AC-12/10/2023

Item No-5.171

Rayat Shikshan Sanstha's

KARMAVEER BHAURAO PATIL COLLEGE, VASHI.
NAVI MUMBAI
(EMPOWERED AUTONOMOUS COLLEGE)

Sector-15- A, Vashi, Navi Mumbai - 400 703

Program: M.Sc. Information Technology Syllabus for

M.Sc. Information Technology–Part I

NEP 2023-2024

Rayat Shikshan Sanstha‟s

Karmaveer Bhaurao Patil College Vashi, Navi Mumbai

Empowered Autonomous College

[University of Mumbai] Syllabus

Sr. No.	Heading	Particulars
1	**Title of Course**	**M.Sc. Information Technology**
2	**Eligibility for Admission**	**Degree with 12th Math**
3	**Passing Marks**	**40%**
4	**Ordinances/Regulations (if any)**	
5	**No. of Years/Semesters**	**04 Semester /One Semester**
6	**Level**	**P.G.**
7	**Pattern**	**Semester**
8	**Status**	**New**
9	**To be implemented from Academic year**	**2023-2024**

Preamble of the Syllabus:

The subject of Information Technology is one of the important application tools which can be applied to different areas in teaching, training and learning which is considered to be important in terms of human resource development, Information Processing and Decision Making which enhances the development of a Nation.

Information Technology as an application science is studied to be applied for other areas, right from Mathematics to other basic sciences, applied sciences, social sciences and each and every aspect of human life.

The main aim of the course is to focus on the technological tools and concepts available and how they can be applied to the developmental processes

The various concepts include Embedded System, Information Security Management, Virtualization, Ethical Hacking, Artificial Intelligence, IT Infrastructure Management, Computer Forensics, Cloud Management, Project and so on..

Information Technology Experts are very much required right from academic institutions, Research and Development to Industries both Public and Private Sectors. The two year programme of M.Sc. (Information Technology) is prescribed according to the credit system of University of Mumbai from the academic year 2020-21. The course has been divided into four semesters. The programme has a total 16 theory papers, and four in each semester.

The programme is designed to provide students a focused elaborate training in Information Technology concepts and tools as well as exposing them to the advanced fields. In addition to theoretical knowledge, significant emphasis has been given to provide hands-on experience to the students in the frontier areas of Information Technology. A multidisciplinary approach has been employed to provide best leverage to students to enable.

Syllabus for M.Sc. Part-1 Information Technology

Objectives of the Course:

A few years after graduation, students with a M.Sc in Information Technology will be able to::

- Prepare highly qualified specialists for the IT industry in the field of information technology.
- Develop interpersonal skills, teamwork skills, leadership skills, and project management skills.
- Learn how to operate a professional IT practice
- Study a broad context of advanced contemporary IT issues

Course Outcome:

By the end of the course, a student should develop the ability:

Upon graduation, students with a M.Sc in Information Technology will be able to:

- Students will develop the ability to use IT skills in decision making, by analyzing problems, developing solutions and explaining findings.
- Students can recognize ethical and professional responsibilities in IT.
- Students can design an IT solution using best practices and standard methodologies in the field.
- Students can easily implement, and test an IT solution, and evaluate its effectiveness.
- Studentsṣ can use and apply current technical concepts and practices in the core information technologies of networking, data management, software engineering, computer security.
- Student can demonstrate a deep understanding of the IT methodologies and frameworks used to solve complex computing problems related to at least one IT Body-of-Knowledge
- Students will build the ability to identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems.
- Students can effectively integrate IT-based solutions into the user environment.
- Students will develop and implement optimal solutions to complex computing problems using industry-recognized best practices and standards.
- Students can apply ethical decision making in the development, implementation, and management of IT systems.

Scheme of examination for Each Semester:

Continuous Internal Evaluation: 40 Marks (40 Marks for- Assignment, Projects, Open book test, Presentation, Seminar/Workshop, Research Paper Writing, NPTEL/ Swayam Online Courses, Teaching Assistance, Social Responsibility Activity etc.)

Semester End Examination: 60 Marks will be as follows -

I	**Theory:** The Semester End Examination for theory course work will be conducted as per the following scheme.	
	Each theory paper shall be of two and half hour duration.	
	All questions are compulsory and will have internal options.	
	Q – I	From Unit – I (having internal options.) 12 M
	Q – II	From Unit – II (having internal options.) 12 M
	Q – III	From Unit – III (having internal options.) 12 M
	Q – IV	From Unit – IV (having internal options.) 12 M
	Q - V	From Unit – V (having internal options.) 12 M
II.	**Practical**	The Semester End Examination for practical coursework will be conducted as per the following scheme.

Sr. No.	**Particulars of Semester End Practical Examination**	**Marks%**
1	Laboratory Work	40
2	Journal	05
3	Viva	05
	TOTAL	**50**

Semester – I		
Course Code	**Course Title**	**Credits**
IT401	Cloud Computing(4+2)	6
IT402	Big Data Analytics(4+2)	6
IT403	Ethical Hacking (2)	2
Elective		
IT404A IT404B	Image Processing (2 +2) OR Soft Computing Techniques(2 +2)	4
IT405	Research Methodology(3+1)	4
	Total Credits	**22**

Semester – II		
Course Code	**Course Title**	**Credits**
IT451	Data Science(4+2)	6
IT452	Applied Artificial Intelligence(4+2)	6
IT453	Microservices Architecture (2)	2
Elective		
IT454A IT455B	Computer Forensic(2+2) OR Computer Vision (2+2)	4
IT455	Internship	4
	Total Credits	22

Rayat Shikshan Sanstha's

KARMAVEER BHAURAO PATIL COLLEGE,

VASHI.

