SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)
(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)
UG Programmes CE,CSE,ECE,EEE,IT & ME are Accredited by NBA
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204
Estd:1980

Regulation: R20	III / IV - B.Tech. I - Semester

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2020-21 admitted Batch onwards)

Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20AD3101	Foundation of data Science	PC	3	3	0	0	30	70	100
B20AD3102	Computer Networks	PC	3	3	0	0	30	70	100
B20AD3103	Data Base Management Systems	PC	3	3	0	0	30	70	100
#PE-I	Professional Elective -I	PE	3	3	0	0	30	70	100
#OE-I	Open Elective-I	OE	3	3	0	0	30	70	100
B20AD3108	Data Science Lab	PC	1.5	0	0	3	15	35	50
B20AD3109	Data Base Management Systems Lab	PC	1.5	0	0	3	15	35	50
B20HS3102	Soft Skills **(Skill Oriented Course)**	SOC	2	1	0	2	--	50	50
B20MC3102	Competitive Coding	MC	0	3	0	0	--	--	--
B20AD3110	Summer Internship	PR	1.5	--	--	--	--	50	50
	TOTAL		**21.5**	**19**	**0**	**8**	**180**	**520**	**700**

	Course Code	Course
#PE-I	B20AD3104	Software Engineering
	B20AD3105	Automata Theory and Compiler Design
	B20AD3106	DevOps
	B20AD3107	Internet of Things
#OE-I	Student has to study one Open Elective offered by CE or ECE or EEE or ME or S&H from the list enclosed.	

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3101	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

FOUNDATION OF DATA SCIENCE

(For AI&DS)

Course Objectives:

1.	To impart knowledge on basics of data science, data manipulation and exploratory data analysis concepts that is vital for data science.
2.	To develop skills for applying tools and techniques to analyze, visualize and interpret data.

Course Outcomes: At the end of this course, the students will be able to

S.No	Outcome	Knowledge Level
1.	Demonstrate knowledge on the concepts of data science to perform mathematical computations using efficient storage and data handling methods in NumPy..	K3
2.	Apply Data Preparation and Exploration methods using Pandas to perform data manipulation.	K3
3.	Create data visualization using charts, plots and histograms to identify trends, patterns and outliers in data using Matplotlib and Seaborn	K3
4.	Develop methods to analyze and interpret time series data to extract meaningful statistics.	K3

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION TO DATA SCIENCE** Basic terminologies of data science, Types of data, Five steps of data science, Arrays and vectorized computation using NumPy - The NumPy ndarray: A multidimensional array object, Universal functions: Fast element-wise Array functions, Array-oriented Programming with arrays, File input and output with arrays, Linear algebra, pseudorandom number generation.
UNIT-II (10 Hrs)	**DATA EXPLORATION WITH PANDAS** Process of exploring data, Pandas data structures – Series, Data frame, Index objects; Essential functionality, Summarizing and computing descriptive statistics – Correlation and covariance, Unique values, Value counts and membership; Data loading, Storage, and file formats - Reading and writing data in text format , Binary data formats.
UNIT-III (10 Hrs)	**DATA CLEANING, PREPARATION AND DATA WRANGLING** Handling missing data, Data transformation, String manipulation - String object methods, Regular expressions, Vectorized string functions in Pandas; Data wrangling: join, Combine and reshape - Hierarchical indexing, Combining and merging datasets,

	Reshaping and pivoting.
UNIT-IV (10 Hrs)	**DATA VISUALIZATION WITH MATPLOTLIB** Plotting and visualization- A brief matplotlib API primer, Plotting with Pandas and Seaborn, Other python visualization tools; Data aggregation and Group operations Group By mechanics, Data aggregation, Apply: General split-apply-combine, Pivot tables and Cross-tabulation.
UNIT-V (10 Hrs)	**TIME SERIES ANALYSIS** Date and time data types and tools, Time series basics, Date ranges, Frequencies, and shifting. Time zone handling, Periods and period arithmetic, Re sampling and frequency Conversion – Down sampling, up sampling and interpolation, Re sampling with periods; Moving window functions.
Text Books:	
1.	Wes McKinney, Python for Data Analysis, O'Reilly, 2nd Edition, 2017
Reference Books:	
1.	Sinan Ozdemir, Principles of Data Science, Packt Publishers, 2nd Edition, 2018.
2.	Rachel Schutt, Cathy O'Neil, Doing Data Science: Straight Talk from the Frontline, O'Reilly, 2014.
Web links:	
1	https://swayam.gov.in/nd1_noc19_cs60/preview
2	https://towardsdatascience.com/
3	https://www.w3schools.com/datascience/
4	https://github.com/jakevdp/PythonDataScienceHandbook
5	https://www.kaggle.com

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3102	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

COMPUTER NETWORKS

(For AI&DS)

Course Objectives: Students are expected to

1.	Provide insight about networks, topologies, and the key concepts.
2.	Gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
3.	Understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
4.	Know the basic concepts of network services and various network applications.

