

# Nagindas Khandwala College



**Revised Syllabus  
And  
Question Paper Pattern  
Of Course  
Of  
Master of Science Information Technology  
(MSc IT) Programme**

**(Department Of IT)  
Part II  
*Semester III***

**Under Autonomy**

***(To be implemented from Academic Year- 2017-2018)***

**Masters In Information Technology (MSc IT) Program**  
*Under Choice Based Credit, Grading and Semester System*  
**Course Structure**

**MSC IT**

*(To be implemented from Academic Year- 2017-2018)*

MSC IT – SEMESTER III							
Course Code	Course	Hrs. of Instruction/Week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1731PITES	<b>Core -9 :</b> Embedded Systems	4	2 hrs 30 minutes	40	60	100	4
1732PITIS	<b>Core -10:</b> Information Security Management	4	2 hrs 30 minutes	40	60	100	4
1733PITNN 1733PITVR	<b>DSE 1:</b> Artificial Neural Networks; Virtualization	4	2 hrs 30 minutes	40	60	100	4
1734PITIP 1734PITEH	<b>DSE 2:</b> Digital Image Processing; Ethical Hacking	4	2 hrs 30 minutes	40	60	100	4
1735PITES	Embedded Systems Practical	4	2 hrs	-	50	50	2
1736PITIS	Information Security Management Practical	4	2 hrs	-	50	50	2
1737PITNN	Artificial Neural Networks Practical;	4	2 hrs	-	50	50	2

1737PITVR	Virtualization Practical							
1738PITIP	Digital Image Processing Practical;	4	2 hrs	-	50	50	2	
1738PITEH	Ethical Hacking Practical							
		<b>32</b>				<b>600</b>	<b>24</b>	
<b>Total Marks : 600</b>								

Course Code :	Course	Hrs. of Instruc tion/ week	Exam Duratio n (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
<b>1731PITES</b>	<b>Embedded Systems</b>	3	2 ½ hrs	25	75	100	4

Sr. No.	Modules / Units
<b>1</b>	<b>UNIT 1</b>
	<p><b>Introduction</b> What is an Embedded System, Embedded System Vs, General Computing System.</p> <p><b>The Typical Embedded System</b> Core of Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware.</p> <p><b>Characteristic and quality attributes of Embedded System</b> Characteristics of an Embedded System, Quality Attributes of Embedded System.</p> <p><b>Embedded product development life cycle</b> What is EDLC, Why EDLC? Objectives of EDLC, Different Phases of EDLC.</p>
<b>2</b>	<b>UNIT 2</b>
	<p><b>Hardware Software Co-design and Program Modelling</b> Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Introduction to Unified Modelling Language (UML), Hardware Software Trade-offs.</p> <p><b>Embedded Hardware design and development</b> Analog Electronic Components, Digital Electronic Components, Electronic design Automation (EDA) Tools, The PCB Layout design.</p>

	<p><b>Embedded Firmware design and development</b>          Embedded Firmware Design Approaches, Embedded Firmware Development Languages  <b>Real Time Operating System(RTOS)</b>          Operating System Basics, Types of Operating Systems, Device Drivers, How to choose an RTOS</p>
<b>3</b>	<b>UNIT 3</b>
	<p><b>Memories and Memory Subsystem</b>          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.</p>
<b>4</b>	<b>UNIT 4</b>
	<p><b>Programming Concept and Embedded Programming in C/C++ and Java</b>          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.</p>
<b>5</b>	<b>UNIT 5</b>
	<p><b>Trends in the Embedded Industry</b>          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 .</p>

Reference Books	
Embedded Systems	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Introduction to embedded systems Shibu K. V 2<sup>nd</sup> Edition Tata McGraw-Hill</li> <li>2. Embedded Systems Architecture, Programming and Design Raj Kamal 2nd Edition Tata McGraw-Hill</li> </ol>	

3. Embedded Systems: A Contemporary Design Tool. James K. Peckol 1st Edition  
Wiley Edition

**Practical (1735PITES)**

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.

