Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College of Arts, Science & Commerce

(Autonomous College)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for Semester IV

Program: M.Sc. Information Technology

Program Code: RJSPIT

(CBCS 2018-19)

SEMESTER IV

Course Code	Unit	Topics	Credits	L / Week
RJSPIT401	Title: Artificial Intelligence			
	I	• Introduction • Logic and Computation • Heuristic Search	4	4
	II	• Game Playing • Knowledge Representation • Automated Reasoning		4
	III	• Probabilistic Reasoning • Knowledge Acquisition		4
	IV	• Planning • Constraint Satisfaction Problem		4
	V	• Knowledge-Based Systems • Prolog		4

RJSPIT402	Title: IT Infrastructure Management			
	I	• Introduction • The Service Lifecycle • Service Strategy	4	4
	II	• Service Design		4
	III	• Service Transition		4
	IV	• Service Operation		4
	V	• Continual Service Improvement		4

RJSPIT403a Elective	Title: Intelligent Systems			
	I	• Intelligent Agents • Problem Solving by searching	4	4
	II	• Games • Constraint Satisfaction, Constraint Propagation • Logical Agents • First-Order Logic		4
	III	• Planning • Uncertain Knowledge and Reasoning • Probabilistic Reasoning • Probabilistic reasoning over time		4
	IV	• Simple Decision Making • Complex Decision making • Knowledge in Learning		4
	V	• Statistical and Reinforced Learning • Natural Language Processing		4

RJSPIT403b Elective	Title: Real Time Embedded Systems			
	I	• Introduction • Embedded Operating Systems • Caches	4	4
	II	• Exception and Interrupt handling • Firmware • Memory Management		4
	III	• Real Time Task Scheduling • Handling Resource Sharing and Dependencies		4
	IV	• Real Time Communication		4
	V	• Real Time Databases		4

RJSPIT403c Elective	Title: Computer Forensics			
	I	• Computer Forensic and Data Acquisition	4	4
	II	• Computer Forensic Tools		4
	III	• Computer Forensic Analysis		4
	IV	• Virtual Machines, Network Forensics and Live Acquisition		4
	V	• High-Tech Investigation		4

RJSPIT404a Elective	Title: Design of Embedded Control Systems			
	I	• Introduction to Microcontrollers • Design with Atmel Microcontrollers	4	4
	II	• PIC Microcontrollers • PIC16F8XX Flash Microcontrollers • More about Microcontrollers		4
	III	• ARM Embedded Systems • ARM Processor Fundamentals		4
	IV	• Introduction to the ARM Instruction Set • Introduction to the Thumb Instruction Set		4
	V	• Writing and Optimizing ARM Assembly Code		4

RJSPIT404b Elective	Title: Advanced Image processing			
	I	• Enhancement in Frequency Domain • Remote Sensing	4	4
	II	• Microwave Remote Sensing • Remotes Sensing Platforms and Sensors		4
	III	• Image Analysis • Application		4
	IV	• Medical Image Processing		4
	V	• Future Extraction and Statistical Measurements		4

RJSPIT404c Elective	Title: Cloud Management			
	I	• Virtualized data Center Architecture	4	4
	II	• Storage Network Design		4
	III	• Cloud Management		4
	IV	• Managing and maintaining with Configuration Manager 2012		4
	V	• Implementing Monitoring • Building private clouds		4

Course Code	Title	**Credit**	**L/Week**
RJSPITP403a	Intelligent Systems	2	4
RJSPITP403b	Real Time Embedded Systems	2	4
RJSPITP403c	Computer Forensics	2	4
RJSPITP404a	Design of Embedded Control Systems	2	4
RJSPITP404b	Advanced Image processing	2	4
RJSPITP404c	Cloud Management	2	4
RJSPITP405	Project	4	

