NAAC REACCREDITED - 'A' GRADE

SIES College of Arts, Science and Commerce (Autonomous)

Affiliated to University of Mumbai

Syllabus under NEP effective from June 2024

Programme: M.Sc.

Subject: Information Technology

Class: MSc(IT) Part II

Semester: III and IV

Choice Based Credit System (CBCS)
with effect from the academic year 2024-25

Semester III

Course Code	Course Type	Course Title	Credits
SIPITCC611	Core Course I	Advanced Database Management Systems	**4**
SIPITCCP611		Advanced Database Management Systems Practical	**2**
SIPITCC612	Core Course II	IT in Forensic Science	**4**
SIPITCCP612		IT in Forensic Science Practical	**2**
SIPITEL611	Discipline Specific Elective	Machine Learning	**3**
SIPITELP611		Machine Learning Practical	**1**
SIPITRP611	Research Project	Research Project	**6**
		TOTAL CREDITS	**22**

Semester III
Core Course

This Core course is offered to students of MSc(IT) in Semester III, who have chosen Information Technology as Major/ Minor subject

Name of Program: Masters of Science			**Name of Department:** Information Technology			
Class	**Semester**	**Course Code**	**Course Name**	**No. of lectures/ practical per week**	**Credits**	**Marks**
MSc(IT)	III	SIPITCC611	Advanced Database Management Systems	4L	4	100
MSc(IT)	III	SIPITCCP611	Advanced Database Management Systems Practical	2P per batch	2	50
P(Practical)=2 Hours per week						

Course Name: Advanced Database Management Systems **Credits: 4 Type: Theory**		
Expected Course Outcomes On completion of this course, students will be able to 1. Design the extended entity relationship models, specialization and generalization. 2. Implement object oriented database and understand the importance of object relational database management systems. 3. Create the parallel and distributed databases and understand client server architecture.		
Unit I	• **The Extended Entity Relationship Model and Object Model:** The ER model revisited, Motivation for complex data types, User defined abstract data types and structured types, Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization, Relationship types of degree higher than two.	15 Lectures
Unit II	• **Object-Oriented Databases:** Overview of Object-Oriented concepts, Object identity, Object structure, and type constructors, Encapsulation of operations, Methods, and Persistence, Type hierarchies and Inheritance, Type extents and queries, Complex objects; Database schema design for OODBMS; OQL, Persistent programming	15 Lectures

	languages, OODBMS architecture and storage issues, Transactions and Concurrency control, Example of ODBMS ● **Object Relational and Extended Relational Databases:** Database design for an ORDBMS - Nested relations and collections, Storage and access methods, Query processing and Optimization, An overview of SQL3, Implementation issues for extended type, Systems comparison of RDBMS, OODBMS, ORDBMS	
Unit III	● **Parallel and Distributed Databases and Client-Server Architecture:** Architectures for parallel databases, Parallel query evaluation, Parallelizing individual operations, Sorting, Joins, Distributed database concepts, Data fragmentation, Replication, and allocation techniques for distributed database design, Query processing in distributed databases, Concurrency control and Recovery in distributed databases. An overview of ClientServer architecture	15 Lectures
Unit IV	● **Databases on the Web and Semi Structured Data:** Web interfaces to the Web, Overview of XML, Structure of XML data, Document schema, Querying XML data, Storage of XML data, XML applications, The semi structured data model, Implementation issues, Indexes for text data ● **Enhanced Data Models for Advanced Applications:** Active database Concepts. Temporal database Concepts, Deductive databases and Query processing, Mobile databases, Geographic information systems.	15 Lectures

Course Name: Advanced Database Management Systems Practical
Credits: 2 Type : Practical

Expected Course Outcomes

On completion of this course, students will be able to

1. Design the extended entity relationship models, specialization and generalization.
2. Implement object oriented database and understand the importance of object relational database management systems.
3. Create the parallel and distributed databases and understand client server architecture.

