Mahatma Education Society's

Pillai College of Arts, Commerce & Science (Autonomous)

Affiliated to University of Mumbai
New Panvel

Syllabus for M. Sc. IT Part II Semester IV Program: M. Sc. Information Technology

(Semester based Credit and Grading system for the academic year 2019-20)

Semester IV

Course Code	Course Type	Course Title	Theory/ Practical	Marks	Credits	Lectures /Week
PMSIT401	Core	Artificial Intelligence	Theory	100	4	4
PMSIT402	Core	IT Infrastructure Management	Theory	100	4	4
PMSIT403		Elective I (Select Any One)		100	4	4
	Elective	Intelligent Systems	Theory			4
	Elective	Real Time Embedded Systems	Theory			4
	Elective	Computer Forensics	Theory			
PMSIT404		Elective II (Select Any one)		100	4	
	Elective	Design of Embedded Control Systems	Theory			4
	Elective	Advanced Image Processing	Theory			4
	Elective	Cloud Management	Theory			
PMSIT403P	Elective	Elective I(Select Any one)	Practical	50	2	4
PMSIT404	Elective	Elective II (Select Any one)	Practical	50	2	4
PMSIT405	Core	Internship	Practical	100	4	4
Total				600	24	

BOS	Information Technology
Class	M.Sc.I.T.
Semester	IV
Subject Name	Artificial Intelligence
Subject Code	PMSIT401
Level of the Subject	Advance

Objectives
1. Understand what is Probabilistic Reasoning
2. Learn what is Knowledge-Based Systems used in Artificial Intelligence

Unit No.	Topic Name	Topic No	Details	No. of Lectures
1	Introduction:	1.1	Introduction: AI, Components of AI, History of AI, Salient Points, Knowledge and Knowledge Based Systems, AI in Future, Applications.	15L
		1.2	Logic and Computation: Classical Concepts, Computational Logic, FOL, Symbol Tableau, Resolution,	
		1.3	Unification, Predicate Calculus in Problem Solving, Model Logic, Temporal Logic.	
		1.4	Heuristic Search: Search-Based Problems, Informed Search, Water Jug Problem, TSP, Branch and Bound Method, TSP Algorithm.	
2	Game Playing	1.1	Game Playing: AND/OR Graph, Minimax Problem, Alpha-Beta Search, Puzzle Solving, AI versus Control Robot.	15L
		1.2	Knowledge Representation: Structure of an RBS, Merit, Demerit and Applicability of RBS, Semantic Nets, Frames, Conceptual Graphs, Conceptual Dependency, Scripts.	
		1.3	Automated Reasoning: Default Logic, Problem for Default Reasoning, Closed World	

			Assumption, Predicate Completion, Circumscription	
		1.4	Default Reasoning, Model Based Reasoning, Case Based Reasoning, Reasoning Models, Multimodels, Multimodal Reasoning.	
3	Probabilistic Reasoning:	1.1	Probabilistic Reasoning: Bayes Theorem, Bayesian Network, Dempster and Shafer Theory of Evidence, Confidence Factor, Probabilistic Logic	15L
		1.2	Knowledge Acquisition: Knowledge Acquisition process, Automatic Knowledge Acquisition,	
		1.3	Machine Learning, Induction, Analogical Reasoning	
		1.4	Explanation-Based Learning, Inductive Learning, Knowledge Acquisition Tools.	
4	Planning	1.1	Planning: Necessity of planning, Planning Agents, Planning generating schemes, Non-hierarchical planning, Hierarchical planning, Script-based planning, Oppurtunistic planning, Algorithm for planning	15L
		1.2	Planning representation with STRIPS an example Constraint Satisfaction Problem: Constraints and Satisfiabillity, Basic search strategies for solving CSP, Representation of CSP problem, Examples of constraint satisfaction problem.	
		1.3	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	
		1.4	Prolog: Prolog programming features, Syntax, Syntax of Rules, LIST, Structure, Some Solutions using TURBO PROLOG.	
			Total No. Of Lectures	**60**

Expected Outcome

1. Learner understood various methods used to implement security of information
2. Understood ITIL Security Management policies

Reference Books
1. Artificial Intelligence, R. B. Mishra, EEE, PHI
2. Artificial Intelligence, Anandita Das Bhattacharjee, SPD
3. Artificial Intelligence,E.Rich and K.Knight, 2002, TMH
4. Artificial Intelligence: A Modern Approach, S.Russel, P.Norvig, 2002, Pearson Education

