Mahatma Education Society's

Pillai College of Arts, Commerce & Science (Autonomous)

Affiliated to University of Mumbai

New Panvel

Syllabus for M. Sc. IT Part I Semester II

Program: M. Sc. Information Technology

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

Semester II						
Course Code	**Course Type**	**Course Title**	**Theory/ Practical**	**Marks**	**Credits**	**Lectures /Week**
PMSIT201	Core	Big Data Analytics	Theory	100	4	4
PMSIT202	Core	Modern Networking	Theory	100	4	4
PMSIT203	Core	Microservices Architecture	Theory	100	4	4
PMSIT204	Core	Image Processing	Theory	100	4	4
PMSIT201P	Core	PMSIT201	Practical	50	2	4
PMSIT202P	Core	PMSIT202	Practical	50	2	4
PMSIT203P	Core	PMSIT203	Practical	50	2	4
PMSIT204P	Core	PMSIT204	Practical	50	2	4
Total				600	24	

BOS	Information Technology
Class	M.Sc.I.T.
Semester	II
Subject	BigData Analytics
Subject Code	PMSIT201
Level of the Subject	Advance

Objectives:

1. To provide an overview of an exciting growing field of big data analytics.
2. To introduce the tools required to manage and analyze big data like Hadoop, NoSqlMapReduce.

Unit No.	Name of Unit	Topic No.	Content	No. of Lectures
1	Introduction to Big Data Analytics and Data Analytics Lifecycle	1.1	Introduction to Big Data, Characteristics of Data, and Big Data Evolution of Big Data, Definition of Big Data, Challenges with big data, Why Big data? Data Warehouse environment, Traditional Business Intelligence versus Big Data. State of Practice in Analytics, Key roles for New Big Data Ecosystems, Examples of big Data Analytics.	15L
		1.2	Big Data Analytics, Introduction to big data analytics, Classification of Analytics, Challenges of Big Data, Importance of Big Data, Big Data Technologies, Data Science, Responsibilities, Soft state eventual consistency. Data Analytics Life Cycle	
2	Analytical Theory and Methods: Clustering, Association	2.1	Analytical Theory and Methods: Clustering Associated Algorithms, Association Rules, Apriori Algorithm, Candidate Rules, Applications of Association Rules, Validation and Testing, Diagnostics	15L

	Rules and Regression	2.2	Regression, Linear Regression, Logistic Regression, Additional Regression Models.	
3	Analytical Theory and Methods and Hadoop Architecture	3.1	Analytical Theory and Methods: Classification, Decision Trees, Naïve Bayes, Diagnostics of Classifiers, Additional Classification Methods, Time Series Analysis, Box Jenkins methodology, ARIMA Model, Additional methods. Text Analysis, Steps, Text Analysis Example, Collecting Raw Text, Representing Text, Term Frequency-Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments.	15L
		3.2	Data Product, Building Data Products at Scale with Hadoop, Data Science Pipeline and Hadoop Ecosystem, Operating System for Big Data, Concepts, Hadoop Architecture, Working with Distributed file system, Working with Distributed Computation.	
4	Advanced Analytics-Technology and Tools	4.1	Framework for Python and Hadoop Streaming, Hadoop Streaming, MapReduce with Python, Advanced MapReduce. In-Memory Computing with Spark, Spark Basics, Interactive Spark with PySpark, Writing Spark Applications.	15L
		4.2	Distributed Analysis and Patterns, Computing with Keys, Design Patterns, Last-Mile Analytics, Data Mining and Warehousing, Structured Data Queries with Hive, HBase, Data Ingestion, Importing Relational data with Sqoop, Injesting stream data with flume. Analytics with higher level APIs, Pig, Spark's higher level APIs.	

Expected Outcome:

1. Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
2. Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics.
3. Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.

