AC: 02.06.2025 ITEM NO: 2.4

Deccan Education Society's

Kirti M. Doongursee College of Arts, Science and Commerce (AUTONOMOUS)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for
Program: Master of Science
Course: M.Sc. Part-1
Subject: Information Technology

Choice Based Credit System (CBCS)
with effect from
Academic Year 2025-2026

PROGRAM OUTCOMES

PO	Description
A student completing Master Degree in Science Program will be able to	
PO1	Ability to apply the knowledge of Information Technology with recent trends aligned with research and industry.
PO2	Ability to apply IT in the field of Computational Research, Soft Computing, Big Data Analytics, Data Science, Image Processing, Artificial Intelligence, Networking and Cloud Computing.
PO3	Ability to provide socially acceptable technical solutions in the domains of Information Security, Machine Learning, Internet of Things and Embedded System, Infrastructure Services as specializations.
PO4	Ability to apply the knowledge of Intellectual Property Rights, Cyber Laws and Cyber Forensics and various standards in interest of National Security and Integrity along with IT Industry.
PO5	Ability to write effective project reports, research publications and content development and to work in a multidisciplinary environment in the context of changing technologies.

Deccan Education Society's

Kirti M. Doongursee College

(Autonomous) Proposed

Curriculum as per NEP-2020

Year of implementation- 2025-2026

Name of the Department-Information Technology

Semester	Course Code	Course Title	Vertical	Credit
I	25ITMJ711	Data Science	Major	4
	25ITMJP71	Data Science Practical	Major	2
	25ITMJ712	Soft Computing Techniques	Major	4
	25ITMJP72	Soft Computing Techniques Practical	Major	2
	25ITMJ713	Cloud Computing	Major	2
	25ITEL721 25ITEL722 25ITEL723	a. Advanced DataAnalysis and Visualization b. Security Breaches and Countermeasures c. Image Processing	Elective	2
	25ITELP71 25ITELP72 25ITELP73	a. Advanced DataAnalysis and Visualization Practical b. Security Breaches and Countermeasures Practical c. Image Processing Practical	Elective	2
	25ITMJ714	Research Methodology	Research Methodology	4
II	25ITMJ811	Big Data Analytics	Major	4
	25ITMJP81	Big Data Analytics– Practical	Major	2
	25ITMJ812	Modern Networking	Major	4
	25ITMJP82	Modern Networking– Practical	Major	2
	25ITMJ813	Microservices Architecture	Major	2

	25ITEL821 **25ITEL822** **25ITEL823**	**a.Advanced IoT** **b.Malware Analysis** **c.Computer Vision**	**Elective**	**2**
	25ITELP81 **25ITELP82** **25ITELP83**	**a.Advanced IoT Practical** **b.Malware Analysis Practical** **c.Computer Vision Practical**	**Elective**	**2**
	25ITOJT83	**Internship Project**	**OJT**	**4**

SEMESTER- I

Course Code	MAJOR SEM – I	Credits	Lecture s/Week
25ITMJ711	PAPER I - Data Science	4	4

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Identify key technologies for data science and business analytics.

CO2: Compare the different tools used for data extraction and data mining.

CO3**:** Implement quantitative modeling and data analysis techniques to the solution of real world business problems

CO4: Differentiate between various exploratory data analysis methods.

Unit	Topics	No of Lectures
I	**Data Science Technology Stack**: Rapid Information Factory Ecosystem, Data Science Storage Tools, Data Lake, Data Vault, Data Warehouse Bus Matrix, Data Science Processing Tools ,Spark, Mesos, Akka , Cassandra, Kafka, Elastic Search, R ,Scala, Python, MQTT, The Future **Layered Framework**: Definition of Data Science Framework, CrossIndustry Standard Process for Data Mining (CRISP-DM), Homogeneous Ontology for Recursive Uniform Schema, The Top Layers of a Layered Framework, Layered Framework for High-Level Data Science and Engineering **Business Layer**: Business Layer, Engineering a Practical Business Layer Utility Layer: Basic Utility Design, Engineering a Practical Utility Layer.	15
II	**Three Management Layer**s: Operational Management Layer, Processing-Stream Definition and Management, Audit, Balance, and Control Layer, Balance, Control, Yoke Solution, Cause-and-Effect, Analysis System, Functional Layer, Data Science Process **Assess Superstep:** Assess Superstep, Errors, Analysis of Data, Practical Actions, Engineering a Practical Assess Superstep	15

III	**Process Superstep** : Data Vault, Time-Person-Object-Location-Event Data Vault, Data Science Process, Data Science, Transform Superstep : Transform Superstep, Building a Data Warehouse, Transforming with Data Science, Hypothesis Testing, Overfitting and Underfitting, Precision-Recall, Cross-Validation Test	**15**
IV	**Transform Superstep:** Univariate Analysis, Bivariate Analysis, Multivariate Analysis, Linear Regression, Logistic Regression, Clustering Techniques, ANOVA, Principal Component Analysis (PCA), Decision Trees, Support Vector Machines, Networks, Clusters, and Grids, Data Mining, Pattern Recognition, Machine Learning, Bagging Data,Random Forests, Computer Vision (CV) , Natural Language Processing (NLP), Neural Networks, TensorFlow.	**15**

References:

- Practical Data Science, Andreas François Vermeulen, APress 2018
- Principles of Data Science Sinan Ozdemir PACKT 2016
- Data Science from Scratch Joel Grus O'Reilly 2015
- Data Science from Scratch first Principle in python Joel Grus Shroff Publishers 2017

Course Code	MAJOR SEM – I	Credits	Lectures /Week
25ITMJP71	**Data Science – Practical**	**2**	**4**

Course Outcome: -

CO1- Recall algorithms to build machine intelligence and demonstrate their use for decision making.
CO2- Explain the purpose of different data preprocessing techniques
CO3- Use quantitative modeling and data analysis techniques to present results using data visualization techniques.
CO4- Differentiate the relationships between variables using correlation coefficients.

