Course Name : **Bachelor of Science**
Discipline : **Information Technology.**
(For those who join in June 2022 and after)

III B.SC. INFORMATION TECHNOLOGY

Semester	Part	Subject Name	Hours	Credit	Int + Ext =Total	Local	Regional	National	Global	Professional Ethics	Gender	Human Values	Environment & Sustainability	Employability	Entrepreneurship	Skill Development	Subject Code	Revised / New / No Change / Interchanged & Percentage of Revision
V	Core13	**Relational Database Management Systems**	4	4	25+75=100				✔					✔		✔	**U24NTC51**	**Revised 5%**
	Core14	**Lab: Python Machine Learning**	5	3	40+60=100				✔					✔			**U24NTCP51**	**New**
	Core15	**Lab: Open Source Programming**	3	2	40+60=100				✔					✔			**U24NTCP52**	**Sem Changed from VI**
	Elective1	**Operating Systems/ Object Oriented Analysis and Design/ Biometrics**	4	3	25+75=100				✔					✔		✔	**U24NTE51/ U24NTE52/ U24NTE53**	**New/ New/ New**
	Elective2	**Python Machine Learning / Data Mining**	4	3	25+75=100				✔					✔			**U24NTE54/ U24NTE55**	**New/ New**
	Skill 2	**Lab: Software Development**	2	2	40+60=100				✔					✔			**U24NTSP51**	**New**
	Skill 3	**Lab: Hardware Trouble shooting**	2	2	**100+0=100**				✔							✔	**U24NTSP52**	**New**
	Skill 4	**Open Source Programming**	2	2	25+75=100				✔					✔			**U24NTS51**	**Sem Changed from VI**
	Skill 5	**Employability Skills**	2	1	25+75=100				✔					✔		✔	**U24PS51**	**Revised 50%**
	NME	**Introduction to Information Technology**	2	2	25+75=100				✔							✔	U3NTN51/ **U24NTN51**	No Change
	Total		**30**	**24**														

VI	Core16	Software Engineering	4	4	25+75=100				✔							✔	U3NTC61/ **U24NTC61**	No Change
	Core17	**Cryptography and Cyber Security**	5	5	25+75=100				✔					✔			**U24NTC62**	**New**
	Core18	**Lab: Dot Net Programming**	5	3	40+60=100				✔					✔			**U24NTCP61**	**Revised 20%**
	Core19	**Lab: Network Simulator**	4	2	40+60=100				✔					✔			**U24NTCP62**	**New**
	Elective3	**Artificial Intelligence/ Software Metrics/ Natural Language Processing**	5	3	25+75=100				✔					✔			**U24NTE61/ U24NTE62/ U24NTE63**	**New/ New/ New**
	Skill 6	**Internet of Things**	2	2	25+75=100				✔							✔	**U24NTS61**	**New**
	NME	Introduction to Internet	2	2	25+75=100				✔							✔	U2NTN61/ **U24NTN61**	No Change
	Elective4	Project	3	3	**50+50=100**				✔							✔	**U24NT6PR**	**Credit Change**
	Total		**30**	**24**														

SEMESTER V

Core - 13

Course Title : Relational Database Management Systems	**Total Hours : 52 Hrs**
Course Code : U24NTC51	**Total Credits : 4**

Course Outcomes:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Learn the fundamental elements of DBMS and RDBMS.
CO2	Explain the basic concepts of Entity - Relationship model and Normalization
CO3	Improve the database design relational algebra, Queries and Aggregate functions
CO4	Understand the use of Structured Query Language (SQL) and PL/SQL.
CO5	Interpret the concept of Transaction and Query processing

UNIT I **10 Hours**

Introduction to Database Management Systems (DBMS): Introduction - Why a Database - Characteristics of Data in a Database - Database Management System - Why DBMS - Types of Database Management Systems.

Files, File Organization and File Structures: Introduction - Operations of Files - File Storage Organization - Sequential File Organization -Sequential File Processing - Case Study - Efficiency of Sequential File Organization.

Introduction to Relational Database Management Systems(RDBMS): Introduction – RDBMS Terminology - The Relational Data Structure - Relational Data Integrity - Domain Constraints -Entity Integrity - Referential Integrity - Operational Constraints - Relational Data Manipulation – Codd's rules.

UNIT II **10 Hours**

Database Architecture and Data Modeling: Introduction - Conceptual, Physical and Logical Database Models - Functional Dependencies.

Entity - Relationship (ER) Modeling: Introduction - E - R model - Components of an E - R model - ER diagram Conventions – Relationships – Entity list - ER diagrams (ERDs) - ER Modeling Symbols**.**

Data Normalization: Introduction – Keys – Relationships - First Normal Form (1NF) – Second Normal Form (2NF) -Third Normal Form (3NF) - Boyce - Codd Normal Form (BCNF) - Fourth Normal Form (4NF) -Fifth Normal Form (5NF) - Domain key Normal Form (DKNF) – Denormalization. Case Studies

UNIT III **10 Hours**

Relational Algebra and Relational Calculus: Relational Algebra - Relational Algebraic Operations - Relational Calculus - Tuple Relational Calculus - Expressions - Domain Relational Calculus.

Queries and Subqueries: SQL Data Types - Types of SQL Commands - SQL Operator - Subqueries.

Aggregate Functions: Introduction - General rules - COUNT() and COUNT(*) - SUM() - AVG() - MAX() and MIN().

Insert, Update and delete operations: Introduction - INSERT statement - Bulk inserts of data - UPDATE statement - DELETE statement.

UNIT IV **11 Hours**

PL/SQL Concepts : Introduction of PL/SQL - Difference between PL/SQL and SQL - Advantages of PL/SQL - PL/SQL Block - Conditional, Iterative Statements, Operators, Control Structure, Functionality, Coding, Functions, Procedures, Anonymous Block in PL/SQL - Packages - Variables in PL/SQL - Conditional Statements - Array, Error, Exception Handling in PL/SQL - For Loops - Cursors - PL/SQL Subprograms - Stored Procedures, Parameters, Discovering Errors, Printing Variables, Simple Programs in PL/SQL - Control Flow, The Character Set in PL/SQL - Data types in PL/SQL.

UNIT V **11 Hours**

Triggers: Introduction - What is Trigger? - Types of Triggers - Trigger Syntax - Combining Trigger Types - Setting Inserted Trigger Values - Disabling and Enabling Triggers -Replacing Triggers - Dropping Triggers - Advantages and Limitations of Triggers.

Transaction Management and Concurrency Control: Introduction - Transaction Properties - Database Structure - Transaction States - Concurrency Control - Serializabillity - Recoverability - Concurrency Control Schemes - Transaction Management in SQL - Transaction and Recovery - User - Defined Transactions - Commit - Rollback - Save point

Recovery System: Introduction - Database Backups - Hardware Protection and Redundancy - Transactions Logs - Importance of Backups - Database Recovery

Text Book:

1. Alexis Leon &Mathews Leon, "Database Management System", Leon Vikas Publishing Chennai, 2002.
2. Rakesh Saini, M.M.S.Rauthan, Abhay Saxena, Bindu Sharma, "Database Management System", First Edition, Vayu Education of India publishing, 2010.

Unit I	Book 1: Chapters: 5, 3, 7 Pg. Nos. : Chapter 5 (99 - 117) Chapter 3 (41 – 64) Chapter 7 (159 – 168)
Unit II	Book 1: Chapters: 8, 9, 11 Pg. Nos. : Chapter 8 (177 - 188)

	Chapter 9 (195 - 212) Chapter 11 (241 – 256)
Unit III	Book 1: Chapters: 12, 17, 18, 19 Pg. Nos. : Chapter 12 (263 – 277) Chapter 17 (355 – 378) Chapter 18 (385 – 392)
Unit IV	Book 2: Chapter: 6 Pg. Nos. : 279 – 326
Unit V	Book 1: Chapters: 25, 29, 30 Pg. Nos. : Chapter 25 (485 – 491) Chapter 29 (583 – 607) Chapter 30 (615 – 632)

Reference Books:

1. Raghu Ramakrishnan& Johannes Gehrke,"Database Management Systems", Second Edition, McGraw Hill International Edition, 2000.
2. Silberschatz, Korth, Sudarshan, "Database System Concepts", Fourth Edition, McGraw Hill International Edition, 2001.

e-Resources:

1. https://www.w3schools.com/mysql/mysql_rdbms.asp
2. https://www.javatpoint.com/what-is-rdbms
3. https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
4. https://www.guru99.com/database-normalization.html

Core 14

Course Title : LAB: Python Machine Learning	**Total Hours : 65 Hrs**
Course Code : U24NTCP51	**Total Credits : 3**

Course Outcomes:

Upon completion of the course, students will be able to

COs	CO Statement
CO1	Apply Python Programming Basics, Classification, Regression, Clustering
CO2	Outline predictions using machine learning algorithms
CO3	Describe the implementation procedures for the Machine Learning algorithms.
CO4	Experiment Machine Learning Algorithms: KNN, Linear Regression, KMeans, Decision Tree, Random Forest, Logistic Regression, SVM
CO5	Analyse the performance metrics of the Machine Learning algorithm

1. Find the mean, median, mode, variance and standard deviation of a list.
2. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)
3. Extract the data from database using python
4. Implement Perceptron learning algorithm in python.
5. Develop Logistic Regression Model for a given dataset
6. Implement the support vector machine algorithm.
7. Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.
8. Build KNN Classification model for a given dataset.
9. Implement Random forest ensemble method on a given dataset.
10. Implement Boosting ensemble method on a given dataset.
11. Implement Linear Regression Models.
12. Implement K-Means clustering Algorithm.

