College of Arts, Science & Commerce

SIES

R I S E   W I T H   E D U C A T I O N

Sion (West), Mumbai – 400022.

(Autonomous)

Faculty: Science

Program: M.Sc.

Subject: INFORMATION TECHNOLOGY

Academic Year: 2023 – 2024

PART 1

Credit Based Semester and Grading Syllabi (as per NEP) approved by Board of Studies in Information Technology to be brought into effect from July 2023.

PREAMBLE

On the completion of the MSc(IT) course, the students will :

1. Have sound knowledge of the theory behind the concepts like Cloud computing, Security, Soft Computing Fundamentals, Natural Language Processing, IT in Forensic Science, Block Chain Technology etc.

2. Have sound skills in the field of Data science through Machine learning, Big Data Analytics, Web and Social data analytics

3. Be able to critically analyze, synthesize and solve complex unstructured business and real world problems with scientific approach.

PROGRAMME SPECIFIC OUTCOMES

PSO No	Details
PSO1	**Sound Knowledge:** Demonstrate the knowledge of core IT concepts and apply them to develop a user-friendly, scalable and robust applications
PSO2	**Critical and Rational Thinking:** Exhibit higher order skills to adapt to the everchanging technological environment
PSO3	**Logic Building and Programming Skills:** The ability to apply logic to problem solving and acquire proficiency in various programming languages.
PSO4	**Develop Communication skills and environmental awareness:** Knowledge of basic communication skills and environmentally friendly computing practices. Work and communicate effectively in teams within organizations.
PSO5	**Enable Employability:** Create computer experts, who can be directly employed or start his/her own work as Web Designer, Database User, Programmer, Testing professional, Designer of a System and Network implementer.
PSO6	**Pursue Higher Education:** Make students competent to take up advanced degree courses like MCA, MSc(CS), MSc(IT) and MBA etc.
PSO7	**Research:** Make students competent to take up advanced level research in the field of technology

Semester I

Course Code	Course Type	Course Title	Credits
SIPSIT11	Major – Mandatory	Advanced Security in Computing	4
SIPSITP11	Major – Mandatory	Advanced Security in Computing Practical	2
SIPSIT12	Major – Mandatory	Cloud Computing	4
SIPSITP12	Major – Mandatory	Cloud Computing Practical	2
SIPSIT13	Major – Mandatory	Web Mining - I	1
SIPSITP13	Major – Mandatory	Web Mining -I Practical	1
SIPSIT14	Major – Elective	Introduction to Data Science	3
SIPSITP14	Major – Elective	Introduction to Data Science Practical	1
SIPSIT15	Research Methodology	Research Methodology	3
SIPSITP15	Research Methodology	Research Methodology Practical	1
		TOTAL CREDITS	22

Semester I

Advanced Security in Computing (SIPSIT11)

Course Objective:
- To offer complete coverage of all aspects of computer security
- To identify computer and network security threats, classify the threats and develop a security model to prevent, detect and recover from the attacks and ensure privacy.

Course Outcome:

CO1: Detect potential security vulnerabilities and Explain cryptography, Cyber Forensics.

CO2: Demonstrate ways of recovering from the effects of attacks and Examine security countermeasures.

Theory Component:

M. Sc (Information Technology)	Semester – I - SIPSIT11
Course Name	**Advanced Security in Computing**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	**Introduction:** The Need for Security, Challenges and Basic Approaches, Threats, vulnerabilities, and controls, Confidentiality, integrity and availability, Attackers and attack types; method, opportunity, and motive , Valuing assets **Toolbox:** Authentication, Access Control, and Cryptography.	**15**
II	**Programs and Programming**:- Unintentional (Non-malicious) Programming Oversights, Malicious Code - Malware, Countermeasures. **The Web—User Side:-** Browser Attacks, Web Attacks Targeting Users, Email Attacks, Ransomeware. **Rootkit :**- Phone Rootkit , Rootkit Evades Detection , Rootkit Operates Unchecked , Sony XCP Rootkit, TDSS Rootkits	**15**
III	**Networks:** Network Concepts ,War on Networks: Network Security Attacks, Wireless Network Security, Denial of Service, Distributed Denial-of-Service. Strategic Defenses: **Security Countermeasures** :- Cryptography in Network Security, Firewalls ,Intrusion Detection and Prevention Systems.	**15**