Course Code:	Course	Hrs. of Instruction/week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1732PITIS	Information Security Management	3	2 ½ hrs	25	75	100	4

Sr. No.	Modules / Units
1	<b>UNIT 1</b>
	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
<b>2</b>	<b>UNIT 2</b>
	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
<b>3</b>	<b>UNIT 3</b>
	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
<b>4</b>	<b>UNIT 4</b>
	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.
<b>5</b>	<b>UNIT 5</b>
	Computer forensics: techniques and tools. Audit Tools: NESSUS and NMAP. Information Security Standards and Compliance: Overview of ISO 17799 Standard. Legal and Ethical issues.

## Reference Books

### Information Security Management

#### Text book:

1. IT Security and Risk Management (Main reference) Slay, J. and Koronios, A., 2006 Wiley
2. Incident Response and Computer Forensics. Chris Prosise and Kevin Mandia, 2003. McGraw-Hill
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) 1st edition Auerbach, 2001

### Practical (1736PITIS)

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.

Course Code	Course	Hrs. of Instruction/Week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1731PITVR	<b>Elective 1 Virtualization</b>	3	2 1/2 Hours	25	75	100	4

Sr. No.	Modules / Units
<b>1</b>	<b>UNIT 1</b>
	<p>OVERVIEW OF VIRTUALIZATION</p> <p>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</p>
<b>2</b>	<b>UNIT 2</b>
	<p>SERVER CONSOLIDATION</p> <p>Hardware Virtualization – Virtual Hardware Overview - Server Virtualization – Physical and Logical Partitioning - Types of Server Virtualization – Business cases for Server Virtualization – Uses of Virtual server Consolidation – Planning for Development –Selecting server Virtualization Platform</p>
<b>3</b>	<b>UNIT 3</b>
	<p>NETWORK VIRTUALIZATION</p> <p>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</p> <p>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.</p>



<b>4</b>	<b>UNIT 4</b>
	<p><b>VIRTUALIZING STORAGE</b></p> <p>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</p>
<b>5</b>	<b>UNIT 5</b>
	<p>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</p>

<b>Reference Books</b>
<b>ELECTIVE 1:- Virtualization</b>
<p><b>Reference books:</b></p> <ol style="list-style-type: none"> <li>1. Mastering_VMware_vSphere_5.5 Sybex Publication</li> <li>2. Configuring Windows Server Virtualization Microsoft Press</li> <li>3. Citrix.XenServer.6.0.Administration.Essential.Guide Feb.2007 Packtpub.</li> <li>4. Blade.Servers.and.Virtualization. Wiley.</li> <li>5. Virtualization:A Beginner’s Guide</li> <li>6. Professional Xen Virtualization William von Hagen January, 2008. Wrox Publications</li> <li>7. Virtualization: From the Desktop to the Enterprise Chris Wolf , Erick M. Halter 2005. APress</li> <li>8. VMware and Microsoft Platform in the Virtual Data Center 2006 Auerbach</li> <li>9. Network virtualization . Kumar Reddy, Victor Moreno July, 2006 Cisco Press</li> </ol>

<b>Practical (1737PITVR)</b>
<ol style="list-style-type: none"> <li>1. Implement vmware ESXi for server virtualization</li> <li>2. Implement XEN for server virtualization</li> <li>3. Implement Hyper-V server virtualization</li> <li>4. Manage vmware ESXi with vCentre server</li> <li>5. Manage xen server Xen center</li> <li>6. Understanding blade server with cisco UCS/HP eva simulator</li> <li>7. Implement vlan concept with L2/L3 switches/nexus virtual switching</li> <li>8. Simulating SAN with navisphere/netapps</li> </ol>

Course Code	Course	Hrs. of Instruction/Week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1731PITNN	<b>Elective 2</b> <b>Artificial Neural Network</b>	<b>3</b>	<b>2 1/2 Hours</b>	<b>25</b>	<b>75</b>	<b>100</b>	<b>4</b>

Sr. No.	Modules / Units
<b>1</b>	<b>UNIT 1</b>
	The Brain Metaphor, Basics of Neuroscience, Artificial Neurons, Neural Networks and Architectures
<b>2</b>	<b>UNIT 2</b>
	Geometry of Binary Threshold Neurons and Their Networks , Supervised Learning I: Perceptrons and LMS, Supervised Learning II: Backpropagation and Beyond
<b>3</b>	<b>UNIT 3</b>
	Neural Networks: A Statistical Pattern Recognition Perspective , Statistical Learning Theory, Support Vector Machines and Radial Basis Function Networks
<b>4</b>	<b>UNIT 4</b>
	Dynamical Systems Review, Attractor Neural Networks, Adaptive Resonance Theory
<b>5</b>	<b>UNIT 5</b>
	Towards the Self-organizing Feature Map, Fuzzy Sets and Fuzzy Systems , Evolutionary Algorithms