BOS	Information Technology
Class	M.Sc.I.T.
Semester	IV
Subject Name	IT Infrastructure Management
Subject Code	PMSIT402
Level of the Subject	Advance

Objectives:

1. Identify the critical infrastructure choices necessary for sustainable community
2. Develop an understanding of how current municipal decision-making may lead away from the achievement of sustainability objectives

Unit No.	Topic Name	Topic No	Details	No. of Lectures
1	Introduction	1.1	The four perspectives (attributes) of IT service management, benefits of IT service management, business and IT alignment, Concept of a Service, What is ITIL?, What are services?, Service Management as a practice, The concept of Good Practice	15 L
		1.2	Concept of Service Management, Functions and Processes, The process model and the characteristics of processes.	
		1.3	The Service Lifecycle: Mapping the Concepts of ITIL to the Service Lifecycle, How does the Service Lifecycle work?	
		1.4	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	

2	Service Design:	1.1	Objectives, Major Concepts, Five Major Aspects of Service Design, Service Design Packages, Service Design Processes, Service	15 L
		1.2	Service Level Management, Supplier Management, Service Catalogue Management, Capacity Management, Availability Management, IT Service Continuity Management,	
		1.3	Information Security Management, Service Design Scenario, Service Level Management Considerations, Capacity Management Considerations, Availability Management Considerations, Information Security Management Considerations,	
		1.4	Catalogue Management Considerations, ITSCM Considerations, Supplier Management Considerations	
3	Service Transition	1.1	Objectives, Service Transition Processes, Knowledge Management, Service Asset and Configuration Management	15L
		1.2	Change Management, Release and Deployment Management, Service Validation and Testing, Service Transition Summary, Service Transition Scenario,	
		1.3	Knowledge Management Considerations, Service Asset and Configuration Management Considerations, Change Management Considerations,	
		1.4	Release and Deployment Management Considerations, Service Validation and Testing Considerations	
4	Service Operation:	1.1	Objectives, Major Concepts, Service Operation Functions, The Service Desk, Technical Management	**15**
		1.2	IT Operations Management,Application Management, Service Operation Processes, Event Management, Incident Management	
		1.3	Problem Management, Request Fulfillment, Access Management, Service Operation Summary, Service Operation Scenario, Functions, Processes	

		1.4	Continual Service Improvement: Objectives, Major Concepts Continual Service Improvement Processes, Service Level Management, Service Measurement and Reporting	
			Total No. Of Lectures	**60**

Expected Outcome :

1. A dynamically interactive website designed to increase literacy on public infrastructure
2. Beta-testing of an on-line dynamic case study tool developed by the Canada Research Chair in Sustainable Community Development;

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

BOS	Information Technology
Class	M.Sc. I.T.
Semester	IV
Subject Name	Intelligent Systems
Subject Code	PMSIT403a
Level of the Subject	Advance

Objectives:

1. Learner will understand the principal achievements and shortcomings of AI
2. The difficulty of distinguishing AI from advanced computer science in general

Unit No.	Topic Name	Topic No	Details	No. of Lectures
1	Intelligent Agents:	1.1	Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, Structure of Agents	**15L**
		1.2	Problem Solving by searching: Problem-Solving Agents Example Problems, Searching for Solutions, Uninformed Search Strategies	
		1.3	Informed Search and exploration : Informed (Heuristic) Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces	
		1.4	Searching with Nondeterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environments	
2	Games	1.1	Games: Optimal Decisions in Games, Alpha-Beta Pruning, Imperfect Real-Time Decisions, Stochastic Games, Partially Observable Games, State-of-the-Art Game Programs	**15L**
		1.2	Constraint Satisfaction, Constraint Propagation : Inference m CSPs, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems	