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Reference Books:

1. Big Data and Analytics, SubhashiniChellappanSeema Acharya, Wiley, First
2. Data Analytics with Hadoop, *An* Introduction for Data Scientists, Benjamin Bengfort andJenny Kim ,O'Reilly, 2016
3. Big Data and Hadoop, V.K Jain, Khanna Publishing, First 2018

BOS	Information Technology
Class	MSc. I.T.
Semester	II
Subject	BigData Analytics Practical
Subject Code	PMSIT201P
Level of the Subject	Advance

Practical No	Details
1.	Install, configure and run Hadoop and HDFS ad explore HDFS
2.	Implement word count / frequency programs using MapReduce
3.	Implement an MapReduce program that processes a weather dataset.
4.	Implement an application that stores big data in Hbase / MongoDB and manipulate it using R / Python
5.	Implement the program in practical 4 using Pig.
6.	Configure the Hive and implement the application in Hive.
7.	Write a program to illustrate the working of Jaql.
8.	Implement the following: a. Implement Decision tree classification techniques b. Implement SVM classification techniques
9.	Solve the following: a. REGRESSION MODEL Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in an institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. require (foreign), require(MASS). b. MULTIPLE REGRESSION MODEL Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.
10.	Solve the Following: CLASSIFICATION MODEL a. Install relevant package for classification. b. Choose classifier for classification problem. c. Evaluate the performance of classifier. CLUSTERING MODEL a. Clustering algorithms for unsupervised classification. b. Plot the cluster data using R visualizations.

BOS	Information Technology
Class	M.Sc. I.T
Semester	II
Subject Name	Modern Networking
Subject Code	PMSIT202
Level of the Subject	Advanced

Objectives:

1. To understand the state-of-the-art in network protocols, architectures and applications.
2. Analyze existing network protocols and networks.

Unit No.	Name of Unit	Topic No.	Name of Topic	No. of Lectures
1	Modern Networking	1.1	Elements of Modern Networking – The Networking Ecosystem, Example Network Architectures, Global Network Architecture, A Typical Network Hierarchy, Ethernet Applications of Ethernet Standards Ethernet Data Rates, Wi-Fi, Applications of Wi-Fi, Standards Wi-Fi Data Rates, 4G/5G Cellular – First Generation Second Generation, Third Generation Fourth Generation, Fifth Generation. Cloud Computing – Cloud Computing Concepts The Benefits of Cloud Computing Cloud Networking Cloud Storage, Internet of Things – Things on the Internet of Things, Evolution Layers of the Internet of Things, Network Convergence, Unified Communications.	15L
		1.2	Requirements and Technology :Types of Network and Internet Traffic, Elastic Traffic, Inelastic Traffic, Real-Time Traffic Characteristics. Demand: Big Data, Cloud Computing, and Mobile Traffic – Big Data, Cloud Computing, Mobile Traffic, Requirements: QoS and QoE, Quality of Service,	

			Quality of Experience. Routing: Characteristics, Packet Forwarding, Congestion Control, Effects of Congestion, Congestion Control Techniques, SDN and NFV Software – Defined Networking, Network Functions, Virtualization – Modern Networking Elements.	
		1.3	SDN: Background and Motivation : Evolving Network Requirements Demand Is Increasing, Supply Is Increasing, Traffic Patterns Are More Complex, Traditional Network Architectures are Inadequate, The SDN Approach Requirements SDN Architecture Characteristics of Software-Defined Networking, SDN- and NFV-Related Standards Standards : Developing Organizations Industry Consortia Open Development Initiatives.	
2	Software Defined Network	2.1	SDNData Plane and Open Flow**:** SDN Data Plane, Data Plane Functions, Data Plane Protocols, OpenFlow Logical Network, Device Flow Table Structure Flow Table Pipeline, The Use of Multiple, Tables Group Table OpenFlow Protocol. SDN Control Plane : SDN Control Plane , Architecture Control Plane Functions, Southbound Interface Northbound Interface Routing, ITU-T Model, OpenDaylight : OpenDaylight Architecture OpenDaylight Helium, REST – REST Constraints Example REST API, Cooperation and Coordination Among Controllers, Centralized Versus Distributed Controllers, High- Availability Clusters Federated SDN Networks, Border Gateway Protocol Routing and QoS Between Domains, Using BGP for QoS Management IETF SDNi OpenDaylight SNDi.	15
		2.2	SDN Application Plane –SDN Application Plane Architecture Northbound Interface Network Services Abstraction Layer Network Applications, User Interface, Network Services Abstraction Layer Abstractions in SDN, Frenetic Traffic Engineering PolicyCop Measurement and Monitoring Security OpenDaylight DDoS Application Data Center Networking, Big Data over SDN Cloud Networking over SDN Mobility and Wireless Information-Centric Networking CCNx, Use of an Abstraction Layer	