NAVI MUMBAI

(Autonomous) Department of Information Technology

M. Sc. Information Technology

Program Outcomes (POs)

Learners are able to–

PO-1	**Disciplinary Knowledge and Skills**	Acquire the comprehensive and in-depth knowledge of various subjects in sciences such as Physics, Chemistry, Mathematics, Microbiology, Bio-analytical Science, Computer Science, Data Science, Information Technology and disciplinary skills and ability to apply these skills in the field of science, technology and its allied branches
PO-2	**Communication and Presentation Skills**	Develop various communication skills including presentation to express ideas evidentl y to achieve common goals of the organization.
PO-3	**Creativity and Critical Judgment**	Facilitate solutions to current issues based on investigations, evaluation and justification using evidence based approach.
PO-4	**Analytical Reasoning and Problem Solving**	Build critical and analytical attitude in handling the problems and situations.
PO-5	**Sense of Inquiry**	Curiously raise relevant questions based on highly developed ideas, scientific theories and its applications including research.
PO-6	**Use of Digital Technologie s**	Use various digital technologies to explore information/data for business, scientific research and related purposes.
PO-7	**Research Skills**	Construct, collect, investigate, evaluate and interpret information/data relevant to science and technology to adapt, evolve and shape the future.
PO-8	**Application of Knowledge**	Develop a scientific outlook to create consciousness against the social myths and blind faith. VIR
PO-9	**Moral and Ethical Reasoning**	Imbibe ethical, moral and social values to develop virtues such as justice, generosity and charity as beneficial to individuals and society at large.

PO-10	**Leadership and Teamwork**	Work cooperatively and lead proactively to achieve the goals of the organization by implementing the plans and projects in various field-based situations related to science, technology and society at large.
PO-11	**Environment and Sustainability**	Create social awareness about the environment and develop sustainability for betterment of the future.
PO-12	**Lifelong Learning**	Realize that pursuit of knowledge is a lifelong activity and in combination with determined efforts, positive attitude and other qualities to lead a successful life.

Department of Information Technology Program Specific Outcomes(PSO)

PSO-1	Prepare highly qualified specialists for the IT industry in the field of information technology.
PSO-2	Develop interpersonal skills, teamwork skills, leadership skills, and project management skills.
PSO-3	Learn how to operate a professional IT practice.
PSO-4	Studya broad context of advanced contemporary IT issues.

SEMESTER I

M.Sc Information Technology
Course Code: IT401
Course Name: Cloud Computing

Periods per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
04	04	TH-60 Marks INT-40 Marks

IT401 Cloud Computing

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures.

CO2: Design different workflows according to requirements and apply map reduce Programming model.

CO3: Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms

CO4:. Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds.

CO5:. Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application.

ICT Tools Used: Videos, PPT, Pen-Tablet, Visual Studio, JVM, JDK, Netbeans

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2. https://www.udemy.com/course/introduction-to-cloud-computing-on-amazon-aws-for- beginners/
3. https://www.coursera.org/learn/introduction-to-cloud

The CO-PO Mapping Matrix

CO\ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 1 2
CO1	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	2	-	-	-	-	2	-	-	-	-
CO3	-	-	2	-	-	-	2	2	-	-	-	-
CO4	-	-	2	-	2	-	-	-	-	-	-	-
CO5	-	-	1	-	-	2	-	2	-	-	-	-

.

Unit	Details	Lectures
I	**Introduction to Cloud Computing:** Introduction, Historical developments,BuildingCloudComputingEnvironments, **Principles Of Parallel and Distributed Computing:**Era of Computing,Parallelv/s distributed computing, Elements of Parallel Computing, Elements of 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.LogicalNetworkPerimeter,VirtualServer,CloudStorage Device, Cloud usage monitor, Resource replication, Ready-made environment.	**12**
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.	**12**
III	**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 Sign-On (SSO), Cloud-Based Security Groups, Hardened Virtual Server Images	**12**
IV	**Fundamental Cloud Architectures:** Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant StorageArchitecture. **Advanced Cloud Architectures:** Hypervisor Clustering Architecture, Load Balanced Virtual Server Instances Architecture, Non-Disruptive Service Relocation Architecture, Zero Downtime Architecture, Cloud Balancing Architecture, Resource Reservation Architecture, Dynamic Failure Detection and Recovery Architecture, Bare-MetalProvisioning Architecture, Rapid Provisioning Architecture, StorageWorkload ManagementArchitecture	**12**
V	**Cloud Delivery Model Considerations:** Cloud Delivery Models: The Cloud Provider Perspective, Cloud Delivery Models: The Cloud Consumer Perspective, **Cost Metrics and Pricing Models**: Business Cost Metrics, Cloud Usage Cost Metrics, Cost Management Considerations, **Service Quality Metrics and SLAs:** Service Quality Metrics, SLA Guidelines	**12**

Reference Books:

1. Mastering Cloud Computing Foundations and ApplicationsProgramming, RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi, 2013

2. Cloud Computing Concepts, Technology & Architecture, Thomas Erl, ZaighamMahmood, and Ricardo Puttini, 2013

3. Distributed and Cloud Computing, FromParallel Processing to the Internet of Things, Kai Hwang, Jack Dongarra, Geoffrey Fox, 2012

E-Books and Online Learning Material :

1) https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2)https://www.udemy.com/course/introduction-to-cloud-computing-on-amazon-aws-for-beginners/
3) https://www.coursera.org/learn/introduction-to-cloud

M.Sc Information Technology Course Code: IT401

Course Name: Cloud Computing Practical

Practical per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
04	02	PR-50 Marks

List of Practicals

1.Write a program for implementing a Client Server communication model using TCP.

A) A client server based program using TCP to find if the number entered is prime.

B) A client server TCP based chatting application.

2.Write a program for implementing a Client Server communication model using UDP.

A) A client server based program using UDP to find if the number entered is even or odd.

B) A client server based program using UDP to find the factorial of the entered number.

C) A program to implement simple calculator operations like addition, subtraction, multiplication and division.

D) A program that finds the square, square root, cube and cube root of the entered number.

3.

A) A multicast Socket example.

4. Write a program to show the object communication using RMI.

A) A RMI based application program to display current date and time.

B) A RMI based application program that converts digits to words, e.g. 123 will be converted to one two three.

5. Show the implementation of web services.

A) Implementing “Big” Web Service.

B) Implementing Web Service that connects to MySQL database.