Practical No.	Title
1	Horizontal Fragmentation
2	Vertical Fragmentation
3	Creating a Replica of the database
4	OODBMS Application
5	XML Database
6	Active Database Application
7	Temporal Database Application
8	Multimedia Database
9	Prolog Programming

References

1. Fundamentals of Database Systems by Elmasri and Navathe, Pearson Education Publication ,4 th edition, 2003.
2. Database Management Systems by Raghu Ramakrishnan, Johannes Gehrke , McGraw Hill Publication, 2 nd edition, 2002.
3. Database Systems, Design, Implementation and Management by Peter Rob and Coronel, Thomson Learning Pulication, 9 th edition, 2010

Scheme of Evaluation:

I) Continuous Internal Evaluation (40 Marks)	
Class Test	20 Marks
Assignment/ Project and Viva/ Presentation	20 Marks
II) Theory Examination (60 Marks)	
Semester End Examination based on entire syllabus	60 Marks
III) Practical Examination (50 Marks)	
Certified Journal	5 marks
Viva Voce	5 marks
Practical exam	40 marks

Semester III
Core Course

This Core course is offered to students of MSc(IT) in Semester III, who have chosen Information Technology as Major/ Minor subject

Name of Program: Masters of Science			**Name of Department:** Information Technology			
Class	**Semester**	**Course Code**	**Course Name**	**No. of lectures/ per week**	**Credits**	**Marks**
MSc(IT)	III	SIPITCC612	IT in Forensic Science	4L	4	100
MSc(IT)	III	SIPITCCP612	IT in Forensic Science Practical	2P per batch	2	50
P(Practical)=2 Hours per week						

Course Name: IT in Forensic Science **Credits: 4 Type: Theory**		
Expected Course Outcomes On completion of this course, students will be able to 1. Understand the basic terminology of computer forensics, extract and handle digital data that will be processed tackle micro threats and various methods of information warfare. 2. Outline protocols used when a crime scene is being secured and evidence is being procured bylaw enforcement members. 3. Classify the various types of evidence that may be obtained at a crime scene. 4. Identify the importance of taking safety precautions at a crime scene.		
Unit I	• Digital Evidence: Increasing awareness of digital evidence, challenging aspects of digital evidence, challenging aspects of cyber trail, forensic science and digital evidence, computer image verification and authentication, digital image watermarking and its application in forensic science, Various techniques for digital watermarking, Logical structures of the Microsoft operating system FAT file system, DOS and Windows boot process, How to recover deleted files, The significance and determination of the creation date and time. Case Study:- Computer Forensic Investigation • Digital signature and cryptography: Signature in paper based society, Transfer of computer based documents, digital signature and authentication, digital signature generation and verification, certification of public keys, certification of authority.	15 Lectures

Unit II	• Passwords and encryption techniques: Importance of keeping a log, Explanation of passwords keys and hashes. • Seizure of computers: Preparations to be made before seizure, Actions at the scene, Treatment of exhibits, bitstream (exact copies) of the original media, Establishing a case in computer forensics, Computer forensic analysis within the forensic tradition	15 Lectures
Unit III	• Investigation: Investigating on various imaging methods. Lay down the image provided onto a hard disk and provide a disk map of the suspect drive. Extraction of all relevant information from a hard disk. Instruction on the acquisition, collection and seizure of magnetic media. How to best acquire, collect or seize the various operating systems.Legal and privacy issues, Forensic examination procedures, Preparing and verifying forensically sterile storage media. • Case Study:- Corporate Investigators • Cyberspace: Concept of Cyberspace, Emergence of Cyberspace, Nature & Meaning of Cyberspace, Attributes of Cyberspace, Classification of Cyberspace, Legal Framework for Cyberspace.	15 Lectures
Unit IV	• Research Directions and Future Developments: Introduction, Forensic data mining, finding useful patterns in evidence, Text categorization, Authorship attribution: identifying e-mail authors, Association rule mining, application to investigative profiling, Evidence extraction, link analysis, and link discovery, Evidence extraction and link analysis, Link discovery Stego forensic analysis Image mining, Cryptography and cryptanalysis, The future society and technology. Case Study:- Banking Industry • Cyber crimes and related offences and penalties: Introduction to Cybercrimes, Classification of cybercrimes, Distinction between cyber crime and conventional crimes, Reasons for commission of cyber crime, Kinds of cyber crimes – cyber stalking; cyber pornography; forgery and fraud; crime related to IPRs; Cyber terrorism; Spamming, Phishing, Privacy and National Security in Cyberspace, Cyber Defamation and hate speech, computer vandalism etc.	15 Lectures