		2.3	Virtualization **:**Network Functions Virtualization: Concepts and Architecture, Background and Motivation for NFV, Virtual Machines The Virtual Machine Monitor, Architectural Approaches Container Virtualization, NFV Concepts Simple Example of the Use of NFV, NFV Principles High-Level NFV Framework, NFV Benefits and Requirements NFV Benefits, NFV Requirements, NFV Reference Architecture NFV Management and Orchestration, Reference Points Implementation,	
		2.4	NFV Functionality : NFV Infrastructure, Container Interface, Deployment of NFVI Containers, Logical Structure of NFVI Domains, Compute Domain, Hypervisor Domain, Infrastructure Network Domain, Virtualized Network Functions, VNF Interfaces, VNFC to VNFC Communication, VNF Scaling, NFV Management and Orchestration, Virtualized Infrastructure Manager, Virtual Network Function Manager, NFV Orchestrator, Repositories, Element Management, OSS/BSS, NFV Use Cases Architectural Use Cases, Service-Oriented Use Cases, SDN and NFV Network.	
3	Virtualization	3.1	Network Virtualization – Virtual LANs ,The Use of Virtual LANs, Defining VLANs, Communicating VLAN Membership, IEEE 802.1Q VLAN Standard, Nested VLANs, OpenFlow VLAN Support, Virtual Private Networks, IPsec VPNs, MPLS VPNs, Network Virtualization, Simplified Example, Network Virtualization Architecture, Benefits of Network Virtualization, OpenDaylight's Virtual Tenant Network, Software-Defined Infrastructure, Software – Defined Storage, SDI Architecture.	15L
		3.2	Defining and Supporting User Needs – Quality of Service, Background, QoS Architectural Framework, Data Plane, Control Plane, Management Plane, Integrated Services Architecture, ISA Approach ISA Components, ISA Services, Queuing Discipline, Differentiated Services, Services, DiffServ Field, DiffServ Configuration and Operation, Per-Hop Behavior, Default Forwarding PHB, Service Level, Agreements, IP Performance Metrics, OpenFlow QoS Support, Queue Structures, Meters	
		3.3	**QoE –** User Quality of Experience, Why QoE?,Online Video Content Delivery, Service Failures Due to Inadequate QoE Considerations QoE-Related Standardization Projects, Definition of Quality of Experience, Definition of Quality, Definition of	

			Experience Quality Formation Process, Definition of Quality of Experience, QoE Strategies in Practice, The QoE/QoS Layered Model Summarizing and Merging the ,QoE/QoS Layers, Factors Influencing QoE, Measurements of QoE, Subjective Assessment, Objective Assessment, End-User Device Analytics, Summarizing the QoE Measurement Methods, Applications of QoE.	
		3.4	Network Design Implications of QoS and QoE – Classification of QoE/ QoS MappingModels, Black-Box Media-Based QoS/QoE Mapping Models, Glass-Box Parameter-Based QoS/QoE Mapping Models, Gray-Box QoS/QoE Mapping Models, Tips for QoS/QoE Mapping Model Selection, IPOriented Parameter-Based QoS/QoE Mapping Models, Network Layer QoE/QoS Mapping Models for Video Services, Application Layer QoE/QoS Mapping Models for Video Services Actionable QoE over IP-Based Networks, The System-Oriented Actionable QoE Solution, The Service-Oriented Actionable QoE Solution, QoE Versus QoS Service Monitoring, QoS Monitoring Solutions, QoE Monitoring Solutions, QoE-Based Network and Service Management, QoE-Based Management of VoIP Calls, QoE-Based Host-Centric Vertical Handover, QoE-Based Network-Centric Vertical Handover.	
4	Modern Network Architecture – Clouds and Fog	4.1	Cloud Computing – Basic Concepts, Cloud Services, Software as a Service, Platform as a Service, Infrastructure as a Service, Other Cloud Services, XaaS, Cloud Deployment Models, Public Cloud Private Cloud Community Cloud,Hybrid Cloud, Cloud Architecture, NIST Cloud Computing Reference Architecture, ITU-T Cloud Computing Reference Architecture, SDN and NFV, Service Provider Perspective Private Cloud Perspective, ITU-T Cloud Computing Functional Reference Architecture.	15
		4.2	The Internet of Things – Components The IoT Era Begins, The Scope of the Internet of Things Components of IoT-Enabled Things, Sensors, Actuators, Microcontrollers, Transceivers, RFID.	
		4.3	The Internet of Things :Architecture and Implementation, IoT Architecture, ITU-T – IoT Reference Model, IoT – World Forum Reference Model, IoT Implementation, IoTivity, Cisco IoT System, ioBridge, Security Security Requirements, SDN Security Threats to SDN, Software – Defined Security, NFV Security, Attack Surfaces, ETSI Security Perspective, Security Techniques, Cloud Security, Security Issues and Concerns, Cloud Security Risks and	