Core 15

Course Title : LAB: Open Source Programming	**Total Hours : 39 Hrs**
Course Code : U24NTCP52	**Total Credits : 2**

Course Outcomes:

Upon completion of the course, students will be able to

COs	CO Statement
CO1	Understand the basics of the open source framework
CO2	Experiment with Node JS Modules and Node Package Manager
CO3	Use MySQL to store data in a database
CO4	Create Interface to a MongoDB database and a web service
CO5	Build advanced, scalable and high performance web applications

1. Hello World using Node.js
2. Modules in Node.js
3. Require function in Node.js
4. HTTP module in Node.js
5. File system in Node.js

6. Events in Node.js
7. File upload in Node.js
8. Retrieve contents from MySQL in Node.js
9. Create and Sort MongoDB using Node.js
10. Perform Insert, Delete and Update in MongoDB using Node.
11. Query MongoDB database using Node.js

Elective - 1

Course Title : Operating Systems	**Total Hours : 52 Hrs**
Course Code : U24NTE51	**Total Credits : 3**

Course Outcomes:
Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Learn the different types of operating systems and I/O Structure.
CO2	Learn the process scheduling in the system, how processes communicate with each other.
CO3	Learn the synchronization between the processes, when deadlock will happen to prevent and recover from deadlock.
CO4	Learn memory management schemes and virtual memory concepts in the system
CO5	Learn different ways of directory implementation and allocation methods in operating system

Unit I **10 Hours**

Introduction: What Operating Systems Do – Computer System Organization - Computer - System Architecture - Operating System Structure - Operating System Operations - Process Management - Memory Management – Storage Management – Computing Environments.

Unit II **10 Hours**

System Structures: Operating System Services - User Operating System Interface - System Calls - Types of System Calls - System Programs.

Process Concept: Process Concept - Process Scheduling - Inter Process Communication.

Process Scheduling: Basic Concepts - Scheduling Criteria – Scheduling Algorithms.

Unit III **10 Hours**

Synchronization: The Critical Section Problem - Peterson's Solution - Classic Problems of Synchronization - Monitors.

Deadlocks: System Model - Deadlock Characterization - Methods for Handling

Deadlock - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from deadlock.

Unit IV **11 Hours**

Memory-Management Strategies: Background – Swapping - Contiguous Memory allocation - Paging - Structure of the Page Table - Segmentation.

Virtual-Memory Management: Background - Demand Paging - Page Replacement

Unit V **11 Hours**

Implementing File System: Directory Implementation - Allocation Methods - Free Space Management-Recovery.

Secondary Storage Structure: Disk Structure - Disk Attachment - Disk Scheduling - Disk Management - RAID Structure

Text Book:

1. Abraham Silberschatz, Peter B. Galvin, G. Gagne, "Operating System Concepts", Eighth Edition, Wiley India Edition, 2003.

Unit I	Chapter: 1.1 to 1.8,1.12 Pg. Nos. : 3 - 28, 34 – 37
Unit II	Chapter: 2.1 to 2.5 Pg. Nos. : 49 - 68 Chapter: 3.1,3.2,3.4 Pg. Nos.: 101 - 110, 116 - 123 Chapter: 5.1,5.2,5.3 Pg. Nos.: 183 – 199
Unit III	Chapter: 6.2, 6.3, 6.6 & 6.7 Pg. Nos.: 227 - 231, 239 - 252 Chapter: 7.1 to 7.7 Pg. Nos. : 283 – 306
Unit IV	Chapter: 8.1 - 8.6 Pg. Nos. : 315 - 345 Chapter: 9.1, 9.2, 9.4 Pg. Nos. : 357 - 367, 369 – 381
Unit V	Chapter: 11.3 to 11.5, 11.7 Pg. Nos. : 470 - 482, 486 - 490 Chapter: 12.2 to 12.5, 12.7 Pg. Nos. : 508 - 520, 522 – 531

Reference Books:

1. Milan Milenkovic, "Operating Systems: Concepts and Design", Second Edition, McGraw-Hill,1992.
2. Willam Stalling, "Operating System", Fourth Edition, Pearson Education, 2003.

e-Resources:

1. https://www.javatpoint.com/operating-system

2. https://www.tutorialspoint.com/operating_system/os_overview.htm
3. https://www.geeksforgeeks.org/operating-systems/

Elective - I

Course Title : Object Oriented Analysis and Design	**Total Hours : 52 Hrs**
Course Code : U24NTE52	**Total Credits : 3**

Course Outcomes:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Learn the Object orientation and Modeling Concepts
CO2	Learn the Requirement Capture and Analysis
CO3	Learn the Object interaction and Specifying control
CO4	Learn the system design and object design
CO5	Learn the human computer Interaction and designing the boundary classes

Unit I **10 Hours**

Object orientation: Introduction-Basic Concepts - The origin of object Orientation - Object oriented languages today. **Modeling Concepts:** Introduction - models and diagrams - drawing activity Diagrams - A development process.

Unit II **10 Hours**

Requirement Capture: Introduction - user requirements - Fact Finding Technique-user Involvement-Documenting Requirements-use case-Requirements capture and Modeling.

Requirement Analysis: Introduction - What must a requirements model do?-use case Realization - the class diagram - Drawing a class Diagram – CRC (Class Responsibility Collaboration) - Assembling the Analysis class Diagram.

Unit III **10 Hours**

Object Interaction: Introduction-Object Interaction and Collaboration - Interaction sequence Diagrams-collaboration Diagrams-model consistency.

Specifying Control: Introduction-states and Events-basic Notation-Further Notation-consistency Checking

Unit IV **11 Hours**

System Design: Introduction-The Major Elements Of System Design-Software Architecture-Concurrency-Processor Allocation-Data Management Issues-Development Standards-Prioritizing Design Trade-offs-Design for Implementation. **Object Design:** Introduction-Class Specification-Interfaces-Criteria for Good Design-Designing Associations-Integrity Constraints-Designing Operations-Normalization.

Unit V **11 Hours**

Human-Computer Interaction: Introduction-The User Interface-Approaches to User Interface Design-Standards and Legal Requirements.

Designing Boundary Classes: Introduction-The Architecture of the Presentation Layer-Prototyping the User Interface-Designing Classes-Designing Interaction with Sequence Diagrams-The Class Diagram Revisited-User Interface Design Patterns-Modeling the Interface Using State charts.

Text Book:

1. Simon Bennett, Steve Mc Robb And Ray Farmer ,"Object Oriented Systems Analysis and Design", Second Edition ,McGraw Hill Education Pvt Ltd ,2004.

Unit I	Chapters: 4.1 to 4.4, 5.1 to 5.4 Pg. Nos. : Chapter 4 (63 - 82) Chapter 5 (96 - 116)
Unit II	Chapters: 6.1 to 6.7, 7.1 to 7.7 Pg. Nos. : Chapter 6 (118 – 144) Chapter 7 (160 – 195)
Unit III	Chapter : 9 (9.1 – 9.5) Pg.No. : 231 – 249 Chapter : 11 (11.1 – 11.6) Pg.No : 272 - 288
Unit IV	Chapters: 13.1 to 13.9, 14.1 to 14.8 Pg. Nos. : Chapter 13 (321 – 342) Chapter 14 (344 – 366)
Unit V	Chapters: 16.1 to 16.4, 17.1 to 17.8 Pg. Nos.: Chapter 18 (387 – 407) Chapter 17 (409 – 438)

Reference Books:

1. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, "Object-Oriented Analysis and Design with Applications" ,3rd Edition ,Pearson Education.
2. JayamalaD, S.Geetha, "Object Oriented Analysis and Design Using UML", First Edition,McGraw Hill Education, 2013
3. ArpitaGopal,"Magnifying Object Oriented Analysis and Design" ,PHI Learning Pvt Ltd 2010.

e-Resources:

1. https://www.geeksforgeeks.org/object-oriented-analysis-and-design/
2. https://www.tutorialspoint.com/object_oriented_analysis_design/index.htm

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Elective - I

Course Title : Biometrics	**Total Hours : 52 Hrs**
Course Code : U24NTE53	**Total Credits : 3**

Course Outcomes:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	To understand the basic concepts and the functionality of the Biometrics, Fingerprint and Hand Geometry.
CO2	To know the concepts of Facial, Voice Recognition and Eye Biometrics Iris and Retina Scanning.
CO3	To analyse the Signature Recognition, Keystroke Dynamics and Esoteric Biometrics
CO4	To get analytical idea on Biometric Liveness Testing and Biometrics in large Scale Systems
CO5	To Gain knowledge on Biometric Standards , Biometric Testing and Evaluation

Unit I **10 Hours**

How Biometric works: Brief history of Biometrics-Why use Biometrics-key Elements of Biometric Systems-Biometric Characteristics and Traits-Enrollment-signal processing-Decision Policy-Template Management-Repository Issues-User Training.