		1.3	Logical Agents: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic	
		1.4	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	
3	Planning, Uncertain Knowledge and Reasoning	1.1	Planning : Classical Planning, Algorithms for Planning as State- Space Search, Planning Graphs, Other Classical Planning Approaches, Hierarchical Planning, Planning and Acting m Nondeterministic Domains, Multiagent Planning	15L
		1.2	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,	
		1.3	Probabilistic Reasoning : Representing Knowledge m an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Exact Inference m Bayesian Networks, Approximate Inference m Bayesian Networks, Relational and First-Order Probability Models, Approaches to Uncertain Reasoning,	
		1.4	Probabilistic reasoning over time: Inference in Temporal Models, Hidden Markov Models, Kalman Filters, Dynamic Bayesian Networks, Keeping Track of Many Objects	
4	Simple Decision Making, Complex Decision Making	1.1	Simple Decision Making: Combining Beliefs and Desires under Uncertainty, The Basis of Utility Theory, Utility functions, Multiattribute Utility Functions, Decision Networks,	15L
		1.2	Complex Decision Making : Sequential Decision Problems, Value Iteration, Policy Iteration, Partially Observable MDPs,	

		Decisions with Multiple Agents: Game Theory	
	1.3	Knowledge in Learning : Review of Forms and types of Learning, Logical Formulation of Learning, Knowledge m Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming,	
	1.4	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 m Reinforcement Learning, Applications of Reinforcement Learning	
		Total No. of Lectures	**60**

Expected Outcome:

1. Having successfully completed this module, you will be able to demonstrate knowledge and understanding of:The principal achievements and shortcomings of AI
2. The difficulty of distinguishing AI from advanced computer science in general

Reference Books:

1. Artificial Intelligence : A Modem Approach, Staurt Russell, Peter Norvig, 3rd Edition, Pearson Education
2. Artificial Intelligence: Structures and Strategies for Complex Problem, George F.Luger, Pearson Education
3. Artificial Intelligence, Patrick Winston
4. Intelligent Decision Making in Quality Management: Theory and Applications (Intelligent Systems Reference Library) Hardcover – Import, 12 Nov 2015 by Cengiz Kahraman (Editor), Seda Yanik (Editor)
5. Performance Evaluation and Benchmarking of Intelligent Systems (English, Paperback, unknown

BOS	Information Technology
Class	M.Sc. I.T.
Semester	IV
Subject Name	Intelligent Systems
Subject Code	PMSIT403aP
Level of the Subject	Advance

Practical No.	Details
1.	Write a program using C/C++/Java for implementing the Depth First Search Algorithm . And also write the algorithm for the same.
2.	Write a program using C/C++/Java for implementing the Breadth First Search Algorithm .
3.	Apply domain specific heuristic to generate possible solution for the AI problems using. Greedy Best First Search.
4.	Implement the mechanism A* algorithm.
5.	Implement Recursive Breadth First Search.
6.	Generate succession nodes and check possibility of finding solutions of the specified problems using : a. Steepest Ascent Hill Climbing b. Simulated Annealing
7.	Optimize the search strategy for the suggested problems using : a. Mini-max algorithm . b. 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.

BOS	Information Technology
Class	M.Sc.I.T.
Semester	IV
Subject Name	Real Time Embedded
Subject Code	PMSIT403b
Level of the Subject	Advance

Objectives :

1. To learn fundamentals of operating system.
2. To study implementation aspects of real time concepts.

Unit No.	Topic Name	Topic No	Content	No. of Lectures
1	Introduction-	1.1	Introduction- What is Real Time System, Application of real time system, A Basic Model of Real time system, Characteristics of Real Time System,	15L
		1.2	Safety and Reliability, Types of Real Time Task, Timing Constraints, Modeling Timing Constraints.	
		1.3	Embedded Operating Systems Fundamental Components, Example: Simple Little Operating System Caches	
		1.4	The Memory Hierarchy and Cache Memory, Cache Architecture, Cache Policy	
2	Exception and Interrupt Handling	1.1	Exception Handling, Interrupts, Interrupt Handling Schemes	15L
		1.2	Firmware and Bootloader, Example: Sandstone	
		1.3	Moving from an MPU to an MMU, How Virtual Memory Works, Details of the ARM MMU, Page Tables, The Translation Look aside Buffer,	