Theory Semester IV

Course Code	Title	Credits
RJSPIT401	Artificial Intelligence	4

Unit	Description
I	**Introduction:** AI, Components of AI, History of AI, Silent Points, Knowledge and Knowledge Based Systems, AI in Future, Applications. **Logic and Computation:** Classical Concepts, Computational Logic, FOL, Symbol Tableau, Resolution, Unification, Predicate Calculus in Problem Solving, Model Logic, Temporal Logic. **Heuristic Search:** Search-Based Problems, Informed Search, Water Jug Problem, TSP, Branch and Bound Method, TSP, Branch and Bound Method, TSP Algorithm.
II	**Game Playing:** AND/OR Graph, MinMax Problem, Alpha-Beta Search, Puzzle Solving, AI versus Control Robot. **Knowledge Representation:** Structure of an RBS, Merit, Demerit and Applicability of RBS, Semantic Nets, Frames, Conceptual Graphs, Conceptual Dependency, Scripts. **Automated Reasoning:** Default Logic, Problem for Default reasoning, Closed World Assumption, Predicate Completion, Circumscription, Default Reasoning, Model Based Reasoning, Case Based reasoning, Reasoning Models, Multimodal, Multimodal Reasoning.
III	**Probabilistic Reasoning:** Bayes Theorem, Bayesian Network, Dumpster and Shafer Theory of Evidence, Confidence Factor, Probabilistic Logic. **Knowledge Acquisition:** Knowledge Acquisition process, Automatic Knowledge Acquisition, Machine Learning, Induction, Analogical Reasoning, explanation-Based Learning, Inductive Learning, Knowledge Acquisition Tools.
IV	**Planning:** 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. **Constraint Satisfaction Problem:** Constraints and Satisfability, Basic search strategies for solving CSP, representation of CSP Problem, Example of constraint satisfaction problem.
V	**Knowledge-Based Systems:** Structure of an Expert System, Expert System in different Areas, expert System Shells, Comparison of expert Systems, Comparative View, Ingredients of Knowledge-Based Systems, Web-based Expert Systems **Prolog:** Prolog programming features, Syntax of Rules, LIST, Structure, some Solution Using TURBO PROLOG.

M.Sc. IT	Semester IV Theory
RJSPIT401 Course I	Course Outcomes 4.1 : ➢ To present the overview of AI principles and approaches. ➢ This course develops basic understanding of the building blocks of

Artificial Intelligence	AI as presented in terms of intelligent agents: Search, Knowledge representation, Inference, logic and learning. Learning outcomes : Students will be able to: ➢ Know working knowledge in Lisp in order to write simple Lisp programs and explore more sophisticated Lisp code on their own (a, c, i). ➢ Understand different types of AI agents ➢ Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms) ➢ Know how to build simple knowledge-based systems ➢ Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information ➢ apply knowledge representation, reasoning, and machine learning techniques to real-world problems ➢ carry out independent (or in a small group) research and communicate it effectively in a seminar setting ➢ Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving ➢ Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving

Course Code	Title	Credits
RJSPIT402	IT Infrastructure Management	4

Unit	Description
I	**Introduction** The four perspectives (attributes) of IT service management, benefits of IT service management, business and IT alignment, What is ITIL?, What are Services?, Service Management as a practice, The concept of Good Practice, Concept of a Service, Concept of Service Management, Functions and Processes, the process model and the Characteristics of processes. **The Service Lifecycle** Mapping the Concepts of ITIL to the Service Lifecycle How does the Service Lifecycle Work? **Service Strategy** Objectives, Creating Service Value, Service Packages and Service Level Packages, Service Strategy Processes, Service Portfolio Management, Financial Management, Demand management, Service Strategy Summary, Interface 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
II	**Service Design** Objectives, Major Concepts, Five Major Aspects of Service Design, Service Design Packages, Service Design Processes, Service Level management, Supplier