Fingerprint and Hand Geometry: History of Fingerprints- Fingerprint card-Manual Matching of Fingerprints-The First age of Automation- The Second age of Automation-Template Extraction and size-Robustness, Expected Accuracy-Vulnerabilities- Hand Geometry-History of Hand Geometry-The technology-Uses of Hand Geometry -Robustness, Expected Accuracy-Vulnerabilities.

Unit II **10 Hours**

Facial and Voice Recognitions: Facial Recognition Applications- Facial Recognition Technology-Voice verification-History and Development-Applications-How speaker recognition works-Other related software resources and technology -Research Challenges.

Eye Biometrics Iris and Retina Scanning: Iris Scanning-Iris Recognition Technology- Applications-Retina Scanning-Accuracy.

Unit III **10 Hours**

Signature Recognition and Keystroke Dynamics: How Signature Recognition works-History and Development-Implementation studies-Limitations-Keystroke dynamics-History-Application-Digraph Representation-other uses-Which Biometric is better.

Esoteric Biometrics: Vein Pattern-Facial Thermography-DNA-Sweat Pores-Hand Grip-Fingernail Bed-Body odor-Ear-Gait-Skin Luminescence-Brain Wave Pattern-Footprint and Foot Dynamics-The Future.

Unit IV **11 Hours**

Biometric Liveness Testing: Why Testing for Liveness? why not?-What is Liveness testing-Difficulties with Liveness Testing-Best Approaches to Liveness Testing.

Biometrics in large Scale Systems: Documenting the Procurement Process-Specifying the systems-sample AFIS RFP Overview-Terms and conditions-Proposal Preparation Instructions-Source Selection process Overview-Source Selection-Evaluation Process.

Unit V **11 Hours**

Biometric Standards: Biometric Implementation-Formal Standards Organization-International Standard Organization (ISO)-American National Standards Institute (ANSI)-the X9 Committee-Informal Standards Organizations-The Bio API Consortium-OASIS-Standards Development.

Biometric Testing and Evaluation: Who tests and who benefits-The three Bears Principle-Best Practices for Biometrics Testing-Testing Criteria-Match Decision Accuracy-Crossover Error rate-Failure to Enroll rate-Failure to Acquire-User Throughput-Matching Algorithm Throughput-Performance- Types of Testing-Algorithm testing-Technology testing-Scenario Testing-Vulnerability Testing-Certification.

Text Book:

1. John D. Woodward, Jr. Nicholas M. Orlans Peter T. Higgins ,Biometrics, The McGraw-Hill 2002.

Unit I	Chapters: 2,3 Pg. Nos. : Chapter 2 (25 - 41) Pg. Nos. : Chapter 3 (45 – 69)
Unit II	Chapter: 4 Pg. Nos. : 71-87 Chapter: 5 Pg. Nos. : 88-100
Unit III	Chapters: 6,7 Pg. Nos. : Chapter 6 (101 – 113) Pg. Nos. : Chapter 7 (115 – 136)
Unit IV	Chapters: 8 ,9 Pg. Nos. : Chapter 8 (139-149) Pg. Nos. : Chapter 9 (151-165)
Unit V	Chapter: 10 Pg. Nos. : 167 - 181 Chapter: 11 Pg. Nos. : 183-194

Reference Books:

1. Ruud M. Bolle ,SharathPankanti, Nalinik.Ratha, Andrew W.Senior, Jonathan H. Connell , "Guide to Biometrics ", Springer 2009.
2. Anil k. Jain, Arun A. Ross, Karthik Nandaku ,"Introduction to Biometrics", Springer New York, NY, 2011.
3. Anil K. Jain, Patrick Flynn, Arun A.Ross," Hand book of Biometrics", Springer New York, NY, 2007.

e-Resources:

1. https://www.tutorialspoint.com/biometrics/index.htm
2. https://www.javatpoint.com/biometrics-tutorial
3. https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics

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Elective 2

Course Title : Python Machine Learning	**Total Hours : 65 Hrs**
Course Code : U24NTE54	**Total Credits : 4**

Course Outcomes:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Understand the Core concepts of various Machine Learning methods and able to apply specific supervised machine learning algorithms in Python with scikit-learn.
CO2	Solve and implement solutions of Classification problem using Decision Tree, KNN and SVM
CO3	Apply ensembling techniques to solve classification problem.
CO4	Analyze and implement Regression techniques.
CO5	Understand and implement Unsupervised Learning algorithms.

Unit I **13 Hours**

Giving Computers the Ability to learn from Data: Building intelligent machines to transform data into knowledge – The three different types of Machine Learning – An introduction to the basic terminology and notations – A roadmap for building machine learning systems – Using Python for machine learning.

Training Machine Learning Algorithms for Classification: Artificial Neurons-a brief glimpse into the early history of machine learning – Implementing a perceptron algorithm in Python – Adaptive linear neurons and the convergence of learning.

Unit II **13 Hours**

A tour of Machine Learning Classifiers Using Scikit-Learn: Choosing a classification algorithm – First steps with scikit-learn – Modeling class probabilities via logestic regression – Maximum margin classification with Support vector machines – Solving Nonlinear problems using a kernel SVM – Decision tree learning – K-Nearest neighbors-a lazy learning algorithm.

Building Good Training Sets – Data Preprocessing: Dealing with missing data – Handling categorical data – Partitioning a dataset in training and test sets – Bringing features onto the same scale – Selecting meaningful features.

Unit III **13 Hours**

Combining Different Models For Ensemble Learning: Learning with ensembles **–** Implementing a simple majority vote classifier – Evaluating and Tuning the Ensemble classifier – Bagging-building an ensemble of classifiers from bootstrap samples – Leveraging weak learners via adaptive boosting.

Applying Machine Learning to Sentiment Analysis: Obtaining the IMDb movie review dataset – Introducing the bag-of-words model – Training a logistic regression model for document classification - Working with bigger data-online algorithms and out-of-core learning.

Unit IV **13 Hours**

Prediciting Continuous Target Variables with Regression Analysis: Introducing a simple linear regression model – Exploring the Housing Dataset – Implementing an ordinary least squares linear regression model – Fitting a robust regression model using RANSAC – Evaluating the performance of linear regression models – Using regularized methods for regression – Turning a linear regression model into a curve-polynomial regression.

Unit V **13 Hours**

Working with Unlabled Data – Clustering Analysis: Grouping objects by similarity using k-means – Organizing clusters as a hierarchical tree – Locating regions of high density via DBSCAN

Text Book:

1. Sebastian Raschka, "Python Machine Learning", First Edition, Packt Publishing Limited, UK, 2015.

Unit I	Chapters: 1, 2 Pg. Nos. : Chapter 1 (1 – 15) Chapter 2 (17 – 47)
Unit II	Chapters: 3, 4 Pg. Nos. : Chapter 3 (49 – 96) Chapter 4 (99 – 126)
Unit III	Chapters: 7, 8 Pg. Nos. : Chapter 7 (199 – 232) Chapter 8 (233 – 250)
Unit IV	Chapter: 10

	Pg. Nos. : 277 – 309
Unit V	Chapter: 11 Pg. Nos. : 311 – 340

Reference Books:

1. Yuxi (Hayden) Liu,"Python Machine Learning By Example", First Edition, Packt Publishing Ltd., May 2017.
2. A. Krishna Mohan, T. Murali Mohan & Karunakar, "Python with Machine Learning", First Edition, S Chand Publishing, 2019.
3. Andreas C. Müller, Sarah Guido, "Introduction to Machine Learning with Python", First Edition, O'Reilly Media, Inc, September 2016**.**

e- Resources:

1. https://www.geeksforgeeks.org/machine-learning/
2. https://www.w3schools.com/python/python_ml_getting_started.asp
3. https://www.javatpoint.com/machine-learning
4. https://www.kaggle.com/learn/intro-to-machine-learning
5. https://machinelearningmastery.com/start-here/
6. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
7. https://realpython.com/tutorials/machine-learning/
8. https://python-course.eu/machine-learning/
9. https://www.datacamp.com/tutorial/machine-learning-python
10. https://netslovers.com/post/advanced-python-free-courses-udemy/?gad_source=1&gclid=EAIaIQobChMIpoSZ8bTchAMVO808Ah2jhgnsEAMYASAAEgKf_PD_BwE

Elective 2

Course Title: Data Mining	**Total Hours :65 Hrs**
Course Code: U24NTE55	**Total Credits: 3**

Course Outcome:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Understand the basics of data mining, kinds of patterns, data objects and attribute types.
CO2	Acquire knowledge about data pre processing and frequent item set mining methods
CO3	Learn about the basic concepts of classification and its various methods.
CO4	Gain Knowledge about Various cluster analysis methods.
CO5	Able to understand the outlier detection methods.