		1.4	Domains and Memory Access Permission, The Caches and Write Buffer	
3	Real Time Task Scheduling	1.1	Types of real time task and their characteristics, Task Scheduling, Clock driven scheduling,	15L
		1.2	Hybrid Schedulers, Event Driven Scheduling, Earliest Deadline first scheduling, Rate Monotic Algorithm.	
		1.3	Handling Resource Sharing and Dependencies Resource sharing among real time task, Priority Inversion, Prioroty inheritance protocol,	
		1.4	Highest locker protocol,prioroty ceiling protocol,Different types of priority inversion Under PCP,Important features of PCP, Resource sharing Protocol, Handling Task Dependencies.	
4	Real Time Communication	1.1	Basic Concept, Real Time Communication in Lan, Soft/Hard Real Time communication in a Lan, Bounded Access Protocol for Lans,	15L
		1.2	Performance comparison, Real time communication over Packet Switched networks, QoS framework, Routing,Resource reservation, Rate Control, QoS Model-Integrated services and Differentiated Services.	
		1.3	Concept and Example of real time databases, Real time databases application design issues, Characteristics of temporal data,	
		1.4	Concurrency control in real-time databases. Case study on commercial real time databases.	
		Total No. of Lectures		**60**

Expected Outcome :

1. Learner understood fundamentals of operating system.
2. Learner understood an implementation aspects of real time concepts.

Reference Books:

1. Real-Time Systems: Theory and Practice., Rajib Mall, 1ˢᵗ edition , Pearson Publication
2. ARM system developer's guide: designing and optimizing system. software/Andrew N. Sloss, Dominic Symes, Chris Wright, Elsevier Publication 1ˢᵗ edition
3. David Simon, "An Embedded software premier", Pearson education, 2007.
4. Hermann Kopetz, "Real–Time systems – Design Principles for distributed Embedded Applications", Second Edition, Springer 2011.
5. Micro C OS II reference manual. 4. VX works Programmers manual.

BOS	Information Technology
Class	M.Sc.I.T.
Semester	IV
Subject Name	Real Time Embedded Practical
Subject Code	PMSIT403bP
Level of the Subject	Advance

Practical No.	Details
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.	Using Client Socket & Server Socket (UDP/TCP) maintain data received from client node.
11	Small demonstration of Kernel Level & User Level Communications

BOS	Information Technology
Class	M.Sc.I.T.
Semester	IV
Subject Name	Computer Forensic
Subject Code	PMSIT403c
Level of the Subject	Advance

Objectives:

1. Understanding computer forensics
2. Understanding partitioning

Unit No.	Topic Name	Topic No	Details	No. of Lectures
1	Computer Forensics and Investigation	1.1	Computer Forensics and Investigation Processes,	15L
		1.2	Understanding Computing Investigations,	
		1.3	The Investigator's Office and Laboratory,	
		1.4	Data Acquisitions.	
2	Processing	1.1	Processing Crime and Incident Scenes	15L
		1.2	Working with Windows and DOS Systems,	
		1.3	Working with DOS Systems,	
		1.4	Current Computer Forensics Tools.	
3	Macintosh and Linux	1.1	Macintosh and Linux Boot Processes	15L
		1.2	Macintosh and Linux File Systems,	
		1.3	Computer Forensics Analysis,.	
		1.4	Recovering Graphics Files	

4	Virtual Machines	1.1	Virtual Machines	15L
		1.2	Network Forensics, and Live Acquisitions,	
		1.3	E- mail Investigations, Cell Phone and Mobile Device Forensics	
		1.4	Report Writing for High-Tech Investigations,	
			Total No.of Lectures	**60**

Expected Outcome :

1. Learner Understood computer forensics concepts
2. Learner Understood partitioning concept , i-Tech investigation

References Books :

1. Guide to Computer Forensics and Investigations, Bell Nelson, Amelia Phillips, 4th edition , Cengage Leaming
2. Computer Forensics A Pocket Guide, Nathan Clarke, LT G.vemance Publishing
3. Computer Forensics : Computer Crime Scene Investigation, John R. Vacca 2nd edition , Charles River Media
4. The Basics of digital Forensics by Sammons John
5. Building a digital forensic digital Laboratory Andrew Jones and Craig Valli

BOS	Information Technology
Class	M.Sc.I.T.
Semester	IV
Subject Name	Computer Forensic Practical
Subject Code	PMSIT403c
Level of the Subject	Advance

Practical No.	Details
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
11	Using Wireless forensics tools
12	Using Web attack detection tools

BOS	Information Technology
Class	M.Sc.I.T.
Semester	IV
Subject Name	Design of Embedded Control Systems
Subject Code	PMSIT404a
Level of the Subject	Advance

Objectives:

1. The ability to analyse, design, test and maintain complex embedded systems.
2. The ability to describe, validate and optimize embedded electronic systems in different areas of industrial application.