Reference Books
ELECTIVE 1:- Artificial Neural Network
<p><b>Reference books:</b></p> <ol style="list-style-type: none"> <li>1. Neural Networks, A Classroom Approach Satish Kumar 2<sup>nd</sup> Edition <b>McGraw Hill</b></li> <li>2. Artificial Neural Networks Robert Schalkoff <b>McGraw Hill</b></li> <li>3. Introduction to Neural Networks using MATLAB S Sivanandam,S Sumathi <b>McGraw Hill</b></li> </ol>

Practical (1737PITNN)
<ol style="list-style-type: none"> <li>1. Show the Functioning of artificial neural network (Implement all hidden layer functions).</li> <li>2. Demonstrate 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]</li> <li>3. Use perceptron learning rule to find final weights of a neural network using fixed input vectors and a fixed target vector.</li> <li>4. Prediction using neural network.</li> <li>5. Implement Radial Basis Function.</li> <li>6. Implement Least Mean Square Algorithm.</li> <li>7. Implement Support Vector Machine Algorithm.</li> <li>8. Create and train a feed forward back propagation network with a supplied Input P and Target T.</li> <li>9. Design a Hopfield network consisting of two neurons with two stable equilibrium points.</li> <li>10. Perform defuzzification using the following methods: <ol style="list-style-type: none"> <li>a) Centroid</li> <li>b) Bisector</li> <li>c) Smallest of Maximum</li> <li>d) Largest of Maximum</li> </ol> </li> </ol> <p>All practicals can be done using R / Matlab</p>

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1731PITIP	<b>Elective 2:</b> <b>Digital Image Processing</b>	3	2 ½ hrs	25	75	100	4

Sr. No.	Modules / Units
1	<b>UNIT 1</b>
	<b>Introduction to image processing</b> , Example of fields that uses image processing, Steps of image processing, Components, Applications, Image sensors and image formats

	<p><b>Visual Preliminaries</b>  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</p>
2	<b>UNIT 2</b>
	<p><b>Intensity transformations</b>  Introduction, Some basic intensity transformation functions, Histogram equalization, local histogram processing, Using histogram statistics for image enhancement,  <b>Spatial filtering</b>  Fundamentals of spatial filtering, Smoothing and Sharpening spatial filters, Combining spatial enhancement methods, Using fuzzy techniques for intensity transformations and spatial filtering</p>
3	<b>UNIT 3</b>
	<p><b>Colour image processing</b>  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  <b>Image Compression</b>  Fundamentals, Some basic methods, Digital image watermarking, Full motion video compression</p>
4	<b>UNIT 4</b>
	<p><b>Morphological Image Processing</b>  Introduction, Erosion and Dilation, Opening and Closing, The Hit-or-Miss transformation, Some basic morphological algorithms, Gray scale morphology  <b>Segmentation</b>  Fundamentals, Point, Line, and Edge detection, Thresholding, Region based segmentation, Segmentation using morphological watersheds, The use of motion in segmentation- Spatial techniques.</p>
5	<b>UNIT 5</b>
	<p><b>Representation and Description</b>  Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Relational Descriptors  <b>Object Recognition</b>  Patterns and pattern classes, Recognition based on decision theoretic methods, Structural methods</p>

## Reference Books

### ELECTIVE 2:- Digital Image Processing

#### Reference books:

1. Digital Image Processing Gonzalez and Woods **3<sup>rd</sup> Edition Pearson Education**
2. Digital Image Processing and Analysis Bhabatosh Chanda, Dwijesh Dutta Majumder **2<sup>nd</sup> Edition PHI**
3. Fundamentals of Digital Image Processing Anil K. Jain **1<sup>st</sup> Edition PHI**