Unit I **13 Hours**

Introduction : What is Data Mining - What kinds of data can be mined - What kinds of patterns can be mined? - Which technologies are used? - Which kinds of applications are targeted? - Major issues in data mining

Getting to know your data- Data objects and attribute types - Basic statistical descriptions of data - Data visualization - Measuring data similarity and dissimilarity

Unit II **13 Hours**

Data preprocessing: Data preprocessing an overview - Data cleaning - Data integration - Data reduction - Data transformation and data discretization

Mining frequent patterns, associations and correlations: Basic concepts and methods - Basic concepts - Frequent itemset mining methods - Which patterns are interesting – Pattern evaluation methods

Unit III **13 Hours**

Classification: Basic concepts - Basic concepts - Decision tree induction – Bayes classification methods - Rule based classification - Model evaluation and selection - Techniques to improve classification accuracy.

Unit IV **13 Hours**

Cluster analysis: Basic concepts and methods - Cluster analysis - Partitioning methods - Hierarchical methods - Density based methods - Grid based methods - Evaluation of clustering

Unit V **13 Hours**

Outlier detection: Outliers and outlier analysis - Outlier detection methods – Statistical approaches - Proximity based approaches

Data mining trends and research frontiers: Data mining applications.

Text book:

Jiawei Han, Micheline Kamber, Jian Pei **"**Data mining: Concepts and Techniques", Third Edition, MK Publishers, 2012.

Unit I	Chapters: 1.2 – 1.7, 2 Pg. Nos. : Chapter 1 (5 – 33) Chapter 2 (39 – 78)
Unit II	Chapters: 3, 6 Pg. Nos. : Chapter 3 (83 – 119) Chapter 6 (243 – 271)
Unit III	Chapter: 8 Pg. Nos. : 327 – 385
Unit IV	Chapter: 10 Pg. Nos. : 443 – 490
Unit V	Chapters: 12.1 – 12.4, 13.3 Pg. Nos. : 543 – 567, 607 – 618

Reference Book:

- Vikram Pudi, P.Radha Krishna, "Data Mining", Oxford University Press, 2009

e-Resources:

1. https://www.javatpoint.com/data-mining
2. https://www.geeksforgeeks.org/data-mining
3. https://www.ibm.com/topics/data-mining

SBC 2

Course Title : LAB: Software Development	**Total Hours: 26 Hrs**
Course Code: U24NTSP51	**Total Credits: 2**

Course Outcomes:

Upon completion of the course, students will be able to

COs	CO Statement
CO1	Develop Desktop based, Web based Project and Mobile App
CO2	Outline predictions of Software Requirements and Estimation
CO3	Describe the Software Design, Data Modeling and implementation
CO4	Experiment Software Testing and Debugging
CO5	Analyse the performance metrics

Desktop Based Projects:

1. Billing System
2. Attendance Automation
3. Library Management System
4. Canteen Management
5. Hostel Management

Web Based Projects:

6. Resume Builder
7. E-Commerce Website
8. Quiz System
9. Chatbot Application
10. Academic Evaluation System

Mobile Apps:

11. Food Ordering App
12. Exam Time Table
13. Game App
14. Kids Tutorial
15. Recipe Finder

SBC 3

Course Title: LAB: Hardware Trouble Shooting	**Total Hours : 26 hrs**
Course Code: U24NTSP52	**Total Credits: 2**

Course Outcome:

Upon completion of the course, students will be able to

COs	CO Statement
CO1	Obtain practical knowledge about Computer Hardware and Laptop

CO2	Acquire step by step procedure to install the operating system, Device driver and Application program
CO3	Obtain the practical knowledge of Operating system functionality and services.
CO4	Understand the working procedure of networking devices.
CO5	Understand the process and purpose of resource sharing

1. Practice to assemble and dissemble PC/Laptop.
2. Process of BIOS Setup.
3. Installing the Operating System.
4. Configuring Device Drivers and application program.
5. Partitioning and Formatting of Hard Disk Drive.
6. Configuring Printer, Scanner and other devices.
7. User account Creation and User access control.
8. Backup and Restoration.
9. Manage users, groups and user security policy
10. Constructing UTP cables.
11. Configuring Local Area Network through IP address
12. Printer and File sharing.
13. Basic network and Troubleshooting Commands
14. Remote Desktop, Remote Assistance, Telnet, HyperTerminal
15. Troubleshoot wired and wireless network

SBS 4

Course Title : Open Source Programming	**Total Hours : 26 Hours**
Course Code : U24NTS51	**Total Credits : 2**

Course Outcomes:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Identify the use of server-side JavaScript
CO2	Understand how Node.js is architected to allow high scalability with Asynchronous code
CO3	Create basic web applications with Node.js
CO4	Organize the server by creating modules
CO5	Acquire knowledge in NoSQL database MongoDB to store data.

Unit I **5 Hours**

Setting Up for Node.js Development: Installing Node.js -Using the REPL - Executing Node.js Scripts - Setting Up an Integrated development Environment.

Understanding Node.js: Variables - Functions - Closures - Understanding Node.js Performance - More Node.js Internals - More JavaScript

Unit II **5 Hours**

Core Node.js: Node.js File - Based Module System - Important Globals - Core Modules - Reusing Node.js Code in the Browser

Node.js Packages: Revisiting Node Modules - JSON - NPM - Semantic Versioning - Global Node.js Packages - Package.json and require - Modules Recap - Popular Node.js Packages

Unit III **5 Hours**

Events and Streams: Classical Inheritance in JavaScript - Node.js Events – Streams.

Unit IV **6 Hours**

Persisting Data: Introduction to NoSQL - Installing MongoDB - Important MongoDB Concepts - MongoDB Using Node.js - Mongoose ODM - Using a MongoDB as a Distributed Session Store - Managing MongoDB

Unit V **5 Hours**

Front - End Basics: What Is a SPA? - Why AngularJS? - Introduction to Twitter Bootstrap - Set Up a Simple AngularJS Application - Creating a Simple To - Do List Application.

Text Book:

1. BasaratAliSyed, "Beginning Node.js", First Edition, Apress Publication, 2014.

Unit I	Chapters: 1, 2 Pg. Nos. : Chapter 1 (1 – 16) Chapter 2 (17 – 40)
Unit II	Chapters: 3, 4 Pg. Nos. : Chapter 3 (41 – 64) Chapter 4 (65 – 90)
Unit III	Chapter: 5 Pg. Nos. : 91 – 114
Unit IV	Chapter: 8 Pg. Nos. : 165 – 180
Unit V	Chapter: 9 Pg. Nos. : 181 – 196

Reference Books:

1. Tom Hughes, "Node Up and Running", First Edition, O'Reilly Publication,2012.
2. David Herron , "Node.js Web Development: Create real - time server - side applications with this practical, step - by - step guide", 3rd Revised edition ,Packt Publishing, 2016.

3. Mario Casciaro, "Node.js Design Patterns: Master a series of patterns and techniques to create modular, scalable, and efficient applications",First edition,Packt Publishing, 2014.

e- Resources:

1. https://www.w3schools.com/nodejs/
2. https://nodejs.org/en/learn/getting-started/introduction-to-nodejs
3. https://www.tutorialspoint.com/nodejs/index.htm
4. https://www.codecademy.com/learn/learn-node-js
5. https://www.geeksforgeeks.org/nodejs/
6. https://www.freecodecamp.org/news/get-started-with-nodejs/

EMPLOYABILITY SKILLS

Course Title : Employability Skills	**Total Hours : 30 Hours**
Course Code : U24PS51	**Total Credits : 1**

COURSE OUTCOMES:

On completing this course, students can/are able to

Cos	**CO STATEMENT**
CO1:	enhance their skills in solving quantitative aptitude problems
CO2:	expertise themselves in solving verbal and non-verbal reasoning problems.
CO3:	prepare for various public and private sector exams and placement drives.
CO4:	interpret the concepts of LOGICAL REASONING Skills.
CO5:	analyze the problems logically and approach the problems in a different manner

Unit I: Quantitative Aptitude – I **6 Hours**

H.C.F. and L.C.M. of Numbers - Average - Percentage - Profit and Loss - Ratio and Proportion - Time and Work - Time and Distance - Train Speed.

