals can be done using C++/ R / MATLAB. | |

| **CLASS: M. Sc. (Information technology)** | | **Semester – IV** | |
|---|---|---|---|
| **COURSE: Real-time Embedded Systems (PSIT403b)** | | | |
| **Periods per week**<br>**1 Period is 60 minutes** | **Lecture** | **4** | |
| | **TW/Tutorial/Practical** | **4** | |
| | | | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | **3** | **60** |
| | **Internal** | | **40** |
| | **Practical** | **--** | **50** |

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|---|---|---|
| Unit – 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.<br>**Embedded Operating Systems**<br>Fundamental Components, Example: Simple Little Operating System<br>**Caches**<br>The Memory Hierarchy and Cache Memory, Cache Architecture, Cache Policy | **12 Lectures** |
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| Unit- II | **Exception and Interrupt Handling**<br>Exception Handling, Interrupts, Interrupt Handling Schemes<br>**Firmware**<br>Firmware and Bootloader, Example: Sandstone<br>**Memory Management**<br>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 Lectures** |
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|---|---|---|
| Unit-III | **Real Time Task Scheduling**<br>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.<br><br>**Handling Resource Sharing and Dependencies**<br>Resource sharing among real time task, Priority Inversion, Prioroty inheritence protpcol, Highest locker protocol,prioroty ceiling protocol,Different types of priority inversion Under PCP,Important features of PCP, Resource sharing Protocol, Handling Task Dependencies. | **12 Lectures** |
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| Unit-IV | **Real Time Communication**<br>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 Lectures** |
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| Unit –V | **Real Time Databases**<br>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 Lectures** |

**Books / References**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| Real-Time Systems: Theory and Practice. | Rajib Mall | First | Pearson Publication |
| 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 |
| Embedded Systems Design | S. Heath | Second Edition | Newnes Publication |
| Real-Time Systems: Theory and Practice. | Rajib Mall | First | Pearson Publication |

**Practicals (PSIT4P3b):**

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

| **CLASS: M. Sc. (Information technology)** | | **Semester – IV** | |
|---|---|---|---|
| **COURSE: Computer Forensics (PSIT403c)** | | | |
| **Periods per week**<br>**1 Period is 60 minutes** | **Lecture** | **4** | |
| | **TW/Tutorial/Practical** | **4** | |
| | | | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | **3** | **60** |
| | **Internal** | | **40** |
| | **Practical** | **--** | **50** |

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|---|---|---|
| Unit – I | Computer Forensics and Investigation Processes, Understanding Computing Investigations, The Investigator's Office and Laboratory, Data Acquisitions. | **12 Lectures** |
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| Unit- II | Processing Crime and Incident Scenes, Working with Windows and DOS Systems, Current Computer Forensics Tools. | **12 Lectures** |
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| Unit-III | Macintosh and Linux Boot Processes and File Systems, Computer Forensics Analysis, Recovering Graphics Files. | **12 Lectures** |
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| Unit-IV | Virtual Machines, Network Forensics, and Live Acquisitions, E-mail Investigations, Cell Phone and Mobile Device Forensics | **12 Lectures** |
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| Unit –V | Report Writing for High-Tech Investigations, Expert Testimony in High-Tech Investigations, Ethics and High-Tech Investigations. | **12 Lectures** |

**Books / References**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| Guide to Computer Forensics and Investigations | Bell Nelson, Amelia Phillips,Christopher Steuart | 4th Edition | Cengage Learning |
| Computer Forensics A Pocket Guide | Nathan Clarke | | I.T G.vernance Publishing |

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|---|---|---|---|
| 1., Computer Forensics: Computer Crime Scene Investigation | John R. Vacca | 2nd Edition, | Charles River Media |

**Practicals (PSIT4P3c):**

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

| **CLASS: M. Sc. (Information technology)** | | **Semester – IV** | |
|---|---|---|---|
| **COURSE: Design of Embedded Control Systems (PSIT404a)** | | | |
| **Periods per week**<br>**1 Period is 60 minutes** | **Lecture** | **4** | |
| | **TW/Tutorial/Practical** | **4** | |
| | | | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | **3** | **60** |
| | **Internal** | | **40** |
| | **Practical** | **--** | **50** |

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|---|---|---|
| Unit – I | **Introduction to microcontrollers**<br>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.<br>**Design with Atmel microcontrollers**<br>Architecture overview of Atmel 89C51, Pin description of 89C51, Using flash memory devices Atmel 89CXX, Power saving options. | **12 Lectures** |
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| Unit- II | **PIC Microcontrollers**<br>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,<br>**PIC16F8XX Flash microcontrollers** | **12 Lectures** |

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| | 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<br>**More about PIC microcontrollers**<br>Introduction, Capture/compare/PWM modules in PIC16F877, Master synchronous serial port (MSSP) module, USART, ADC | |
| | | |
| Unit-III | **ARM Embedded Systems**<br>The RISC Design Philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software,<br>**ARM Processor Fundamentals**<br>Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions, Architecture Revisions**,** ARM Processor Families | **12 Lectures** |
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| Unit-IV | **Introduction to the ARM Instruction Set**<br>Data Processing Instructions, Branch Instructions, Load-Store Instructions, Software Interrupt Instruction, Program Status Register Instructions, Loading Constants, ARMv5E Extensions, Conditional Execution<br>**Introduction to the Thumb Instruction Set**<br>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 Lectures** |
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| Unit - V | **Writing and Optimizing ARM Assembly Code**<br>Writing Assembly Code, Profiling and Cycle Counting, Instruction Scheduling, Register Allocation, Conditional Execution, Looping Constructs, Bit Manipulation, Efficient Switches, Handling Unaligned Data | **12 Lectures** |