	Management, Service Catalogue Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security Management, Service Design Scenario, Service Level Management Considerations, capacity Management Considerations, Availability Management Considerations, Information Security Management Considerations, Service catalogue Management Considerations
III	**Service Transition** Objectives, Service Transition Processes, Knowledge Management, Service Asset and Configuration Management Change Management, Release and Deployment Management, Service Validation and Testing, Service transition Summary, Service Transition Scenario, Knowledge Management Consideration, Service Asset and Configuration Management Consideration, Change Management Consideration, Release and Deployment management Consideration, Service validation and Testing Consideration
IV	**Service Operation** Objectives, major Concepts, Service Operation Functions, The Service Desk, Technical Management, IT Operations Management, Application Management, Service Operation Process, Event Management, Incident Management, Problem Management, Request Fulfillment, Access Management, Service Operation Summary, Service Operation Scenario, Functions, Process
V	**Continual Service Improvement** Objectives, Major Concepts Continual Service Improvement Processes, Service Level Management, Service Measurement and Reporting, CSI (7 Step) Improvement Process, Continual Service Improvement Summary, Continual Service Improvement Scenario, Service Level Management Service Measurement and Reporting, CSI Process

M.Sc. IT	Semester IV Theory
RJSPIT402 Course II IT Infrastructure Management	Course Outcomes 4.2 : 1. The objective of this course is to expose the academia to the emerging area of IT Infrastructure And its Management. 2. This course will focus on the basics of IT infrastructure and various management aspects of it. Learning outcomes : Student will be able to : Study Basics of IT Infrastructure , Service design , transition ,operation process , Continual Service improvement Process

Course Code	Title	Credits
RJSPIT403a	Intelligent Systems	4

Unit	Description
I	**Intelligent Agents:** Agents and Environments, **Good Behavior:** The concept of Rationality, The nature of Environments, Structure of Agents **Problem Solving by searching:** Problem-Solving Agents Example problems, Searching for Solutions, Uninformed Search Strategies, Informed Search and exploration: Informed (Heuristic) Search Strategies, Heuristic Functions, Local search Algorithms and Optimization Problems, Local search in Continuous Spaces, Searching with Nondeterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environments
II	**Games:** Optimal Decision in Games, Alpha-Beta Pruning, Imperfect Real-Time Decisions, Stochastic Games, Partially Observable Games, State-Of-The-Art game Programs **Constraint Satisfaction, Constraint Propagation:** Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, the Structure of Problems **Logical Agents:** Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic **First-Order Logic:** Representation Revisited Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic, Inference in First-Order Logic, Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, backward Chaining, Resolution
III	**Planning:** Classical Planning, Algorithms for Planning as State-space search, Planning Graphs, Other Classical Planning Approaches, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multiagent planning. **Uncertain Knowledge and Reasoning:** Acting under uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, The Wumpus World Revisited, **Probabilistic Reasoning:** representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks, Relational and First-Order Probability Models, Approaches to Uncertain Reasoning, **Probabilistic reasoning over time:** Inference in Temporal Models, Hidden markov Models, Kalman Filters, Dynamic Bayesian Networks, Keeping Track of many Objects.
IV	**Simple Decision Making:** Combining Beliefs and Desires under Uncertainty, The basis of Utility Theory, Utility Functions, Multiattribute Utility Functions, and Decision Networks. **Complex Decision making:** Sequential Decision Problems, value Iteration, Policy Iteration, Partially Observable MDPs, and Decisions with multiple Agents: Game theory. **Knowledge in Learning:** Review of Forms and types of Learning, Logical Formulation of Learning, Knowledge Using Relevance Information and Inductive Logic Programming.
V	**Statistical and Reinforced Learning:** Statistical Learning, Learning with

	Complex Data Learning with Hidden Variables: The EM Algorithm, Reinforcement Learning, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Application of reinforcement Learning. **Natural Language Processing:** language Models, text Classification, Information retrieval, Information Extraction. Robotics: Introduction, Robot Hardware, Robotic Perception, Planning to Move, Planning Uncertain Movements, Moving, Robotics Software Architectures, Applications.