Unit II: Quantitative Aptitude – II **6 Hours**

Area related problems - Problems on Ages - Boat and Stream - Simple Interest - Compound Interest – True discount – Calendar – Clocks - Data Interpretation - Bar Graphs - Pie Chart.

Unit III: Verbal Reasoning – I **6 Hours**

Analogy - Classification – Series - Coding & Decoding - Coded inequality - Blood relations - Direction sense test.

Unit IV: Verbal Reasoning – II **6 Hours**

Number Test - Ranking and Time Sequence Test - Seating arrangements - Alphabet Test - Logical Venn Diagram.

Unit V: General Knowledge **6 Hours**

Abbreviations & Acronyms - Famous Personalities - Important Days (National & International) - Capital Cities and Currencies – Current affairs - Sports – RBI & Banking Terms – Basics of Computers and Internet.

Reference Books:

1. R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S Chand Publishing company; Revised edition (21 February 2017).
2. R.S.Agarwal, A modern approach to logical reasoning, S Chand Publishing company; August 2022.
3. R.S.Agarwal, A Modern Approach To Verbal Reasoning (Old Edition), S Chand Publishing company.
4. R.S.Agarwal, Advanced objective general knowledge revised edition, S Chand Publishing company, 2017.

e-RESOURCES:

1. https://www.cuemath.com/numbers/hcf-and-lcm/
2. https://www.geeksforgeeks.org/speed-time-distance-formula-and-aptitude-questions/
3. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://cdn1.byjus.com/wp-content/uploads/2020/06/Boat-Stream-Sample-Questions.pdf
4. https://www.hitbullseye.com/Simple-Interest-and-Compound-Interest.php
5. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://examsdaily.in/wp-content/uploads/2018/09/br.pdf
6. https://testbook.com/objective-questions/mcq-on-direction-and-distance--5eea6a0e39140f30f369e42a
7. https://unacademy.com/content/cat/study-material/data-interpretation-and-logical-reasoning/ranking-and-time-sequence/
8. https://www.toppr.com/guides/computer-aptitude-and-knowledge/basics-of-computers/basic-computer-terminology/

Non Major Elective

Course Title: Introduction To Information Technology	**Total Hours :26 Hrs**
Course Code: U3NTN51/ **U24NTN51**	**Total Credits:2**

Course Outcome:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Know about the characteristics and uses of computers
CO2	Gain knowledge about the classification of computers
CO3	Acquire knowledge about CPU RAM and ROM
CO4	Interpret the mechanisms of various secondary storage devices
CO5	Understand the basics of Networks, Internet and Web browser

UNIT I **5 Hours**

Introduction to Computers: Importance of Computers – Characteristics of Computers – Uses of Computers – Overview of the computer system – Parts of a computer –Importance of Hardware.

UNIT II **5 Hours**

Classification of Computers: Portable computers – Personal computers (PCs) – Workstations – Minicomputers – Mainframes – Super computer – Comparison of computers.

UNIT III **6 Hours**

Central Processing Unit (CPU): Central Processing Unit – Memory – Registers.

Computer Memory: Evaluation of memory requirements – Random Access Memory (RAM) – Read Only Memory (ROM).

UNIT IV **5 Hours**

Secondary Storage Devices: Classification of secondary storage devices - Advantages of secondary storage – Magnetic disks – Optical disk – Magnetic tape.

UNIT V **5 Hours**

Telecommunication and Networks: Types of Network – Network Topologies - Network protocols – Network architecture – Network standardization.

Internet and WWW: What can I do on the Internet? – Internet addressing –Web browsers.

Text Book:

1. Alexis Leon**,** Mathews Leon**, "**Introduction to Information Systems"**,** Mc Graw Hill Education (India) Pvt. Ltd., Second Reprint 2009.

Unit I	Chapter: 2 Pg. Nos. : Chapter 2 (17 - 27)
Unit II	Chapter: 3

	Pg. Nos. : Chapter 3 (29 - 37)
Unit III	Chapter: 4 Pg. Nos. : Chapter 4 (39 – 42) Chapter 5 (51 - 56)
Unit IV	Chapter: 6 Pg. Nos. : Chapter 6 (57 – 65)
Unit V	Chapters: 12 ,13 Pg. Nos. : Chapter 12 (156 – 163) Chapter 13 (168 -170, 177 – 179, 182 – 184)

Reference books:

1. Alexis Leon, Mathews Leon**,"**Fundamentals of Information Technology", Second Edition,LeonVikas Pvt. Ltd, Chennai, 2009.
2. Suresh K.Basandra,"Computers Today" , Galgotia Publications Pvt Ltd, Reprint 2010.
3. Dennis P.Curtin,KimFoley,KunalSen,Cathleen Morin, "Information Technology", Tata McGraw Hill,26th Reprint 2010.
4. V.Rajaraman,"Introduction To Information Technology", Third Edition,PHI Learning Pvt. Ltd, 2018

e – Resources:

1. https://www.tutorialspoint.com/fundamentals_of_science_and_technology/information_technology.htm
2. https://www.codecademy.com/learn/introduction-to-it
3. https://www.studocu.com/row/document/kca-university/information-technology/introduction-to-information-technology-pdfdrive/34745752

SEMESTER VI
Core -16

Course Title: Software Engineering	**Total Hours :52 Hrs**
Course Code: U3NTC61/**U24NTC61**	**Total Credits: 4**

Course Outcome:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Learn basic software engineering definitions, size factors, quality and productivity factors
CO2	Acquire knowledge in software cost factors and software cost estimation techniques.
CO3	Produce efficient, reliable, robust and cost - effective software solutions.
CO4	Design a system, component, or process to meet desired needs within realistic

	constraints
CO5	Apply testing principles on software project and understand the maintenance concepts.

UNIT I **10 Hours**

Introduction to Software Engineering: Introduction – Some Definitions - Size Factors - Total Effort Devoted to Software - Distribution of Effort - Project Size Categories - How Programmers Spend their Time - Quality and Productivity Factors - Managerial Issues.

Planning a Software Project: Introduction – Defining the Problem : Goals and Requirements - Developing a Solution Strategy - Planning the Development Process : The Phased Life - Cycle Model - Milestones, Documents, and Reviews - The Cost Model - The Prototype Life - Cycle Model - Successive Versions - Planning an Organizational Structure : Project Structure - Programming Team Structure - Management By Objectives - Other Planning Activities : Planning for Configuration Management and Quality Assurance - Planning for Independent Verification and Validation - Planning Phase - Dependent Tools and Techniques - Other Planning Activities.

UNIT II **10 Hours**

Software Cost Estimation: Introduction - Software Cost Factors: Programmer Ability - Product Complexity - Product Size - Available Time - Required Level of Reliability - Level of Technology - Software Cost Estimations Techniques: Expert Judgment - Delphi Cost Estimation - Work Breakdown Structures - Algorithmic Cost Models - Staffing Level Estimation - Estimating software Maintenance costs.

UNIT III **10 Hours**

Software Requirements Definition: Introduction - Software Requirements Specification – Formal Specification Techniques: Relational Notations - State - Oriented Notations – Summary - Languages and Processors for Requirements Specification: PSL/PSA - RSL/REVS - Structured Analysis and Design Technique (SADT) - Structured System Analysis (SSA) - GIST.

UNIT IV **11 Hours**

Software Design: Introduction - Fundamental Design Concepts : Abstraction - Information Hiding – Structure – Modularity – Concurrency – Verification – Aesthetics - Modules and Modularization Criteria : Coupling and Cohesion - Other Modularization Criteria - Design Notations : Data Flow Diagrams - Structure Charts - HIPO Diagrams - Procedure Templates – Pseudocode - Structured Flowcharts - Structured English - Decision Tables - Design Techniques : Stepwise Refinement - Levels of Abstraction - Structured Design - Integrated Top - Down Development - Jackson Structured Programming - Summary of Design Techniques - Detailed Design Considerations – Real Time and Distributed System Design - Test plans.

UNIT V **11 Hours**

Verification and Validation Techniques: Quality Assurance - Walkthroughs and Inspections: Walkthroughs – Inspections - Static Analysis - Symbolic Execution - Unit Testing

and Debugging: Unit Testing – Debugging - System Testing: Integration Testing - Acceptance Testing.

Software Maintenance: Enhancing Maintainability during development – Managerial Aspects of Software Maintenance– Configuration Management – Source - Code Metrics – Other maintenance Tools and Techniques.