Course Name: IT in Forensic Science Practical
Credits: 2 Type: Practical

Expected Course Outcomes

On completion of this course, students will be able to

1. Analyse hard drives and smart phones.
2. Detect OS, hostname, sessions and open ports
3. Use tools to collect, preserve and reveal digital evidence

Practical No.	Title
1	Analyze hard drives or smart phones using forensic tools.
2	Capture the physical memory of a computer and analyze artifacts in memory.
3	Detect OS, hostname, sessions and open ports through packet sniffing.
4	Acquire web pages for forensic investigation.
5	Calculate the MD5 and SHA1 hashes.
6	View the USB drives content without leaving the fingerprint, changes to metadata and timestamps
7	Use tools to read, write and edit meta information for a number of file types.
8	Use tools to collect, preserve and reveal digital evidence without compromising systems and data.
9	Use tools that scans a hard drive, locate deleted emails and scan a disk.

References

1. Computer Forensics by Nathan Clarke, Fifth edition, 2010.
2. Computer forensics and Digital Investigation.with EnCase Forensic by Suzanne Widup Tata McGraw Hill Publication, First Edition, 2014.
3. Computer Forensics and Cyber Crime:An Introduction by Marjie. T Britz Pearson, Fourth Edition, 2020.

Scheme of Evaluation:

I) Continuous Internal Evaluation (40 Marks)	
Class Test	20 Marks
Assignment/ Project and Viva/ Presentation	20 Marks
II) Theory Examination (60 Marks)	
Semester End Examination based on entire syllabus	60 Marks
III) Practical Examination (50 Marks)	
Certified Journal	5 marks
Viva Voce	5 marks
Practical exam	40 marks

Semester III
Elective

This Elective is offered to students of MSc(IT) in Semester III, who have chosen Information Technology as Major/ Minor subject

Name of Program: Masters of Science **Name of Department:** Information Technology						
Class	**Semester**	**Course Code**	**Course Name**	**No. of lectures/practical per week**	**Credits**	**Marks**
MSc(IT)	III	SIPITEL611	Machine Learning	3L	3	75
MSc(IT)	III	SIPITELP611	Machine Learning Practical	1P per batch	1	25
P(Practical) = 2 Hours per week						

Course Name: Machine Learning **Credits: 3 Type: Theory**		
Expected Course Outcomes On completion of this course, students will be able to 1. Understand the implementation procedures for the machine learning algorithms. 2. Design programs for various Learning algorithms and apply appropriate data sets to the Machine Learning algorithms.		
Unit I	• **Introduction:** Machine learning, Examples of Machine Learning Problems, Structure of Learning, learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, • **Machine learning Models:** Geometric Models, Logical Models, Probabilistic Models. Features: Feature types, Feature Construction and Transformation, Feature Selection. • **Classification and Regression:** Classification: Binary Classification, Assessing Classification performance, Class probability Estimation Assessing class probability Estimates, Multiclass Classification. Regression: Assessing performance of Regression, Error measures, Overfitting, Catalysts for Overfitting, Case study of Polynomial Regression. Theory of Generalization: Effective number of hypothesis, Bounding the Growth function, VC Dimensions, Regularization theory.	15 Lectures
Unit II	• **Linear Models:** Least Squares method, Multivariate Linear Regression, Regularized Regression, Using Least Square regression for Classification. Perceptron, Support Vector Machines, Soft Margin	15 Lectures

	SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non-Linearity. ● **Logic Based and Algebraic Model:** Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm, Hierarchical clustering ● **Rule Based Models:** Rule learning for subgroup discovery, Association rule mining.	
Unit III	● **Tree Based Models:** Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees. ● **Probabilistic Model:** Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier, Discriminative learning with Maximum likelihood, Probabilistic Models with Hidden variables: Estimation, Maximization Methods, Gaussian Mixtures, and Compression based Models. ● **Trends In Machine Learning :** Model and Symbols- Bagging and Boosting, Multitask learning, Online learning and Sequence Prediction, Data Streams and Active Learning, Deep Learning, Reinforcement Learning.	15 Lectures