1	Creating and using database in Cassandra
2	Write the programs for the following: ● Text Delimited CSV to HORUS format ● XML to HORUS format ● JSON to HORUS format ● MySql database to HORUS format ● Picture(JPEG) to HORUS format ● Video to HORUS format ● Audio to HORUS format
3	● Fixers Utilities ● Data Binning or Bucketing ● Averaging of data ● Outlier Detection ● Logging
4	● Perform following data processing using R ● Program retrieve different attributes of data ● Data pattern ● Loading IP_DATA_ALL
5	● Perform error management on the given data using pandas package ● Write python/R program to create the network routing diagram from the given data on routers ● Write a python/R program to build acyclic graph ● Write python/R program to pick the content for BillBoards from the given data ● Write a python/R program to generate GML file from given csv file ● Write python/R program to plan location of warehouse from the given data

	• Write python/R program using data science via clustering to determine new warehouse using the given data • Using the given data Write python/R program to plan the shipping routers from best-fit international logistics • Write python/R program to delete the best packing option to ship in container from the given data • Write python program to create delivery route using the given data • Write python program to create simple forex trading planner from the given data • Write python program to process the balance sheet to ensure the only good data is processing • Write python program to generate payroll from the given data
6	• Build the time hub, links and satellites
7	• Transforming data
8	• Organizing data
9	• Generating data
10	• Data visualisation using power Bi

Note: Students are required to complete a minimum of 80% of all the practicals.

Course Code	MAJOR SEM – I	Credits	Lectures/Week
25ITMJ712	Paper II – Soft computing Techniques	4	4

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Recall the definitions of key techniques like fuzzy logic, neural networks, genetic algorithms, and evolutionary computing.

CO2: Describe how a fuzzy logic system works, including membership functions and fuzzy rules.

CO3:Use a neural network model to classify data in a machine learning task.

CO4:Compare the performance of a neural network on a given dataset, identifying strengths and weaknesses.

Unit	Topics	No of Lectures
I	**a) Introduction of soft computing -** soft computing vs. hard computing, various types of soft computing techniques, Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Classification, Clustering, Bayesian Networks, Probabilistic reasoning, applications of soft computing. **b) Artificial Neural Network -** Fundamental concept, Evolution of Neural Networks, Basic Models, McCulloh-Pitts Neuron, Linear Separability, Hebb Network**.** **c) Supervised Learning Network -** Perceptron Networks, Adaptive Linear Neuron, Multiple Adaptive Linear Neurons, Backpropagation Network, Radial Basis Function, Time Delay Network, Functional Link Networks, Tree Neural Network	15
II	**a) Associative Memory Networks -** Training algorithm for pattern Association, Autoassociative memory network, hetroassociative memory network, bi-directional associative memory, Hopfield networks, iterative autoassociative memory networks, temporal associative memory networks. Kohonen self-organizing feature maps, learning vectors quantization, counter propogation networks, adaptive resonance theory networks. **b) Special Networks -** Simulated annealing, Boltzman machine, Gaussian Machine, Cauchy Machine,	15

	Probabilistic neural net, cascade correlation network, cognition network, neo-cognition network, cellular neural network, optical neural network **c) Third Generation Neural Networks -** Spiking Neural networks, convolutional neural networks, deep learning neural networks, extreme learning machine model. **d) UnSupervised Learning Networks -** Fixed weight competitive nets	
III	**a) Introduction to Fuzzy Logic, Classical Sets and Fuzzy sets -** Classical sets, Fuzzy sets. **b) Classical Relations and Fuzzy Relations -** Cartesian Product of relation,classical relation, fuzzy relations, tolerance and equivalence relations, non- iterative fuzzy sets. **c) Membership Function -** features of the membership functions, fuzzification, methods of membership value assignments. **d)Defuzzification -** Lambda-cuts for fuzzy sets, Lambda-cuts for fuzzy relations, Defuzzification methods. **e) Fuzzy Arithmetic and Fuzzy measures -** fuzzy arithmetic, fuzzy measures, measures of fuzziness, fuzzy integrals.	**15**
IV	**a)Fuzzy Rule base and Approximate reasoning -** Fuzzy proportion, formation of rules, decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, Fuzzy logic control systems, control system design, architecture and operation of FLC system, FLC system models and applications of FLC System. **b)Genetic Algorithm -** Biological Background, Traditional optimization and search techniques, genetic algorithm and search space, genetic algorithm vs. traditional algorithms, basic terminologies, simple genetic algorithm, general genetic algorithm, operators in genetic algorithm, stopping condition for genetic algorithm flow, constraints in genetic algorithm, problem solving using genetic algorithm, the schema theorem, classification of genetic algorithm, Holland classifier systems, genetic programming, advantages and limitations and applications of genetic algorithm.Differential Evolution Algorithm, Hybrid soft computing techniques – neuro – fuzzy hybrid, genetic neuro-hybrid systems, genetic fuzzy hybrid and fuzzy genetic hybrid systems.	**15**

References:

- Artificial Intelligence and Soft Computing, Anandita Battacharya Das, SPD 3rd 2018
- Principles of Soft computing, S.N.Sivanandam S.N.Deepa, Wiley 3 rd 2019.
- Neuro-Fuzzy Computing and Soft J.S.R.Jang, C.T.Sun and E.Mizutani Prentice Hall of India 2004
- Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications S.Rajasekaran, G. A. Vijayalakshmi, Prentice Hall of India 2004
- Fuzzy Logic with Engineering Applications , Timothy J.Ross, McGraw-Hill

Course Code	MAJOR SEM – I	Credit	Lectures/ Week
25ITMJP72	**Soft computing Techniques-Practical**	**2**	**4**

Course Outcomes:

After successful completion of this course, students would be able to

CO1**:** Recall the hands-On Implementation of various soft computing techniques.

CO2**:** Interpret the distinction between exact and approximate reasoning methods in computing.

CO3: Use the algorithms in Real-World Applications.

CO4**:** Compare the effectiveness of a neural network by evaluating its performance using metrics like accuracy, loss, and confusion matrices.

1	a.Design a simple linear neural network model. b.Calculate the output of the neural net using both binary and bipolar sigmoidal function.
2	a.Generate AND/NOT function using McCulloch-Pitts neural net. b. Generate XOR function using McCulloch-Pitts neural net.
3	a.Write a program to implement Hebb's rule b.Write a program to implement the delta rule.
4	a.Write a program for Back Propagation Algorithm b.Write a program for error Backpropagation algorithm.
5	a.Write a program for Hopfield Network. b.Write a program for Radial Basis function

6	a.Kohonen Self organizing map b.Adaptive resonance theory
7	a.Write a program for Linear separation b.Write a program for Hopfield network model for associative memory
8	a.Membership and Identity Operators | in, not in, b.Membership and Identity Operators is, is not
9	a.Find ratios using fuzzy logic b.Solve Tipping problem using fuzzy logic
10	a.Implementation of Simple genetic algorithm b.Create two classes: City and Fitness using Genetic algorithm

Note: Students are required to complete a minimum of 80% of all the practicals.