			Countermeasures, Data Protection in the Cloud, Cloud Security as a Service, Addressing Cloud Computer Security Concerns, IoT Security, The Patching Vulnerability, IoT Security and Privacy Requirements Defined by ITU-TAn IoT Security Framework, Conclusion	
			Total No. of Lectures	60

Expected outcome:

1. Demonstrate in-depth knowledge in the area of Computer Networking.
2. To demonstrate scholarship of knowledge through performing in a group to identify, formulate and solve a problem related to Computer Networks
3. Prepare a technical document for the identified Networking System Conducting experiments to analyze the identified research work in building Computer Networks

Reference Books:

1. Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud – WilliamStallings, Addison-Wesley Professional, October 2015.

BOS	Information Technology
Class	M.Sc. I.T
Semester	II
Subject Name	Modern Networking Practical
Subject Code	PMSIT202P
Level of the Subject	Advanced

Practical No	**Details**
1.	Configure IP SLA Tracking and Path Control Topology
2.	Using the AS_PATH Attribute
3.	Configuring IBGP and EBGP Sessions, Local Preference, and MED
4.	Secure the Management Plane
5.	Configure and Verify Path Control Using PBR
6.	IP Service Level Agreements and Remote SPAN in a Campus Environment
7.	Inter-VLAN Routing
8.	Simulating MPLS environment
9.	Simulating VRF
10.	Simulating SDN with OpenDaylight SDN Controller with the Mininet Network Emulator OFNet SDN network emulator
11.	Simulating OpenFlow Using MININET

All practicals are expected to be performed on GNS3/EVE-Ng network Emulator/MININET

BOS	Information Technology
Class	M.Sc. I.T
Semester	II
Subject Name	Microservices Architecture
Subject Code	PMSIT203
Level of the Subject	Advanced

Objectives:

- Gain a thorough understanding of the philosophy and architecture of Web applications using ASP.NET Core MVC;
- Gain a practical understanding of.NET Core;

Unit No.	Name of Unit	Topic No.	Content	No. of Lectures
1	Understanding Microservices	1.1	Understanding Microservices, Adopting Microservices, The Microservices Way.	15L
		1.2	Microservices Value Proposition: Deriving Business Value, defining a Goal-Oriented, Layered Approach, Applying the Goal-Oriented, Layered Approach.	
		1.3	Designing Microservice Systems: The Systems Approach to Microservices, A Microservices Design Process, Establishing a Foundation: Goals and Principles, Platforms, Culture.	
2	Service Design	2.1	Microservice Boundaries, API design forMicroservices, Data and Microservices, Distributed Transactions andSagas, Asynchronous Message-Passing and Microservices, dealingwith Dependencies,	15L
		2.2	System Design and Operations: Independent Deployability, More Servers, Docker and Microservices, Role ofService Discovery, Need for an API Gateway, Monitoring and Alerting.	

		2.3	Adopting Microservices in Practice: Solution Architecture Guidance,Organizational Guidance, Culture Guidance, Tools and Process Guidance, Services Guidance.	
3	Building Microservices with ASP.NET Core:	3.1	Introduction, Installing .NET Core, Building a Console App, Building ASP.NET Core App. Delivering Continuously: Introduction to Docker, Continuous integration with Wercker, Continuous Integration withCircle CI, Deploying to Dicker Hub.	15L
		3.2	Building Microservice withASP.NET Core: Microservice, Team Service, API First Development,Test First Controller, Creating a CI pipeline, Integration Testing,Running the team service Docker Image. Backing Services:Microservices Ecosystems, Building the location Service, EnhancingTeam Service.	
		3.3	Creating Data Service: Choosing a Data Store, Building a Postgres Repository, Databases are Backing Services, Integration Testing Real Repositories, Exercise the Data Service.Event Sourcing and CQRS: Event Sourcing, CQRS pattern, Event Sourcing and CQRS, Running the samples.	
		3.4	Building an ASP.NET Core Web Application:ASP.NET Core Basics, Building Cloud-Native Web Applications.Service Discovery: Cloud Native Factors, Netflix Eureka, Discoveringand Advertising ASP.NET Core Services. DNS and Platform SupportedDiscovery.	
4	Creating Data Service and Configuring Microservice Ecosystems	4.1	Configuring Microservice Ecosystems: Using Environment Variables with Docker, Using Spring Cloud Config Server, Configuring Microservices with etcd,	15L
		4.2	Securing Applications and Microservices: Security in the Cloud, Securing ASP.NET Core Web Apps, Securing ASP.NET Core Microservices.	
		4.3	Building Real-Time Apps and Services: Real-Time Applications Defined, Websockets in the Cloud, Using a Cloud Messaging Provider, Building the Proximity Monitor. Putting It All Together: Identifying and Fixing Anti-Patterns, Continuing the Debate over Composite Microservices, The Future.	
			Total No. of Lectures	60