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Unit No.	Topic Name	Topic No	Details	No. of Lectures
1	Introduction to microcontrollers	1.1	Introduction to microcontrollers Microprocessors and microcontrollers, History, Embedded vs external memory devices,	15L
		1.2	8-bit and 16-bit microcontrollers, RISC and CISC processors, Harvard and Von Neumann architectures	
		1.3	Commercial microcontroller devices. Industrial applications .	
		1.4	Design with Atmel microcontrollers Architecture overview of Atmel 89C51, Pin description of 89C51, Using flash memory devices Atmel 89CXX, Power saving options.	
2	PIC Microcontrollers	1.1	PIC Microcontrollers Overview, PIC16C6X/7X, Reset actions, Oscillators, Memory organization,	15L

		1.2	PIC16C6X/7X instructions, Addressing modes, I/O ports, Interrupts PIC16C61/71,	
		1.3	PIC16C61/71 timers, PIC16C 71 ADC, PIC16F8XX Flash microcontrollers	
		1.4	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	
3	The RISC Design Philosophy	1.1	Timers, More about PIC microcontrollers Introduction, Capture/compare/PWM modules in PIC16F877	15L
		1.2	Master synchronous serial port (MSSP) module, USART, ADC	
		1.3	ARM Embedded Systems, The RISC Design Philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software,	
		1.4	ARM Processor Fundamentals Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions, Architecture Revisions, ARM Processor Families	
4	Introduction to the ARM Instruction Set	1.1	Introduction to the ARM Instruction Set Data Processing Instructions, Branch Instructions, Load-Store Instructions, Software Interrupt Instruction	15L
		1.2	Program Status Register Instructions, Loading Constants, ARMv5E Extensions, Conditional Execution	
		1.3	Introduction to the Thumb Instruction Set. Thumb Register Usage, ARM-Thumb Interworking, Other Branch Instructions, Data Processing Instructions,	
		1.4	Single Register Load-Store Instructions, Multiple-Register Load-Store Instructions, Stack Instructions, Software Interrupt Instruction. Writing and Optimizing ARM Assembly Code	

Total No. of Lectures	**60**

Expected Outcome:

1. The learner understood how to analyse, design, test and maintain complex embedded systems.
2. The learner understood to describe, validate and
   optimize embedded electronic systems in different areas of industrial application.

Reference Books :

1. Microcontrollers theory and applications, Ajay Deshmukh, 1st edition, Tata McGraw-Hill ARM system developer's guide: designing and optimizing system. Andrew N. Sloss, Dominic Symes, Chris Wright, 1st edition , Elsevier Publication
2. The 8051 microcontroller and embedded systems Paperback – 1 Nov 2012 by Muhammad Ali mazidi Janice gillispie mazidi
3. Systems, Controls, Embedded Systems, Energy, and Machines (English, Hardcover, Dorf Richard C.)
4. Embedded Control System Design: A Model Based Approach 2013th Edition by Alexandru Forrai

BOS	Information Technology
Class	M.Sc. I.T.
Semester	IV
Subject Name	Design of Embedded Control Systems Practical
Subject Code	MSIT404a
Level of the Subject	Advance

Practical No.	Details
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
10.	Interfacing of temperature sensor.
11	Interfacing a 7 segment display.

12	Scrolling text message on LED dot matrix display

BOS	Information Technology
Class	M.Sc. I.T.
Semester	IV
Subject Name	Advanced image Processing
Subject Code	MSIT404bP
Level of the Subject	Advance

Objectives :

1. To enable learner to implement solutions for complex image processing problems.
2. To enable learner understand advanced methodology that is discussed in the image processing and image analysis

Unit No.	Topic Name	Topic No	Content	No. of Lectures
1	Enhancement in Frequency domain	1.1	Introduction, 2-D Discrete Fourier Transform, Properties of Fourier transform, Basic filtering m the frequency domain	15L
		1.2	Smoothing and Sharpening filters, FFT algorithm . Discrete cosine transform (DCT), KL (PCT) transform, HAAR, Basics of wavelets.	
		1.3	Remote Sensing: Introduction (Passive and Active sensing), Electromagnetic remote sensing process,	
		1.4	Physics of radiant energy, Energy source and its characteristics, Atmospheric interactions with electromagnetic radiation, Energy interaction with Earth's surface materials .	