Text Book:

1. Richard Fairley, "Software Engineering Concepts", TMH, 1997, Reprint 2012.

Unit I	Chapters: 1.1 - 1.4, 2 Pg. Nos. : Chapter 1 (1 – 23) Chapter 2 (30 – 60)
Unit II	Chapter: 3 Pg. Nos. : 64 – 84
Unit III	Chapter: 4 Pg. Nos. : 88 – 130
Unit IV	Chapter: 5.1 – 5.7 Pg. Nos. : 137 – 185
Unit V	Chapters: 8.1 – 8.6, 9 Pg. Nos. : Chapter 8 (269 – 297) Chapter 9 (311 – 328)

Reference Books:

1. Rajib Mall,"Fundamentals of software engineering", 4th Edition,Prentice Hall of India Pvt. Ltd., 2003,
2. Ian Sommerville,"Software Engineering",7th edition, Pearson Education, 2004.
3. Roger S. Pressman, "Software Engineering - A Practitioner's Approach", 7th Edition,McGraw Hill Education, 2014.
4. Waman S. Jawadekar,"Software Engineering: A Primer",First Edition ,Tata McGraw – Hill Education Pvt. Ltd., 2008.

e – Resources:

1. https://www.geeksforgeeks.org/software-engineering/
2. https://www.javatpoint.com/software-engineering
3. https://www.guru99.com/software-engineering-tutorial.html

Core -17

Course Title: Cryptography And Cyber Security	**Total Hours : 65 Hrs**
Course Code: U24NTC62	**Total Credits:5**

Course Outcome:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Understand the basic of Cryptography and classical Symmetric-Key Ciphers.
CO2	Gain knowledge of Advanced Symmetric-Key Block and Stream Ciphers, and also Data Encryption standard, Advanced Encryption Standard.
CO3	Understand and analyze public-key cryptography, RSA and other public-key Cryptosystems, such Rabin Cryptosystem, ElGamal Cryptosystem, etc.
CO4	Understand concept of Cyber Crime and Criminals activities.
CO5	Gain knowledge of Cyber Criminals using methods and tools to attack the system.

Unit I **13 Hours**

Introduction: Security Goals, Cryptographic Attacks, Services and Mechanism, Techniques for Security Goals Implementation.

Traditional Symmetric-Key Ciphers: Symmetric-Key Ciphers, Categories of Traditional Ciphers, Stream and Block Ciphers.

Unit II **13 Hours**

Introduction to Modern Symmetric-Key Ciphers: Modern Block Ciphers, Components of a Modern Block Ciphers, Two Classes of Product Ciphers, Attacks Designed for Block Ciphers, Modern Stream Ciphers.

Data Encryption Standard: History of Data Encryption Standard (DES), DES Structure.

Unit III **13 Hours**

Advanced Encryption Standard (AES): History of Advanced Encryption Standard, Transformations used by AES, Key Expansion.

Asymmetric-Key Cryptography: RSA Cryptography: Introduction, Procedure, Some Trivial Examples. Rabin Cryptography, ElGamal Cryptography, Elliptic Curve Cryptography: Elliptic Curves over Real Numbers, Elliptic Curves over GF(p), Elliptic Curves over GF(2^n)

Unit IV **13 Hours**

Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the word, Cybercrime and Information Security, who are Cybercriminals?, Classification of Cybercrimes.

Cyber offenses: How Criminals Plan Them: Introduction, How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

Unit V **13 Hours**

Tools and Methods Used in Cybercrime: Introduction, Proxy Server and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms,

Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL injection, Buffer overflow, Attacks on Wireless Networks.

Text Book:

1. Behrouz A. Forouzan, Debdeep Mukhopadhyay,"Cryptography and Network Security, 3e", , The Mc-Graw Hill Companies, Inc., 2015.
2. Nine Godbole, Sunit Belapure,"Cyber Security", Wiley, 2011.

Unit I	Book 1: Chapters: 1,3 Pg. Nos. : Chapter 1 (1 – 9) Chapter 3 (43 – 73)
Unit II	Book 1: Chapters: 5,6 - LO 1,LO 2 : 2.1 to 2.4 Pg.No.: Chapter 5 (101-132) Chapter 6 (137 – 150)
Unit III	Book 1: Chapters: 7 - LO 1 – 5, 8 - LO 2 :2.1-2.3,3,4,5 :5.1-5.3 Pg. Nos.: Chapter 7 (169 – 190) Chapter 8 (265 – 269, 276 – 287)
Unit IV	Book 2: Chapters 1.1 - 1.5, 2 Pg. Nos.: Chapter 1 (1 – 32) Chapter 2 (45 – 79)
Unit V	Book 2: Chapter 4 Pg. Nos. : 125 – 180

Reference Book:

1. William Stallings **,"**Cryptography & Network Security"**,** Seventh Edition ,Pearson, 2017.
2. Atul Kahate,"Cryptography and Network Security", Fourth Edition, McGraw Hill Education, 2019, .
3. Anand Shinde,"Introduction to Cyber Security", Notionpress,2021.
4. Bhushan, Rathore, Jamshed,"Fundamental of Cyber Security (Principles, Theory &Practices)", BPB Publicaitons, 2017.

e-Resources:

1. https://www.geeksforgeeks.org/cryptography-tutorial/
2. https://www.tutorialspoint.com/cryptography/index.htm
3. https://www.guru99.com/how-to-make-your-data-safe-using-cryptography.html
4. https://www.gatevidyalay.com/tag/cryptography-and-network-security-tutorial/
5. https://www.simplilearn.com/tutorials/cyber-security-tutorial/what-is-cyber-security
6. https://www.w3schools.com/cybersecurity/cybersecurity_crime.php

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Core -18

Course Title: Lab: Dot Net Programming	**Total Hours : 65 Hrs**
Course Code: U24NTCP61	**Total Credits: 3**

Course Outcome:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Recognize and explain the benefits of procedural, event driven, and object oriented languages
CO2	Design and Create windows programs using VB.NET Programming language
CO3	Work with Visual Basic Forms, Toolbox Controls and Properties
CO4	Create user interactive web pages using ASP. NET.
CO5	Use ADO.NET in a windows and also web application to read, insert, and update data in a database

VB.NET

Develop a VB.NET application to,

1. Design the simple calculator.
2. Design an application using scrollbar to change the back color of form.
3. Design the quiz form.
4. Find the age using Data Time Picker.
5. Implement the operation in between two list boxes like add, remove, transfer, print and count items from one list box to other.
6. Implement Collection Class.
7. Implement string operation.
8. Implement Abstract Class.
9. Implement Exception handling.
10. Implement Inheritance.

ASP.NET

Develop a Web application to,

11. Display the selected image.
12. Design an application form to validate the inputs using validation controls.
13. Design advertisement using Ad-Rotator Control.
14. Display the selected date and highlight the given date using calendar control.
15. Demonstrate cookies.
16. Demonstrate Sessions.
17. Design simple online shopping using single master page.
18. Design simple tutorial using multiple master page.

ADO.NET

19. Develop a VB.NET application to maintain a students' records.
20. Develop a VB.NET application to maintain an employee details.
21. Develop a web application to maintain a product details.

Core - 19

Course Title : Lab: Network Simulator	**Total Hours : 52 Hrs**
Course Code : U24NTCP62	**Total Credits : 2**

Course Outcomes:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Experiment basics Networking topologies
CO2	Outline classifications of using IP Addresses
CO3	Describe the implementation procedures for the Switches and Routers.
CO4	Experiment DHCP, DNS, HTTP, Telnet, SSH etc., Protocols
CO5	Analyze the performance metrics of packets through ping, trace root, nslookup commands.

1. Configure and connect two system using crossover cables
2. Create and configure the computers in Local Area Network
3. Demonstrate different types of networking devices
4. Design more than one LAN and Interpreting Ping and Trace route Commands
5. Configure DNS Server in the Network using packet tracer software
6. Configure DHCP Server in the Network using packet tracer software
7. Configuring WEP on a Wireless Router
8. Examining WAN Connections
9. To construct simple LAN and understand the concept and operation of Address Resolution Protocol (ARP)
10. To understand the concept and operation of Routing Information Protocol (RIP)
11. Configuration of TELNET protocols using router
12. To understand the operation of SSH by accessing the remote login using Packet Trace
13. Construct a VLAN and make the system communicate among a VLAN
14. To construct a Inter - VLAN and make the PC's communicate among a VLAN
15. Examining Network Address Translation (NAT)

Elective 3

Course Title : Artificial Intelligence	**Total Hours : 65 Hrs**
Course Code : U24NTE61	**Total Credits : 3**

Course Outcomes:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	To learn the distinction between optimal reasoning vs. human like reasoning
CO2	To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities
CO3	To understand the applications of AI, namely game playing
CO4	Comprehend the applications of probabilistic reasoning and Bayesian Networks
CO5	Analyze supervised learning vs. learning decision trees

UNIT I **15 Hours**

Introduction: What is AI- History of Artificial Intelligence.