Expected Outcome:

1. Develop web applications using Model View Control.
2. Create MVC Models and write code that implements business logic within Model methods, properties, and events.
3. Create Views in an MVC application that display and edit data and interact with Models and Controllers.

Reference Books:

1. Microservice Architecture: Aligning Principles,Practices, and Culture by Irakli Nadareishvili, Ronnie Mitra,Matt McLarty,and Mike Amundsen Publisher : O'Reilly Edition :2016
2. Building Microservices with ASP.NET Core By Kevin Hoffman O'Reilly Edition: 2017.

BOS	Information Technology
Class	M.Sc. I.T
Semester	II
Subject Name	Microservices Architecture Practical
Subject Code	PMSIT203P
Level of the Subject	Advanced

Practical No	Details
1.	Building APT.NET Core MVC Application
2.	Building ASP.NET Core REST API.
3.	Working with Docker, Docker Commands, Docker Images and Containers
4.	Installing software packages on Docker, Working with Docker Volumes and Networks.
5.	Working with Docker Swarm
6.	Working with Circle CI for continuous integration.
7.	Creating Microservice with ASP.NET Core.
8.	Working with Kubernetes
9.	Creating Backing Service with ASP.NET Core.
10.	Building real-time Microservice with ASP.NET Core

Practicals can be done with VS2017, VS2019, Visual Code with ASP.NET Core 3.1.x installed along with Docker and Docker Desktop.

BOS	Information Technology
Class	M.Sc.I.T.
Semester	II
Subject Name	Digital Image Processing
Subject Code	PMSIT204
Level of the Subject	Advance

Objectives:

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.

Unit No.	Name of Unit	Topic No.	Content	No. of Lectures
1	Introduction, Digital Image Fundamentals & Intensity Transformations and Spatial Filtering	1.1	Introduction: Digital Image Processing, Origins of Digital Image Processing, Applications and Examples of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System	**15L**
		1.2	Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationships Between Pixels, Basic Mathematical Tools Used inDigital Image Processing,	
		1.3	Intensity Transformations and Spatial Filtering:Basics, Basic Intensity Transformation Functions, Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing (Lowpass) Spatial Filters, Sharpening (Highpass) Spatial Filters,	

			Highpass, Bandreject, and Bandpass Filters from Lowpass Filters, Combining Spatial Enhancement Methods, Using Fuzzy Techniques for Intensity Transformations and Spatial Filtering	
2	Filtering, Image Restoration and Reconstruction, Feature Extraction	2.1	Filtering in the Frequency Domain:Background, Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform of One Variable, Extensions to Functions of Two Variables, Properties of the 2-D DFT and IDFT, Basics of Filtering in the Frequency Domain, Image Smoothing Using Lowpass Frequency Domain Filters, Image Sharpening Using Highpass Filters, Selective Filtering, Fast Fourier Transform	**15L**
		2.2	Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-----Spatial Filtering, Periodic Noise Reduction Using Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Image Reconstruction from Projections	
		2.3	Feature Extraction:Background, Boundary Preprocessing, Boundary Feature Descriptors, Region Feature Descriptors, Principal Components as Feature Descriptors, Whole-Image Features, Scale-Invariant Feature Transform (SIFT)	
3	Image Transforms, Color Image Processing & Image Compression and Watermarking	3.1	Wavelet and Other Image Transforms:Wavelet and Other Image Transforms: Preliminaries, Matrix-based Transforms, Correlation, Basis Functions in the Time-Frequency Plane, Basis Images, Fourier-Related Transforms, Walsh-Hadamard Transforms, Slant Transform, Haar Transform, Wavelet Transforms	**15L**
		3.2	Color Image Processing**:** Color Fundamentals, Color Models, Pseudocolor Image Processing, Full-Color Image Processing, Color Transformations, Color Image Smoothing and Sharpening, Using Color in Image Segmentation, Noise in Color Images, Color Image Compression	