M.Sc. IT	Semester IV Theory
RJSPIT403a Course IIIa Intelligent Systems	Course Outcomes 4.3a : 1. This course gives introduction into the field of artificial intelligence, with particular focus on technique for solving AI problems. Learning outcomes : .Student will be able to : ➢ The principal achievements and shortcomings of AI. ➢ The difficulty of distinguishing AI from advanced computer science in general. ➢ The main techniques that have been used in AI, and their range of applicability.

Course Code	Title	Credits
RJSPIT403b	Real Time Embedded Systems	4

Unit	Description
I	**Introduction:** What is Real Time System, Application Of Real Time System, A Basic Model Of Real time System, Characteristics of Real time System, Safety and Reliability, Types of Real time Task, Timing Constraints, Modeling Timing Constraints. **Embedded Operating Systems:** Fundamental Components, Example: Simple Little Operating System **Caches:** The Memory Hierarchy and cache Memory, Cache Architecture, Cache Policy
II	**Exception and Interrupt handling:** Exception Handling Interrupts, Interrupt handling Schemes **Firmware:** Firmware and Boot loader, example: Sandstone **Memory Management:** Moving From an MPU to an MMU, How Virtual Memory Works, Detail of the ARM MMU, Page Tables, The Translation Look aside Buffer, Domains and Memory Access Permission, The caches and Write Buffer.
III	**Real Time Task Scheduling**

	Types of real task and their characteristics, Task Scheduling, Clock driven scheduling, Hybrid Schedulers, Event Driven Scheduling, Earliest Deadline first scheduling, Rate Monotic Algorithm. **Handling Resource Sharing and Dependencies** Resource sharing among real time task, Priority Inversion, Priority inheritance protocol, Highest Locker Protocol, Priority Ceiling Protocol, Different types of Priority Inversion Under PCP, Important features of PCP, Resource sharing Protocol, Handling task Dependencies
IV	**Real Time Communication** Basic Concepts, Real Time Communication in LAN, Soft/Hard Real Time Communication in LAN, Bounded Access Protocol For LAN, Performance Comparison, Real Time Communication over Packet Switched networks, QoS Framework, Routing, Resource reservation, Rate Control, QoS model-Integrated Services and Differentiated Services.
V	**Real Time Databases** Concept and example of Real Time Databases, Real Time Databases applications design issues, Characteristics of temporal data, Concurrency control in Real Time Databases. Case study on commercial Real Time Databases.

M.Sc. IT	Semester IV Theory
RJSPIT403b Course IIIb Real Time Embedded Systems	Course Outcomes 4.3b : ➢ The aim of this course is to provide an overview of the topic of Real-Time Embedded Systems. ➢ Students will be able to specify, design and construct an embedded system to achieve a desired performance specification. ➢ Course also covers the topics required to enable an Embedded System to meet Real-Time operation constraints. Learning outcomes : Student should be able to : ➢ An ability to understand advanced concepts in theory of computer science. ➢ An ability to understand advanced concepts in applications of computer science. ➢ An ability to learn emerging concepts in theory and applications of computer science. ➢ An ability to design and conduct experiments as well as to analyze and interpret data. ➢ An ability to function in teams and to communicate effectively.

Course Code	Title	Credits
RJSPIT403c	Computer Forensics	4

Unit	Description
I	Computer Forensics and Investigation Processes, Understanding Computing Investigations, The Investigator's Office and Laboratory, data Acquisitions
II	Processing Crime and Incident Scenes, Working with windows and DOS Systems, Current Computer Forensics Tools
III	Macintosh and Linux Boot Processes and File Systems, Computer Forensics Analysis, Recovering Graphics Files.
IV	Virtual Machines, Network Forensics and Live Acquisitions, E-mail Investigations, Cell Phone and Mobile Device Forensics
V	Report Waiting for High-tech Investigations