Course Code	**MAJOR SEM – I**	**Credits**	**Lectures /Week**
25ITMJ713	**Paper III - Cloud Computing**	**2**	**2**
Course Outcomes: After successful completion of this course, students would be able to CO1: Define the core concepts of the cloud computing paradigm CO2**:** Describe the basic concepts and need of Cloud Computing CO3: Use the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost. CO4**:** Compare the various cloud programming models and apply them to solve problems on the cloud.			
Unit	**Topics**		**No of Lectures**
I	**Introduction to Cloud Computing**: Introduction, Historical developments, Building Cloud Computing Environments, Principles of Parallel and Distributed Computing: Eras of Computing, Parallel v/s distributed computing, Elements of Parallel Computing, Elements of		**15**

	distributed computing, Technologies for distributed computing. **Virtualization**: Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples. Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud usage monitor, Resource replication, Ready-made environment	
II	**Cloud Computing Architecture**: Introduction, Fundamental concepts and models, Roles and boundaries, Cloud Characteristics, Cloud Delivery models, Cloud Deployment models, Economics of the cloud, Open challenges. Fundamental Cloud Security: Basics, Threat agents, Cloud security threats, additional considerations. Industrial Platforms and New Developments: Amazon Web Services, Google App Engine, Microsoft Azure. **Specialized Cloud Mechanisms**: Automated Scaling listener, Load Balancer, SLA monitor, Pay-per-use monitor, Audit monitor, failover system, Hypervisor, Resource Centre, Multi Device broker, State Management Database. Cloud Management Mechanisms: Remote administration system, Resource Management System, SLA Management System, Billing Management System. **Cloud Security Mechanisms**: Encryption, Hashing, Digital Signature, Public Key Infrastructure (PKI), Identity and Access Management (IAM), Single 12 11 Sign-On (SSO), Cloud-Based Security Groups, Hardened Virtual Server Images	**15**

References:

- Mastering Cloud Computing Foundations and Applications Programming, Rajkumar Buyya, Christian Vecchiola, S. Thamarai, Selvi Elsevier - 2013
- Cloud Computing Concepts, Technology & Architecture, Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, Prentice Hall - 2013
- Distributed and Cloud Computing, From Parallel Processing to the Internet of Things Kai Hwang, Jack Dongarra, Geoffrey Fox ,MK Publishers -- 2012

Course Code	Elective	Credits	Lectures /Week
25ITEL721	**Advance Data Analysis and Visualization**	**02**	**02**

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Define key terms related to data analysis, data visualization, and data frames

CO2: Explain the significance of data visualization in decision-making and business intelligence

CO3: Demonstrate the ability to connect to different types of data sources with Tableau

CO4: Compare different data analysis tools used for visualization

Unit	Topics	No of Lectures
I	**Introduction to Data Analysis and Visualization:** Overview, Types of data analysis, introduction to Data Visualization and its importance in decision making and business intelligence Introduction to Data Frames, Concept of a Data Frame, Features of Data Frames, Libraries used for Data Frames, Methods of Creating Data Frames, Basic Operations on Data Frames, Data Manipulation Operations like sorting, filtering, grouping, data transformation.	**15**
II	**Data Visualization with Tableau:** Data types, file types, show me menu, Type of data sources supported by, connecting different data sources, edit metadata, filtering fields, types of charts, group, set, hierarchy, parameters, pivot, data joining, data blending, calculated fields, preparing dashboards and storyboards.	**15**

References:

- Data Analysis and Visualization Using Python, Dr. Ossama Embarak,Apress, 2018

- "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython",Wes McKinney, O'Reilly, 2nd Edition, 2018.
- Learning Tableau 2020, Create effective data visualizations, build interactive visual analytics, and transform your organization. Joshua Milligan, Fourth Edition, Packt, 2020

Course Code	Elective	Credits	Lectures/ Week
25ITELP71	**Advance Data Analysis and Visualization -Practical**	**02**	**04**

Course Outcomes:

After successful completion of this course, students would be able to

CO1:Define data frames and to perform different operations on them.

CO2: Interpret outlier values using statistical methods and visualization tools.

CO3:Employ trend models to identify patterns in data and use them for reliable forecasting.

CO4:Organize the knowledge of the entire data analysis workflow, from data collection and cleaning to visualization and storytelling, through real-world applications.

Note: Practical can be implemented using Python / R studio.

1	Create one-dimensional data using series and perform various operations on it.
2	Create Two-dimensional data with the help of data frames and perform different operations on it.
3	Write a code to read data from the different file formats like JSON, HTML, XML, and CSV files and check for missing data and outlier values and handle them.
4	Perform Reshaping of the hierarchical data and pivoting data frame data.
5	Connecting and extracting with various data resources in tableau.
6	Performing calculations and creating parameters in Tableau.
7	Designing Tableau Dashboards for different displays and devices.
8	Create a Trend model using data, Analyse-it and use it for forecasting.
9	Creating Geospatial feature maps in Tableau using Geospatial Data.
10	Create Dashboard and Storytelling using tableau.

Note: Students are required to complete a minimum of 80% of all the practicals.

Course Code	Elective	Credits	Lectures /Week
25ITEL722	**Security Breaches and Countermeasures**	**02**	**02**

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Recall different types of threats and attack vectors

CO2: Describe the purpose and methodologies of vulnerability analysis and penetration testing

CO3: Utilize network scanning tools to identify live hosts and open ports

CO4: Compare different types of malware and their countermeasures

Unit	Topics	No of Lectures
I	**Introduction to Security Breaching:** Overview of Information Security, Threats and Attack vectors, Concepts of Hacking – Ethical and Unethical, Information Security Controls, Concepts of penetration Testing, Information Security Laws and Standards. **Network Scanning:** Concepts, scanning beyond IDS and firewalls, Tools, Banner Grabbing, Scanning Techniques, Network Diagrams, penetration testing. Enumeration: Concepts, **Different types of enumeration:** Netbios, SNMP, LDAP, NTP, SMTP, DNS, other enumeration techniques, Countermeasures, Penetration Testing **Analysis of Vulnerability:** Concepts, Assessment Solutions, Scoring Systems, Assessment Tools, Assessment Reports. **Breaching System Security:** Concepts, Cracking passwords, Escalating privileges, Executing Applications, Hiding files, covering tracks, penetration testing.	**15**
II	**Threats due to malware:** Concepts, Malware Analysis, Trojan concepts, countermeasures, Virus	

	and worm concepts, antimalware software, penetration testing. Network Sniffing: Concepts, countermeasures, sniffing techniques, detection techniques, tools,penetration testing. **Denial of Service and Distributed Denial of service:** Concepts, techniques, botnets, attack tools, countermeasures, protection tools, penetration testing. **Hijacking an active session:** Concepts, tools, application-level session hijacking, countermeasures, network level session hijacking, penetration testing. **Evasion of IDS, Firewalls and Honeypots**: Introduction and concepts, detecting honeypots, evading IDS, IDS and Firewall evasion countermeasures, evading firewalls, penetration testing. **Reactive Countermeasures:** Security Monitoring and Logging, Incident Response, Legal and Ethical Considerations	**15**

References:

- All in One, Certified Ethical Hacker, Matt Walker, Tata McGraw Hill,2012
- CEH V10: EC-Council Certified Ethical Hacker Complete Training Guide,I.P. Specialist, IPSPECIALIST - 2018
- The Complete Ethical Hacking Book: A Comprehensive Beginner's Guide to Learn and Master in Ethical Hacking, Thirumalesh, Orangebooks Publication

Course Code	**Elective**	**Credits**	**Lectures /Week**
25ITELP72	**Security Breaches and Countermeasures-Practical**	**2**	**04**

Course Outcomes:

After successful completion of this course, students would be able to

CO1:Identify various forms of security breaches such as cyberattacks, insider threats, physical security breaches, and social engineering attacks.