## Practical (1738PITIP)

#### 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. Grey level slicing
  3. Basic Transformation
    - A. Log Transformation
    - B. Power law transformation
    - C. Negation
  4. Different Filters (LPF,HPF, Lapalcian, LOG etc.)  
To generate mask for LOG use the following formula

$$h_g(n_1, n_2) = e^{-(n_1^2 + n_2^2) / (2\sigma^2)}$$

$$h(n_1, n_2) = \frac{(n_1^2 + n_2^2 - 2\sigma^2)h_g(n_1, n_2)}{2\pi\sigma^6 \sum_{n_1} \sum_{n_2} h_g}$$

- A. 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

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1734PITEH	<b>Elective 2: Ethical Hacking</b>	3	2 ½ hrs	25	75	100	4

Sr. No.	Modules / Units
<b>1</b>	<b>UNIT 1</b>
	Introduction to Ethical Hacking, Footprinting and Reconnaissance, Scanning Networks, Enumeration
<b>2</b>	<b>UNIT 2</b>
	System Hacking, Trojans and Backdoors, Viruses and Worms, Sniffing
<b>3</b>	<b>UNIT 3</b>
	Social Engineering, Denial of Service, Session Hijacking, Hacking

	Webservers
<b>4</b>	<b>UNIT 4</b>
	Hacking Web Applications, SQL Injection, Hacking Wireless Networks, Hacking Mobile Platforms
<b>5</b>	<b>UNIT 5</b>
	Evading IDS, Firewalls and Honeypots, Buffer Overflows, Cryptography, Penetration Testing

<b>Reference Books</b>	
<b>Ethical Hacking</b>	
<b>Reference books:</b>	
<ol style="list-style-type: none"> <li>1. Ethical Hacking Review Guide Kimberly Graves <b>Wiley Publishing</b></li> <li>2. Ethical Hacking Ankit Fadia 2<sup>nd</sup> Edition Macmillan India Ltd, 2006</li> <li>3. Insider Computer Fraud Kenneth C.Brancik 2008 Auerbach Publications Taylor &amp; Francis Group</li> </ol>	

<b>Practical (1738PITEH)</b>	
<ol style="list-style-type: none"> <li>1. Using the tools for whois, traceroute, email tracking, google hacking.</li> <li>2. Using the tools for scanning network, IP fragmentation, war dialing countermeasures, SSL Proxy, Censorship circumvention.</li> <li>3. Using NETBIOS Enumeration tool, SNMP Enumeration tool, LINUX/ UNIX. enumeration tools, NTP Enumeration tool, DNS analyzing and enumeration tool.</li> <li>4. Using System Hacking tools.</li> <li>5. Study of backdoors and Trojan tools</li> <li>6. Study of sniffing tools</li> <li>7. Study of Denial of Service attack tools</li> <li>8. Study of Hijacking tools</li> <li>9. Study of webserver attack tools.</li> <li>10. Study of SQL injection and Web server tools</li> <li>11. Study of wireless hacking tools</li> <li>12. Using cryptanalysis tool.</li> <li>13. Study of different security tools.</li> </ol>	

## Evaluation Scheme

### I. Internal Exam-40 Marks

**(i) Test– 30 Marks** - Duration 60 mins

It will be conducted either as a written test or using any open source learning management system such as Moodle (Modular object-oriented dynamic learning environment) Or a test based on an equivalent online course on the contents of the concerned course(subject) offered by or build using MOOC (Massive Open Online Course) platform.

**(ii) 10 Marks** – Presentation and active participation in routine class instructional deliveries

Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.

### II. External Examination- 60 Marks

**(i) Duration** - 2.5 Hours.

**(ii) Theory question paper pattern:-**

All questions are compulsory.		
Question	Based on	Marks
Q.1	Unit I	12
Q.2	Unit II	12
Q.3	Unit III	12
Q.4	Unit IV	12
Q.5	Unit V	12

- All questions shall be compulsory with internal choice within the questions.
- Each Question may be sub-divided into sub questions as a, b, c, d & e, etc & the allocation of Marks depends on the weightage of the topic.

### III. Practical Examination – 50 marks (Duration: 2 Hours)

- Each practical course carries 50 Marks : 40 marks + 05 marks (journal)+ 05 marks(viva)
- Minimum 75% practical from each core/allied course are required to be completed and written in the journal.

**(Certified Journal is compulsory for appearing at the time of Practical Exam)**