M.Sc. IT	Semester IV Theory
RJSPIT403c Course IIIc Computer Forensics	Course Outcomes 4.3c : ➢ To provide an understanding Computer forensics fundamentals ➢ To analyze various computer forensics technologies ➢ To provide computer forensics systems ➢ To identify methods for data recovery. ➢ To apply the methods for preservation of digital evidence Learning outcomes : Student should be able to : ➢ Understand the definition of computer forensics fundamentals. ➢ Describe the types of computer forensics technology. ➢ Analyze various computer forensics systems. ➢ Illustrate the methods for data recovery, evidence collection and data seizure. ➢ Summarize duplication and preservation of digital evidence.

Course Code	Title	Credits
RJSPIT404a	Design of Embedded Control Systems	4

Unit	Description
I	**Introduction to Microcontrollers** Microprocessors and Microcontrollers, History, Embedded vs. external memory devices, 8-bit and 16-bit Microcontrollers, RISC and CISC processors, Harvard and Von Neumann architectures, Commercial Microcontrollers devices. Industrial applications. **Design with Atmel Microcontrollers** Architecture overview of Atmel 89C51, Pin description of 89C51, Using flash memory devices Atmel 89CXX, Power saving options.

II	**PIC Microcontrollers** Overview, PIC16C6X/7X, Reset actions, Oscillators, Memory organization, PIC16C6X/7X instructions, Addressing modes, I/O ports, Interrupts PIC16C61/71, PIC16C61/71 timers, PIC16C 71 ADC, **PIC16F8XX Flash Microcontrollers** Introduction, pin diagram, status registers, options registers, power control registers, PIC16F8 program memory, PIC16F8 data memory, Data EEPROM, Flash program EEPROM, Interrupts PIC16F877, I/O ports, Timers **More about Microcontrollers** Introduction, Capture/compare/PWM modules in PIC16F877, Master synchronous serial port (MSSP) module, USART, ADC
III	**ARM Embedded Systems** The RISC Design Philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, **ARM Processor Fundamentals** Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions, Architecture revision, ARM Processor Families
IV	**Introduction to the ARM Instruction Set** Data Processing Instructions, Branch Instructions, Load_Store Instructions, Software Interrupt Instruction, Program Status Register Instructions, Loading Constants, ARMv5E extensions, Conditional Execution **Introduction to the Thumb Instruction Set** Thumb Register Usage, ARM-Thumb Interworking, Other Branch Instructions, Data Processing Instructions, Single-Register Load-Store Instructions, Multiple-Register Load-Store Instructions, Stack Instructions, Software Interrupt Instructions.
V	**Writing and Optimizing ARM Assembly Code** Writing Assembly Code, Profiling and Cycle Counting, Instruction Scheduling, Register Allocation, Conditional Execution, Looping Constructs, Bit Manipulation, Efficient Switches, Handling Unaligned Data.

M.Sc. IT	Semester IV Theory
RJSPIT404a Course IV Design of Embedded Control Systems	Course Outcomes 4.4a : ➢ The objective of this course is to model, analyze, and control such systems, where continuous modes are linked together according to given transition rules. For this, a hybrid formalism will be introduced by combining ideas from computer science, such as automata theory, with control theory. Learning outcomes : Student should be able to : ➢ show abilities necessary in order to participate in the conducting of a realistic embedded control systems project, with participants from different background and with different competence ➢ account for how a large project is run from the initial planning to

	the finish ➢ find efficient and reliable techniques and methods for design of complex embedded control systems, where the fields providing such techniques and methods are not known a priori ➢ account for the role of the controller in the system from a holistic perspective ➢ account for and reflect on her/his own role in the project group and in the development process