IV	**Privacy:-** Privacy Concepts, Authentication and Privacy ,Email Security. Computer Crime ,Ethical Issues in Computer Security. **Cryptography :-**Message Digests, Digital Signatures, Cyber Warfare. **Cyber Forensics:-**Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.	**15**

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Security in Computing	Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies	Pearson Education	Fifth edition	2015
2	Security in Computing Systems :Challenges, Approaches and Solutions	Prof. Dr. Joachim Biskup	Springer		2009
3	Principles of Computer Security	Vincent Nestler and Keith Harrison and Matthew Hirsch and Wm. Arthur Conklin	Mc Graw Hill	Fourth Edition	2015

Advanced Security in Computing (SIPSIT11)

M. Sc (Information Technology)	Semester – I -SIPSITP11
Course Name	Advanced Security in Computing Practical
Periods per week (1 Period is 60 minutes)	4 per batch
Credits	2

List of Practical:

1	Learn Network Attacks Using Wireshark.
2	Implementing Diffie Helman Key Exchange Algorithm.
3	Implement web based exploitations.
4	Implement Software based attacks.
5	Implement AES.
6	Implement RSA Algorithm.
7	Implement Blowfish.
8	Perform a simple MITM attack on local network using ARP Spoofing.
9	Detect and Prevent Malware Free Attacks with CrowdStrike Falcon.
10	**Tools to perform Behavioural Analysis of Malware:-** 1.Process Hacker 2. Process Monitor (ProcMon) 3. CaptureBat 4. Microsoft Network Monitor 5. Autoruns

Cloud Computing (SIPSIT12)

Course Objective:

The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internet, cloud concepts capabilities across the various cloud service models including Iaas,Paas,Saas, and developing cloud based software applications on top of cloud platforms.

Course Outcome:

CO1: Explain Cloud Computing and memorize the different Cloud service and deployment models.

CO2: Describe various virtualization technologies with its utilization.

CO3: Explain cloud management services through System Center with its components.

Theory Component:

M. Sc (Information Technology)	Semester – I - SIPSIT12
Course Name	**Cloud Computing**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	**Defining Cloud Computing**: Define Cloud Computing, Cloud Types, The NIST model, The Cloud Cube Model, Deployment models, Service models, Examining the Characteristics of Cloud Computing, Paradigm shift, Benefits of cloud computing, Disadvantages of cloud computing, **Understanding Services and Applications by Type:** Defining Infrastructure as a Service (IaaS), Defining Platform as a Service (PaaS), Defining Software as a Service (SaaS), Defining Identity as a Service (IDaaS), Defining Compliance as a Service (CaaS)	15
II	**Understanding Virtualization:** Using Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Understanding Machine Imaging, Porting Applications **Virtual Machines Provisioning and Migration Services:** Virtual Machines Provisioning and Manageability**,** Virtual Machine Migration Services, VM Provisioning and Migration in Action, Provisioning in the Cloud Context **Secure Distributed Data Storage in Cloud Computing:** Cloud Storage: from LANs TO WANs, Technologies for Data Security in Cloud Computing.	15

III	**Cloud Management**: System Center and the Cloud OS, Provisioning infrastructure with Virtual Machine Manager	**15**
IV	**Configuration Manager & DPM:** Managing and maintaining with Configuration Manager, Backup and recovery with Data Protection Manager **Operations Manager, Service Manager, Orchestrator** : Real-time monitoring with Operations Manager, Standardization with Service Manager, Automation with Orchestrator	**15**

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Cloud Computing Bible	Barrie Sosinsky	Wiley-India	--	2010
2	Cloud Computing: Principles and Paradigms	Rajkumar Buyya, James Broberg ,Andrzej M. ,Goscinski,	Wiley	--	2011
3	Introducing Microsoft System Center 2012, Technical Overview	Mitch Tulloch, Symon Perriman	Microsoft	--	--

Cloud Computing Practical (SIPSIT12)

M. Sc (Information Technology)	Semester – I - SIPSITP12
Course Name	Cloud Computing Practical
Periods per week (1 Period is 60 minutes)	4 per batch
Credits	2

List of Practicals:

1	Creating Failover Clustering using Windows server.
2	Migration of VM's (using any VM)
3	Implement PaaS
4	Implement IaaS
5	Implementing ESXi Sever with Vsphere Client
6	Managing with SCVMM
7	Using Service Manager to Standardize.
8	Using Orchestrator for Automation.
9	Using Operations Manager for real-time monitoring.
10	Using Data Protection Manager for Backup and Recovery.