Course Name: Machine Learning Practical
Credits: 1 Type: Practical

Expected Course Outcomes

On completion of this course, students will be able to

1. Understand the implementation procedures for the machine learning algorithms.
2. Design programs for various Learning algorithms and apply appropriate data sets to the Machine Learning algorithms.

Practical No.	Title
1	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples.
2	Implement and demonstrate the Candidate-Elimination algorithm
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm.
4	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
5	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task.
6	Write a program to construct a Bayesian network considering medical data.
7	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm.
8	Write a program to implement k-Nearest Neighbour algorithm.

References

1. Machine Learning: The Art and Science of Algorithms that Make Sense of Data by Peter Flach, Cambridge University Press.
2. UNDERSTANDING MACHINE LEARNING : From Theory to Algorithms by Shai Shalev-Shwartz, Shai Ben-David, Cambridge University Press Publication, First Edition, 2014
3. Machine Learning by Rudolph Russell , 2018
4. Introduction to Statistical Machine Learning with Applications in R by Hastie, Tibshirani, Friedman, Spinger ,2nd ed.
5. Introduction to Machine Learning by Ethem Alpaydin, PHI, 2nd edition

Scheme of Evaluation:

I) Continuous Internal Evaluation (25 Marks)	
Class Test	10 Marks
Assignment/ Project and Viva/ Presentation	15 Marks
II) Theory Examination (50 Marks)	
Semester End Examination based on entire syllabus	50 Marks
III) Practical Examination (25 Marks)	
Certified Journal	5 marks
Viva Voce	5 marks
Practical exam	15 marks

Semester III
Research Project

Name of Program: Masters of Science **Name of Department:** Information Technology						
Class	**Semester**	**Course Code**	**Course Name**	**No. of lectures /practical per week**	**Credits**	**Marks**
MSc(IT)	III	SIPITRP521	Research Project	--	6	150
1 credit = 15 Hours						

Every student will have to complete one research project of twelve to fifteen weeks at the Industry / Company / Institute / Organization with six credits. Students have to submit complete report/ dissertation consisting of the all the steps in research methodology Evaluation will be for 150 marks with both internal and external evaluation.

Semester IV

Course Code	Course Type	Course Title	Credits
SIPITCC621	Core Course I	Advanced Web Technologies	**4**
SIPITCCP621		Advanced Web Technologies Practical	**2**
SIPITCC622	Core Course II	Natural Language Processing	**4**
SIPITCCP622		Natural Language Processing Practical	**2**
SIPITEL621	Discipline Specific Elective	Data Visualization	**3**
SIPITELP621		Data Visualization Practical	**1**
SIPITRP621	Research Project	Research Project	**6**
		TOTAL CREDITS	**22**

Semester IV
Core Course

This Core course is offered to students of MSc(IT) in Semester IV, who have chosen Information Technology as Major/ Minor subject

Name of Program: Masters of Science				**Name of Department:** Information Technology		
Class	**Semester**	**Course Code**	**Course Name**	**No. of lectures/ practical per week**	**Credits**	**Marks**
MSc(IT)	IV	SIPITCC621	Advanced Web Technologies	4L	4	100
MSc(IT)	IV	SIPITCCP621	Advanced Web Technologies Practical	2P per batch	2	50
P(Practical) = 2 Hours per week						