CO2: Classify the threats and different types of attacks that can be launched on computing systems.

CO3:Use security tools such as intrusion prevention systems (IPS) or anti-malware software to protect systems in a real-world environment.

CO4:Examine the existing security policies and recommend improvements based on the identified weaknesses from a breach investigation.

1	Use the following tools to perform footprinting and reconnaissance i. Recon-ng (Using Kali Linux)

	ii. FOCA Too iii. Windows Command Line Utilities iv. Ping
2	i. Tracert using Ping 1i. Tracert iii. NSLookup iv. Website Copier Tool – HTTrack v. Metasploit (for information gathering)
4	Whois Lookup Tools for Mobile – DNS Tools, Whois, Ultra Tools Mobile i. Smart Whois ii.eMailTrackerPro
5	Tools for Mobile – Network Scanner, Fing – Network Tool, Network Discovery Tool, Port Droid Tool Scan the network using the following tools: i.Hping2 / Hping ii. Advanced IP Scanner iii.Angry IP Scanner iv. Masscan v. NEET vi.CurrPorts vii.Colasoft Packet Builder viii.The Dud
6	Use Proxy Workbench to see the data passing through it and save the data to file.
7	Perform Network Discovery using the following tools: i.Nessus ii.OpenVas
8	a.Perform mobile network scanning using NESSUS. i. Winrtgen

	ii. PWDump iii. Ophcrack iv. Flexispy v. NTFS Stream Manipulation
9	Perform the System Hacking using the following tools: i. ADS Spy ii. Snow iii. Quickstego iv. Clearing Audit Policies v. Clearing Logs
10	Use wireshark to sniff the network

Note: Students are required to complete a minimum of 80% of all the practicals.

Course Code	**Elective**	**Credits**	**Lectures/ Week**
25ITEL723	**Image Processing**	**02**	**02**

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Recall the fundamental concepts of digital image processing and techniques.

CO2: Explain and interpret the principles behind image enhancement, noise reduction, edge detection, morphological operations, and segmentation methods.

CO3: Utilize image processing techniques such as intensity transformations, histogram processing, filtering, edge detection, and morphological operations to analyse and enhance digital images.

CO4: Assess the effectiveness of different image processing techniques in improving image quality, extracting features, and segmenting regions according to the application requirements.

Unit	Topics	No of Lectures
I	**Fundamentals of Digital Image Processing:** Basics of Image Processing: Digital image representation- pixels, resolution, and intensity; Image file formats- BMP, PNG, JPEG, and TIFF; Tools and libraries: OpenCV, Pillow, scikit-image Image Intensity Transformations: Logarithmic and Power-law Transformations, Contrast Stretching and Thresholding. Histogram Processing: Histogram Equalization, Histogram Matching. Noise and Image Smoothing: Noise types-Gaussian, Salt-and-Pepper, Speckle; Noise reduction- Mean, Gaussian, and Median Filtering.	**15**
II	**Advanced Image Processing Techniques :** Edge Detection: Sobel, Prewitt, Roberts, and Canny Techniques. Morphological Operations: Erosion, Dilation, Opening, Closing; Skeletonization, Boundary Extraction. Image Segmentation & Feature Extraction: Thresholding, Region-based Segmentation, feature extraction using Difference of Gaussians (DoG).	**15**

References:

- Digital Image Processing Gonzalez and Woods Year Pearson/Prentice Hall
- Fundamentals of Digital Image Processing A K. Jain PHI Fourth Edition 2018
- The Image Processing Handbook J. C. Russ CRC Fifth Edition 2010

Course Code	Elective	Credits	Lectures/Week
25ITELP73	**Image Processings-Practical**	**2**	**04**

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Identify different techniques for contrast adjustment in images.

CO2: Describe how contrast adjustments can enhance the visual appearance of images. CO3: Implement programs to perform various contrast adjustments on images. CO4: Compare the results of different contrast adjustment techniques on the same image.	
1	Write a program to implement point/pixel intensity transformations such as 1. Log and Power-law Transformations. 2. Contrast Adjustments.
2	Write program to implement Histogram Equalization
3	Write a program to implement Linear and Non-Linear noise smoothing on suitable image.
4	Write a program to apply various image enhancement using image directives by implementing smoothing filters for generating suitable images for specific application requirements.
5	Write a program to apply various image enhancement using image directives by implementing sharpening, and unsharp masking filters for generating suitable images for specific application requirements.
6	Write a program to apply edge detection techniques to extract meaningful information from the given image samples. 1. Sobel Image 2. Canny Edge
7	Write a program to implement morphological image processing techniques on binary images 1. Dilation and erosion. 2. Opening and closing.
8	Write a program to implement morphological image processing techniques on gray scale images 1. Dilation and erosion. 2. Opening and closing.
9	Write a Program to apply Various Enchantments on Images using images directives by Implementing Gradient and Laplacian Operations.
10	Write the program to apply segmentation for detecting lines, circles, and other shapes/objects. Also, implement edge-based and region-based segmentation.

Course Code	RESEARCH METHODOLOGY SEM-I	Credits	Lectures/ Week
25ITMJ714	Paper IV– Research Methodology	4	4

Course Outcomes:

After successful completion of this course, students would be able to

CO1:Recognize various research designs such as experimental, descriptive, exploratory, and correlational designs.

CO2: Explain the steps involved in conducting research, from formulating a research problem to presenting findings.

CO3: Develop the ability to explore research techniques used for solving any real world or innovative problem.