Web Mining - I (SIPSIT13)

Course Objective:

To develop deep understanding of mining techniques, understand analytics for social media data, design and implement various web analytical tools

Course Outcome:

CO1: To understand the difference between Web Mining and Data mining.

CO2: To understand the Basics and Needs of Web Mining.

CO3: To understand Opinion Mining and Sentiment classification.

Theory Component:

M. Sc (Information Technology)	Semester – I - SIPSIT13
Course Name	**Web Mining - I**
Periods per week (1 Period is 60 minutes)	**1 per batch**
Credits	**1**

Unit	Contents	No. of Lectures
I	**Introduction to Web Mining:** Basics of Data Mining, Text mining, Web Mining, Web and its version, Differences-Data mining and Web Mining, Web mining process, Taxonomy, Web Usage Mining phases, Web content mining techniques, Data Preprocessing for Web Data Mining, Applications of Web Mining. Information Retrieval: Basic Concepts of Information Retrieval, Information Retrieval Models, IRS-Design and Structure, Search Strategy, Evaluation of IRS , Relevance feedback, Inverted Index and Its Compression, latent semantic indexing, Web Spamming. **Opinion Mining and Web Usage Mining:** Web Information Retrieval, Characteristics of Web IR , Sentiment Classification, Feature based Opinion Mining, Summarization, Comparative Sentence and Relation Mining, Opinion Search and Opinion Spam,Web Usage Mining.	**15**

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data	Bing Liu	Springer Publications		2017
2	Web Mining: Applications and Techniques	Anthony Scime			2010
3	Mining the Web: Discovering Knowledge from Hypertext Data	Soumen Chakrabarti			2010

M. Sc (Information Technology)	Semester – I - SIPSITP13
Course Name	Web Mining Practical
Periods per week (1 Period is 60 minutes)	2 per batch
Credits	1

List of Practicals:

1	Write a program for Pre-processing of a Text Document: stop word removal.
2	Write a program to Create a inverted index for file
3	Write a program to implement Latent Semantic Analysis
4	Write a program to find the weight of specific term in a given documents
5	Implement hands on experience store and retrieve information from www using semantic approaches
6	Write a program on Sentiment analysis

Course Objective:

- To develop the skill sets needed to be a data scientist.
- To understand Statistical Inference and identify probability distributions commonly used as foundations for statistical modeling.

Course Outcome:

CO1: Describe data science layered framework and the different kinds of supersteps.

CO2: Use R language to carry out basic statistical modeling and analysis.

CO3: Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes) for predictive modeling.

Theory Component:

M. Sc (Information Technology)	Semester – I – SIPSIT14
Course Name	Introduction to Data Science
Periods per week (1 Period is 60 minutes)	3
Credits	3

Unit	Contents	No. of Lectures
I	**Data Science Technology Stack :** Rapid Information Factory Ecosystem, Data Science Storage Tools, Data Lake, Data Vault, Data Warehouse Bus Matrix, Data Science Processing Tools **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**Three Management Layers:** Operational Management Layer, Audit, Balance, and Control Layer, Functional Layer	15
II	**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 **Assess Superstep:** Assess Superstep, Errors, Analysis of Data, Practical Actions, Engineering a Practical Assess Superstep, **Process Superstep :** Data Vault, Time-Person-Object-Location-Event Data Vault, Data Science Process	15

	Transform Superstep : Transform Superstep, Building a Data Warehouse, Transforming with Data Science, Hypothesis Testing, Overfitting and Underfitting, Precision-Recall, Cross-Validation Test. 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.	
III		15
	Organize and Report Supersteps : Organize Superstep, Report Superstep, Graphics, Pictures, Showing the Difference	

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Practical Data Science	Andreas François Vermeulen	APress	1st	2018
2	Doing Data Science	Cathy O'Neil and Rachel Schutt.	O'Reilly	1st	2014
3	Practical Data Science with R	Nina Zumel John Mount	Manning Publication	1st	2014

Introduction to Data Science Practical (SIPSITP14)