Intelligent Agents: Agents and Environments –The Nature of Environments-The Structure of Agents

UNIT II **15 Hours**

Solving Problems by Searching: Problem solving Agents-Searching for Solutions-Uninformed Search Strategies.

Informed Search and Exploration: Informed(heuristics)Search Strategies(Greedy Best First Search, A* Search: Minimizing the total estimated solution cost)-Local Search Algorithms and Optimization Problems(Hill Climbing Search, Simulated Annealing Search)

UNIT III **15 Hours**

Adversarial Search: Optimal Decisions in Games-Alpha-Beta Pruning **-Logical Agents:** Propositional Logic: A very Simple Logic

First-Order Logic : Syntax and Semantic of First-Order Logic-Using First Order Logic

UNIT IV **15 Hours**

Uncertainty: Acting under Uncertainty, Basic Probability Notation - Bayes' Rule and Its Use,

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks.

UNIT V **15 Hours**

Learning from Observations: Forms of Learning-Inductive Learning-Learning Decision Trees-

Statistical Learning Methods: Statistical Learning-Instance Based Learning **Reinforcement Learning:** Introduction-Passive Reinforcement Learning-Active Reinforcement Learning

Text Book:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Second Edition, Pearson Education, 2007.

Unit I	Chapters: 1.1 ,1.3, 2.1, 2.4 Pg. Nos.: Chapter 1 (29 - 33) Chapter: 2 (60 - 63,70 – 82)
Unit II	Chapters: 3.1,3,3,3.4, 4.1,4.3 Pg. Nos.: Chapter 3 (87 - 91,99 - 101, 101 – 111) Chapter: 4 (122 - 128, 138 – 143)
Unit III	Chapters: 6.2, 6.3, 7.4, 8.2, 8.3 Pg. Nos. : Chapter 6 (190 – 199) Chapter 7 (232 – 239) Chapter 8 (273 - 288)
Unit IV	Chapters: 13.1,13.2,13.6,14.1 -14.3 Pg. Nos. : Chapter 13 (490 – 499) Chapter: 14 (520 – 538)
Unit V	Chapters: 18.1 to 18.3, 20.1, 20.4, 21.1 to 21.3 Pg. Nos. : Chapter 18 (677 - 696) Chapter: 20 (740 – 744) Chapter: 21 (791 – 805)

Reference Books :

1. E. Rich and K. Knight (TMH),"Artificial Intelligence", Third Edition, 2010.
2. Patrick Henny Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2002.

e-Resources:

1. https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial
2. https://www.javatpoint.com/artificial-intelligence-ai
3. https://www.tutorialspoint.com/artific ial_intelligence/index.htm

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Elective 3

Course Title : Software Metrics	**Total Hours : 65 Hrs**
Course Code : U24NTE62	**Total Credits : 3**

Course Outcomes:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Understand the various fundamentals of measurements and software metrics
CO2	Identify framework and analysis techniques for software measurements
CO3	Apply internal and external attributes of software product for effort estimation
CO4	Use appropriate analytical techniques tom interpret software metrics data and derive meaningful insights
CO5	Recommend reliability models for predicting software quality

UNIT I **13 Hours**

Fundamentals of Measurement: Need for Measurement: Measurement in software engineering- Scope of software metrics.

The Basics of Measurement: The representational theory of measurement- Measurement and models - Measurement scales and scale types - meaningfulness in measurement

UNIT II **13 Hours**

A Goal-Based Framework for Software Measurement: Classifying software measures - Determining what to measure - Applying the framework - Software measurement validation - Performing software measurement validation.

Empirical Investigation: Principles of Empirical Studies - Planning Experiments- Planning case studies as quasi-experiments - Relevant and Meaningful Studies .

UNIT III **13 Hours**

Software Metrics Data Collection: Defining good data - Data collection for incident reports - How to collect data - Reliability of data collection procedures

Analyzing Software Measurement Data: Statistical distributions and hypothesis testing - Classical data analysis techniques - Examples of simple analysis techniques.

UNIT IV **13 Hours**

Measuring Internal Product Attributes: Size properties of software size - Code size- Design size - Requirements analysis and specification size - Functional size measures and estimators- Applications of size measures.

Measuring internal product attributes: Structure - Aspects of structural measures,- Control flow structure of program units - Design-level Attributes - Object-oriented structural attributes and measures.

UNIT V **13 Hours**

Measuring External Product Attributes: Modelling software quality - Measuring aspects of quality - Usability Measures- Maintainability measures – Security Measures

Software Reliability Measurement and Prediction: Basics of reliability theory- The software reliability problem - Parametric reliability growth models- Predictive accuracy.

Text Book:

1. Norman Fenton, James Bieman ,"Software Metrics A Rigorous and Practical Approach", Third Edition, 2014.

Unit I	Chapters: 1.2,1.3,2.1,2.4 Pg. Nos. : Chapter 1 (11 – 22) Chapter 2 (25 – 78)
Unit II	Chapters: 3.1 - 3.5, 4.1 - 4.4 Pg. Nos. : Chapter 3 (87 – 115) Chapter 4 (133 – 179)
Unit III	Chapters: 5.1 - 5.4, 6.1 – 6.3 Pg. Nos. : Chapter 5 (183 – 214) Chapter 6 (225 – 259)
Unit IV	Chapters: 8.1 - 8.6, 9.1 – 9.4 Pg. Nos. : Chapter 8 (335- 364) Chapter 9 (371 – 425)
Unit V	Chapters: 10.1 - 10.5, 11.1 – 11.4 Pg. Nos. : Chapter 10 (441- 470) Chapter 11 (475 – 508)

Reference Books:

1. Norman E, Fenton and Shari Lawrence Pfleeger, **"**Software Metrics", International
   Thomson Computer Press, 1997.
2. Stephen H.kan, "Metric and Modelsin Software Quality Engineering", Second Edition, Addison Wesley Professional, 2002.
3. Robert B.Grady, "Practical Software Metrics for Project Management and Process
   Improvement", Prentice Hall, 1992.

e-Resources:

1. http://lansa.com/blog/general/what-are-software-metrics-how-can-i-measure-these-metrics/

Elective 3

Course Title : Natural Language Processing	**Total Hours : 65 Hrs**
Course Code : U24NTE63	**Total Credits : 3**

Course Outcomes:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Describe the fundamental concepts and techniques of natural language processing.
CO2	Identify various language models and labeling
CO3	Understand formal language theory for perform parsing
CO4	Learn NLP methods to perform reference and segments.
CO5	Acquire the knowledge of information retrieval and text generation

UNIT I **13 Hours**

Introduction: Natural Language Processing and its Neighbors-Three Themes in Natural Language Processing.

Linguist Applications of Classifications: Sentiment and Opinion Analysis-Word Sense Disambiguation-Design Decisions for Next Classifications-Evaluating Classifiers.

UNIT II **13 Hours**

Language Models: N-Gram Language Models-Smoothing and Discounting-Recurrent Neural Network Language Models-Evaluating Language Models-Out-of-Vocabulary words.

Sequence Labelling: Sequence Labelling as Classification-Sequence Labelling structured Prediction-The Viterbi Algorithm-Hidden Markov Models-Discriminative Sequence Labelling with Features-Neural Sequence Learning.

Applications of Sequence Labelling: Parts of Speech Tagging-Morphosyntactic Attributes-Named Entity Recognition-Tokenization-Code Switching-Dialogue Acts.

UNIT III **13 Hours**

Formal Language Theory: Regular Languages-Context – Free Languages

Logical Semantics: Meaning and Denotation-Logical representation of meaning-Semantic Parsing and Lambda Calculus – Learning Semantic Parser.

Predicate Argument –Semantics: Semantic Rules-Semantic Role Labelling-Abstract Meaning Representation.

UNIT IV **13 Hours**

Reference Resolutions: Forms of Referring Expressions-Algorithms for Coreference Resolutions-Representation for Coreference Resolution-Evaluating Coreference Resolution.

Discourse: Segments-Entities and Reference- Relations.

UNIT V **13 Hours**

Information Extraction: Entities-Relations-Events-Edges, Denials and Hypotheticals.

