



**Janardan Bhagat Shikshan Prasarak Sanstha's  
CHANGU KANA THAKUR  
ARTS, COMMERCE & SCIENCE COLLEGE,  
NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC  
'College with Potential for Excellence' Status Awarded by UGC  
'Best College Award' by University of Mumbai**

**Program: M.Sc**

**Revised Syllabus of M.Sc. Information Technology  
Choice Based Credit & Grading System (60:40)  
w.e.f. Academic Year 2019-2020**

**M.Sc. Part II, Information Technology Syllabus**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
1	Title of Course	Information Technology
2	Eligibility for Admission	<p>a) Semester III</p> <p>A learner shall be allowed to keep term for Semester III notwithstanding that he / she may not have appeared for Semester I and / or Semester II Examination/s or failed in one or more courses at Semester I and / or Semester II.</p> <p>b) Semester IV</p> <p>1. A learner shall be allowed to keep term for Semester IV irrespective of number of courses of failure in Semester III. However learner has to pass each course of Semester I and Semester II in order to appear for Semester IV.</p> <p>2. A learner can appear for Semester IV Examination but the result of Semester IV shall be kept in abeyance until the learner passes each of Semester I, Semester II and Semester III.</p>
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

## **Preamble of the Syllabus:**

- The subject of Information Technology is one of the important application tool which can be applied to different areas in teaching, training and learning which is considered to be important in terms of human resource development, Information Processing and Decision Making which enhances the development of a Nation.
- Information Technology as an application science is studied to be applied for other areas, right from Mathematics to other basic sciences, applied sciences, social sciences and each and every aspect of human life.
- The main aim of the course is to focus on the technological tools and concepts available and how they can be applied to the developmental processes.
- The various concepts include Simulation, Mobile Computing, Networking, Artificial Intelligence, Distributed Computing, Multimedia, Data warehousing, Data mining, Digital Image Processing, Digital Signal Processing, Speech Recognition, Software Architecture and so on.
- Information Technology Experts are very much required right from academic institutions, Research and Development to Industries both Public and Private Sectors. The course has been divided in to four semesters. The programme has a total 16 theory papers, and four in each semester.
- The programme is designed to provide students a focused elaborate training in Information Technology concepts and tools as well as exposing them to the advanced fields. In addition to theoretical knowledge, significant emphasis has been given to provide hands on experience to the students in the frontier areas of Information Technology.
- A multidisciplinary approach has been employed to provide best leverage to students to enable them move into advanced and frontier areas of interdisciplinary research in the future.

## **Objectives of the Course:**

The new syllabus is aimed to achieve the objectives. The syllabus spanning two years covers the industry relevant courses. The students will be ready for the jobs available in different fields like:

- Embedded Systems Programming
- Software Testing
- Networking
- Cloud Management
- Image Processing
- Artificial Intelligence
- Database Analyst
- Virtualization
- IT Service Desk
- Security
- Mobile Computing
- Ethical hacking

## **Course Outcome: By the end of the course, a student should develop the Ability:**

- Learners are able to get the knowledge and ability to develop creative solutions on the basis of technology-oriented syllabus.
- Learners are able to develop skills to learn new technology.

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- Learners are able to apply theory and software development concepts to construct computing-based solutions.
- Learners are able to Design and develop computer programs/computer-based systems in the areas related to algorithms, networking, cloud computing, Artificial Intelligence, Mobile applications, etc.

### **Scheme of Examination**

**A) Internal Assessment: 40 %**

**40 Marks**

<b>Sr. No.</b>	<b>Particular</b>	<b>Marks</b>	
01	One periodical class test / online examination to be conducted in the given semester	20 Marks	
02	One case study/ project with presentation based on curriculum to be assessed by the teacher concerned	15 Marks	
	Presentation		10 Marks
	Written Document		05 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks	

### **Question Paper Pattern for Class Test**

<b>Question No.</b>	<b>Particular</b>	<b>Marks</b>
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) ( 1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

**B) Semester End Examination: 60 %**

**60 Marks**

- Duration: The examination shall be of 2 hours duration.