Course Outcomes: At the end of this course, the students will be able to

S.No	Outcome	Knowledge Level
1.	Explain the functions of the different layer of the OSI Protocol.	K3
2.	Describe and draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs)	K2
3.	Apply different access control techniques to understand operation of internet	K3
4.	Analyze to resolve IP addresses class full, perform routing	K4
5.	Apply DNS, EMAIL, HTTP, in real world applications	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction:** Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History. **Physical Layer** –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.
UNIT-II (10 Hrs)	**Data link layer:** Design issues, **Framing:** fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, **Elementary Data Link Layer protocols:** simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel. **Sliding window protocol:** One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field.

UNIT-III (10 Hrs)	**Media Access Control**: Random Access: Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, **Controlled Access**: Reservation, Polling, Token Passing, **Channelization:** frequency division multiple Access (FDMA), time division multiple access (TDMA), code division multiple access (CDMA). **Wired LANs:** Ethernet, Ethernet Protocol, Fast Ethernet (100 Mbps), Gigabit Ethernet **Wireless LANs**: 802.11architecture, Bluetooth Layers.
UNIT-IV (10 Hrs)	**The Network Layer Design Issues** – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, **Routing Algorithms**-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms General principles of congestion control, Congestion prevention polices. **Internet Working:** How networks differ- How networks can be connected- Tunneling, internetwork routing-, Fragmentation, network layer in the internet – IP Version 4 protocol-IPV4 Header Format, IP addresses, Class full Addressing, CIDR, NAT-, Subnets-IP Version 6-The main IPV6 header, Transition from IPV4 to IPV6, Comparison of IPV4 & IPV6-, DHCP
UNIT-V (10 Hrs)	**The Transport Layer:** Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services TCP features- Segment- A TCP connection- windows in TCP- flow control-Error control, Congestion control in TCP. **Application Layer:** World Wide Web: HTTP, Electronic mail-Architecture- web based mail- email security- TELENET-local versus remote Logging-Domain Name System: Name Space, DNS in Internet ,- Resolution-Caching- Resource Records- DNS messages- Registrars-security of DNS Name Servers

Textbooks:	
1.	Computer Networks — Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2.	Data Communications and Networks – Behrouz A. Forouzan, Fifth Edition TMH.
3.	Everyday Cryptography, 1st Edition, Keith M.Martin, Oxford,2016
Reference Books:	
1.	Data Communications and Networks- Achut S Godbole, AtulKahate
2.	Computer Networks, Mayank Dave, CENGAGE

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3103	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DATA BASE MANAGEMENT SYSTEMS

(For AI&DS)

Course Objectives:

1.	To introduce about database management systems.
2.	To give a good formal foundation on the relational model of data.
3.	To introduce the concepts of basic SQL as a universal Database language.
4.	To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.
5.	To provide an overview of Transaction processing and physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes: At the end of this course, the students will be able to

S.No	Outcome	Knowledge Level
1.	Understand fundamental concepts and architectures of database systems.	K2
2.	Develop database for an organization using E-R and Relational data models.	K3
3.	Apply knowledge of SQL to Create, Manipulate and Query databases.	K4
4.	Examine anomalies in database design and Apply Normalization concepts to refine the design.	K4
5.	Understand concepts, issues and solutions related to transaction processing and efficient data storage.	K2

SYLLABUS

UNIT-I (6Hrs)	**Introduction**: Database System Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene), Advantages of Database Systems, Database Applications, Brief introduction of different Data Models; Concepts of Schema, Instance and Data Independence; Three Tier Schema Architecture for Data Independence; Database System Structure, Centralized and Client- Server Architecture for the Database.
UNIT-II (10 Hrs)	**Entity Relationship Model**: Introduction, Entities, Attributes, Entity Set, Relationship, Relationship Set, Mapping Cardinalities, Key and Participation Constraints, Weak Entity Sets, Specialization and Generalization using ER Diagrams, Aggregation. **Relational Model**: Introduction to Relational Model, Concepts of Domain, Attribute, Tuple, Relation, Importance of Null Values, Constraints (Domain, Key constraints, Integrity Constraints) and their importance. **BASIC SQL**: Simple Database Schema, Data Types, Table Definitions (Create, Alter), Different DML Operations (insert, delete, update), Translating E-R Diagrams to Relations.

UNIT-III (12 Hrs)	**Basic SQL Querying:** (Select and Project) using *where* clause, Arithmetic & Logical operations, SQL Functions (Date and Time, Numeric, String conversion), Set Operations, Nested Queries, Correlated Queries, Grouping, Aggregation, Ordering, Implementation of Different Types of Joins, Views (Updatable and Non-Updatable).
UNIT-IV (10 Hrs)	**Schema Refinement** (Normalization): Purpose of Normalization or Schema Refinement, Concept of Functional Dependency, Normal Forms based on Functional Dependency (1NF, 2NF and 3 NF), Concept of Surrogate Key, Boyce-Codd Normal Form(BCNF), Lossless Join and Dependency Preserving Decomposition, Multi Valued Dependencies and Fourth Normal Form(4NF), Join Dependencies and Fifth Normal Form (5NF).
UNIT-V (12 Hrs)	**Transaction Concepts**: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, ARIES Recovery algorithm. **Indexing Techniques**: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing and Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning.
Textbooks:	
1.	Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2.	Database System Conceppts,5/e, Silberschatz, Korth, TMH
Reference Books:	
1.	Introduction to Database Systems, 8/e C J Date, PEA.
2.	Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3.	Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.
e-Resources	
1.	https://nptel.ac.in/courses/106/105/106105175/
2.	https://www.geeksforgeeks.org/introduction-to-nosql/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3104	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