Text Generation: Data to Text Generation-Text to Text Generation-Dialogue

Text Book :

1. Jacob Eisenstein, "Natural Language Processing", The Massachusetts Institute of Technology, 2019

Unit I	Chapters: 1.1, 1.2, 4.1 - 4.4 Pg. Nos. : Chapter 1 (1 - 10) Chapter 4 (4.1 - 4.4)
Unit II	Chapters: 6.1 - 6.5, 7.1 - 7.6, 8.1 – 8.6 Pg. Nos. : Chapter 6 (119 – 136) Chapter 7 (137 – 160) Chapter 8 (167 – 182)
Unit III	Chapters: 9.1 - 9.2, 12.1 - 12.4, 13.1 – 13.3 Pg. Nos. : Chapter 9 (184 – 209) Chapter 12 (269 – 288) Chapter 13 (289 – 308)
Unit IV	Chapters: 15.1 - 15.4, 16.1 – 16.3 Pg. Nos. : Chapter 15 (333 – 356) Chapter 16 (357 – 376)
Unit V	Chapters: 17.1 - 17.4, 19.1 – 19.3 Pg. Nos. : Chapter 17 (379 – 398) Chapter 19 (431 – 446)

Reference Books:

1. Daniel Jurafsky, James H. Martin ,"Speech & language processing", Pearson Publications, 2014.
2. Allen James,"Natural language understanding**"**, Benjamin-Cummings Publishing Co.,Inc,Second Edition ,1995.

e-Resources:

1. https://en.wikipedia.org/wiki/Natural_language_processing
2. https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP

SBS 6

Course Title : Internet of Things	**Total Hours : 26 Hrs**
Course Code : U24NTS61	**Total Credits : 2**

Course Outcomes:
Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Understand the various fundamentals of IoT design techniques, templates and

	domains.
CO2	Identify similarities and differences in M2M and IoT
CO3	Learn IoT design methodologies.
CO4	Use python to implement programming using Raspberry devices
CO5	Apply web application framework to develop web services

UNIT I **5 Hours**

Introduction to Internet of Things: Introduction-Physical Design of IoT- Logical Design of IoT-IoT Enabling Technologies-IoT Levels & Deployment Templates.

Domain Specific IOTs: Introduction-Home Automation-Cities-Environment-Energy-Retail-Logistics-Agriculture-Industry-Health&Lifestyle

UNIT II **5 Hours**

IoT and M2M: Introduction-M2M-Difference between IoT and M2M-SDN and NFV for IoT

UNIT III **5 Hours**

IoT Platforms Design and Methodology: Introduction-IoT Design Methodology-Case Study on IoT System for Weather Monitoring.

UNIT IV **5 Hours**

IOT Physical Devices & Endpoints: What is an IOT device-Exemplary Device: Raspberry PI-About the board-Linux on Raspberry PI Interfaces-Programming Raspberry PI with Python-Other IoT Devices.

UNIT V **6 Hours**

IOT Physical Servers & Cloud Offerings : Introduction to Cloud Storage Models & Communication APIs-WAMP-AutoBahn for IoT-Xively Cloud for Iot-Python Web Application Frameork-Django-Designing a RESTful web API-Amazon Web Services for IoT-SkyNet IoT Messaging Platform.

Text Book:

1. Arshdeep Bahga,"Internet of Things A Hands –on Approach", Vijay Madisetti , Universities Press(India)Private Limited, 2015.

Unit I	Chapter: 1.1 - 1.5 Pg. Nos. : 20 - 50 Chapter: 2.1 - 2.10 Pg. Nos. : 54 – 72
Unit II	Chapter: 3.1 - 3.5 Pg. Nos. : 76 – 88
Unit III	Chapter: 5.1 - 5.4 Pg. Nos. : 114 – 137
Unit IV	Chapter: 7.1 - 7.7 Pg. Nos. : 178 – 194
Unit V	Chapter: 8.1 to 8.7 Pg. Nos. : 198 – 250

Reference Books:

1. Michael Miller **,"**The Internet of Things: How Smart TVs, Smart Cars, Smart Homes and Smart Cities Are Changing the World" , kindle version, 2015.
2. Francis da Costa,"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

e-Resources:

1. https://www.javatpoint.com/iot-internet-of-things
2. https://www.guru99.com/iot-tutorial.html
3. https://developer.ibm.com/technologies/iot/tutorials/

Non Major Elective

Course Title : Introduction to Internet	**Total Hours : 26 Hrs**
Course Code : U2NTN61/**U24NTN61**	**Total Credits : 2**

Course Outcomes:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Get familiar with basics of Internet
CO2	Acquire knowledge about Internet and different ways to access it.
CO3	Surfing the Internet effectively
CO4	Interpret E-mail and explain the benefits and challenges of using E-Mail
CO5	Learn the web page designing and website hosting

UNIT I **5 Hours**

Introduction to Internet: Introduction – Some Statistics – What is Internet – Howdoes Internet Work? – What is Special about the Internet? – A Brief History of Internet.

How Internet Works?: Introduction –People and Organizations– Hardware.

UNIT II **5 Hours**

Getting Connected: Introduction–Dial –up Connection–Dedicated Lines–ISDN-DSL–Cable Modem–Satellite Internet–Cellular broadband–Wireless Broadband- Wired and Wireless Broadband Internet Access– Choosing the best Internet Connection.

World Wide Web (WWW): Introduction–Internet and Web – How the Web Works? – A Brief History of WWW.

UNIT III **6 Hours**

Searching the Web: Introduction–InformationSources–Organizations–Companies–Newspapers and the Media – Electronic Books–Library Catalogs and Book shops – Finding Information on the Internet – Searching the Web – Web Index –Web Directory – Search

Engines – Meta -search Engines – Making Your search – Improving Your Searching–Tips for Internet Research –Invisible Web.

UNIT IV **5 Hours**

E -Mail: Introduction – How E -mail works?-Why Use E -mail? – E -mail-Names and Addresses – Mailing Basics**:** Address Book – File Attachments-Signature –SettingPriority– ReplyingandForwardingE-mailMessengers–CustomizingyourMail Program. How Private is the E -mail? – E -mail Ethics – Spamming – E -mail –Advantages and Disadvantages – Tips for effective e -mail use – E -mail Safety Tips –Smileys (Emotions)– Free E-mail Providers.

UNIT V **5 Hours**

Websites and Webpages: Introduction-Webdesign-CreatingWebsite-WebHosting-WebsitePromotion. **Making Money on the Internet:** Introduction–Writing-Product Reviews–Sharing Your Knowledge–Advertising– Affiliate Programs–Selling– On-line Tutoring.

Text Book:

1. Alexis Leon and Mathews Leon **,**"Internet for Everyone", Press (a division of Win Leon Publishing Pvt Ltd)**,** 15th Anniversary Edition, 2012

Unit I	Chapters: 1,2 Pg. Nos. : Chapter 1 (1 – 10) Chapter 2 (12 – 18)
Unit II	Chapters: 3,4 Pg. Nos. : Chapter 3 (19 – 39) Chapter 4 (42 - 46)
Unit III	Chapter: 6 Pg. Nos. : 60 - 73
Unit IV	Chapter: 10 Pg. Nos. : 99 – 114
Unit V	Chapter: 11 Pg. Nos. : 115 - 123 Chapter: 18 Pg. Nos. : 180 -185

Reference Books:

1. Douglas E.Comer, "The Internet Book: Everything You Need to Know about Computer Networking and How the Internet Works", 4th Edition, Champ man and Hall CRC Publication,2006.
2. Prof.Satish Jain, Shashank Jain, Shashising hand M.GeethaIyer,"Internet Technology and Web Design"**,** BPB publications, 2014**.**
3. Scott D.James, "Introduction to the internet", Prentice Hall, 3rd edition ,2000

e-Resources:

1. https://www.tutorialspoint.com/internet technologies/internetoverview.htm
2. https://jdgsmahilacollege.files.wordpress.com/2014/01/ch3.pdf
3. https://www.w3schools.blog/internet

Elective 4

Course Title: Project	**Total Hours : 39 Hrs**
Course Code: U24NT6PR	**Total Credits: 3**

Course Outcome:

Upon completion of the course, students will be able to

Cos	CO Statement
CO1	Analyze end user requirements, identifying and implementing solutions to user requests.
CO2	Give the students in depth knowledge in algorithmic techniques in the project.
CO3	Analyze technical requirements to determine resource requirements.
CO4	Design, plan, budget and propose an IT project.
CO5	Install technical hardware and software support to the project..
CO6	Analyze and select application and operating system settings to create an optimal user environment.
CO7	Identify and resolve technical problems using trouble-shooting methods.

Objective: To train the students to develop software applications in webpage development and from the core subjects, like, Data Structure, Machine learning, Android applications, Data communication and Computer Network, IOT etc.,.

Based on case study, the following components need to be done by students :

1. Planning a problem
2. Analyzing the problem
3. Requirement analysis
4. Designing prototype.
5. Table Design
6. Data Flow diagram/ UML diagrams
7. Coding
8. Testing.
9. Implementation.
10. Feature Enhancements