Course Name: Advanced Web Technologies **Credits: 4 Type: Theory**		
Expected Course Outcomes On completion of this course, students will be able to 1. Properly separate the model, view, and controller layers of your application and implement them using AngularJS, along with its expressions and filters 2. Learn MongoDB design goals, Setup MongoDB environment and List MongoDB tools 4. Create cross-platform iOS and Android apps 5. Apply the most useful React Native components		
Unit I	• Introduction to Angular JS: JavaScript Client-Side Frameworks, Single-Page Applications, Bootstrapping the Application, Dependency Injection, AngularJS Routes, AngularJS Templates, AngularJS Views (MVC), AngularJS Models (MVC), AngularJS Controllers (MVC) The IDE and AngularJS, MVC and AngularJS • AngularJS Controllers: Initializing the Model with Controllers, Adding Behavior with Controllers, AngularJS Views and Bootstrap- Creating the Blog Project, Adding a New Blog Controller, AngularJS Models-Changes to the Controllers, Model Properties, Blog Application Public Services	15 Lectures

Unit II	• AngularJS Directives-Building Custom Directives, Naming Conventions for Directives, Template Attributes • The MongoDB Data Model: The Data Model, JSON and BSON, The Identifier (_id), Capped Collection, Polymorphic Schemas, ObjectOriented Programming, Schema Evolution	15 Lectures
Unit III	• Using MongoDB Shell: Basic Querying, Create and Insert, Explicitly Creating Collections, Inserting Documents Using Loop, Inserting by Explicitly Specifying _id, Update, Delete, Read, Using Indexes, Stepping Beyond the Basics, Using Conditional Operators, Regular Expressions, MapReduce, aggregate(), Designing an Application's Data Model, Relational Data Modeling and Normalization, MongoDB Document Data Model Approach	15 Lectures
Unit IV	• MongoDB Storage Engine: Data Storage Engine, Data File (Relevant for MMAPv1), Namespace (.ns File), Data File (Relevant for WiredTiger), Reads and Writes, How Data Is Written Using Journaling, GridFS – The MongoDB File System, The Rationale of GridFS, GridFSunder the Hood, Using GridFS, Indexing, Types of Indexes, Behaviors and Limitations MongoDB Use Cases: Use Case 1 -Performance Monitoring, Schema Design, Operations, Sharding, Managing the Data, Use Case 2 – Social Networking, Schema Design, Operations, Sharding JSON: Introduction, JSON Grammar, JSON Values, JSON Tokens, Syntax, JSON vs XML, Data Types, Objects, Arrays, Creating JSON, JSON Object, Parsing JSON, Persisting JSON, Data Interchange • React Native: Why React?, Rendering with JSX, Understanding Properties and State, Event Handling, The React Component Lifecycle, Validating Component Properties, Handling Navigation with Routes, Server Side React Components, Why React Native?, Navigating between screens, Collecting user input, Alerts ,Notifications	15 Lectures

Course Name: Advanced Web Technologies Practical
Credits: 2 Type : Practical

Expected Course Outcomes

On completion of this course, students will be able to

1. Properly separate the model, view, and controller layers of your application and implement them using AngularJS, along with its expressions and filters
2. Apply the most useful React Native components

Practical No.	Title
1	Multiple Filters in Angular JS
2	NG – Repeat in Angular JS
3	Ascending and Descending Order in Angular JS
4	Sort by Table Header in Angular JS
5	Single page application / angular js routing
6	Angular js validations using html form
7	Angular js validations and custom validations
8	Functional components in react
9	Parent/child components in react
10	Styling in react with css classes

References

1. Angular JS by Brad Green & Shyam Seshadri , O'Reilly Publication, First edition,2013
2. Mongo DB – The definitive Guide by Kristina Chodorow, O'Reilly Publication, Second edition ,2013
3. Practical MongoDB by Shakuntala Gupta Edward Navin Sabharwal, Apress Publication.
4. Next Generation Databases by Guy Harrison, Apress Publication.