Course Code	Title	Credits
RJSPIT404b	Advanced Image Processing	4

Unit	Description
I	**Enhancement in Frequency Domain** Introduction, 2-D Discrete Fourier transform, Properties of Fourier transform, Basic Filtering in the frequency domain, Smoothing and Sharpening filters, FFT algorithm. Discrete cosine transform (DCT), KL (PCT) transform, HAAR, Basics of wavelets. **Remote Sensing** Introduction (Passive and Active sensing), Electromagnetic remote sensing process, Physics of radiant energy, Energy source and its characteristics, Atmospheric interactions with electromagnetic radiation, Energy interaction with earth's surface materials.
II	**Microwave Remote Sensing** Introduction, The radar Principle, Factors Affecting microwave measurements, Radar wavebands, side looking airborne (SLAR) systems, Synthetic Aperture Radar (SAR), Polarimetric SAR (PolSAR), Interaction between microwaves and Earth's surface, Interpreting SAR images, Geometric characteristics. **Remotes Sensing Platforms and Sensors** Introduction, Satellite system parameters, Spatial Resolution, Spectral resolution, radiometric Resolution, Temporal resolution, Imaging sensor systems (thermal, multispectral and microwave imaging), Earth resuorces satellites, Meteorological satellites, Satellites carrying microwave sensors, OCEASAT-1, IKONOS, Latest trends in remote sensing platform and sensors (weathers, land observation and marine satellites).
III	**Image Analysis** Introduction, Visual interpretation, Elements of visual interpretation, Digital Processing, Pre-Processing, Enhancement, Transformations, Classification, Integration, Classification accuracy assessment. **Application** Introduction, Agriculture, Forestry, Geology, Hydrology, Sea Ice, Land Cover, Mapping, Ocean and Costal.
IV	**Medical Image Processing** Various modalities of medical imaging Breast cancer imaging, Mammographic imaging, Ultrasound imaging, Magnetic resonance imaging (MRI), Breast thermograph imaging, Problem with medical images. Image enhancement, Spatial domain methods, Frequency domain methods, Other modalities of medical

	imaging, radiography, Positron emission Tomography (PET), Computed tomography angiography (CTA), Echocardiogram.
V	**Future Extraction and Statistical Measurements** Selection of Features. Shape related features. Shape representation, Bounding box, Shape matrix, Moments of region and shape, Co-occurrence matrix, Principle feature analysis (PFA), Fourier descriptor, 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.

M.Sc. IT	Semester IV Theory
RJSPIT404b Course IVb Advanced Image Processing	Course Outcomes 4.4b : ➢ The course is designed to introduce students to advanced theoretical concepts and practical issues associated with image processing. A special effort will be made to develop students' problem solving skills and engineering intuition Learning outcomes : Student will be able to : ➢ apply the concepts, and should be capable of reading advanced textbooks and research literature in the subject area.

Course Code	Title	Credits
RJSPIT404c	Cloud Management	4

Unit	Description
I	**Virtualized data Center Architecture:** Cloud infrastructures; public, private, hybrid. Service provider interfaces; Saas, Paas, Iaas. VDC environments; concept, planning and design, business continuity and disaster recovery principles. Managing VDC and cloud environments and infrastructures
II	**Storage Network Design:** Architecture of storage, analysis and planning. Storage network design considerations; NAS and FC SANs, hybrid storage networking technologies (iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing, host system design considerations IP-SAN; Introduction, iSCSI-components of iSCSI host connectivity, topologies for iSCSI connectivity, iSCSI discovery, iSCSI names, iSCSI security and error handling, FCIP-FCIP topology, FCIP performance and security, iFCP-iFCP topology, iFCP addressing and routing, iFCP gateway architecture, FCOE architecture.
III	**Cloud Management:** System Center 2012 and Cloud OS, Provisioning Infrastructure: Provisioning Infrastructure with Virtual Machine Designing, Planning and Implementing. Managing Hyper-V Environment with VMM 2012. Provisioning self-service with App Controller, App Controller essentials, Managing Private, Public, Hybrid clouds, App Controller cmdlets.
IV	**Managing and maintaining with Configuration Manager 2012**: Design,

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

M.Sc. IT	Semester IV Theory
RJSPIT404c Course IVc Cloud Management	Course Outcomes 4.4c : 1. To learn how to use Cloud Services. 2. To implement Virtualization 3. To implement Task Scheduling algorithms. 4. Apply Map-Reduce concept to applications. 5. To build Private Cloud. **6.** Broadly educate to know the impact of engineering on legal and societal issues involved Learning outcomes : Student will be able to : ➢ Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures. Design different workflows according to requirements and apply map reduce programming model. ➢ Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.