M. Sc (Information Technology)	Semester – I – SIPSITP14
Course Name	**Introduction to Data Science Practical**
Periods per week (1 Period is 60 minutes)	**2 per batch**
Credits	**1**

List of Practical:

1	Perform Linear Regression on any given data – Simple and Multiple Linear Regression
2	Perform classification on any given data – Logistic Regression and Discriminant Analysis.
3	Generate unique sampling distribution – Bootstrapping and Cross validation.
4	Implement methods that can provide better prediction accuracy and model interpretability for fitting linear models- Subset Selection, Best-Subset Selection, Forward Stepwise Selection, Backward Stepwise Selection, and Hybrid Methods.
5	Perform Shrinkage approach to fit a model involving all predictors – Ridge Regression and Lasso.
6	Implement dimension reduction by 2 approaches – Principal Component Regression and Partial Least Squares.
7	Implement a nonlinear regression using the following techniques – Step function, Piecewise function, Spline function and Generalized Additive Model.
8	Perform regression and classification using Tree based methods – Bagging, Boosting and Random Forest.
9	Implement Supervised Learning Model using Support Vector Machine.
10	Implement Unsupervised Learning using the following algorithms – Principal Component Analysis, k-Means Clustering, and Hierarchical Clustering.

Research Methodology (SIPSIT15)

Course Objective:

To develop the aptitude for research and the ability to explore research techniques to solve real world problems

Course Outcome:

CO1: Critically analyze, synthesize and solve complex unstructured business and real world problems with scientific approach.

CO2: Develop analytical skills by applying scientific methods.

Theory Component:

M. Sc (Information Technology)	Semester – I - SIPSIT15
Course Name	Research Methodology
Periods per week (1 Period is 60 minutes)	3
Credits	3

Unit	Contents	No. of Lectures
I	**Introduction to Research**: Objectives of research, Types of Research, Research approaches, Research methods versus methodology, Research Process. Formulation of the research problem: Selecting the problem, Technique involved in defining a problem. **Research Design:** Meaning, Need and Features of a research design, Different research designs, Basic principles of Experimental Designs,	15
II	**Sampling Design:** Implications and Steps in Sampling Design, Types of Sampling Designs. **Data Collection Methods:** Primary data and Secondary data, Processing and Analysis of Data, Statistics in research, Sampling theory, Concept of Standard Error, Estimation, Sample size and its determination	15
III	**Testing of hypotheses:** Procedure and flow diagram for hypothesis testing, Parametric Tests, Chi-Square Test, Analysis of Variance and Covariance, Non-parametric tests **Multivariate analysis techniques:** Classification, Variables, Factor Analysis, Path Analysis, Interpretation and Report Writing :Technique and Precaution in interpretation, Report Writing, Layout of the Research report, Types of Report, Writing a Research report, Use of tools/techniques for research	15

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Research Methodology – Methods and Techniques	C.R.Kothari, Gaurav Garg	New Age	4e	
2	Research Methodology – a step by step guide for beginners	Ranjit Kumar	Sage Publications	3e	2011
3	Research Methodology	Panneerselvam	PHI Learning	2e	2014
4	Business Research Methods	William G.Zikmund, B.J Babin, J.C. Carr, Atanu Adhikari, M.Griffin	Cengage	8e	2016
5	Business Research Methods	Alan Bryman and Emma Bell	Oxford University Press	3e	2011

Research Methodology Practical (SIPSITP15)

M. Sc (Information Technology)	Semester I - SIPSITP15
Course Name	Research Methodology Practical
Periods per week (1 Period is 60 minutes)	2 per batch
Credits	1

List of Practical:
(Using Google scholar/SPSS/Mendeley/End note etc)

1	Defining a research problem
2	Literature Review using search tools like google scholar
3	Research design
4	Sampling Design
5	Usage of measurement and scaling techniques
6	Testing of Hypothesis
7	Implement data analysis techniques
8	Writing a research report

Semester II

Course Code	Course Type	Course Title	Credits
SIPSIT21	Major – Mandatory	Soft Computing Fundamentals	4
SIPSITP21	Major – Mandatory	Soft Computing Fundamentals Practical	2
SIPSIT22	Major – Mandatory	Microservices Architecture	4
SIPSITP22	Major – Mandatory	Microservices Architecture Practical	2
SIPSIT23	Major – Mandatory	Web Mining –II	1
SIPSITP23	Major – Mandatory	Web Mining -II Practical	1
SIPSIT24	Major – Elective	Big Data Analytics	3
SIPSITP24	Major – Elective	Big Data Analytics Practical	1
SIPSIT25	On the Job Training/Field Project		4
		TOTAL CREDITS	22