SOFTWARE ENGINEERING

(For AI&DS)

Course Objectives:

1.	Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agile process
2.	Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
3.	Give exposure to Software Design techniques

Course Outcomes: At the end of this course, the students will be able to

S.No	Outcome	Knowledge Level
1.	Organize an Object-Oriented Design into high quality, executable code	K3
2.	Skills to design, implement, and execute test cases at the Unit and Integration level	K4
3.	Compare conventional and agile software methods	K3

SYLLABUS

UNIT-I (10 Hrs)	The Nature of Software, The Unique Nature of Web Apps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths, How It All Starts. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.
UNIT-II (10 Hrs)	Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.
UNIT-III (10 Hrs)	Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.
UNIT-IV (8 Hrs)	Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural

	Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, What Is a Component?, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.
UNIT-V (12 Hrs)	The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, Elements of Software Qualtiy Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing
Text Books:	
1.	Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2.	Software Engineering, Ian Sommerville, Ninth Edition, Pearson.
Reference Books:	
1.	Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
2.	Software Engineering, Ugrasen Suman, Cengage.
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105182/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3105	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

AUTOMATA THEORY AND COMPILER DESIGN

(For AI&DS)

Course Objectives:

1.	To learn fundamentals of Regular and Context Free Grammars and Languages
2.	To understand the relation between Contexts free Languages, Context Free Grammer
3.	To study the various phases in the design of a compiler
4.	To understand the design of top-down and bottom-up parsers
5	To understand syntax directed translation schemes and approaches to generate code for a target machine

Course Outcomes: At the end of this course, the students will be able to

S.No	Outcome	Knowledge Level
1.	To design DFA, NFA for the given regular expressions	K3
2.	To design parse trees and parsers for the given grammar	K3
3.	To design algorithms to perform code optimization in order to improve the performance of a program in terms of space and time complexity	K3
4.	To design algorithms to generate machine code	K3

SYLLABUS

UNIT-I (10 Hrs)	**Formal Language and Regular Expressions**: Languages, Definition Languages regular expressions, Finite Automata – DFA, NFA. Conversion of regular expression to NFA, NFA to DFA. Applications of Finite Automata to lexical analysis
UNIT-II (10 Hrs)	**Context Free grammars and parsing**: Context free grammars, derivation, parse trees, ambiguity LL(K) grammars and LL(1) parsing Bottom up parsing handle pruning LR Grammar Parsing, LALR parsing, parsing ambiguous grammars, YACC programming specification.
UNIT-III (10 Hrs)	**Semantics**: Syntax directed translation, S-attributed and L-attributed grammars, Intermediate code – abstract syntax tree, translation of simple statements and control flow Statements **Context Sensitive features** – Chomsky hierarchy of languages and recognizers. Type checking, type conversions, equivalence of type expressions, overloading of functions and operations.

UNIT-IV (8 Hrs)	**Run time storage**: Storage organization, storage allocation strategies scope access to now local names, parameters, language facilities for dynamics storage allocation. **Code optimization** : Principal sources of optimization, optimization of basic blocks, peephole optimization, flow graphs, Data flow analysis of flow graphs.
UNIT-V (12 Hrs)	Code generation : Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Block.
Text Books:	
1.	Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008.
2.	Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education.
Reference Books:	
1.	Louden: "Compiler Construction, Principles & Practice", 1st Edition, Thomson Press, 2006.
2.	Tremblay J P, Sorenson G P: "The Theory & Practice of Compiler writing", 1st Edition, BSP publication, 2010.
3.	Theory of Computation, V. Kulkarni, Oxford University Press, 2013

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3106	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

DevOps

(For AI&DS)

Course Objectives:

1.	Introduces the basic concepts of Information System.
2.	To understand the Management Control Framework and The Application Control Framework.

Course Outcomes: At the end of this course, the students will be able to

S.No	Outcome	Knowledge Level
1.	Explain the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility	K2
2.	Describe DevOps & DevSecOps methodologies and their key concepts	K2
3.	Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models	K2
4.	Design a complete private infrastructure using version control systems and CI/CD tools	K4
5.	Acquire the knowledge of maturity model, Maturity Assessment	K2

SYLLABUS

UNIT-I (10 Hrs)	Phases of Software Development life cycle. Values and principles of agile software development.
UNIT-II (10 Hrs)	Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.
UNIT-III (10 Hrs)	DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes
UNIT-IV (8 Hrs)	CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices
UNIT-V (12 Hrs)	Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Text Books:

1.	The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in

	Technology Organizations, Gene Kim, John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
2.	What is Devops? Infrastructure as code, 1st Edition, Mike Loukides, O'Reilly publications, 2012.
Reference Books:	
1.	Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.
2.	The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Micro services, 1st Edition, Viktor Farcic, Create Space Independent Publishing Platform publications, 2016
3.	Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.
4.	Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and Micro services, 1st Edition, Dave Harrison, Knox Lively, Apress publications, 2019.
Web links:	
1.	https://www.javatpoint.com/devops
2.	https://github.com/nkatre/Free-DevOps-Books-1/blob

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3107	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

INTERNET OF THINGS

(For AI&DS)

Course Objectives:

1.	The application areas of IOT
2.	The revolution of Internet in Mobile Devices, Cloud & Sensor
3.	Networks building blocks of Internet of Things and characteristics

Course Outcomes: At the end of this course, the students will be able to

S.No	Outcome	Knowledge Level
1.	Review Internet of Things (IoT).	K3
2.	Demonstrate various business models relevant to IoT	K2
3.	Construct designs for web connectivity	K3
4.	Organize sources of data acquisition related to IoT, integrate to enterprise systems	K4
5.	Utilize IoT with Cloud technologies.	K3

SYLLABUS

UNIT-I (10 Hrs)	**The Internet of Things-** An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, Examples OF IoTs, Design Principles For Connected Devices, Internet connectivity, **Application Layer Protocols-** HTTP, HTTPS, FTP
UNIT-II (10 Hrs)	Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability
UNIT-III (10 Hrs)	Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.
UNIT-IV (8 Hrs)	Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT-V (12 Hrs)	Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.
Text Books:	
1.	Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education.
2.	Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015.
3.	Internet of Things from Hype to Reality: The road to Digitization, Ammar Rayes Samersalam.
Reference Books:	
1.	Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley.
2.	Getting Started with the Internet of Things Cuno Pfister , Oreilly.
3.	Internet of Things and Data Analytics Handbook, HWAIYU GENG, Wiley publications.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3108	**PC**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs**

DATA SCIENCE LAB

(For AI&DS)

Course Objectives:

1	To impart knowledge on data manipulation and exploratory data analysis concepts that is vital for data science.

Course Outcomes At the end of the course, the students will be able to:

S.No	Outcome	Knowledge Level
1	Demonstrate efficient storage and data handling methods in NumPy to perform mathematical computations vital for data science.	K3
2	Apply Data Preparation and Exploration methods using Pandas to gain insights about raw data and transform quality data to perform analysis.	K3
3	Create data visualization using charts, plots and histograms to identify trends, patterns and outliers in data importing Matplotlib and Seaborn	K3
4	Develop methods to analyze and interpret time series data to extract meaningful statistics.	K3

SYLLABUS

List Of Experiments

1. Array Computations using NumPy

a. Perform arithmetic operations using array.

b. Perform slicing and indexing on multi-dimensional arrays.

c. Perform computations on multi-dimensional array using universal functions(ufunc).

d. Compute arithmetic mean, standard deviation, variance, percentile, minimum and maximum, cumulative sum and product using statistical functions in NumPy.

e. Perform set theory operations such as union, intersection, symmetric differenceand fetching unique values**.**

2. Linear Algebra and Random Number generation using linalg and random module in NumPy

a. Compute dot product, vector product and inner product of two arrays.

b. Perform matrix operations such as multiplication, determinant, sum of diagonal elements and inverse.

c. Compute eigenvalues, eigenvectors and singular value decomposition for a square matrix.

d. Generate random samples from uniform, normal, binomial, chi-square and Gaussian distributions using numpy. random functions.

e. Implement a single random walk with 1000 steps using random module and extract the statistics like minimum and maximum value along the walk‘s trajectory.

3. Data Manipulation using pandas

a. Create Data Frame from List, Dict, List of Dicts, Dicts of Series and perform operations such as column selection, addition, deletion and row selection, addition and deletion.

b. Create a Data Frame and perform descriptive statistics functions such as sum, mean, median, mode, standard deviation, skewness, kurtosis, cumulative sum, cumulative product and percent changes.

c. Implement the computation of correlation and covariance by considering the
Data Frames of stock prices and volumes obtained from Yahoo Finance! Using pandas-data reader package.

4. Working with different data formats using pandas

a. Perform reading and writing data in text format using read_csv and read_table considering any online dataset in delimited format (CSV).

b. Perform reading and writing of Microsoft Excel Files (xslx) using read_excel.

5. Interacting with Web APIs and Databases

a. Predict the last 30 GitHub issues for pandas using request and response object‘s json method. Move the extracted data to DataFrame and extract fields of interest. (Use url: 'https://api.github.com/repos/pandas-dev/pandas/issues')

b. Connect to any relational database using corresponding SQL drivers and perform operations such as table creation, populating the table, selecting data from table, moving data from table to DataFrame, updating records and deleting records in a table.