CO4: Organize the data to help the decision makers in innovative Business process

Unit	Topics	No of Lectures
I	**Introduction:** Role of Business Research, Information Systems and Knowledge Management, Theory Building, Organization ethics and Issues Beginning Stages of Research Process: Problem definition, Qualitative research tools, Secondary data research	15
II	**Research Methods and Data Collection:** Survey research, communicating with respondents, Observation methods, Experimental research	15
III	**Measurement Concepts, Sampling and Field work**: Levels of Scale measurement, attitude measurement, questionnaire design, sampling designs and procedures, determination of sample size.	15
IV	**Data Analysis and Presentation**: Editing and Coding, Basic Data Analysis, Univariate Statistical Analysis and Bivariate Statistical analysis and differences between two variables. Multivariate Statistical Analysis.	15

References:

- Business Research Methods William, G.Zikmund, B.J, Babin, J.C. Carr, Atanu Adhikari, M.Griffin, Cengage 8e 2016
- Business Analytics, Albright Winston, Cengage 5e 2015
- Research Methods for Business Students Fifth Edition, Mark Saunders 2011

SEMESTER- II

Course Code	MAJOR SEM – II	Credits	Lectures/ Week
25ITMJ811	**Paper I- Big Data Analytics**	**4**	**4**

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Recall the basics of Big Data and its technologies.

CO2: Describe the overview of an exciting growing field of big data analytics.

CO3: Use the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.

CO4: Compare the big data like Hadoop, NoSql MapReduce

Unit	Topics	No of Lectures
I	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. 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	15
II	Analytical Theory and Methods: Clustering and Associated Algorithms, Association Rules, Apriori Algorithm, Candidate Rules, Applications of Association Rules, Validation and Testing, Diagnostics, Regression, Linear Regression, Logistic Regression, Additional Regression Models.	15
III	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	15

	Raw Text, Representing Text, Term Frequency-Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments	
IV	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, 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, V Distributed Analysis and Patterns,	15

References:

- Big Data and Analytics Subhashini Chellappan Seema Acharya Wiley First
- Data Analytics with Hadoop An Introduction for Data Scientists Benjamin Bengfort and Jenny Kim O'Reilly 2016
- Big Data and Hadoop V.K Jain Khanna Publishing First 2018

Course Code	MAJOR SEM – II	Credits	Lectures/Week
25ITMJ811	Big Data Analytics– Practical	2	4

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics.

CO2: Describe the key issues in big data management and its associated applications in intelligent business and scientific computing.

CO3:Employ business models and scientific computing paradigms, and apply software tools for big data analytics.

CO4:Compare different perspectives of big data analytics in various applications like recommender systems, social media applications etc.

1	Install, configure and run Hadoop and HDFS and explore HDFS.
a	Implement word count / frequency programs using MapReduce
b	Implement an MapReduce program that processes a weather dataset.
c	Implement an application that stores big data in Hbase / MongoDB and manipulate it using R / Python
2	Implement the program in practical 4 using Pig
3	Configure the Hive and implement the application in Hive
4	Write a program to illustrate the working of Jaql.
5	Implement the following:
6	Implement Decision tree classification techniques
7	Implement SVM classification techniques
8	Solve the following: 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 fitor not. require (foreign), require(MASS)
9	MULTIPLE REGRESSION MODEL Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.
10	Solve the Following: i.CLASSIFICATION MODEL a. Install relevant packages for classification. b. Choose a classifier for classification problems. c. Evaluate the performance of the classifier. ii.CLUSTERING MODEL a. Clustering algorithms for unsupervised classification. b. Plot the cluster data using R visualizations.

Note: Students are required to complete a minimum of 80% of all the practicals.

Course Code	MAJOR SEM – II	Credits	Lectures/Week
25ITMJ812	Modern Networking	4	4

Course Outcomes:

After successful completion of this course, students would be able to

CO1:Recall the networking concepts and protocols.

CO2:Describe the state-of-the-art in network protocols, architectures and applications.

CO3:Implement novel ideas in the area of Networking via term-long research projects.

CO4:Compare existing network protocols and networks.

Unit	Topics	No of Lectures
I	**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, Requirements and Technology Types of Network and Internet Traffic,Elastic Traffic,Inelastic Traffic, Real-Time Traffic Characteristics Demand: Big Data, Cloud Computing, and Mobile TrafficBig 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 SoftwareDefined Networking,Network Functions Virtualization Modern Networking Elements	15
	Software-Defined Networks SDN: Background and Motivation, Evolving Network Requirements Demand Is Increasing,Supply Is IncreasingTraffic Patterns Are More ComplexTraditional Network Architectures are Inadequate, The SDN Approach Requirements SDN Architecture Characteristics of Software12 20 Defined Networking, SDN-and NFV-Related Standards StandardsDeveloping	15

II	Organizations Industry Consortia Open Development Initiatives, SDN Data Plane and OpenFlow 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 InterfaceRouting, ITU-T Model, OpenDaylight OpenDaylight Architecture OpenDaylight Helium, REST REST Constraints Example REST API, Cooperation and Coordination Among Controllers, Centralized Versus Distributed Controllers, HighAvailability Clusters Federated SDN Networks, Border Gateway Protocol Routing and QoS Between Domains, Using BGP for QoS Management IETF SDNi OpenDaylight SNDi 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	
III	**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, 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 30 Hrs Manager,NFV Orchestrator, Repositories, Element Management, OSS/BSS, NFV Use Cases Architectural Use Cases, Service-Oriented Use Cases, SDN and NFV 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	15

	Example, Network Virtualization Architecture, Benefits of Network Virtualization, OpenDaylight's Virtual Tenant Network, Software-Defined Infrastructure,Software-Defined Storage, SDI Architecture	
IV	**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, 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 Network Design Implications of QoS and QoE Classification of QoE/ QoS Mapping Models, BlackBox 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,IP-Oriented 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, QoE15 Based Host-Centric Vertical Handover, QoE-Based NetworkCentric Vertical Handover	15

References:

- Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud William Stallings AddisonWesley Professional October 2015
- SDN and NFV Simplified A Visual Guide to Understanding Software Defined Networks and Network Function Virtualization Jim Doherty Pearson Education, Inc
- Network Functions Virtualization (NFV) with a Touch of SDN Rajendra Chayapathi Syed Farrukh Hassan AddisonWesley

- CCIE and CCDE Evolving Technologies Study Guide Brad dgeworth, Jason Gooley, Ramiro Garza Rios Pearson Education, Inc 2019

Course Code	**MAJOR SEM –II**	**Credits**	**Lecture/ week**
25ITMJP82	**Modern Networking Practical**	**2**	**4**

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Recall fundamental concepts, principles, and terminology related to modern networking.

CO2: Describe a technical document for the identified Networking System Conducting experiments to analyze the identified research work in building Computer Networks

CO3: Solve a problem related to computer networks by identifying and formulate the network solution

CO4: Differentiate the traditional computer networks with modern networking.