<b>Theory question paper pattern</b>
1. There shall be five questions each of 12 marks. 2. All questions shall be compulsory with internal options. 3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

#### **➤ Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each

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course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

**Choice Based Credit Grading and Semester System (CBCGS)**

**M. Sc. Information Technology Syllabus**

**To be implemented from the Academic year 2019-2020**

**SEMESTER III**

Course Code	Course Nomenclature	Lectures	Credits	Practical Course	Hours	Credits	Total Credits
PIT3EMS	Embedded Systems	60	4	PIT3ESP	60	2	6
PIT3ISM	Information Security Management	60	4	PIT3ISP	60	2	6
Elective 1		60	4	Elective 1	60	2	6
PIT3VIR	Virtualization			PIT3VIP			
PIT3ANN	Artificial Neural Networks			PIT3ANP			
Elective 2		60	4	Elective 2	60	2	6
PIT3DIP	Digital Image Processing			PIT3DPP			
PIT3ETH	Ethical Hacking			PIT3EHP			
<b>Total</b>							24

**Choice Based Credit Grading and Semester System (CBCGS)**

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**SEMESTER IV**

Course Code	Course Nomenclature	Lectures	Credits	Practical Course	Hours	Credits	Total Credits
PIT4ARI	Artificial Intelligence	60	4				4
PIT4IIM	IT Infrastructure Management	60	4				4
Elective 1		60	4	Elective 1	60	2	6
PIT4INS	Intelligent Systems			PIT4ISP			
PIT4RTE	Real Time Embedded			PIT4RTP			

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	Systems							
PIT4COF	Computer Forensics			PIT4CFP				
Elective 2		60	4	Elective 2	60	2	6	
PIT4DEC	Design of Embedded Control Systems			PIT4DEP				
PIT4AIP	Advanced Image Processing			PIT4APP				
PIT4CLM	Cloud Management			PIT4CMP				
PIT4PRO	Project		2	PIT4PRP		2	4	
<b>Total</b>								24

### Semester III

<b>Course Code</b> PIT3EMS	<b>Embedded system</b>	
<b>Objectives</b> The objective of this course is to have Skills in analysis, organisation and planning in the fields of electronics, information technology and embedded systems. Skills in oral and written communication of analysis, development and evaluation in the field of embedded systems.		
<b>Expected Learning Outcomes:</b>		
<ol style="list-style-type: none"> <li>1) To be able to design, describe, validate and optimize embedded electronic systems in different industrial application areas.</li> <li>2) To be able to define hardware and software communication and control requirements.</li> <li>3) To acquire knowledge of and be able to use tools for the development and debugging of programs implemented on microcontrollers and DSPs.</li> <li>4) To design electronic circuits for the processing of information in communications and control systems.</li> <li>5) To acquire knowledge of sensor properties and apply these in the design of Electronic systems which integrate measurement and actuation in different industrial production contexts.</li> </ol>		
<b>I</b>	<b>Introduction</b> What is an Embedded System, Embedded System Vs, General Computing System. <b>The Typical Embedded System</b> Core of Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware. <b>Characteristic and quality attributes of Embedded System</b> Characteristics of an Embedded System, Quality Attributes of Embedded System. <b>Embedded product development life cycle</b> What is EDLC, Why EDLC? Objectives of EDLC, Different Phases of EDLC.	<b>12</b>
<b>II</b>	<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. <b>Embedded Hardware design and development</b>	<b>12</b>

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	Analog Electronic Components, Digital Electronic Components, Electronic design Automation (EDA) Tools, The PCB Layout design. <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	
<b>III</b>	<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.	<b>12</b>
<b>IV</b>	<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.	<b>12</b>
<b>V</b>	<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.	<b>12</b>

<b>Course Code</b>	<b>Practical List</b>
<b>PIT3ESP</b>	1 (Compulsory) Study of hardware components <ol style="list-style-type: none"> <li>1. 8051 Microcontroller</li> <li>2. Resistors (color code, types)</li> <li>3. Capacitors</li> <li>4. ADC, DAC</li> <li>5. Operational Amplifiers</li> <li>6. Transistors, Diode, Crystal Oscillator</li> <li>7. Types of Relays</li> <li>8. Sensors</li> <li>9. Actuator</li> <li>10. Types of connectors</li> </ol> 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

**Reference Books:**

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- 1) Introduction to embedded systems, Shibu K. V, 2nd Edition, Tata McGraw-Hill
- 2) Embedded Systems Architecture, Programming and Design, Raj Kamal, 2nd Edition, Tata McGraw-Hill.
- 3) Embedded Systems: A Contemporary Design Tool, James K. Peckol, 1<sup>st</sup> edition.