6. Data Cleaning and Preparation

a. Perform data cleaning by creating a DataFrame and identifying missing data using NA(Not Available) handling methods, filter out missing data using dropna function, fill the missing data using fillna function and remove duplicates using duplicated and drop_duplicates functions.

b. Perform data transformation by modifying set of values using map and replace method and create transformed version of original dataset without modification using rename method.

c. Create a DataFrame with normally distributed data using random sampling and detect possible outliers.

d. Perform text manipulation with regular expression by applying relevant regular expression methods to split a string with a variable number of whitespace characters (tabs, spaces, and newlines) and get a list of all patterns matching**.**

7. Data Wrangling

a. Perform hierarchical indexing by creating a series with a list of lists (or arrays) as the index, select subsets of data at outer and inner levels using partial indexing.

b. Rearrange the tabular data with hierarchical indexing using unstack and stack method.

c. Create two different DataFrames and merge them using index as merge key and combine data with overlap using combine_first method.

8. Perform Data Visualization with Matplotlib and SeaBorn considering online dataset for processing.

a. Create a Line Plot by setting the title, axis labels, ticks, ticklabels , annotations on subplots and save to a file.

b. Create Bar Plots using Series and DataFrame index.

i. Create bar plots with a DataFrame to group the values in each row together in a group in bars side

by side for each value.
ii. Create stacked bar plots from a DataFrame.
c. Create Histogram to display the value frequency and Density Plot to generate continuous probability distribution function for observed data.
d. Create Scatter Plot and examine the relationship between two one-dimensional data series.
e. Create Box plots to visualize data with many categorical variables

9. Time Series Analysis

a. Create time series using datetime object in pandas indexed by timestamps.
b. Use pandas.date_range to generate a DatetimeIndex with an indicated length.
c. Generate data ranges by setting time zone, localize time zone and convert to particular time zone using tz_convert and combine two different time zones.
d. Perform period arithmetic such as adding and subtracting integers from periods and construct range of periods using period_range function.
e. Convert Periods and PeriodIndex objects to another frequency with asfreq method.
f. Convert Series and DataFrame objects indexed by timestamps to periods with the to_period method.
g. Perform resampling, downsampling and upsampling for the time series**.**

10. Data Aggregation

a. Create a tabular dataset as a DataFrame and split data into groups using group by method including single key and multiple key values. Select group by considering single and multiple columns.
b. Compute summary statistics such as sum, mean and standard deviation for the grouped data using aggregate method.
c. Use group by function to split data into groups based on one column, multiple columns, compute summary statistics and perform exploratory data analysis. Consider any online dataset for processing.

REFERENCE BOOKS/LABORATORY MANUALS

1.	Wes McKinney, Python for Data Analysis, O'Reilly,2nd Edition,2017.
2.	Sinan Ozdemir, Principles of Data Science, Packt Publishers, 2nd Edition,2018.
3.	Rachel Schutt, Cathy O'Neil, Doing Data Science: Straight Talk from the Frontline, O'Reilly, 2014.

SOFTWARE/Tools used:

1.	Python 3.8
2.	Python Libraries – NumPy, Pandas, Matplotlib, Seaborn, Beautiful Soup, Vader
3.	Anaconda Framework

ADDITIONAL LEARNING RESOURCES:

1.	https://swayam.gov.in/nd1_noc19_cs60/preview
2.	https://towardsdatascience.com/
3.	https://www.w3schools.com/datascience/
4.	https://github.com/jakevdp/PythonDataScienceHandbook
5.	https://www.kaggle.com

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3109	**PC**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

DATA BASE MANAGEMENT SYSTEMS LAB

(For AI&DS)

Course Objectives: The student who successfully completes this course will have:

1	Populate and query a database using SQL DDL/DML Commands
2	Declare and enforce integrity constraints on a database
3	Writing Queries using advanced concepts of SQL
4	Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes: After completion of the course, the student will be able to

S. No	Outcome	Knowledge Level
1	Utilize SQL to execute queries for creating database and performing data manipulation operations	K3
2	Examine integrity constraints to build efficient databases	K4
3	Apply Queries using Advanced Concepts of SQL	K3
4	Build PL/SQL programs including stored procedures, functions, cursors and triggers	K3

SYLLABUS

List of Exercises:

1	Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2	Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3	Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4	Queries using Conversion functions (to char, to number and to date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next day, add months, last day, months between, least, greatest, trunc, round, to_char, to_date)
5	a) Creation of simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found) b) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.

6	Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7	Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8	Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9	Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10	Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11	Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12	Create a table and perform the search operation on table using indexing and non-indexing techniques
Reference Books:	
1.	Oracle: The Complete Reference by Oracle Press
2.	Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3.	Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS3102	**SOC**	**1**	**--**	**2**	**2**	**--**	**50**	**3Hrs.**

SOFT SKILLS

(Common to AIDS, CSBS, CSE, ECE, & IT)

Course Objectives:

1.	To familiarize students with soft skills and how they influence their professional growth.
2.	To build/refine the professional qualities/skills necessary for a productive career and to instill Confidence through attitude building.