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

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 and Simulating VRF
9	Simulating SDN with

	• OpenDaylight SDN Controller • with the Mininet Network • Emulator • OFNet SDN network emulator
10	Simulating OpenFlow Using MININET

Note: Students are required to complete a minimum of 80% of all the practicals.

Course Code	**MAJOR SEM II**	**Credits**	**Lectures/ Week**
25ITMJ813	**Microservices Architecture**	**2**	**2**

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Recall the fundamental principles, architecture, and key features of web applications developed using ASP.NET Core MVC.

CO2:Describe how microservices can improve scalability, fault isolation, and independent deployment, compared to monolithic architectures.

CO3:Use service discovery tools like Consul or Eureka to enable microservices to dynamically discover and communicate with each other.

CO4:Differentiate the potential performance bottlenecks in the system, such as inefficient inter-service communication or database contention.

Unit	**Topics**	**No.of Lectures**
I	**Microservices:**UnderstandingMicroservicesAdoptingMicroservices,The Microservices Way. Microservices Value Proposition: DerivingBusiness Value, defining a Goal-Oriented, Layered Approach,Applyingthe Goal-Oriented, Layered Approach. **Designing Microservice Systems**: The Systems Approach to Microservices, A MicroservicesDesign Process, Establishing a Foundation: Goals and Principles,Platforms, Culture.	15

II	**Service Design**: Microservice Boundaries, API design for Microservices, Data and Microservices, Distributed Transactions and Sagas,Asynchronous Message-Passing and Microservices, dealing with Dependencies, **System Design and Operations:** Independent Deployability, More Servers, Docker and Microservices, Role of Service Discovery, Need for an API Gateway, Monitoring and Alerting. Adopting Microservices in Practice: Solution Architecture Guidance, Organizational Guidance, Culture Guidance, Tools and Process Guidance, Services Guidance.	15

References:

- Microservice Architecture:Aligning Principles,Practices, and CultureIrakli Nadareishvili,Ronnie Mitra,Matt McLarty, and Mike Amundse O'Reilly First Edition 2016
- Building Microservices with ASP.NET Core Kevin Hoffman O'Reilly First 2017

Course Code	Elective SEM II	Credits	Lectures/ Week
25ITEL821	**Advance IoT**	**2**	**2**

Course Outcomes:

After successful completion of this course, students would be able to
CO1: Recall the concepts and principles of AI empowered IoT
CO2: Explain the fundamental concepts and applications of IoT
CO3: Employ a distributed intelligence at the edge of an IoT system for a given application.
CO4:Analyze the technical architecture and application of AIoT across diverse smart environments.

Unit	Topics	No.of Lectures
I	Introduction to IoT, IoT applications, sensor systems, IoT sensing techniques, IoT networking- IoT Data analytics- IoT platforms and systems-Raspberry Pi ArduinoProgramming. AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation. **Introduction to AIoT:**AIoT concepts and issues-Technologies behind AIoT- AIoT application segments-Distributed intelligence at the edge of IoT systems (edge computing; blockchain, etc.) -Robotics for AIoT.	15
II	**Technical architecture of AIoT** - Smart sensors and devices- Wearables- Smart object and human sensing- Challenges of AI in networks for IoT- AI for IoT data analytics and automation. Intelligent manufacturing-Smart health-Smart infrastructure and construction-Smart Appliances in home and Industry-smart Vehicle Intelligent Agriculture.	15

References:

- "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", by Francis DaCosta. Publisher: Apress. 2013.
- "Internet of Things", by Vlasios Tsiatsis Stamatis Karnouskos Jan Holler David Boyle Catherine Mulligan. Publisher: Elsevier. 2nd edition. 2018.
- "Big-Data Analytics for Cloud, IoT and Cognitive Computing", by Kai Hwang and Min Chen. Publisher: Wiley. 2017.
- "AIoT Innovation", ed. Fadi AI-Turjman. Publisher: Springer. 2020

Course Code	Elective	Credits	Lectures/Week
25ITELP81	**Advanced IoT– Practical**	**4**	**8**

Course Outcomes: -
CO1:Recall the basic steps and tools required for installing and configuring microservices in IoT environments.
CO2: Use Microsoft cognitive APIs to build IoT applications.
CO3:Implement our own IoT platform and use it in a customized way.
CO4:Differentiate the interaction between blockchain protocols and IoT devices, and their potential impacts on security, scalability, and data integrity.

1	Load Raspbian and Windows IoT Core on Raspberry Pi and execute applications on it using Python and node.js.
2	Create a home automation system and control the devices remotely. Control 4 devices with the system.
3	Interface fingerprint module with raspberry Pi to capture and store fingerprints. Interface 16X2 LCD with the same Pi and display whether the fingerprint is valid or invalid.
4	Interface RFID module with Raspberry Pi. Write and read RFID cards. Map them with student Roll no. Read the card and display the information of the student.
5	Interface GPS module with Raspberry Pi. Display the latitude and longitude on the 16X2 LCD display.
6	Interface Pi Camera with Raspberry Pi. Capture and store faces along with their names. Scan the face and display the Name of the person.
7	a. Create a private Ethereum blockchain with Raspberry Pi. b. Integrate Node Red with MQTT on Raspberry Pi.
8	Interface stepper motor with Raspberry Pi. Use the motor to rotate an item clockwise and anticlockwise in steps.
9	Send telemetry from a device to an IoT hub and read it with a service application.
10	Build AI Powered Auto Billing System for Fast Checkout in Retail Stores with Raspberry Pi.

Note: Students are required to complete a minimum of 80% of all the practicals.

Course Code	Elective	Credits	Lectures/ Week
25ITEL822	**Malware Analysis**	**2**	**2**

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Recall the basic definition of malware and different types of malware.

CO2: Describe the general process and considerations for analyzing malware.

CO3: Use tools to find strings within malware executables.

CO4: Compare different packing and confusing techniques used by malware.