<b>Course Code</b> PIT3ISM	<b>Information Security Management</b>	
<p><b>Objectives:</b> Information Security Management is the study of identification of an organization's assets (including people, buildings, machines, systems and information assets), followed by the development, documentation, and implementation of policies and procedures for protecting these assets.</p> <p><b>Expected Learning Outcomes</b></p> <ol style="list-style-type: none"> <li>1) Risk management will make the students able to identify potential problems before they occur so that risk-handling activities may be planned and invoked as needed across the life of the product or project to mitigate adverse impacts on achieving objectives.</li> <li>2) Students will be able to provide a basic level of security, independent of external requirements so that they can maintain the uninterrupted operation of the IT organisation.</li> <li>3) It will make learners aware of key management which is the process of administering or managing cryptographic keys for a cryptosystem.</li> <li>4) It will make learners aware of the risks or threats to the success of the plan and test the controls in place to determine whether or not those risks are acceptable.</li> <li>5) Students will know the basic process of identifying, preserving, analyzing and presenting the digital evidence in such a manner that the evidences are legally acceptable</li> </ol>		
<b>I</b>	<b>Security Risk Assessment and Management:</b> 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>12</b>
<b>II</b>	<b>Security Management of IT Systems:</b> 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>12</b>
<b>III</b>	<b>Key Management in Organizations:</b> 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>12</b>
<b>IV</b>	<b>Auditing and Business continuity Planning:</b> 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>12</b>
<b>V</b>	<b>Computer forensics:</b> techniques and tools. Audit Tools: NESSUS and NMAP. Information Security Standards and Compliance: Overview of ISO 17799 Standard. Legal and Ethical issues.	<b>12</b>



<b>Course Code</b>	<b>Practical List</b>
PIT3ISP	<ol style="list-style-type: none"><li>1. Working with Sniffers for monitoring network communication (Ethereal)</li><li>2. Using open SSL for web server - browser communication</li><li>3. Using GNU PGP</li><li>4. Performance evaluation of various cryptographic algorithms</li><li>5. Using IP TABLES on Linux and setting the filtering rules</li><li>6. Configuring S/MIME for e-mail communication</li><li>7. Understanding the buffer overflow and format string attacks</li><li>8. Using NMAP for ports monitoring</li><li>9. Implementation of proxy based security protocols in C or C++ with features like confidentiality, integrity and authentication</li><li>10. Socket programming</li><li>11. Exposure to Client Server concept using TCP/IP, blowfish, Pretty Good Privacy.</li></ol>

**Reference Books:**

- 1) IT Security and Risk Management(Main reference) ,Slay, J. and Koronios, A.,Wiley
- 2) Incident Response and Computer forensics., Chris Prosis and Kevin Mandia, McGraw-Hill
  
- 3) Information Systems Security-Security Management, Metrics, Frameworks and Best Practices, Nina Godbole Wiley
- 4) Information Security Policies, Procedures, and Standards: Guidelines for Effective Information Security Management (Paperback) 1st edition Auerbach, 2001.

<b>Course Code</b> PIT3VIR	<b>Virtualization</b>	
<p><b>Objectives:</b> Objective of this course is to make learner aware of digital dominance, businesses and individuals are now shifting their focus on working virtually instead of physically and Keeping up with the trends in virtualization</p> <p><b>Expected Learning Outcomes:</b></p> <ol style="list-style-type: none"> <li>1. Learners should be able to understand Use virtual machines of public cloud platform.</li> <li>2. Learners should be able to understand Virtual machines and Implementation of virtual machines.</li> <li>3. Learners should be able to understand virtualization and various ways of using virtualization.</li> <li>4. Learners should be able to understand Implementation of private cloud platform using virtualization.</li> <li>5. Learners should be able to understand Blade servers.</li> </ol>		
<b>I</b>	<p><b>OVERVIEW OF VIRTUALIZATION</b> Basics of Virtualization - Virtualization Types – Desktop Virtualization – NetworkVirtualization – 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>12</b>
<b>II</b>	<p><b>SERVER CONSOLIDATION</b> Hardware Virtualization – Virtual Hardware Overview - Sever Virtualization – Physicaland Logical Partitioning - Types of Server Virtualization – Business cases for SeverVirtualization – Uses of Virtual server Consolidation – Planning for Development-Selecting server Virtualization Platform</p>	<b>12</b>
<b>III</b>	<p><b>NETWORK VIRTUALIZATION</b> 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</p>	<b>12</b>
<b>IV</b>	<p><b>VIRTUALIZING STORAGE</b> SCSI- Speaking SCSI- Using SCSI buses – Fiber Channel – Fiber Channel Cables –Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI – SAN backupand 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 – PerformingBackups – Virtual tape libraries.</p>	<b>12</b>
<b>V</b>	<p><b>Blades and Virtualization</b> — 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>12</b>