Course Outcomes: Students will be able to

S.No	Outcome	Knowledge Level
1	Apply soft skills in the work place and build better personal and professional relationships making informed decisions.	K3
2	Participate in group discussions/group activities, exhibit team spirit, use language effectively according to the situation, respond to their interviewer/employer with a positive mind, make answers to the questions asked during their technical/personal interviews, exhibit skills required for the different kinds of interviews (stress, technical, HR) that they would face during the course of their recruitment process.	K3

SYLLABUS

1.	Introduction to Soft Skills, Significance of Inter & Intra-Personal Communication
2.	SWOT Analysis, Creativity & Problem Solving
3.	LSRW, JAM, Presentation Skills
4.	Building a positive attitude, Leadership & Team Work
5.	Goal Setting – Guidelines for Goal Setting
6.	Group Discussion: Essential guidelines
7.	Telephone Etiquette, Telephonic Interview
8.	Resume Preparation: Common resume blunders, tips for betterment, Resume Review
9.	Employability Skills: Emotional Intelligence, Report Writing, Social Consciousness and Social Entrepreneurship, Stress Management.
10.	Awareness about Industry, Companies, Importance of researching the prospective workplace, Knowing about Selection Process
11.	Interview Skills: Types of Interviews, Mock Interview, Do's and Don'ts of Interview.

Text Books:	
1	Soft Skills & Employability Skills by Samina Pillai and Agna Fernandez, Cambridge University Press India Pvt. Ltd.
2	Soft Skills, by Dr. K. Alex, S. Chand & Company Ltd., New Delhi
Reference Books:	
1	The Art of Public Speaking by Dale Carnegie
2	The Leader in You by Dale Carnegie
3	Emotional Intelligence by Daniel Golman
4	Stay Hungry Stay Foolish by Rashmi Bansal
5	I have a Dream by Rashmi Bansal.
Additional Materials	
1	https://www.youtube.com/watch?v=LTnI7cmpDZI
2	https://www.youtube.com/watch?v=ic5O2sxhH9M
3	https://www.youtube.com/watch?v=4ZQkYSpmOdU
4	https://www.youtube.com/watch?v=d8p-5WcXoRs
5	https://www.youtube.com/watch?v=yZOar04g4zk&t=94s

Code	Category	L	T	P	C	I.M	E.M	Exam
B20MC3102	**MC**	**3**	**--**	**3**	**---**	**---**	**---**	**3 Hrs.**

COMPETITIVE CODING

(Common to IT, AIDS and CSBS)

Course Objectives:

1	To enhance the Programming and Data Structure and Algorithm skills by solving number of real-world programming problems under crucial constraints including Time and Space Complexities.
2	Students to come up with an optimized Solution by passing all required test cases.
3	To Compete with various brilliant minds across the globe in enhancing Programming, Data Structure and Algorithm Skills, Analytical Skills, Problem Solving and Time Management Skills.

Course Outcomes: At the end of the course, the students will be able to**:**

S. No	Outcome	Knowledge Level
1	Solve Recursion and Backtracking Problems	K3
2	Solve various algorithms related to Number Theory	K3
3	Implement various algorithms related to Linear Data Structures	K4
4	Implement various algorithms related to Non - Linear Data Structures	K4
5	Implement Divide and Conquer and Greedy Algorithms	K4
6	Understand the concept of Dynamic Programming by solving problems	K2

SYLLABUS

1	**Overview:** • Introduction to the Course
2	**Introduction to Recursion and Backtracking:** • Multiplication without using * Operator • Tower's of Hanoi • Ackermann's Problem • Convert given number Decimal to Binary and Binary to Decimal • Convert given Digit to String

3	**Number Theory:** • Euclid's Algorothm (Greatest Common Divisor) • Check the given number is Prime or Not • Find Prime Factors of a given Number • Binomial Coefficient • Generate the following Patterns 1 A 2 2 A B A 3 3 3 A B C B A 4 4 4 4 A B C D C B A 5 5 5 5 5 A B C D E D C B A *
4	**Stacks:** • Implement two Stacks in single Array • Infix to Postfix Conversion • Infix to prefix Conversion
5	**Queues:** • Implement Queue Operations using Two Stacks • Generate Binary Numbers between **1** to **N** using a Queue
6	**Linked List:** • Implementation of Reverse a Singly Linked List • Swapping of Two nodes in a Singly Linked List without Swapping Data
7	**Circular Linked List:** • Concatenate two Circular Linked List • Maximum and Minimum Value of Circular Linked List
8	**Trees:** • Check whether two Binary Trees are Identical or Not • Find the Height of a Binary Tree • Check for Height balancing of a Binary Tree
9	**Graphs:** • Find the Number of Connected components in a graph • Depth First Search • Breadth First Search • Cycle Detection using Breadth First Search
10	**Greedy Algorithm:** • Introduction to Greedy Technique • Prim's Minimum Spanning Tree • Kruskal's Minimum Spanning Tree • Dijkstra's Shortest Path Algorithm

11	**Divide and Conquer:** • Introduction to Divide and Conquer Technique • Binary Search • Quick Sort • Merge Sort
12	**Dynamic Programming:** • Introduction to Dynamic Programming • Longest Common Subsequence • Longest Pallindrome Subsequence
CODING PLATFORMS: • **CodeChef** • **CodeForces** • **LeetCode** • **HackerRank** • **HackerEarth**	
Reference Books:	
1	Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahini and Anderson-Freed, University Press,2008.
2	Data Structures using C by Aaron M. Tenenbaum, Y. Langsam and M.J. Augenstein, Pearson Education, 2009
3	Data Structures with C by Seymopur Lipschutz, Schaum Outline Series,2010.
4	Data Structures using C by R.KrishnaMoorthy G.Indirani Kumaravel, TMH, New Delhi,2008