Scheme of Evaluation:

I) Continuous Internal Evaluation (40 Marks)	
Class Test	20 Marks
Assignment/ Project and Viva/ Presentation	20 Marks
II) Theory Examination (60 Marks)	
Semester End Examination based on entire syllabus	60 Marks
III) Practical Examination (50 Marks)	
Certified Journal	5 marks
Viva Voce	5 marks
Practical exam	40 marks

Semester IV
Core Course

This Core course is offered to students of MSc(IT) in Semester IV, who have chosen Information Technology as Major/ Minor subject

Name of Program: Masters of Science			**Name of Department:** Information Technology			
Class	**Semester**	**Course Code**	**Course Name**	**No. of lectures/ per week**	**Credits**	**Marks**
MSc(IT)	IV	SIPITCC622	Natural Language Processing	4L	4	100
MSc(IT)	IV	SIPITCCP622	Natural Language Processing Practical	2P per batch	2	50
P(Practical)=2 Hours per week						

Course Name: Natural Language Processing **Credits: 4 Type: Theory**		
Expected Course Outcomes On completion of this course, students will be able to 1. Work on unstructured text and gain knowledge of algorithms used for analyzing the content and structure of written communication. 2. Implement predictive text ,email filtering ,automatic summarization and translation.		
Unit I	• Language Processing and Python: Computing with Language: Texts and Words, A Closer Look at Python: Texts as Lists of Words, Computing with Language: Simple Statistics, Back to Python: Making Decisions and Taking Control, Automatic Natural Language Understanding • Accessing Text Corpora and Lexical Resources: Accessing Text Corpora, Conditional Frequency Distributions, More Python: Reusing Code, Lexical Resources, WordNet	15 Lectures
Unit II	• Processing Raw Text: Accessing Text from the Web and from Disk, Strings: Text Processing at the Lowest Level, Text Processing with Unicode, Regular Expressions for Detecting Word Patterns, Useful Applications of Regular Expressions, Normalizing Text, Regular Expressions for Tokenizing Text, Segmentation, Formatting: From Lists to Strings • Writing Structured Programs: Back to the Basics, Sequences,	15 Lectures

	Questions of Style, Functions: The Foundation of Structured Programming, Doing More with Functions, Program Development Algorithm Design	
Unit III	• Categorizing and Tagging words: Using a Trigger, Tagged Corpora, Mapping words to properties using Python Dictionaries,Tagging, How to determine category of a word • Learning to classify text: Supervised Classification,Evaluation, Decision Trees, Naïve Bayes Classifier, Maximum Entropy Classifiers,Modeling Linguistic Patterns • Extracting Information from Text:.Information Extraction, Chunking, Developing and Evaluating Chunkers, Recursion in Linguistic Structure, Named Entity Recognition, Relation Extraction	15 Lectures
Unit IV	• Analyzing Sentence Structure: Some Grammatical Dilemmas, What's the Use of Syntax?, Context-Free Grammar, Parsing with ContextFree Grammar, Dependencies and Dependency Grammar, Grammar Development • Building Feature-Based Grammars: Grammatical Features, Processing Feature Structures, Extending a Feature-Based Grammar • Analyzing the Meaning of Sentences: Natural Language Understanding, Propositional Logic, First-Order Logic, The Semantics of English Sentences, Discourse Semantics • Managing Linguistic Data: Corpus Structure: A Case Study, The Life Cycle of a Corpus, Acquiring Data, Working with XML, Working with Toolbox Data, Describing Language Resources Using OLAC Metadata	15 Lectures

Course Name: Natural Language Processing Practical
Credits: 2 Type: Practical

Expected Course Outcomes

On completion of this course, students will be able to

1. Work on unstructured text and gain knowledge of algorithms used for analyzing the content and structure of written communication.
2. Implement predictive text ,email filtering ,automatic summarization and translation.

Practical No.	Title
1	Write a practical Program to perform tokenization over word and sentence on English and Hindi Text
2	Write a Program to identify Stopwords in a given sentence in English.
3	Write a program to perform Stemming and Lemmatization for English Text.
4	Write a program to segregate Part Of Speech (POS Tagging) for English Text.
5	Write a program to perform Name Entity Recognition (NER) & Chunking on English Text.
6	Write a program to perform WordNet & also check Word Similarity on English Text.
7	Write a program to implement word cloud of English Text.
8	Write a program to process Text Summarization.
9	Write a program to implement Word2Vec on Wikipedia Articles and finding the similarity between the words.
10	Write a program to Train a model for Movie Review Classification using NLP Techniques.