6. Implement Xen virtualization and manage with XenCenter

7. Implement virtualization using VMWareESXi Server and managing withvCenter

8. Implement Windows Hyper V virtualization

9. Develop application for Microsoft Azure.

10. Develop application for Google App Engine

M.Sc Information Technology
Course Code: IT402
Course Name: Big Data Analytics

Periods per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
04	04	TH-60 Marks INT-40 Marks

IT403 Big Data Analytics

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.

CO-2: Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics.

CO-3: Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.

CO-4: Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc

ICT Tools Used: Videos, PPT, Pen-Tablet, R studio,hadoop

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. https://www.coursera.org/specializations/big-data
3. https://www.udemy.com/course/big-data-and-hadoop-

The CO-PO Mapping Matrix

CO\ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	2	-	-	3	-	-	-	-
CO3	-	-	2	-	3	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	2	-	-	-	-

Unit	Details	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 LifeCycle	**12**
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.	**12**
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 Raw Text, Representing Text, Term Frequency-Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments	**12**
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, Map Reduce with Python, Advanced Map Reduce. In-Memory Computing with Spark, Spark Basics, Interactive Spark with PySpark, Writing Spark Applications,	**12**
V	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, Ingesting stream data with flume. Analytics with higher level APIs, Pig, Spark‟s higher level APIs.	**12**

Reference Books:

1. Big Data and Analytics, Subhashini ChellappanSeema Acharya

2. Data Analytics with Hadoop: An Introduction for Data Scientists, Benjamin Bengfort and Jenny Kim, 2016

3.Big Data and Hadoop, V.K Jain, 2018

E-Books and Online Learning Material :

1) https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2) https://www.coursera.org/specializations/big-data
3) https://www.udemy.com/course/big-data-and-hadoop-

M.Sc Information Technology Course Code: IT402

Course Name: Big Data Analytics Practical

Practical per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
04	02	PR-50 Marks

List of Practicals

1) Install, configure and run Hadoop and HDFS and explore HDFS.
2) Implement word count / frequency programs using MapReduce
3) Implement a 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 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 if 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 the above dataset.
10) Solve the Following:
a) CLASSIFICATION MODEL
   a. Install relevant packages for classification.
   b. Choose a classifier for a classification problem.
   c. Evaluate the performance of the classifier.
b) CLUSTERING MODEL
   a. Clustering algorithms for unsupervised classification.
   b. Plot the cluster data using R visualizations.

M.Sc Information Technology Course Code: IT403 Course Name: Ethical Hacking Practical		
Practical per week(1 periods is 60 minutes)	**No. of Credits**	**Evaluation System**
0 4	**0 2**	**PR-50 Marks**

List of Practicals

1. Using the tools for whois, traceroute, email tracking, google hacking.
2. Using the tools for scanning network, IP fragmentation, war dialing countermeasures, SSL Proxy, Censorship circumvention.
3. Using NETBIOS Enumeration tool, SNMP Enumeration tool, LINUX/ UNIX.enumeration tools, NTP Enumeration tool, DNS analyzing and enumeration tool.
4. Using System Hacking tools.
5. Studyof backdoors and Trojan tools
6. Studyof sniffing tools
7. Studyof Denial of Service attack tools
8. Studyof Hijacking tools
9. Studyof web server attack tools.
10. Studyof SQL injection and Web server tools
11. Studyof wireless hacking tools
12. Using a cryptanalysis tool.
13. Studyof different security tools.

M.Sc Information Technology
Course Code: IT404A
Course Name: Image Processing

Periods per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
02	02	TH-60 Marks INT-40 Marks

IT404A Image Processing

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Understand the relevant aspects of digital image representation and their practical implications.

CO2: Understand 2-D convolution, the 2-D DFT, and have the ability to design systems using these concepts

CO3: Have the ability to design point wise intensity transformations to meet stated specifications.

CO4: Understand the role of alternative color spaces, and the design requirements leading to choices of color space.

CO5: Appreciate the utility of wavelet decompositions and their role in image processing systems

ICT Tools Used: Videos, PPT.

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.udemy.com/course/digital-image-processing-from-ground-up-in- python/
2. https://www.coursera.org/learn/introduction-image-processing
3. https://onlinecourses.nptel.ac.in/noc19_ee55/preview

The CO-PO Mapping Matrix

CO\ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	2	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	1	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	2	-	-	-	-	-
CO4	2	-	-	-	2	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	1

Unit	Details	Lectures

I	**Introduction:**DigitalImageProcessing,OriginsofDigitalImageProcessing, Applications and Examples of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, **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 in Digital Image Processing, **Intensity**	**12**
	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)SpatialFilters,High Pass,Band Reject,andBandpassFiltersfromLowpass Filters, Combining Spatial Enhancement Methods, UsingFuzzy Techniques for Intensity Transformations and SpatialFiltering	
II	**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 Low Pass Frequency Domain Filters, Image Sharpening Using High Pass Filters, Selective Filtering, Fast Fourier Transform **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	**12**
III	**Wavelet and Other Image Transforms:** Preliminaries, Matrix-based Transforms, Correlation, Basis Functions in the Time-Frequency Plane, BasisImages, Fourier-Related Transforms, Walsh-Hadamard Transforms, Slant Transform, Haar Transform, Wavelet Transforms **Color Image Processing:** Color Fundamentals, Color Models, Pseudocolor Image Processing, Full-Color Image Processing, Color Transformations, ColorImageSmoothingandSharpening, UsingColorinImageSegmentation, Noise in Color Images, Color ImageCompression. **Image Compression and Watermarking:** Fundamentals, Huffman Coding, Golomb Coding, Arithmetic Coding, LZW Coding, Run-length Coding, Symbol-based Coding, 8 Bit-plane Coding, Block TransformCoding, Predictive Coding, Wavelet Coding, Digital ImageWatermarking,	**12**

IV	**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 **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	**12**
V	**Image Segmentation II: Active Contours: Snakes and Level Sets:** Background, Image Segmentation Using Snakes, Segmentation Using Level Sets. **Feature Extraction:** Background, Boundary Preprocessing, Boundary Feature Descriptors, Region Feature Descriptors, Principal Components as Feature Descriptors, Whole-Image Features, Scale-Invariant Feature Transform (SIFT)	**12**