Regulation: R20	III / IV - B.Tech. II - Semester

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2020-21 admitted Batch onwards)

Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20HS3201	Managerial economics and Financial Accountancy	HS	3	3	0	0	30	70	100
B20AD3201	Machine Learning	PC	3	3	0	0	30	70	100
B20AD3202	Data Ware housing and Data Mining	PC	3	3	0	0	30	70	100
#PE-II	Professional Elective -II	PE	3	3	0	0	30	70	100
#OE-II	Open Elective-II	OE	3	3	0	0	30	70	100
B20AD3208	Machine Learning Lab	PC	1.5	0	0	3	15	35	50
B20AD3209	Data Analytics using R Lab	PC	1.5	0	0	3	15	35	50
B20AD3210	Data Mining using Python Lab	PC	1.5	0	0	3	15	35	50
#SOC-IV	Skill Oriented Course - IV	SOC	2	1	0	2	--	50	50
B20MC3201	Employability Skills	MC	0	3	0	0	--	--	--
B20HS3204	*Gender Sensitization	HS	0	2	0	0	--	--	--
	TOTAL		**21.5**	**21**	**0**	**11**	**195**	**505**	**700**

	Course Code	Course
#PE-II	B20AD3203	Deep Learning
	B20AD3204	Software Project Management
	B20AD3205	Distributed Systems
	B20AD3206	Data Wrangling in Data Science
	B20AD3207	Snow flake Cloud Analytics
#SOC-IV	B20AD3211	Mean Stack Technologies module -1- MongoDB, Express.js, Angular JS Node.js AJAX
	B20AD3212	Mobile App development
#OE-II	Student has to study one Open Elective offered by CE or ECE or EEE or ME or S&H from the list enclosed.	

***Note:** Gender Sensitization is a Self-Learning noncredit Audit Course

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS3201	**HS**	**3**	**0**	**0**	**3**	**30**	**70**	**3 Hrs.**

MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY

(For AIDS)

Course Objectives:

1.	To Study Managerial Economics and Demand Analysis
2.	To familiarize about the Concepts of Cost and Break-Even Analysis.
3.	To understand the nature of markets and to know the Pricing Policies
4.	To learn about accounting cycle and preparation of Financial Statements.
5.	To know the concept of Capital and sources of raising and Depreciation

Course Outcomes: At the end of the course, Students will be able to

S.No	Outcome	Knowledge Level
1.	Equip oneself with the knowledge of estimating the Demand and demand elasticities fora product.	K2
2.	Have knowledge of Cost and its types and ability to calculate BEP	K3
3.	Understand the nature of different markets	K2
4.	Understand Pricing Practices prevailing in today's business world	K2
5.	Prepare Financial Statements and know how to calculate Profit & Loss for a firm	K3
6.	Know Types of capital and their sources and know how to calculate Depreciation	K2

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to Managerial Economics and demand Analysis:** **Managerial Economics:** Definition of Economics & Classification of Economics (Micro & Macro), Meaning, Nature, & Scope of Managerial Economics. **Demand Analysis:** Concept of Demand, Determinants of Demand, Demand schedule, Demand curve, Law of Demand and its exceptions. Elasticity of Demand, Types of Elasticity of Demand. Importance of demand forecasting and its Methods.
UNIT-II (10 Hrs)	**Cost Analysis**: Importance of cost analysis, **Types of Cost-** Actual cost Vs Opportunitycost, Fixed cost Vs Variable cost, Explicit Vs Implicit cost, Historical cost Vs Replacementcost, Incremental cost Vs Sunk cost; **Elements of costs** – Material, Labour, Expenses; **Methods of costing** - Job costing, contract costing, Process costing, Batch costing, Unit costing, Service costing, Multiple costing. **Break-even analysis:** Determination of Breakeven point - Applications, Assumptions and Limitations of Break -even analysis (Theory only).

UNIT-III (10 Hrs)	**Introduction to Markets & Pricing Policies** **Market Structures:** Salient Features of Perfect Competition, Monopoly, Monopolistic competition, Oligopoly and Duopoly. **Pricing:** Importance of pricing and its meaning; **Methods of Pricing**: **Cost Based** -Full cost, Mark-up, Marginal &Break-even; **Demand Based** - Penetrating, Skimming; **Competition Based-** Going rate, Sealed Bid, Discount; **Internet Pricing** - Flat-rate, Usage sensitive.
UNIT-IV (08 Hrs)	**Introduction to Financial Accounting:** Importance of Accounting - Double Entry System of Accounting - Types of Accounts - Journal, Ledger, Trail Balance, Trading Account, Profit and Loss Account and Balance Sheet (outlines only).
UNIT-V (12 Hrs)	**Capital & Depreciation:** Types of Capital - Fixed capital & Working Capital, Components of Working Capital, Factors influencing Working capital. Methods of Raising Finance -Short term, medium term and Long term. **Depreciation** - Meaning, Importance and causes of depreciation; Methods of Depreciation- Straight line and diminishing balancing methods (Theory only)