2	Microwave Remote Sensing	1.1	Introduction, The Radar principle, Factors affecting microwave measurements, Radar wavebands, Side looking airborne (SLAR) systems,	15L
		1.2	Synthetic Aperture Radar (SAR), Polarimetric SAR (PolSAR), Interaction between microwaves and Earth's surface, Interpreting SAR images, Geometric characteristics.	
		1.3	Remotes Sensing Platforms and Sensors Introduction, Satellite system parameters, Spatial Resolution, Spectral Resolution, Radiometric Resolution, Temporal resolution, Imaging sensor systems (thermal, multispectral and microwave imaging),	
		1.4	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).	
3	Image Analysis	1.1	Introduction, Visual interpretation, Elements of visual interpretation, Digital processing, Pre-processing, Enhancement, , Oceans and Costal.	15L
		1.2	Transformations, Classification, Integration, Classification accuracy assessment.	
		1.3	**Applications** Introduction, Agriculture, Forestry, Geology, Hydrology, Sea Ice, Land cover, Mapping	
		1.4	Medical Image Processing: Various modalities of medical imagmg, Breast cancer imagmg, Mammographic 1magmg,Ultrasound 1magmg, Magnetic resonance 1magmg (MRI), Breast thermograph imaging, Problems with medical images.	
4	. Image enhancement	1.1	. Image enhancement, Spatial domain methods, Frequency domain methods, Other modalities of medical imaging, Radiography,.	**15L**

		1.2	Positron emission tomography (PET), Computed tomography angiography (CTA), Echocardiogram	
		1.3	Feature Extraction and Statistical Measurement : Selection of features, Shape related features, Shape representation, Bounding box, Shape matrix, Moments of region and shape, Co-occurrence matrix,	
		1.4	Principal 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	
			Total No. of Lectures	**60**

Expected Outcome:

1. Learner understood how implement solutions for complex image processing problems.
2. Learner understood advanced methodology that is discussed in the image processing and image analysis

References Books :

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

BOS	Information Technology
Class	M.Sc. I.T.
Semester	IV
Subject Name	Advanced image Processing
Subject Code	MSIT404bP Practical
Level of the Subject	Advance

Practical No.	Details
1.	Apply DFT on Image

2.	WAP for implementing LPF
	    a. Ideal LPF on square image
	    b. Butterworth filter
	    c. Gaussian filter

3.	WAP for implementing HPF
	    a. Ideal **HPF** on square image
	    b. Butterworth filter
	    c. Gaussian filter

4.	a. WAP for high boost filtering on square image b. 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 (Huffinan coding, Arithmetic encoding, LZW encoding)

10.	Apply DCT and PCA on image.
	● Satellite images can be downloaded from
	http://bhuvan3.nrsc. gov.in/bhuvan/bhuvannew/bhuvan2d.php
	http://landsat.usgs. gov/Landsat_Search_and_Download.php
	http://uavsar.jpl.nasa.gov/ http://airsar.jpl.nasa.gov/
	● Medical images can be downloaded from http://www.barre.nom. fr/medical/samples/

BOS	Information Technology
Class	M.Sc. I.T.
Semester	IV
Subject Name	Cloud Management
Subject Code	MSIT404c
Level of the Subject	Advance

Objectives :

1. Understand the underlying principle of cloud virtualization, cloud storage, data management and data visualization.
2. Understand different cloud programming platforms and tools.

Unit No.	Topic Name	Topic No	Content	No. of Lectures
1	Virtualized Data Center Architecture	1.1	Virtualized Data Center Architecture : Cloud infrastructures ; public, private, hybrid.	15L
		1.2	Service provider interfaces; Saas, Paas, Iaas. VDC environments; concept, planning and design, business continuity and disaster recovery principles.	
		1.3	Managing VDC and cloud environments and infrastructures Virtualized Data Center Architecture : Cloud infrastructures ; public, private, hybrid. Service provider interfaces; Saas, Paas, Iaas.	