Course Code	Practical List
PIT3VIP	<ol style="list-style-type: none"> <li>1. Implement vmwareESXi for server virtualization</li> <li>2. Implement XEN for server virtualization</li> <li>3. Implement Hyper-V server virtualization</li> <li>4. Manage vmwareESXi 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>

**Reference Books:**

- 1) Mastering\_VMware\_vSphere\_5.5, Sybex Publication.
- 2) Configuring Windows Server Virtualization, Microsoft Press.
- 3) Citrix.XenServer.6.0.Administration.Essential.Guide, Feb.2007, Packtpub.
- 4) Blade.Servers.and.Virtualization, Wiley.
- 5) Virtualization: A Beginner's Guide.
- 6) Professional Xen Virtualization, William von Hagen, January, 2008, Wrox publication.
- 7) Virtualization: From the Desktop to the Enterprise, Chris Wolf , Erick M.halter, 2005. APress.
- 8) VMware and Microsoft Platform in the Virtual Data center, 2006,Auerbach.
- 9) Network virtualization, Kumar reddyvictor Moreno, July, 2006,Cisco press

Course Code PIT3ETH	Ethical Hacking
<p><b>Objectives</b> The main objective and aim of this study is to let students know about what is ethical hacking and how they can take advantage of it to prevent from fraud regarding their hacking situations.</p> <p><b>Expected Learning Outcomes:</b></p> <ol style="list-style-type: none"> <li>1) It prepares students to handle information security with more simplicity.</li> <li>2) It provides knowledge in advanced Hacking concepts – hacking Mobile devices &amp; smart phones, writing Virus codes, Corporate Espionage, exploit writing &amp; Reverse Engineering.</li> <li>3) It evaluates the security of and identifies the vulnerabilities in systems, networks or system infrastructure.</li> </ol>	

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

<b>Course Code</b>	<b>Practical List</b>
PIT3EHP	<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>

**Reference Books:**

- 1) Ethical Hacking Review Guide, Kimberly Graves, Wiley Publishing
- 2) Ethical Hacking, Ankit Fadia, 2nd Edition, Macmillan India Ltd, 2006
- 3) Insider Computer Fraud, Kenneth C.Brancik, 2008, Auerbach Publications Taylor & Francis Group