**Books / References**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| Microcontrollers theory and applications (UnitI and II) | Ajay Deshmukh | First | Tata McGraw-Hill |
| ARM system developer's guide: designing and optimizing system. (Unit III to V) | Andrew N. Sloss, Dominic Symes, Chris Wright. | First | Elsevier Publication |

**Practicals (PSIT4P4a):**

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

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| **CLASS: M. Sc. (Information technology)** | | **Semester – IV** | |
| **COURSE: Advanced Image Processing (PSIT404b)** | | | |
| **Periods per week**<br>**1 Period is 60 minutes** | **Lecture** | **4** | |
| | **TW/Tutorial/Practical** | **4** | |
| | | | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | **3** | **60** |
| | **Internal** | | **40** |
| | **Practical** | **--** | **50** |

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| Unit – I | **Enhancement in Frequency domain**<br>Introduction, 2-D Discrete Fourier Transform, Properties of Fourier transform, Basic filtering in the frequency domain, | **12 Lectures** |

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| | Smoothing and Sharpening filters, FFT algorithm. Discrete cosine transform (DCT), KL (PCT) transform, HAAR, Basics of wavelets.<br>**Remote Sensing**<br>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. | |
| | | |
| Unit- II | **Microwave Remote Sensing**<br>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.<br>**Remotes Sensing Platforms and Sensors**<br>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 Lectures** |
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| Unit-III | **Image Analysis**<br>Introduction, Visual interpretation, Elements of visual interpretation, Digital processing, Pre-processing, Enhancement, Transformations, Classification, Integration, Classification accuracy assessment.<br>**Applications**<br>Introduction, Agriculture, Forestry, Geology, Hydrology, Sea Ice, Land cover, Mapping, Oceans and Costal. | **12 Lectures** |
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| Unit-IV | **Medical Image Processing**<br>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 Lectures** |
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| Unit –V | **Feature Extraction and Statistical Measurement**<br>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. | **12 Lectures** |

**Books / References**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| Text Book of Remote Sensing and Geographical Information Systems | M. Anji Reddy | **4th Edition** | BS publication |
| Remote Sensing and Image Interpretation | Lillesand, T.M. and Kiefer, R.W. | 6th edition. | John Wiley and Sons Inc. |
| Medical Image Processing Concepts and Applications | Sinha, G.R., Patel, Bhagwati Charan | | PHI |
| Digital Image Processing | Gonzalez and Woods | 3rd Edition | Pearson |
| Digital Image Processing and Analysis | Bhabatosh Chanda, Dwijesh Dutta Majumder | 2nd Edition | PHI |

**Practicals (PSIT4P4b):**

**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**
    a. **http://www.barre.nom.fr/medical/samples/**

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|---|---|
| 1 | Apply DFT on Image |
| 2 | WAP for implementing LPF<br>1. Ideal LPF on square image<br>2. Butterworth filter<br>3. Gaussian filter |
| 3 | WAP for implementing HPF<br>1. Ideal HPF on square image<br>2. Butterworth filter<br>3. Gaussian filter |
| 4 | 1. WAP for high boost filtering on square image<br>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. |

| CLASS: M. Sc. (Information technology) | | Semester – IV | |
|---|---|---|---|
| COURSE: Cloud Management (PSIT404c) | | | |
| Periods per week<br>1 Period is 60 minutes | Lecture | 4 | |
| | TW/Tutorial/Practical | 4 | |
| | | | |
| | | Hours | Marks |
| Evaluation System | Theory Examination | 3 | 60 |
| | Internal | | 40 |
| | Practical | -- | 50 |

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|---|---|---|
| Unit – 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 Lectures** |
| | | |
| Unit- 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, iFCP gateway architecture,FCOE architecture. | **12 Lectures** |
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| Unit-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. AppController cmdlets. | **12 Lectures** |
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| Unit-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 Lectures** |
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| Unit –V | Implementing Monitoring: Real-time monitoring with Operations Manager, Proactive monitoring with Advisor, Operations Design, | **12 Lectures** |

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| | 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**

| Title | Author/s | Edition | Publisher |
|---|---|---|---|
| Introducing Microsoft System Center 2012, Technical Overview | Mitch Tulloch, Symon Perriman and Symon Perriman | | **Microsoft** |
| Microsft System Center 2012 Unleashed | Chris Amaris, Rand Morimoto, Pete Handley, David E. Ross, Technical Edit by Yardeni | | Pearson Education |
| The.Official.VCP5.Certification.Guide | | Aug.2012 | VMware.Press |
| VCAP5-DCD Official Cert Guide | | | VMware.Press |
| Automating vSphere with VMware vCenter Orchestrator | | | |
| VMware Private Cloud Computing with vCloud Director | | | |
| Managing and optimizing VMWare VSphere deployment | | | |
| Storage Networks: The Complete Reference | Robert Spalding | | |
| Storage Networking Protocol Fundamentals | James Long | | |
| Storage Networking Fundamentals: An Introduction to Storage Devices, Subsystems, Applications, Management, and Filing Systems | Marc Farley | | |

**Practicals (PSIT4P4c):**

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