Soft Computing Fundamentals (SIPSIT21)

Course Objective:
- Soft Computing is a consortium of methodologies which collectively provide the concepts and techniques for designing intelligent systems.
- To introduce the techniques of soft computing and adaptive neuro-fuzzy inferencing systems which differ from conventional AI and computing in terms of its tolerance to imprecision and uncertainty.

Course Outcome:

CO1: Describe about the fuzzy logic involved in various systems.
CO2: Examine the fundamental theory and concepts of neural networks and identify different neural network architectures and algorithms.
CO3: Discuss Genetic algorithms with its different architecture.

Theory Component:

M.Sc (Information Technology)	Semester – II - SIPSIT21
Course Name	**Soft Computing Fundamentals**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	**Introduction to Soft Computing**: Concept of computing systems, "Soft" computing versus "Hard" computing, Characteristics of Soft computing, Some applications of Soft computing techniques. **Fuzzy logic:** Introduction to Fuzzy logic, Fuzzy sets and membership function, Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, Defuzzification techniques. Fuzzy logic controller design, Some applications of Fuzzy logic.	**15**
II	**Genetic Algorithms:**Biological Background, Traditional optimization and search techniques, genetic algorithm and search space, genetic algorithm vs. traditional algorithms, basic terminologies, simple genetic algorithm, general genetic algorithm, operators in genetic algorithm, stopping condition for genetic algorithm flow, constraints in genetic algorithm, Problem solving using genetic algorithm, the schema theorem, classification of genetic algorithm, Holland classifier systems, genetic programming, advantages and limitations and applications of genetic algorithm. Concept of multi-objective optimization problems (MOOPs) and issues of solving them.	**15**

III	**Artificial Neural Networks :** What is Neural Network, Learning rules and various activation functions, Single layer Perceptron, Back Propagation networks, Architecture of Backpropagation(BP) Networks, Backpropagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.	15
IV	**Special Networks:** Simulated annealing, Boltzmann machine, Gaussian Machine, Cauchy Machine, Probabilistic neural net, cascade correlation network, cognition network, neo-cognition network, cellular neural network, optical neural network **Third Generation Neural Networks:** Spiking Neural networks, convolutional neural networks, deep learning neural networks, extreme learning machine model.	15

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Fuzzy Logic with Engineering Applications	Timothy J. Ross	Wiley	3rd	
2	Introduction to Genetic Algorithms	S.N Sivanandam and S.N. Deepa	Springer		
3	Principles of Soft Computing	S.N.Sivanandam, S.N.Deepa	Wiley	2nd	
4	Genetic Algorithms: Search, Optimization and Machine Learning	Davis E.Goldberg	Addison Wesley		
5	An Introduction to Genetic Algorithm	Melanic Mitchell	MIT Press		
6	Evolutionary Algorithm for Solving Multi-objective, Optimization Problems	Collelo, Lament, Veldhnizer	Springer	2nd	
7	Neural Networks and Learning Machines	Simon Haykin	PHI		

Soft Computing Fundamentals Practical (SIPSITP21)

M. Sc (Information Technology)	Semester – II - SIPSITP21
Course Name	**Soft Computing Fundamentals Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practical:

1	Implementation of Fuzzy operations using JAVA/C/C++/MATLAB
2	Implementation of Fuzzy Relations(Max-Min composition) using JAVA/C/C++/MATLAB
3	Implementation of Fuzzy controller(Washing machine) using JAVA/C/C++/MATLAB
4	To implement Mc-Culloch pits Model using XOR using JAVA/C/C++/MATLAB
5	Implementation of Single layer Perceptron Learning Algorithm using JAVA/MATLAB
6	Implementation of unsupervised learning algorithm – Hebbian Learning using JAVA/MATLAB
7	Implementation of simple Genetic Application – Match Word Finding using JAVA/MATLAB
8	Implement TSP using GA

Microservices Architecture (SIPSITP22)

Course Objective:

To understand architecture of Web applications using ASP.NET and develop applications using them.