References

1. Natural Language Processing with Python by Steven Bird, Ewan Klein and Edward Lope, O'Reilly, 1st ed.
2. Speech and Language Processing by Daniel Jurafsky and James H Martin, 3rd ed.

Scheme of Evaluation:

I) Continuous Internal Evaluation (40 Marks)	
Class Test	20 Marks
Assignment/ Project and Viva/ Presentation	20 Marks
II) Theory Examination (60 Marks)	
Semester End Examination based on entire syllabus	60 Marks
III) Practical Examination (50 Marks)	
Certified Journal	5 marks
Viva Voce	5 marks
Practical exam	40 marks

Semester IV
Elective

This Elective is offered to students of MSc(IT) in Semester IV, who have chosen Information Technology as Major/ Minor subject

Name of Program: Masters of Science **Name of Department:** Information Technology						
Class	**Semester**	**Course Code**	**Course Name**	**No. of lectures/ practical per week**	**Credits**	**Marks**
MSc(IT)	IV	SIPITEL621	Data Visualization	3L	3	75
MSc(IT)	IV	SIPITELP621	Data Visualization Practical	1P per batch	1	25
P(Practical)=2 Hours per week						

Course Name: Data Visualization **Credits: 3 Type: Theory**		
Expected Course Outcomes On completion of this course, students will be able to 1. Understand visual perception, visual representation of data 2. Understand and apply various classification and prediction techniques using tools. 3. Study and apply visualization of groups, trees, graphs, clusters, networks on data set.		
Unit I	• Introduction of visual perception, visual representation of data, Gestalt principles, information overloads, • Design principles: Categorical, time series, and statistical data graphics. • Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.	15 Lectures
Unit II	• Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents. • Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization	15 Lectures
Unit III	• Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations	15 Lectures

Course Name: Data Visualization Practical
Credits: 1 Type: Practical

Expected Course Outcomes

On completion of this course, students will be able to

1. Analyze the visual representation of data on time series and statistical data.
2. Apply visual mapping and visual analytics
3. Design of visualization applications

Practical No.	Title
1	Demonstrate a nonobvious insight gleaned from the data, or to make a particular point. You can stick with a single chart or other type of visualization, or you can use multiple displays that together tell a story. To create your visualization(s) you can use the simple tools - spreadsheet graphing tools (e.g., Google Sheets, Excel), Tableau tool, or any other method of creating a visual point or story from the data.
2	Demonstrate Time series and statistical data graphics using visualization tool.
3	Generating visualizations of map-based data
4	Demonstrate temporal component, showing change over time
5	Demonstrate visualization of one, two and multi-dimensional data.
6	Visualizing tenure, monthly charges, total charges, and other individual columns using a scatter plot
7	Demonstrate visualization of text and text documents.
8	Create a Map view with appropriate data set using tableau
9	Demonstrate Metaphorical visualization.
10	Demonstrate visualization of groups, trees, graphs, clusters.
11	Demonstrate collaborative visualization

References

1. Interactive Data Visualization: Foundations, Techniques, and Applications by Ward, Grinstein Keim, A K Peters/CRC Press, 2nd ed
2. The Visual Display of Quantitative Information by E. Tufte, Graphics Press, 2nd ed

Scheme of Evaluation:

I) Continuous Internal Evaluation (25 Marks)	
Class Test	10 Marks
Assignment/ Project and Viva/ Presentation	15 Marks
II) Theory Examination (50 Marks)	
Semester End Examination based on entire syllabus	50 Marks
III) Practical Examination (25 Marks)	
Certified Journal	5 marks
Viva Voce	5 marks
Practical exam	15 marks

Semester IV
Research Project

Name of Program: Masters of Science **Name of Department:** Information Technology						
Class	**Semester**	**Course Code**	**Course Name**	**No. of lectures /practical per week**	**Credits**	**Marks**
MSc(IT)	IV	SIPITRP621	Research Project	--	6	150
1 credit = 15 Hours						

Every student will have to complete one research project of twelve to fifteen weeks at the Industry / Company / Institute / Organization with six credits. Students have to submit complete report/ dissertation consisting of the all the steps in research methodology Evaluation will be for 150 marks with both internal and external evaluation.

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