		1.4	VDC environments; concept, planning and design, business continuity and disaster recovery principles. Managing VDC and cloud environments and infrastructures	
2	Storage Network Design	1.1	Storage Network Design: Architecture of storage, analysis and planning . Storage network design considerations ; NAS and FC	15L
		1.2	SANs hybrid storage networking technologies (iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing,	
		1.3	host system design considerations IP-SAN : Introduction, iSCSI-components of iSCSI, iSCSI	
		1.4	cHost 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	
3	Cloud Management	1.1	Cloud Management: System Center 2012 and Cloud OS, ,	15L
		1.2	Provisioning Infrastructure : Provisioning Infrastructure with Virtual Machine Designing,	
		1.3	Planning and Implementing . Managing Hyper-V Environment with VMM 2012. Provisioning self-service with App Controller, App Controller essentials	
		1.4	Managing Private, Public, Hybrid clouds. App Controller cmd lets .	
4	Implementing Monitoring	1.1	Implementing Monitoring : Real-time monitoring with Operations Manager, Proactive monitoring with Advisor,	15L
		1.2	Operations Design, Planning, Implementation, Administration, Monitoring, Alerting,	
		1.3	Operations and Security reporting. Building private clouds: Standardization with service manager, Service Manager 2012 :	

		1.4	Design, Planning, Implementing, Incident Tracking, Automation with orchestrator, System Orchestrator 2012 : Design, Planning, Implementing . Windows Azure Pack.	
			Total No. of Lectures	**60**

Expected Outcome :

1. Learner Understood the underlying principle of cloud virtualization, cloud storage, data management and data visualization.
2. Learner Understand different cloud programming platforms and tools.

References Books:

1. Introducing Microsoft System Center 2012, Technical Overview, Mitch Tulloch, SymonPerriman and SymonPerriman, Microsoft
2. Microsft System Center 2012 Unleashed, Pearson Education
3. The.Official.VCP5.Certification .Guide, VMware Press Aug 2002
4. VCAP5-DCD Official Cert Guide, VMware Press
5. Storage Networks : The Complete Reference, Robert Spalding

BOS	Information Technology
Class	M.Sc. I.T.
Semester	IV
Subject Name	Cloud Management Practical
Subject Code	MSIT404cP
Level of the Subject	Advance

Practical No	Details
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

BOS	Information Technology
Class	M.Sc. I.T.
Semester	IV
Subject Name	Internship Program
Subject Code	PMSIT405
Level of the Subject	Advance

- Part II Students need to do regular Internship program in IT industry of 120 Hrs in Semester IV
- At the end of the program report should be submitted to the Teacher-in-Charge at the semester end
- External examiner will be appointed to conduct Viva-voce for 100 marks

Format of the Report to be Submitted at the End of Internship Program

Date:

CERTIFICATE OF APPROVAL

This is to certify that the project report titled

Name of the Project

Is a bona-fide record of the work done by

<div align="center">Name of the Student</div>

Under the guidance of

<Prof. **Name of the internal Guide**>

Director   External Examiner   Internal Guide

<Seal of College>

Company Certificate format:

Company Letter head

                                                       Date:

CERTIFICATE

This is to certify that (**Name of the student)** , student of **Pillai College , New Panvel** , studying in Semester IV , Roll No. **20** has worked under the guidance and mentorship of **Abhinav Pal** on the project titled "Campus Recruitment System." as part of final year M.Sc. I.T project of University Of Mumbai for the Academic year **2019-2020**.

Further, I certify that the information provided about this project is true, complete and correct to the best of my knowledge.

We have monitored her progress and ensured that she obtained sufficient advice and assistance during the project. She has worked **120 Hrs** on the project from 1 February 2018 to 30 June 2018.

(Name of the Manager).

<Seal of the Company>

Performance Appraisal from Project Employees:

PERFORMANCE APPRAISAL FROM PROJECT EMPLOYEES INSTRUCTIONS: The immediate supervisor is asked to evaluate the student objectively comparing <him/her> with other students of comparable academic records with other personnel assigned to the same on similarly classified or with corporate standards.

Name of the Student   :

Course Title   :   MSc. I.T.

College Name   : Pillai College of Arts Commerce & Science,
New Panvel

Name of Project   :

Name of Project Guide   :

Company Name   :

Signature   :

Seal Of Company   :

Evaluation Criteria	Exceptional	Very Good	Average	Marginal	Unacceptable	Non-Applicable	Comments (if needed, write on back side of the page or on fresh new sheet then attach the same)
Relations with others							
Judgments							
Ability to Learn							
Communication Skills							
Technical Skills							
Teamwork Skills							
Dependability							
Quality of Work							
Educational Preparation for							

the Assignment						
Potential for Greater Responsibility						
Comparison with students is at the same level from other Institutions						
Overall performance						

Attendance: Regular/Irregular **Punctuality**: Regular/Irregular