Reference Books:

1. Digital Image Processing, Gonzalez and Woods, Fourth, 2018

2.Fundamentals of Digital Image Processing, A K. Jain

3.The Image Processing Handbook, J. C. Russ, Fifth, 2010

E-Books and Online Learning Material :

1) https://www.udemy.com/course/digital-image-processing-from-ground-up-in- python/
2) https://www.coursera.org/learn/introduction-image-processing
3) https://onlinecourses.nptel.ac.in/noc19_ee55/preview

M.Sc Information Technology
Course Code: IT404A
Course Name: Image Processing Practical

Practical per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
04	02	PR-50 Marks

List of Practicals

All practicals can be done in MATLAB / Scilab / Python
Note:

1) Use of built-in functions for matrix operations and mathematical operations are allowed
2) Use gray-level and color images or image matrices as input to all programs.

1) Basics

a) Program to calculate number of samples required for an image.
b) Program to study the effects of reducing the spatial resolution of a digital image.
c) Program to study the effects of varying the number of intensity levels in a digital image
d) Program to perform image averaging (image addition) for noise reduction.
e) Program to compare images using subtraction for enhancing the difference between images.
f) Image Registration.

2)Intensity transformation and Spatial Filtering IMAGE ENHANCEMENT

A) Basic Intensity Transformation functions

1. Program to perform Image negation
2. Program to perform threshold on an image.
3. Program to perform Log transformation
4. Power-law transformations
5. Piecewise linear transformations

a) Contrast Stretching
b) Gray-level slicing with and without background.
c) Bit-plane slicing

B)

1) Program to plot the histogram of an image and categorize
2) Program to apply histogram equalization

C) Write a program to perform convolution and correlation

D) Write a program to apply smoothing and sharpening filters on grayscale and color images

1. Low Pass
2. High Pass

Note: Use all kernels mentioned in the reference book

3)Filtering in Frequency Domain

1. Program to apply Discrete Fourier Transform on an image
2. Program to apply Low pass and High pass filters in frequency domain
3. Program to apply Laplacian filter in frequency domain
4. Note:All other filters can be applied, studied and compared with filters in the spatial domain.
5. Program for high frequency emphasis filtering, high boost and homomorphic filtering.

4) Image Denoising

1. Program to denoise using spatial mean, median and adaptive mean filtering
2. Program for Image deblurring using inverse, Wiener filters

5) Color Image Processing

1. Program to read a color image and segment into RGB planes , histogram of color image
2. Program for converting from one color model to another model
3. Program to apply false coloring(pseudo) on a grayscale image

6) Fourier Related Transforms

1. Program to compute Discrete Cosine Transforms, Walsh -Hadamard Transforms, Haar Transform , Wavelet

7) Image compression

1. Program to apply compression and decompression algorithms on an image (Arithmetic, Huffman and LZW coding techniques.

8) Morphological Image Processing

1. Program to apply erosion, dilation, opening, closing
2. Program for detecting boundary of an image
3. Program to apply Hit-or-Miss transform
4. Program to apply morphological gradient on an image
5. Program to apply Top-Hat/Bottom-hat Transformations

9) Image Segmentation

1. Program for Edge detection using
    a) Sobel, Prewitt, Marr-Hildreth and Canny
2. Illustrate Watershed segmentation algorithm
3. Any more to be included(to be consulted)

10) Feature Extraction

1. Apply Principal components for image description
2. Apply Harris-Stephens corner detector algorithm

M.Sc Information Technology
Course Code: IT404B
Course Name: Soft Computing Techniques

Periods per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
02	02	TH-60 Marks INT-40 Marks

IT404B Soft Computing Technique

Course Outcomes: After successful completion of this course, students will be able to:

- **CO1:**Identify and describe soft computing techniques and their roles inbuilding intelligent machines
- **CO2**:Recognize the feasibility of applying a soft computing methodology for a particular problem
- **CO3**:Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
- **CO4**:Apply genetic algorithms to combinatorial optimization problems
- **CO5:**Apply neural networks for classification and regression problems

ICT Tools Used: Videos, PPT.

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://onlinecourses.nptel.ac.in/noc22_cs54/preview
2. https://nptel.ac.in/courses/106105173
3. https://archive.nptel.ac.in/courses/106/105/106105173/

The CO-PO Mapping Matrix

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
CO1	2	-	2	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	1	-	-	-	-	-	-	1
CO3	-	-	-	-	-	-	2	-	-	-	-	-
CO4	2	-	-	-	2	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	1

Unit	Details	Lectures
I	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.	

II	**Artificial Neural Network:** Fundamental concept, Evolution of Neural Networks, Basic Models, McCulloh-Pitts Neuron, Linear Separability,Hebb Network. **Supervised Learning Network:** Perceptron Networks, Adaptive LinearNeuron, Multiple Adaptive Linear Neurons, BackpropagationNetwork,Radial Basis Function, Time Delay Network, Functional Link Networks,Tree Neural Network. **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.	
III	**UnSupervised Learning Networks:** Fixed weight competitive nets, Kohonen self-organizing feature maps, learning vectors quantization, counterpropogation networks, adaptive resonance theory networks. Special Networks: Simulated annealing, Boltzman machine, Gaussian Machine, Cauchy Machine, Probabilistic neural net, cascade correlationnetwork, cognition network, neo-cognition network, cellular neuralnetwork, optical neural network **Third Generation Neural Networks:**Spiking Neural networks, convolutional neural networks, deep learningneural networks, extreme learning machine model.	**12**
IV	**Introduction to Fuzzy Logic, Classical Sets and Fuzzy sets:** Classical sets, Fuzzy sets. **Classical Relations and Fuzzy Relations:** Cartesian Product of relation, classical relation, fuzzyrelations, tolerance and equivalence relations, non-iterative fuzzy sets. Membership Function: features of the membership functions, fuzzification, methods of membership value assignments. Defuzzification: Lambda-cuts for fuzzy sets, Lambda-cuts for fuzzy relations, Defuzzification methods. **Fuzzy Arithmetic and Fuzzy measures:** fuzzy arithmetic, fuzzy measures, measures of fuzziness, fuzzy integrals.	**12**
V	**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. **Genetic Algorithm:** Biological Background, Traditional optimization and search techniques, genetic algorithm and search space, genetic algorithm vs. traditional algorithms, basic terminologies, simple geneticalgorithm, general genetic algorithm, operators in genetic algorithm,stopping condition for genetic algorithm flow, constraints in geneticalgorithm, problem solving using genetic algorithm, the schematheorem, classification of genetic algorithm, Holland classifier systems,genetic programming, advantages and limitations and applications ofgeneticalgorithm.Differential Evolution Algorithm, Hybrid soft computing techniques –neuro – fuzzy hybrid, genetic neuro-hybrid systems, genetic fuzzyhybrid and fuzzy genetic hybrid systems	**12**