Unit	Topics	No.of Lectures
I	**Malware Analysis:** Introduction, Techniques, Types of malware, General rules for Malware Analysis. Basic Static Techniques: Antivirus Scanning, Hashing, Finding Strings, Packed and Obfuscated Malware, Portable Executable Malware, Portable executable File Format, Linked Libraries and Functions, Static Analysis, The PE file headers and sections. **Basic Dynamic Analysis:** Sandboxes, Running Malware, Monitoring with process monitor, Viewing processes with process explorer, Comparing registry snapshots with regshot, Faking a network, Packet sniffing with Wireshark, Using INetSim, Basic Dynamic Tools. x86 Disassembly **IDA PRO:** Loading an executable, IDA Pro Interface, Using cross references, Analysing functions, Using graphing options, Enhancing disassembly, Extending IDA with plug-ins	**15**
II	**Recognising C Code constructs in assembly:** Global v/s local variables, Disassembling arithmetic operations, recognizing if statements, recognizing loops, function call conventions, Analysing switch statements, Disassembling arrays, Identifying structs, Analysing linked list traversal. **Analysing Malicious Windows Programs:** The windows API, The Windows Registry, Networking APIs, 12 CO2 33 Understanding running malware. Kernel v/s user mode, Native API. Advanced Dynamic Analysis – Debugging: Sourcelevel v/s Assembly-level debugging, kernel v/s user mode debugging, Using a debugger, Exceptions, Modifying execution with a debugger, modifying program execution. **Malware Functionality – Malware Behavior**:	**15**

	Downloaders and launchers, Backdoors, Credential stealers, Persistence mechanisms, Privilege escalation, covering the tracks. Covert Malware Launching: Launchers, Process injection, Process replacement, Hook injection, detours, APC injection.	

References:

- Mastering Malware Analysis, Alexey Kleymenov, Amr Thabet, Packt Publishing, 2019
- Windows Malware Analysis Essentials, Victor Marak, Packt Publishing, 2015
- Practical Malware Analysis – The Hands-On Guide to Dissecting Malicious Software, Michael Sikorski, Andrew Honig, No Scratch Press - 2013

Course Code	**Elective**	**Credits**	**Lectures/ Week**
25ITELP82	**Malware Analysis Practical**	**2**	**4**

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Recall various introductory techniques of malware analysis and creating the testing environment

CO2: Describe data encoding and various techniques for anti-disassembly and anti-debugging

CO3: Execute advanced dynamic analysis and recognize constructs in assembly code.

CO4: Analyze various anti-virtual machine techniques by dissecting their mechanisms and evaluate shellcode across different languages and the x64 architecture to identify patterns, behaviors, and potential vulnerabilities.

1	i. Upload the files to http://www.VirusTotal.com/ and view the reports. Does does either file match any existing antivirus signatures? ii. When were these files compiled? iii. Are there any indications that either of these files is packed or obfuscated?If so, what are these indicators? iv. Do any imports hint at what this malware does? If so, which imports are they?
2	i.What is the address of DllMain? ii. Use the Imports window to browse to gethostbyname. Where is the import located? iii. How many functions call gethostbyname? iv. Focusing on the call to gethostbyname located at 0x10001757, can you figure out which DNS request will be made?

	v. How many local variables has IDA Pro recognized for the subroutine at 0x10001656?
3	analyze the malware found in the given file xyz.exe. i. How does this program ensure that it continues running (achieves persistence) when the computer is restarted? ii. Why does this program use a mutex? iii. What is a good host-based signature to use for detecting this program? iv. What is a good network-based signature for detecting this malware? v. What is the purpose of this program?
4	i.Does this program make any direct changes to the registry? (Use procmon to check.) ii. The user-space program calls the ControlService function. Can you set a breakpoint with WinDbg to see what is executed in the kernel as a result of the call to ControlService? iii. What does this program do?
5	i. What does the malware drop to disk? ii. How does the malware achieve persistence? iii. How does the malware steal user credentials? iv. What does the malware do with stolen credentials? v. How can you use this malware to get user credentials from your test environment?
6	i. What happens when you run the malware executable? ii. What process is being injected? iii. How can you make the malware stop the pop-ups? iv. How does this malware operate?
7	i. Compare the strings in the malware (from the output of the strings command) with the information available via dynamic analysis. Based on this comparison, which elements might be encoded? ii. Use IDA Pro to look for potential encoding by searching for the string xor. What type of encoding do you find? iii. What is the key used for encoding and what content does it encode? iv. Use the static tools FindCrypt2, Krypto ANALyzer (KANAL), and the IDA Entropy Plugin to identify any other encoding mechanisms. What do you find? v. What type of encoding is used for a portion of the network traffic sent by the malware?
8	i.Which networking libraries does the malware use, and what are their advantages?

	ii. What source elements are used to construct the networking beacon, and what conditions would cause the beacon to change? iii. Why might the information embedded in the networking beacon be of interest to the attacker? iv. Does the malware use standard Base64 encoding? If not, how is the encoding unusual? v. What is the overall purpose of this malware?
9	i.How is the shellcode encoded? ii. Which functions does the shellcode manually import? iii. What network host does the shellcode communicate with?
10	i. What filesystem residue does the shellcode leave? ii. What does the shellcode do?

Note: Students are required to complete a minimum of 80% of all the practicals

Course Code	**Elective**	**Credits**	**Lectures /Week**
25ITEL823	**Computer Vision**	**2**	**2**

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Recall the concept of computer vision and its brief history.

CO2: Explain the process of image formation and the role of geometric primitives.

CO3: Implement the triangulation to estimate the 3D location of points from multiple views.

CO4: Compare the linear and iterative algorithms for 3D alignment and pose estimation.

Unit	**Topics**	**No.of Lectures**
I	**Introduction:** What is computer vision?, A brief history, Image formation, Geometric primitives and transformations, Geometric primitives, D transformations, D transformations, D rotations, D to D projections, Lens distortions, Photometric image formation, Lighting, Reflectance and shading, Optics, The digital camera, Sampling and aliasing, Color. **Compression Feature-based alignment:** D and D feature-based alignment, D alignment using least squares ,	**15**

	Application: Panography , Iterative algorithms , Robust least squares and RANSAC , D alignment , Pose estimation , Linear algorithms, Iterative algorithms , Application: Augmented reality , Geometric intrinsic calibration, Calibration patterns, Vanishing points , Application: Single view metrology , Rotational motion ,Radial distortion **Structure from motion** : Triangulation, Two-frame structure from motion , Projective (uncalibrated) reconstruction, Self-calibration , Application: View morphing , Factorization, Perspective and projective factorization , Application: Sparse D model extraction, Bundle adjustment, Exploiting sparsity , Application: Match move and augmented reality , Uncertainty and ambiguities , Application: Reconstruction from Internet photos , Constrained structure and motion , Line-based techniques , Plane-based techniques	
II	**Dense motion estimation** : Translational alignment , Hierarchical motion estimation, Fourier-based alignment , Incremental refinement , Parametric motion, Application: Video stabilization, Learned motion models , Splinebased motion, Application: Medical image registration, Optical flow, Multi-frame motion estimation ,Application: Video denoising , Application: De-interlacing , Layered motion, Application: Frame interpolation, Transparent layers and reflections **Image stitching** : Motion models, Planar perspective motion, Application: Whiteboard and document scanning , Rotational panoramas , Gap closing , Application: Video summarization and compression, Cylindrical and spherical coordinates, Global alignment, Bundle adjustment,Parallax removal , Recognizing panoramas, Direct vs feature-based alignment, Compositing , Choosing a compositing surface, Pixel selection and weighting (de-ghosting) , Application: Photomontage,Blending	**15**

References:

- Computer Vision: Algorithms and Applications, Richard Szeliski, Springer, 1st Edition 2010

Course Code	Elective	Credits	Lectures/Week
25ITELP83	**Computer Vision Practical**	**2**	**04**

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Recall the fundamental concepts, terminology, and key techniques in computer vision.