## Semester IV

Course Code PIT4ARI	Artificial Intelligence	
<p><b>Objectives:</b> The basic objective of AI is to enable computers to perform intellectual tasks such as decision making, problem solving, perception, understanding human communication.</p> <p><b>Expected Learning Outcomes:</b></p> <ol style="list-style-type: none"> <li>1) Students will able to Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.</li> <li>2) Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.</li> <li>3) Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing.</li> <li>4) Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.</li> <li>5) Formulate and solve problems with uncertain information using Bayesian approaches.</li> </ol>		
<b>I</b>	<p><b>Introduction:</b> AI, Components of AI, History of AI, Salient Points, Knowledge and Knowledge Based Systems, AI in Future, Applications.</p> <p><b>Logic and Computation:</b> Classical Concepts, Computational Logic, FOL, Symbol Tableau, Resolution, Unification, Predicate Calculus in Problem Solving, Model Logic, Temporal Logic.</p> <p><b>Heuristic Search:</b> Search-Based Problems, Informed Search, Water Jug Problem, TSP, Branch and Bound Method, TSP Algorithm.</p>	12
<b>II</b>	<p><b>Game Playing:</b> AND/OR Graph, Minimax Problem, Alpha-Beta Search, Puzzle Solving, AI versus Control Robot.</p> <p><b>Knowledge Representation:</b> Structure of an RBS, Merit, Demerit and Applicability of RBS, Semantic Nets, Frames, Conceptual Graphs, Conceptual Dependency, Scripts.</p> <p><b>Automated Reasoning:</b> 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.</p>	12
<b>III</b>	<p><b>Probabilistic Reasoning:</b> Bayes Theorem, Bayesian Network, Dempster and Shafer Theory of Evidence, Confidence Factor, Probabilistic Logic.</p> <p><b>Knowledge Acquisition:</b> Knowledge Acquisition process, Automatic Knowledge Acquisition, Machine Learning, Induction, Analogical Reasoning, Explanation-Based Learning, Inductive Learning, Knowledge Acquisition Tools.</p>	12
<b>IV</b>	<p><b>Planning:</b> Necessity of planning, Planning Agents, Planning generating schemes, Non-hierarchical planning, Hierarchical planning, Script-based planning, Opportunistic planning, Algorithm for planning, planning representation with STRIPS an example.</p> <p><b>Constraint Satisfaction Problem:</b> Constraints and Satisfiability, Basic search strategies for solving CSP, Representation of CSP problem, Examples of constraint satisfaction problem.</p>	12
<b>V</b>	<p><b>Knowledge-Based Systems:</b> 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.</p> <p><b>Prolog:</b> Prolog programming features, Syntax, Syntax of Rules, LIST, Structure, Some Solutions using TURBO PROLOG.</p>	12

**Reference Books:**

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

<p><b>Course Code</b> PIT4IIM</p>	<p><b>IT Infrastructure Management</b></p>	
<p><b>Objectives</b> To make the students aware about core management of essential operation components, such as policies, processes, equipment, data, human resources, and external contacts, for overall effectiveness.</p> <p><b>Expected Learning Outcomes:</b></p> <ol style="list-style-type: none"> <li>1) Students will gain knowledge on development of service concepts in preparation for the selection of services to be provided.</li> <li>2) Students will be able to design profitable services that provides high level of quality to satisfy the business needs.</li> <li>3) Students will be able to identify any potential risk and provide measures to overcome its impact on other services and business.</li> <li>4) Students will become familiar with IT service operations used to ensure that the required IT services are delivered efficiently and effectively as per the service level agreements to the business users and customers.</li> <li>5) Students will learn about continuously improving the service quality after the service the service have been put into operation.</li> </ol>		
<p><b>I</b></p>	<p><b>Introduction:</b> 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.</p> <p><b>The Service Lifecycle:</b> Mapping the Concepts of ITIL to the Service Lifecycle, How does the Service Lifecycle work?</p> <p><b>Service Strategy:</b> 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</p>	<p><b>12</b></p>
<p><b>II</b></p>	<p><b>Service Design:</b> 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</p>	<p><b>12</b></p>

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	Considerations, Service Catalogue Management Considerations, ITSCM Considerations, Supplier Management Considerations	
<b>III</b>	<b>Service Transition:</b> 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	<b>12</b>
<b>IV</b>	<b>Service Operation:</b> 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	<b>12</b>
<b>V</b>	<b>Continual Service Improvement:</b> 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	<b>12</b>

**Reference Books:**

1. ITIL V3 Foundation Complete Certification Kit
2. Foundations of IT Service Management - The Unofficial ITIL® v3 Foundations Course Brady Orand ,2nd Edition
3. ITILv3 Foundation Exam, The Study Guide , Arjen de Jong Axel Kolthof ,Mike Pieper Ruby Tjassing Annelies van der Veen Tienneke Verheijen Van Harren.