Reference Books:
1.Artificial Intelligence and Soft Computing ,Anandita DasBattac harya ,SPD, 3rd,2018 2.Principles of Soft computing, S.N.Sivanandam S.N.Deepa,Wiley,3rd,2019 3. Neuro-FuzzyandSoftComputing, J.S.R.Jang, C.T.Sun and E.Mizutani Prentice Hall of India, 2004
E-Books and Online Learning Material :
1) https://onlinecourses.nptel.ac.in/noc22_cs54/preview 2) https://nptel.ac.in/courses/106105173 3) https://archive.nptel.ac.in/courses/106/105/106105173/

M.Sc Information Technology Course Code: IT404B Course Name: Soft Computing Practical		
Practical per week(1 periods is 60 minutes)	**No. of Credits**	**Evaluation System**
04	**02**	**PR-50 Marks**

List of Practicals		
1		Implement the following:
	a	Design a simple linear neural network model.
	b	Calculate the output of neural net using both binary and bipolar sigmoidal function.
2		Implement the following:
	a	Generate AND/NOT function using McCulloch-Pitts neural net.
	b	Generate XOR function using McCulloch-Pitts neural net.
3		Implement the Following
	a	Write a program to implement Hebb‟s rule.
	b	Write a program to implement of delta rule.
4.		Implement the Following
	a	Write a program for Back Propagation Algorithm
	b	Write a program for error Backpropagation algorithm.
5.		Implement the Following
	a	Write a program for Hopfield Network.
	b	Write a program for Radial Basis function
6.		Implement the Following
	a	Kohonen Self organizing map
	b	Adaptive resonance theory
7.		Implement the Following
	a	Write a program for Linear separation.
	b	Write a program for Hopfield network model for associative memory
8.		Implement the Following
	a	Membership and Identity Operators | in, not in,
	b.	Membership and Identity Operatorsis, is not
		Implement the Following

9.	**a**	Find ratios using fuzzy logic
	b	Solve Tipping problem using fuzzy logic
10.		Implement the Following
	a	Implementation of Simple genetic algorithm
	b	Create two classes: City and Fitness using Genetic algorithm

M.Sc Information Technology Course
Code: IT405
Course Name: Research Methodology

Periods per week(1 periods is 60 minutes)	**No. of Credits**	**Evaluation System**
03	**03**	**TH-60 Marks INT-40 Marks**

IT405 Research Methodology

Course Outcomes: After successful completion of this course, students will be able to:

- **CO1:** solve real world problems with scientific approach. develop analytical skills by applying scientific methods.
- **CO2**: recognize, understand and applythe language, theory and models of the field of business analytics
- **CO3**: foster an ability to critically analyze, synthesize and solve complex unstructured business problems
- **CO4**: understand and critically apply the concepts and methods of business analytics
- create viable solutions to decision making problems
- **CO5:** Identify and describe soft computing techniques and their roles in building intelligent machines

ICT Tools Used: Videos, PPT.

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1) https://onlinecourses.nptel.ac.in/noc21_me68/preview
2)https://nptel.ac.in/courses/121106007

The CO-PO Mapping Matrix

CO\ PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	2	-	2	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	1	-	-	-	-	-	-	1
CO3	-	-	-	-	-	-	2	-	-	-	-	2
CO4		-	-	-	2	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	1

Unit	Details	Lectures
I	**Introduction:** Role of Business Research, Information Systems and Knowledge Management, Theory Building, Organization ethics and Issues	12
II	**Beginning Stages of Research Process:**Problemdefinition, Qualitative research tools, Secondary data research	12
III	**Research Methods and Data Collection:** Survey research, communicating with respondents, Observation methods, Experimenta l research	12
IV	**Measurement Concepts, Sampling and Field work:** Levels of Scale measurement, attitude measurement, questionnaire design, sampling designs and procedures, determination of sample size	12
V	**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.	12

Reference Books:

1.Business Research Methods, William G.Zikmund, B.J Babin, J.C. Carr,AtanuAdhizkari, M.Griffin, Cengage,8e,2016

2. Research Methods for Business Students Fifth Edition, Mark Saunders,2011

E-Books and Online Learning Material :

1) https://onlinecourses.nptel.ac.in/noc21_me68/preview
2) https://nptel.ac.in/courses/121106007

M.Sc Information Technology
Course Code: IT405
Course Name: Research Methodology Practical

Practical per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
02	01	PR-50 Marks

Practical No	Details
A	Write a program for obtaining descriptive statistics of data.

1	**B**	Import data from different data sources (from Excel, csv, mysql, sql server, oracle to R/Python/Excel)
2	**A**	Design a survey form for a given case study, collectthe primary data and analyze it
	B	Perform suitable analysis of given secondary data.
3	**A**	Perform testing of hypothesis using one sample t-test.
	B	Perform testing of hypothesis using two sample t-test.
	C	Perform testing of hypothesis using paired t-test.
4	**A**	Perform testing of hypothesis using chi-squared goodness-of-fit test.
	B	Perform testing of hypothesis using chi-squared Test of Independence
5		Perform testing of hypothesis using Z-test.
6	**A**	Perform testing of hypothesis using one-way ANOVA.
	B	Perform testing of hypothesis using two-way ANOVA.
	C	Perform testing of hypothesis using multivariate ANOVA (MANOVA).
7	**A**	Perform the Random sampling for the given data and analyse it.
	B	Perform the Stratified sampling for the given data and analyse it.
8		Compute different types of correlation.
9	**A**	Perform linear regression for prediction.
	B	Perform polynomial regression for prediction.
10	**A**	Perform multiple linear regression.
	B	Perform Logistic regression.