Course Code	Practical Title	Credits
RJSPITP403a	Intelligent Systems	2

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.
   i. Greedy Best First Search
2. Implement the mechanism A* algorithm.

3. Implement Recursive Breadth First Search.
4. Generate succession nodes and check possibility of finding solutions of the specified problems using:

   i. Steepest Ascent Hill Climbing
   ii. Simulated Annealing

5. Optimize the search strategy for the suggested problems using:

   i. Mini-max algorithm.
   ii. Alpha Beta Pruning

6. Find a solution to map-coloring as a constraint satisfaction problem using: forward checking.
7. Show the implementation of Bayesian Network Classification.
8. Show the application of Hidden Markov Model.

M.Sc. IT	Semester IV Practical
RJSPITP403a Practical IIIa Intelligent Systems	Course Outcome: 1. To make students understand various AI methods like searching and how to apply them to solve real applications. Learning outcomes : The students will be able to: ➢ Develop intelligent algorithms for various searching methods. ➢ Formulate and solve problems with uncertain information using Bayesian approaches and Hidden Markov model. ➢ Work with the new search methods and a deeper understanding of problem structure and complexity.

Course Code	Practical Title	Credits
RJSPITP403b	Real Time Embedded Systems	2

1. Schedule a task periodically: after 5 min xzy task has to perform (Hint JITTER).
2. Schedule a task non periodically: no specific time stamp is set for any task
3. Shared resources management using SEMAPHORE.
4. Shared resources management using MUTEX.
5. Implement Scheduling algorithm FIFO.
6. Implement Scheduling algorithm ROUND ROBIN.
7. Implement Scheduling algorithm RATE MONOTONIC.
8. Implement Inter Process Communication (IPC) using NAMED PIPES.

9. IPC Using simple PIPES.
10. IPC Using MAIL BOXES.
11. Using client socket and server socket (UDP/TCP) maintain data receiver from client node.
12. Small demonstration of Kernel Level & User Level Communications.

M.Sc. IT	Semester IV Practical
RJSPITP403b Practical IIIb Real Time Embedded Systems	Course Outcome: 1. To study computing required for the real-time embedded systems. 2. To study communication required for the real-time embedded systems. Learning outcomes : The students will be able: ➢ To develop shared resource management using SEMAPHORE and MUTEX. ➢ To develop real-time algorithm for task scheduling. ➢ To implement inter process communication using named pipes, simple pipes and mail boxes. ➢ To work on design and development of protocols related to real-time communication.

Course Code	Practical Title	Credits
RJSPITP403c	Computer Forensics	2

1. File system Analysis using the sleuth Kit
2. Using Windows forensics tools
3. Using data acquisition tools
4. Using file recovery tools
5. Using Forensic Toolkit (FTK)
6. Forensic Investigation using EnCase
7. Using Steganography tools
8. Using password cracking tools
9. Using Log Capturing and Analysis tools
10. Using Traffic Capturing and Analysis Tools
11. Using Wireless Forensics Tools
12. Using Web Attack Detection Tools
13. Using Email Forensics tools

14. Using Mobile Forensics software tools 15. Writing Report using FTK

M.Sc. IT	Semester IV Practical
RJSPITP403c Practical IIIc Computer Forensics	Course Outcome: 1. To study the various tools for system analysis, data acquisition, file recovery, investigation. 2. To study the tools for steganography, password cracking, log capturing, traffic capturing. 3. To study the wireless forensics tools, web attack detection tools, e-mail forensics tools, mobile forensic software tools. 4. To study the report writing using forensic toolkit, FTK. Learning outcomes : The students will be able: ➢ To handle the various tools for system analysis, data acquisition, file recovery, investigation. ➢ To handle the tools for steganography, password cracking, log capturing, traffic capturing. ➢ To use the wireless forensics tools, web attack detection tools, e-mail forensics tools, mobile forensic software tools. ➢ To do write the reports using forensic toolkit, FTK.