Course Outcome:

CO1: Examine Web application development using ASP.NET Core MVC and Visual Studio
CO2: Create HTTP services using ASP.NET Core Web API
CO3: Deploy ASP.NET Core MVC applications to the Windows Azure cloud.

Theory Component:

M.Sc (Information Technology)	Semester – II - SIPSIT22
Course Name	**Microservices Architecture**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**4**

Unit	Contents	No. of Lectures
I	**Microservices:** Understanding Microservices, Adopting Microservices, The Microservices Way. **Microservices Value Proposition:** Deriving Business Value, defining a Goal-Oriented, Layered Approach, Applying the Goal-Oriented, Layered Approach. **Designing Microservice Systems:** The Systems Approach to Microservices, A Microservices Design Process, Establishing a Foundation: Goals and Principles, Platforms, Culture **Service Design:** Microservice Boundaries, API design for Microservices, Data and Microservices, Distributed Transactions and Sagas, Asynchronous Message-Passing and Microservices, dealing with Dependencies	**15**
II	**System Design and Operations:** Independent Deployability, More Servers, Docker and Microservices, Role of Service Discovery, Need for an API Gateway, Monitoring and Alerting. Adopting Microservices in Practice: Solution Architecture Guidance, Organizational Guidance, Culture Guidance, Tools and ProcessGuidance, Services Guidance. **Building Microservices with ASP.NET Core:** Introduction, Installing .NET Core, Building a Console App, Building ASP.NET Core App. Delivering Continuously: Introduction to Docker, Continuous integration with Wercker, Continuous Integration with Circle CI, Deploying to Dicker Hub, Microservice, Team Service, API First Development, Test First Controller, Creating a CI pipeline, Integration Testing,Running the team service Docker Image.	**15**

III	**Backing Services:** Microservices Ecosystems, Building the location Service, Enhancing Team Service. **Creating Data Service:** Choosing a Data Store, Building a Postgres Repository, Databases are Backing Services, Integration Testing Real Repositories, Exercise the Data Service.**Event Sourcing and CQRS:** Event Sourcing, CQRS pattern, Event Sourcing and CQRS, Running the samples. **Building an ASP.NET Core Web Application:** ASP.NET Core Basics, Building Cloud-Native Web Applications. **Service Discovery:** Cloud Native Factors, Netflix Eureka, Discovering and Advertising ASP.NET Core Services. DNS and Platform Supported Discovery	15
IV	**Configuring Microservice Ecosystems:** Using Environment Variables with Docker, Using Spring Cloud Config Server, Configuring Microservices with etcd, Securing Applications and Microservices: Security in the Cloud, Securing ASP.NET Core Web Apps, Securing ASP.NET Core Microservices. Building Real-Time Apps and Services: Real-Time Applications Defined, Websockets in the Cloud, Using a Cloud Messaging Provider, Building the Proximity Monitor. Putting It All Together: Identifying and Fixing Anti-Patterns, Continuing the Debate over Composite Microservices, The Future.	15

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Microservice Architecture: Aligning Principles, Practices, and Culture	Irakli Nadareishvili, Ronnie Mitra, Matt McLarty,and Mike Amundsen	O'Reilly	First	2016
2	Building Microservices with ASP.NET Core	Kevin Hoffman	O'Reilly	First	2017
3	Building Microservices: Designing Fine-Grained Systems	Sam Newman	O'Reilly	First	
4	Production-ready Microservices	Susan J. Fowler	O'Reilly		2016

Microservices Architecture Practical (SIPSITP22)

M. Sc (Information Technology)	Semester – II - SIPSITP22
Course Name	**Microservices Architecture Practical**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

List of Practical:

Any 10 practical with respect to the syllabus topics.