		3.3	Image Compression and Watermarking**:** Fundamentals, Huffman Coding, Golomb Coding, Arithmetic Coding, LZW Coding, Run-length Coding, Symbol-based Coding, 8 Bit-plane Coding, Block Transform Coding, Predictive Coding, Wavelet Coding, Digital Image Watermarking,	
4	Morphological Image Processing & Image Segmentation	4.1	Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transform, Morphological Algorithms, Morphological Reconstruction¸ Morphological Operations on Binary Images, Grayscale Morphology	15L
		4.2	Image Segmentation I: Edge Detection, Thresholding, and Region Detection: Fundamentals, Thresholding, Segmentation by Region Growing and by Region Splitting and Merging, Region Segmentation Using Clustering and Superpixels, Region Segmentation Using Graph Cuts, Segmentation Using Morphological Watersheds, Use of Motion in Segmentation	
		4.3	Image Segmentation II: Active Contours: Snakes and Level Sets: Background, Image Segmentation Using Snakes, Segmentation Using Level Sets.	
			Total No. of Lectures	60

Expected Outcome:

1. Understand the relevant aspects of digital image representation and their practical implications.
2. Have the ability to design point wise intensity transformations to meet stated specifications.
3. Have an understanding of the underlying mechanisms of image compression, and the ability to design systems using standard algorithms to meet design specifications.

Reference Books :

1. Digital Image Processing Gonzalez and Woods, Pearson/Prentice Hall ,Fourth 2018.
2. Fundamentals of Digital Image Processing,A K. Jain PHI.
3. The Image Processing Handbook,J. C. Russ CRC, Fifth 2010

BOS	Information Technology
Class	M.Sc.I.T.
Semester	II
Subject Name	Digital Image Processing Practical
Subject Code	PMSIT204P
Level of the Subject	Advance

Practical No.	**Details**
1	Apply following image enhancement algorithms to the given input image. Display the resulting image. ● Contrast stretching ● Histogram Equalization ● Image averaging ● Smoothing
2	A filter function from one of the following filters along with a set of values for the parameter list is provided. For this filter function derive the an (k x k) filter mask for one of the values of k, k = 3,5,9. The filter mask is to be applied to the given input image and the enhanced image is to be displayed. ● Gaussian Low Pass Filter ● Butterworth Low Pass Filter ● Ideal High Pass Filter ● (iv) Ideal Low Pass Filter
3	The Statistical Filter specifications are provided. This filter should be applied to the input image and the resulting image should be displayed ● Mean and Median Filters ● (ii) Max-min and Min-max Filters
4	A one dimensional function is input. This can be extracted from scan line information of an image. A wavelet basis for one dimensional function should be

	encoded. The function is displayed at different resolution levels, j = 4, 8, 16, 32 (Wavelet Toolbox)
5	An input image is provided. Any one of the following Error Free Image Compressionalgorithm is provided. The algorithm is to be applied the input image and percentage reduction along with the compressed image is to be displayed. This image is now to bedecompressed and the original image must be displayed. ● Variable length coding ● Huffman coding ● (iii) Lempel-Ziv-Welch (LZW) Coding
6	An input image is provided. A Lossy Image Compression algorithm is provided. The algorithm is to be applied the input image and percentage reduction along with the compressed image is to be displayed. The nature of information lost is to be explained. This image is now to be decompressed and the original image must be displayed
7	A texture image or a granular image is provided as input. A suitable algorithm that computes pattern size or granule size in terms of number of pixel it occupies is to be implemented. This information is to display as a histogram.
8	A texture image or a granular image is provided as input. A suitable edge detection algorithm is implemented which determines the number of patterns or granule in the input image. If there are patterns/granules of different characteristics (like color) then their number is determined and the information is to be displayed as a histogram.
9	A texture image or a granular image is provided as input. A suitable edge detection algorithm is implemented which determines the number of patterns or granule in the input image. If there are patterns/granules of different characteristics (like color) then their number is determined and the information is to be displayed as a histogram.
10	Write a program to input an image and fill the empty region inside the image using Region Filling procedure.
11	Write a program to input an image and perform following morphological operations on it: ● Erosion and Dilation ● Opening and Closing ● Boundary Extraction