Course Code	Practical Title	Credits
RJSPITP404a	Design of Embedded Control Systems	2

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 12C bus.
6. Using a watchdog timer.
7. Using an external RTC.
8. Design a 4 bit binary counter.
9. DC motor control using PWM module.
10. Interfacing of temperature sensor.
11. Interfacing a 7 segment display.

12. Scrolling text message on LED dot matrix display.

M.Sc. IT	Semester IV Practical
RJSPITP404a Practical IVa Design of Embedded Control Systems	Course Outcome: 1. To make the students understand the interfacing of LED, relay push button, serial communication, PC Keyboard, temperature sensor, seven segment display and EEPROM. 2. To make student to understand the interfacing of wireless module using ASL and FSK. 3. To make student understand the watchdog timer, external real time clock RTC, designing of 4-bit counter and using DC motor control. Learning outcomes : The student will be able: ➢ To design the interfaces of LED, relay push button, serial communication, PC Keyboard, temperature sensor, seven segment display and EEPROM. ➢ To do interfacing of wireless module using ASL and FSK. ➢ To use the watchdog timer, external real time clock RTC, designing of 4-bit counter and using DC motor control.

Course Code	Practical Title	Credits
RJSPITP404b	Advanced Image Processing	2

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 technique to improve the quality of image (use different low pass filters and compare the results).
6. Apply different image enhancement techniques (to improve contrast, brightness, sharpness) on satellite image
7. Apply different supervised classification techniques to classify the satellite image (minimum distance, maximum likelihood, decision tree, ANN)
8. Apply different clustering algorithms (K-means, ISODATA)
9. Apply compression and decompression algorithm on image (Huffman coding, Arithmetic encoding, LZW encoding)
10. Apply DCT and PCA on image

M.Sc. IT	Semester IV Practical
RJSPITP403c Practical IVb Advanced Image Processing	Course Outcome: 1. To make the student understand the various filtering algorithms for filtering images, algorithms for improving the quality of images. 2. To make the student understand the various algorithms for clustering, compression and decompression. Learning outcomes : The students will be able: ➢ To filter the images, enhance the quality of image using various algorithms. ➢ To cluster the images. ➢ To compress and decompress the images.

Course Code	Practical Title	Credits
RJSPITP404c	Cloud Management	2

1. Managing Hyper –V Environment with SCVVM 2012
2. Provisioning Self-service with App Controller
3. Managing Private cloud with App Controller
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

M.Sc. IT	Semester IV Practical
RJSPITP404a Practical V Cloud Management	Course Outcome: 1. To make the student understand the tools that help businesses to manage their cloud infrastructure. 2. To make the student understand the use of Hyper V environment, use of app controller, operation manager, data protection manager, advisor, service manager and Orchestrator. 3. To make the student understand the implementation of Windows Azure Pack. Learning outcomes : The students will be able: ➢ To manage the cloud infrastructure. ➢ To use Hyper V environment, app controller, operation manager, data protection manager, advisor, service manager and Orchestrator. ➢ To implement Windows Azure Pack.

Course Code	Practical Title	Credits
RJSPITP405	Project	2
• Project		

M.Sc. IT	Semester IV Practical
RJSPITP405 Practical V Project	Course Outcome: 1. To make the student understand the phases of project development. Learning outcomes : The students will be able: ➢ To do plan, design, implement and deploy the software applications/ embedded projects/ cloud based projects.

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