Semester -I

M.Sc Information Technology Course
Code: IT451 Course Name: Data Science

Periods per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
04	04	TH-60 Marks INT-40 Marks

IT451 Data Science

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Apply quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data visualization techniques
CO2: Recognize and analyze ethical issues in business related to intellectual property, data security, integrity, and privacy.
CO3: Apply ethical practices in everyday business activities and make well- reasoned ethical business and data management decisions.
CO4: Demonstrate knowledge of statistical data analysis techniques utilized in business decision making.
CO5: Apply principles of Data Science to the analysis of business problems.

ICT Tools Used: Videos, PPT,Python

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://onlinecourses.nptel.ac.in/noc21_cs69/preview
2. https://www.udemy.com/course/python-for-data-science-and-machine-learning-bootcamp/
3. https://www.coursera.org/professional-certificates/ibm-data-science

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	2	2	-	-	-	-	-	-	-
CO2	-	-	-	2	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	1	2	3	-	-
CO4	-	2	-	-	-	-	-	2	-	-	-
CO5	-	-	-	2	-	-	-	3	-	-	-

Unit	Details	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,ElasticSearch,R,Scala,Python,MQTT,The Future **Layered Framework:** Definition of Data Science Framework, Cross-Industry 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	**12**
II	**Three Management Layers:** 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 **Retrieve Superstep :** Data Lakes, Data Swamps, Training the Trainer Model, Understanding the Business Dynamics of the Data Lake, Actionable Business Knowledge from Data Lakes, Engineering a Practical Retrieve Superstep, Connecting to Other Data Sources,	**12**
III	**Assess Superstep:** Assess Superstep, Errors, Analysis of Data, Practical Actions, Engineering a Practical Assess Superstep,	**12**
IV	**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.	**12**
V	**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. **Organize and Report Supersteps :** Organize Superstep, Report Superstep, Graphics, Pictures, Showing the Difference	**12**

Reference Books:

1. Practical Data Science, Andreas François Vermeulen, 2018
2. Principles of Data Science, SinanOzdemir, 2016
3. Data Science from Scratch, Joel Grus, O‟Reilly, 2015
4. Data Science from Scratch first Principle in python, Joel Grus, Shroff Publishers, 2017
5. Experimental Design in Data science with Least Resources, N.C.Das, 2018

E-Books and Online Learning Material :

1) https://onlinecourses.nptel.ac.in/noc21_cs69/preview
2) https://www.udemy.com/course/python-for-data-science-and-machine-learning-bootcamp/
3) https://www.coursera.org/professional-certificates/ibm-data-science

M.Sc Information Technology
Course Code: IT451
Course Name: Data Science Practical

Practical per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
04	**02**	**PR-50 Marks**

List of Practicals

1) Creating a Data Model using Cassandra.

2) Conversion from different formats to HOURS format.

A) Text delimited csv format.
B) XML
C) JSON
D) My SQL Database
E) Picture
(JPEG) F)Video
G) Audio

3) Utilities and Auditing
4) Retrieving Data
5) Assessing Data
6) Processing Data
7) Transforming Data
8) Organizing Data
9) Generating Report
10) Data Visualization with Power BI

M.Sc Information Technology
Course Code: IT452
Course Name: Applied Artificial Intelligence

Periods per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
04	04	TH-60 Marks INT-40 Marks

IT452 Applied Artificial Intelligence

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, Knowledge representation and learning.
CO3: Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
CO4: Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications
CO5: Demonstrate proficiency in applying scientific method to models of machine learning

ICT Tools Used: Videos, PPT, Python ,IDLE, Jupiter

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.udemy.com/course/modern-artificial-intelligence-with-zero-coding/
2. https://onlinecourses.nptel.ac.in/noc22_cs83/preview

The CO-PO Mapping Matrix

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	2	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	1	2
CO5	-	-	2	-	-	-	-	3	-	-	-	-

Unit	Details	Lectures

I	**Review of AI:** History, foundation and Applications **Expert System and Applications:** Phases in Building Expert System, Expert System Architecture, Expert System versus Traditional Systems, Rule based Expert Systems, Blackboard Systems, Truth Maintenance System, Application of Expert Systems, Shells and Tools	**12**
II	**Probability Theory:** joint probability, conditional probability, Bayes"s theorem, probabilities in rules and facts of rule based system, cumulative probabilities, rule based system and Bayesian method **Fuzzy Sets and Fuzzy Logic:** Fuzzy Sets, Fuzzy set operations, Types of Membership Functions, Multivalued Logic, Fuzzy Logic, Linguistic variables and Hedges, Fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems, possibility theory and other enhancement to Logic	**12**
III	**Machine Learning Paradigms:** Machine Learning systems, supervised and unsupervised learning, inductive learning, deductive learning, clustering, support vector machines, cased based reasoning and learning. **Artificial Neural Networks:** Artificial Neural Networks, Single-Layer feedforward networks, multi-layer feed-forward networks, radial basis function networks, design issues of artificial neural networks and recurrent networks	**12**
IV	**Evolutionary Computation:** Soft computing, genetic algorithms, genetic programming concepts, evolutionary programming, swarm intelligence, ant colony paradigm, particle swarm optimization and applications of evolutionary algorithms. **Intelligent Agents:** Agents vs software programs, classification of agents, working of an agent, single agent and multiagent systems, performance evaluation, architecture, agent communication language, applications	**12**
V	Advanced Knowledge Representation Techniques: Conceptual dependency theory, script structures, CYC theory, script structure, CYC theory, case grammars, semantic web. Natural Language Processing: Sentence Analysis phases, grammars and parsers, types of parsers, semantic analysis, universal networking language, dictionary	