<b>Course Code</b> PIT4COF	<b>Computer Forensics</b>
<p><b>Objectives</b> The main objective of studying computer forensics is to train students about the science of cyber security, digital and computer forensics and other advanced technologies and tools.</p> <p><b>Expected Learning Outcomes:</b></p> <ol style="list-style-type: none"> <li>1) Interpret and appropriately apply the laws and procedures associated with identifying, acquiring, examining and presenting digital evidence.</li> <li>2) Create a method for gathering, assessing and applying new and existing legislation and industry trends specific to the practice of digital forensics.</li> <li>3) Adhere to the ethical standards of the profession and apply those standards to all aspects of the study and practice of digital forensics.</li> <li>4) Using the scientific process, apply the principles of effective digital forensics investigation techniques.</li> <li>5) Identify the culture of white-collar crime and the methods used by white-collar criminals and employ this knowledge to guide economic crime investigations.</li> </ol>	
<b>I</b>	Computer Forensics and Investigation Processes, Understanding Computing Investigations, The Investigator's Office and Laboratory, Data Acquisitions. <b>12</b>

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<b>II</b>	Processing Crime and Incident Scenes, Working with Windows and DOS Systems, Current Computer Forensics Tools.	<b>12</b>
<b>III</b>	Macintosh and Linux Boot Processes and File Systems, Computer Forensics Analysis, Recovering Graphics Files.	<b>12</b>
<b>IV</b>	Virtual Machines, Network Forensics, and Live Acquisitions, E-mail Investigations, Cell Phone and Mobile Device Forensics	<b>12</b>
<b>V</b>	Report Writing for High-Tech Investigations, Expert Testimony in High-Tech Investigations, Ethics and High-Tech Investigations.	<b>12</b>

<b>Course Code</b>	<b>Practical List</b>
PIT4CFP	<ol style="list-style-type: none"> <li>1. File System Analysis using The Sleuth Kit</li> <li>2. Using Windows forensics tools</li> <li>3. Using Data acquisition tools</li> <li>4. Using file recovery tools</li> <li>5. Using Forensic Toolkit (FTK)</li> <li>6. Forensic Investigation using EnCase</li> <li>7. Using Steganography tools</li> <li>8. Using Password Cracking tools</li> <li>9. Using Log Capturing and Analysis tools</li> <li>10. Using Traffic capturing and Analysis tools</li> <li>11. Using Wireless forensics tools</li> <li>12. Using Web attack detection tools</li> <li>13. Using Email forensics tools</li> <li>14. Using Mobile Forensics software tools</li> <li>15. Writing report using FTK</li> </ol>

**Reference Books:**

- 1) Guide to Computer Forensics and Investigations, Bell Nelson, Amelia Phillips, Christopher Stuart, 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

<b>Course Code</b>	<b>Cloud Management</b>
PIT4CLM	<p><b>Objectives:</b> To make the learners familiar with the software and technologies designed for operating and monitoring applications, data and services residing in the cloud. Cloud management tools help ensure cloud computing-based resources are working optimally and properly interacting with users and other service.</p> <p><b>Expected Learning Outcomes:</b></p> <ol style="list-style-type: none"> <li>1) Learners should be able to understand virtualized data centers.</li> <li>2) Learners should be able to understand storage network designs.</li> <li>3) Learners should be able to understand system center 2012.</li> <li>4) Learners should be able to understand different components of system center 2012.</li> <li>5) Learners should be able to understand different cloud management platforms.</li> </ol>



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<b>I</b>	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.	<b>12</b>
<b>II</b>	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 architecture.	<b>12</b>
<b>III</b>	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.	<b>12</b>
<b>IV</b>	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.	<b>12</b>
<b>V</b>	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.	<b>12</b>

<b>Course Code</b>	<b>Practical List</b>
PIT4CMP	<ol style="list-style-type: none"> <li>1) Managing Hyper –V environment with SCVVM 2012</li> <li>2) Provisioning Self-service with AppController</li> <li>3) Managing Private Cloud with AppController</li> <li>4) Using Data Protection Manager for Backup and Recovery</li> <li>5) Using Operations Manager for real-time monitoring</li> <li>6) Using Advisor for proactive monitoring</li> <li>7) Using Service Manager to standardize</li> <li>8) Using Orchestrator for automation</li> <li>9) Implementing Windows Azure Pack</li> <li>10) Using Configuration Manager 2012 for managing and maintaining</li> </ol>

**Reference Books:**

- 1) Introducing Microsoft System Center 2012, Technical Overview, Mitch Tulloch, Symon Perriman, Microsoft.
- 2) Microsoft System Center 2012 Unleashed Chris Amaris, Rand Morimoto, Pete Handley, David E. Ross, Technical Edit by Yardeni, Pearson Education.

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- 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, James Long.

<b>Course Code</b> PIT4PRO	<b>Project</b>
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