CO2: Describe the principles of structure from motion and various methods for estimating dense motion, and interpret their applications in visual computing.

CO3: Use various motion models to images and understand computation photography techniques

CO4: Categorise the principles and processes of Epipolar geometry, Rectification, and 3D correspondence techniques.

1	a.Perform Geometric transformations b.Perform Image Stitching c.Perform Camera Calibration
2	Perform the following: a.Face detection b.Object detection c.Pedestrian detection d.Face recognition
3	Construct 3D model from images
4	Implement object detection and tracking from video
5	Perform Feature extraction using RANSAC
6	Setup SQL Server reporting Service using Service Manager 2019
7	Perform Feature extraction using RANSAC
8	Perform Colorization
9	Perform Text detection and recognition
10	Perform Image matting and Compositing.

Note: Students are required to complete a minimum of 80% of all the practicals

Course Code	OJT	Credits	Hours
25ITOJT83	Internship Project	4	120

Course Outcome:
CO1: Recall relevant terms and definitions in the industry related to the project.
CO2: Describe the relationships between different project components and their impact.
CO3: Use the project management techniques you've learned to real-world tasks.
CO4:Analyze project data to identify trends, issues, or areas of improvement.

Purpose of the Internship:

- To provide students with practical, real-world experience in their field of study.
- To bridge the gap between theoretical knowledge and practical application.
- To develop professional skills, such as communication, teamwork, and problem-solving.
- To gain exposure to industry practices and potential career paths.

Internship Duration:

- The duration of the internship can vary, but it's often specified by the university or department. Common durations range from a few weeks to several months.
- Some courses may have mandatory internship periods.

Internship Placement:

- Students may be required to find their own internship placements, or the university/college may provide assistance.
- The internship should be relevant to the student's field of study.

Internship Report/Project:

- Students are typically required to submit a written report or project at the end of their internship.
- The report should document the student's experiences, tasks, and learning outcomes.
- It may also include an analysis of the organization, industry, or specific projects worked on.
- Often the report will contain:
    - Introduction to the company.
    - Description of the project/tasks.
    - Methodology used.
    - Findings and analysis.
    - Conclusion and recommendations.

Evaluation:

- The internship may be evaluated based on the student's performance at the internship site, the internship report, and/or a presentation.
- The evaluation may be conducted by the internship supervisor and/or faculty members.

Certification:

- Internship completion certificates are normally provided by the company where the internship was performed.

Evaluation Scheme for First Year (PG) under NEP (4 credits)

I. Internal Evaluation for Theory Courses – 40 Marks

1) Continuous Internal Assessment(CIA) Assignment - Tutorial/ Case Study/ Project / Presentations/ Group Discussion / Ind. Visit. – 20 marks

2) Continuous Internal Assessment(CIA) ONLINE Unit Test – 20 marks

II. External Examination for Theory Courses – 60 Marks

Duration: 2 Hours

Theory question paper pattern:

Question	**Based on**	**Marks**
Q.1	Unit I	15
Q.2	Unit II	15
Q.3	Unit III	15
Q.4	Unit IV	15

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

- **Paper Pattern of Theory Paper:(for 4 credits)**

DES's Kirti M. Doongursee College (AUTONOMOUS), Dadar (W), Mumbai-28			
Regular / Additional / ATKT Examination			
Duration: 2 Hour			**Max Marks: 60**
Date: **Time:** **Code:** ***(For office use)***			
N. B.	i)	*All Questions are compulsory.*	
	ii)	*Mixing of sub-questions is not allowed*	
	iii)	*Draw neat labeled diagrams wherever necessary.*	
Q. No.			**Marks**

Q.1 A		**07**
OR		
Q.1 B		**07**
Q.1 C		**08**
OR		
Q.1 D		**08**

Q.1 E		**07**
	OR	
Q.1 F		**07**
Q.2 G		**08**
	OR	
Q.2 H		**08**
Q.3 I		**07**
	OR	
Q.3 J		**07**
Q.3 K		**08**
	OR	
Q. 3 L		**08**
Q.4 M		**07**
	OR	
Q.4 N		**07**
Q.4 O		**08**
	OR	
Q.4 P		**08**

III. Practical Examination

- Each core subject carries 50 Marks
- Duration: 3 Hours for each practical course.
- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam

NOTE: To pass the examination, attendance is compulsory in both Internal & External (Theory + Practical) Examinations.

Evaluation Scheme for First Year (PG) under NEP (2 credits)

I. Internal Evaluation for Theory Courses – 20 Marks

1) Continuous Internal Assessment(CIA) Assignment - Tutorial/ Case Study/ Project / Presentations/ Group Discussion / Ind. Visit. – 10 marks

2) Continuous Internal Assessment(CIA) ONLINE Unit Test – 10 marks

II. External Examination for Theory Courses – 30 Marks

Duration: 1 Hours

Theory question paper pattern:

Question	Based on	Marks
Q.1	Unit I	15
Q.2	Unit II	15

- All questions shall be compulsory with internal choice within the questions.
- Each Question may be subdivided into sub questions as a, b, c, d, etc. & the allocation of Marks depends on the weightage of the topic.
- **Paper Pattern of Theory Paper:(for 2 credits)**

DES's Kirti M. Doongursee College (AUTONOMOUS), Dadar (W), Mumbai-28			
Regular / Additional / ATKT Examination			
Duration: 1 Hour			**Max Marks: 30**
Date: **Time:** **Code:** ***(For office use)***			
N. B.	i)	*All Questions are compulsory.*	
	ii)	*Mixing of sub-questions is not allowed*	
	iii)	*Draw neat labeled diagrams wherever necessary.*	
Q. No.			**Marks**

Q.1 A		**07**
OR		
Q.1 B		**07**
Q.1 C		**08**
OR		
Q.1 D		**08**

Q.1 E		**07**
OR		
Q.1 F		**07**
Q.2 G		**08**
OR		
Q.2 H		**08**

III. Practical Examination

- Each core subject carries 50 Marks.
- Duration: 2 Hours for each practical course.
- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam

NOTE: To pass the examination, attendance is compulsory in both Internal & External (Theory + Practical) Examinations.