Reference Books:

1. Practical Data Science, Andreas François Vermeulen, 2018 Artificial Intelligence, Saroj Kaushik
Cengage, 1st Edition, 2019
2. Artificial Intelligence: A Modern Approach, Russel, Peter Norvig
3. Artificial Intelligence, Elaine Rich,Kevin Knight,Shivashankar,B. Nair

E-Books and Online Learning Material :

1) https://www.udemy.com/course/modern-artificial-intelligence-with-zero-coding/
2) https://onlinecourses.nptel.ac.in/noc22_cs83/preview

M.Sc Information Technology Course Code: IT452 Course Name: Applied Artificial Intelligence Practical		
Practical per week(1 periods is 60 minutes)	**No. of Credits**	**Evaluation System**
04	**02**	**PR-50 Marks**
List of Practicals		
1) Implement Bayes Theorem using Python. 2) Implement Conditional Probability and joint probability using Python. 3) Implement ratios using fuzzy logic 4) Write an application to implement kmeans clustering algorithm. 5) Write an application to implement support vector machine algorithm. 6) Write A Program in Python for Removing stop words with NLTK. 7) Case Study on Prolog 8) Write A Program in Python to Create A New Column in Pandas Data Frame Based on The Existing Columns.		

M.Sc Information Technology Course Code: IT453 Course Name: Microservices Architecture Practical		
Practical per week(1 periods is 60 minutes)	**No. of Credits**	**Evaluation System**
04	**02**	**PR-50 Marks**
List of Practicals		
Practicals can be done with VS2017, VS2019, Visual Code with ASP.NET Core 3.1.x installed along with Docker and Docker Desktop. 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.		

IT453 Microservices Architecture

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Develop web applications using Model View Control.

CO2: Create MVC Models and write code that implements business logic within Model methods, properties, and events.

CO3: Create Views in an MVC application that display and edit data and interact with Models and Controllers.

CO4: Boost your hire ability through innovative and independent learning

CO5: Gaining thorough understanding of the philosophy and architecture of .NET Core

ICT Tools Used: Videos, PPT, PostGress, SQL

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

3. https://www.udemy.com/course/microservices-architecture-the-complete-guide/
4. https://www.coursera.org/lecture/service-oriented-architecture/4-3-3-introduction-to-icroservices-

The CO-PO Mapping Matrix

CO\ P	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 1	PO 1	PO 1

O										0	1	2
CO1	-	-	-	-	-	-	2	2	-	-	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	2
CO4	-	-	-	-	-	-	2	-	-	-	-	1
CO5	2	-	-	-	-	-	-	-	-	-	-	-

M.Sc Information Technology Course
Code: IT454A
Course Name: Computer Forensics

Periods per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
02	02	TH-60 Marks INT-40 Marks

IT454A Computer Forensic

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Define the concept of ethical hacking and its associated applications in Information Communication Technology (ICT) world.

CO2: Underline the need of computer forensic.

CO3: Explain the methodology of incident response and various security issues in ICT world, and identify computer forensic tools for data collection.

CO4: Recognize the importance of computer forensic duplication and various tools for analysis to achieve adequate perspectives of computer forensic investigation in various applications.

ICT Tools Used: Videos, PPT.

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.coursera.org/specializations/computerforensics
2. https://www.udemy.com/course/learning-computer-forensics-with-infinite-skills/

The CO-PO Mapping Matrix

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	1	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	3	-	1	-	-	-
CO4	-	-	3	-	-	-	-	-	1	-	-	2

Unit	Details	Lectures
I	Computer Forensics and Investigation Processes, Understanding Computing Investigations, The Investigator's Office and Laboratory, Data Acquisitions.	12
II	Processing Crime and Incident Scenes, Working with Windows and DOS Systems, Current Computer Forensics Tools.	12
III	Macintosh and Linux Boot Processes and File Systems, Computer Forensics Analysis, Recovering Graphics Files.	12
IV	Virtual Machines, Network Forensics, and Live Acquisitions, E-mail Investigations, Cell Phone and Mobile Device Forensics	12
V	Report Writing for High-Tech Investigations, Expert Testimony in High-Tech Investigations, Ethics and High-Tech Investigations.	12

Books / References:

1)Guide to Computer Forensics and Investigations,Bell Nelson, Amelia Philli PG, Christopher Steuart,4th,

2)Computer Forensics A Pocket Guide, Nathan Clarke,I.T, Governance Publishing

3)Computer Forensics: Computer,Crime Scene Investigation, John R. Vacca,2nd Edition,Charles River Media

E-Books and Online Learning Material :

1)https://onlinecourses.swayam2.ac.in/cec20_lb06/preview

2) https://www.classcentral.com/course/swayam-digital-forensics-45145

M.Sc Information Technology Course Code: IT454A

Course Name: Computer Forensics Practical

Practical per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
04	02	PR-50 Marks

List of Practicals

1) Using Windows forensics tools
2) Using Data acquisition tools
3) Using file recovery tools
4) Using Forensic Toolkit (FTK)
5) Forensic Investigation using EnCase
6) Using Steganography tools
7) Using Password Cracking tools
8) Using Log Capturing and Analysis tools
9) Using Traffic capturing and Analysis tools
10) Using Wireless forensics tools

M.Sc Information Technology
Course Code: IT454B
Course Name: Computer Vision

Periods per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
02	02	TH-60 Marks INT-40 Marks

IT454B Computer Vision

Course Outcomes: After successful completion of this course, students will be able to:

CO1: To implement fundamental image processing techniques required for computer vision
CO2: Understand Image formation process.
CO3: To perform shape analysis
CO4: Extract features form Images and do analysis of Images

ICT Tools Used: Videos, PPT , SciLab

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.coursera.org/specializations/firstprinciple
2. https://onlinecourses.nptel.ac.in/noc19_cs58/preview

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO10	PO11	PO12
CO1	-	-	2	-	1	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	2	-	-	2	-	-	-	-	-
CO4	-	-	-	2	-	-	2	-	-	-	-	-
CO5	-	-	-	-	-	3	2	-	-	-	-	-