Course Objective:

To develop deep understanding of mining techniques, understand analytics for social media data, design and implement various web analytical tools

Course Outcome:

CO1: Develop deep understanding of mining techniques exclusively for the Internet

CO2: Design and implementation of various web analytical tool to understand complex unstructured data on the Internet

CO3: Understand and develop analytics for social media data

Theory Component:

M. Sc (Information Technology)	Semester – II – SIPSIT23
Course Name	**Web Mining - II**
Periods per week (1 Period is 60 minutes)	1
Credits	1

Unit	Contents	No. of Lectures
I	**Social Network & Link Analysis**, Scrapy using python (without pipelining), Social Network Analysis, Co-Citation and Bibliographic Coupling, PageRank,HITS, Community Discovery **Webpage crawlers and usage mining:** Basic Crawler Algorithm, Implementation Issues, Universal Crawlers, Focused Crawlers, Topical Crawlers, Crawler Ethics and Conflicts, Data modelling and webpage usage mining., Discovery and analysis of web usage patterns, Recommender systems and collaborative filtering, query log mining	15

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data	Bing Liu	Springer Publications		2017
2	Web Mining: Applications and Techniques	Anthony Scime			2010
3	Mining the Web: Discovering Knowledge from Hypertext Data	Soumen Chakrabarti			2010
4	Data Mining: Concepts and Techniques	Jiawei Han, Micheline Kamber	Elsevier Publications	Second Edition	2017

Web Mining - I Practical (SIPSITP13)

M. Sc (Information Technology)	Semester – I - SIPSITP13
Course Name	Web Mining Practical
Periods per week (1 Period is 60 minutes)	2 per batch
Credits	1

List of Practicals:

1	Implement Page rank Algorithm
2	Scrape an online Social Media Site for Data. Use python to scrape information from twitter.
3	Develop a basic crawler for the web search for user defined keywords.
4	Develop a focused crawler for local search.
5	Write a program to Implement Text Summarization for the given sample text

Big Data Analytics (SIPSIT24)

Course Objective:

The main goal of this course is to help students learn, understand, and practice big data analytics approaches, which include the conceptualization and summarization of big data and machine learning, and big data computing technologies.

Course Outcome:

CO1: Comprehend the difference between traditional and Big Data approach.
CO2: Analyze data using various clustering algorithms and classification algorithms.
CO3: Understand the Hadoop Architecture and make out the importance of NoSQL and role of MapReduce.

M. Sc (Information Technology)	Semester – II –SIPSIT24
Course Name	**Big Data Analytics**
Periods per week (1 Period is 60 minutes)	3
Credits	3

Unit	Contents	No. of Lectures
I	**Introduction:** Introduction to Big Data, Big Data Characteristics, Types of Big Data, Traditional Versus Big Data Approach, Technologies Available for Big Data, Infrastructure for Big Data, Use of Data Analytics, Big Data Challenges, Desired Properties of a Big Data System, Case Study of Big Data Solutions **Analytical Theory and Methods:** Clustering and Associated Algorithms, Association Rules, Apriori Algorithm, Candidate Rules, Applications of Association Rules, Validation and Testing, Diagnostics, Regression, Linear Regression, Logistic Regression, Additional Regression Models.	15
II	**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	15
III	**Hadoop:** Introduction, What is Hadoop?, Core Hadoop Components, Operating System for Big Data, Concepts, Hadoop Architecture, Hadoop Ecosystem, Hive, Hadoop Limitations **NoSQL:** What is NoSQL?, NoSQL Business Drivers, NoSQL Case Studies, NoSQL Data	15

	Architectural Patterns, Variations of NoSQL Architectural Patterns, Using NoSQL to Manage Big Data **Map Reduce:** MapReduce and The New Software Stack, MapReduce, Algorithms Using MapReduce	

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Big Data Analytics	Radha Shankarmani	Wiley		
2	Big Data and Analytics	Subhashini Chellappan Seema Acharya	Wiley	First	
3	Big Data Analytics with R and Hadoop	Vignesh Prajapati	Packt	First	
4	Practical Big data Analytics	Nataraj Dasgupta	Pack	First	
5	Big Data Analytics	Anuradha Bhatia			

Big Data Analytics (SIPSITP24)

M. Sc (Information Technology)	Semester – II –SIPSITP24
Course Name	Big Data Analytics Practical
Periods per week (1 Period is 60 minutes)	2 per batch
Credits	1

List of Practical:

1	Installation of HADOOP
2	Implement the following file management tasks in Hadoop System (HDFS): Adding files and directories, Retrieving files, Deleting files
3	Basic CRUD operations in MongoDB
4	Implement programs related to MapReduce
4	Implement clustering and associated algorithms
6	Implement Linear Regression
7	Implement Bloom Filters for filter on Stream Data
8	Implement Time Series

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