Unit	Details	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 , Application: Panography , Iterative algorithms , Robust least squares and RANSAC , D alignment , Pose estimation , Linear	12

	algorithms, Iterative algorithms , Application: Augmented reality , Geometric intrinsic calibration, Calibration patterns, Vanishing points , Application: Single view metrology , Rotational motion ,Radial distortion	
II	**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 **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: Deinterlacing , Layered motion, Application: Frame interpolation,Transparent layers and reflections	**12**
III	**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 **Computational photography :** Photometric calibration ,Radiometric response function ,Noise level estimation ,Vignetting ,Optical blur (spatial response) estimation ,High dynamic range imaging ,Tone mapping ,Application: Flash photography, Super-resolution and blur removal, Color image demosaicing ,Application: Colorization, Image matting and compositing ,Blue screen matting ,Natural image matting ,Optimization-based matting ,Smoke, shadow, and flash matting ,Video matting ,Texture analysis and synthesis ,Application: Hole filling and in painting ,Application: Non-photorealistic rendering	**12**
IV	**Stereo correspondence** Epipolar geometry , Rectification ,Plane sweep , Sparse correspondence , D curves and profiles , Dense correspondence, Similarity measures , Local methods , Sub-pixel estimation and uncertainty , Application: Stereo-based head tracking , Global optimization , Dynamic programming , Segmentation-based techniques, Application: Z-keying and background replacement, Multi-view stereo, Volumetric and D surface reconstruction, Shape from silhouettes **3D reconstruction :** Shape from X , Shape from shading and photometric stereo, Shape from texture, Shape from focus , Active rangefinding , Range data merging , Application: Digital heritage , Surface representations , Surface interpolation, Surface simplification, Geometry images , Point-based representations, Volumetric representations , Implicit surfaces and level sets , Model based reconstruction, Architecture, Heads and faces , Application: Facial animation , Whole body modeling and tracking ,Recovering texture maps and albedos , Estimating BRDFs ,Application: D photography	**12**

V	**Image-based rendering :** View interpolation, View dependent texture maps, Application: Photo Tourism , Layered depth images, Impostors, sprites, and layers, Light fields and Lumigraphs , Unstructured Lumigraph, Surface light fields, Application: Concentric mosaics, Environment mattes, Higher-dimensional light fields , The modeling to rendering continuum, Video-based rendering , Video-based animation, Video textures , Application: Animating pictures, D Video, Application: Video-based walkthroughs **Recognition :** Object detection, Face detection, Pedestrian detection, Face recognition, Eigenfaces, Active appearance and D shape models, Application: Personal photo collections, Instance recognition, Geometric alignment, Large databases, Application: Location recognition, Category recognition, Bag of words, Part Based models, Recognition with segmentation, Application: Intelligent photo editing, Context and scene understanding , Learning and large image collections, Application: Image search, Recognition databases and test sets	**12**

Books and References:

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

E-Books and Online Learning Material :

1) https://onlinecourses.nptel.ac.in/noc19_cs58/preview
2) https://nptel.ac.in/courses/108103174
3) http://iitk.ac.in/ee/computer-vision-lab

M.Sc Information Technology Course
Code: IT454B
Course Name: Computer Vision Practical

Practical per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
04	**02**	**PR-50 Marks**

List of Practicals

1) Handling Files, Cameras, and GUIs

Basic I/O scripts ,Reading/writing an image file ,Converting between an image and raw bytes ,Accessing image data with numpy.array ,Reading/writing a video file ,Capturing camera frames, Displaying images in a window, Displaying camera frames in a window

2) Processing Images with OpenCV 3

Converting between different color spaces, The Fourier Transform, High pass filter, Low pass filter,

3) Edge detection with Canny, Contour detection, Contours – bounding box, minimum area rectangle, and minimum enclosing circle ,Contours – convex contours and the Douglas-Peucker algorithm ,Line and circle detection

4) Depth Estimation Capturing frames from a depth camera Creating a mask from a disparity map Masking a copy operation Depth estimation with a normal camera

5) Object segmentation using the Watershed and GrabCut algorithms Example of foreground detection with GrabCut Image segmentation with the Watershed algorithm

6) Detecting and Recognizing Faces Conceptualizing Haar cascades Getting Haar cascade data Using OpenCV to perform face detection Performing face detection on a still image

7) Performing face detection on video Performing face recognition Generating the data for face recognition Recognizing faces Preparing the training data Loading the data and recognizing faces Performing an Eigenfaces recognition
8)Retrieving Images and Searching Using Image Descriptors , Feature detection algorithms, Defining features Detecting features – corners Feature extraction and description using DoG and SIFT Anatomy of a keypoint
9) Detecting and Recognizing Objects Object detection and recognition techniques HOG descriptors The scale issue The location issue Non-maximum (or non-maxima) suppression Support vector machines People detection
10)Creating and training an object detector Bag-of-words BOW in computer vision Detecting cars in a scene

M.Sc Information Technology
Course Code: IT455
Course Name: Internship

Practical per week(1 periods is 60 minutes)	No. of Credits	Evaluation System
--	04	PR-100 Marks

Objective:

Internships are educational and career development opportunities, providing practical experience in a field or discipline. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the „Industrial Internship" in classroom will be used in classroom discussions.
- Create conditions conducive to quest for knowledge and its applicability on the job.

Learning Outcomes:

- An opportunity to get hired by the Industry/ organization.
- Practical experience in an organizational setting.
- Excellent opportunity to see how the theoretical aspects learned in classes are integrated into the practical world. On-floor experience provides much more professional experience which is often worth more than classroom teaching.
- Opportunity to learn new skills and supplement knowledge.
- Opportunity to practice communication and teamwork skills.

• Opportunity to learn strategies like time management, multi-tasking etc in an industrial
Every student is required to prepare a file containing documentary proofs of the activities done by him. The evaluation of these activities will be done by Programmed Head/Cell In-charge/ Project Head/ TPO/ faculty mentor or Industry Supervisor