Text Books:	
1.	A R Aryasri, Managerial Economics and Financial Analysis, TMH Pvt. Ltd, 2015
2.	Dr. N.Appa Rao, Dr.P. Vijayakumar: Managerial Economics and Financial Analysis', CengagePublications, 2012
Reference Books:	
1.	Dr.B.Kuberudu& T.V. Ramana : Managerial Economics and Financial anaysis, Himalaya Publishing House, 2013
2.	Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd, 2014
3.	Shashi K. Gupta & R.K. Sharma Management Accounting, Kalyani Publishers, 2017
4.	Maheswari S.N, An Introduction to Accountancy, Vikas Publishing House Pvt Ltd, 2013

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3201	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

MACHINE LEARNING

(For AI&DS)

Course Objectives:

1	Identify problems that are amenable to solution by ANN methods, and which ML methods may be suited to solving a given problem.
2	Formalize a given problem in the language/framework of different ANN methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).

Course Outcomes: At the end of this course, the students will be able to

S.No	Outcome	Knowledge Level
1	Explain the fundamental usage of the concept Machine Learning system	K2
2	Demonstrate on various regression, classification techniques	K3
3	Analyze the Ensemble Learning Methods	K4
4	Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.	K3
5	Discuss the Neural Network Models and Fundamentals concepts of Deep Learning	K2

SYLLABUS

UNIT-I (12Hrs)	**Introduction-** Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning. **Statistical Learning**: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.
UNIT-II (10 Hrs)	**Supervised Learning**(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, **Linear Models:** Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, **Binary Classification:** Multiclass/Structured outputs, MNIST, Ranking.
UNIT-III (10 Hrs)	**Ensemble Learning and Random Forests:** Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking. **Support Vector Machine:** Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

UNIT-IV (8 Hrs)	**Unsupervised Learning Techniques:** Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Pre processing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures. Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.
UNIT-V (10Hrs)	**Neural Networks and Deep Learning:** Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing Tensor Flow 2, Loading and Preprocessing Data with Tensor Flow.
Text Books:	
1.	Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow, 2nd Edition, O'Reilly Publications, 2019
2.	Data Science and Machine Learning Mathematical and Statistical Methods, Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,25th November 2020
Reference Books:	
1.	Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3202	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DATA WARE HOUSING AND DATA MINING

(For AI&DS)

Course Objectives:

1.	To understand and implement classical models and algorithms in data warehousing and data mining.
2.	To analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
3.	To assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior

Course Outcomes: By the end of the course, students will be able to

S.No	Outcome	Knowledge Level
1.	Summarize the architecture of data warehouse	K2
2.	Apply different pre processing methods, Similarity, Dissimilarity measures for any given raw data.	K3
3.	Construct a decision tree and resolve the problem of model over fitting	K3
4.	Compare Apriori and FP-growth association rule mining algorithms for frequent item set generation	K3
5.	Apply suitable clustering algorithm for the given data set	K3

SYLLABUS

UNIT-I (10 Hrs)	**Data Warehouse and OLAP Technology:** An Overview: Data Warehouse, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining. (Han & Kamber)
UNIT-II (10 Hrs)	**Data Mining:** Introduction, Data Mining, Motivating challenges, The origins of Data Mining, Data Mining Tasks, Types of Data, Data Quality. **Data Preprocessing:** Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature creation, Discretization and Binarization, Variable Transformation, Measures of Similarity and Dissimilarity. (Tan &Vipin)
UNIT-III (10 Hrs)	**Classification:** Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction. **Model Overfitting:** Due to presence of noise, due to lack of representation samples,

	evaluating the performance of classifier: holdout method, random sub sampling, cross-validation, bootstrap. Bayes Theorem, Naïve Bayes Classifier (Tan &Vipin)
UNIT-IV (10 Hrs)	**Association Analysis:** Basic Concepts and Algorithms: Problem Definition, Frequent Item Set Generation, Apriori Principle, Apriori Algorithm, Rule Generation, Compact Representation of Frequent Itemsets, FP-Growth Algorithm. (Tan &Vipin)
UNIT-V (12 Hrs)	**Cluster Analysis:** Basic Concepts and Algorithms: Overview, What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Tan &Vipin)

Text Books:	
1.	Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson, 2015.
2.	Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier, 2011
Reference Books:	
1.	Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning, 2010
2.	Data Mining : Introductory and Advanced topics : Dunham, First Edition, Pearson, 2020
3.	Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH, 2008
4.	Data Mining Techniques, Arun K Pujari, Universities Press, 2001
Web links:	
1.	NPTEL Online Course on Data Mining: https://onlinecourses.nptel.ac.in/noc18_cs14/preview

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3203	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DEEP LEARNING

(For AI&DS)

Course Objectives: Students are expected to

1	Learn deep learning methods for working with sequential data
2	Learn deep recurrent and memory networks
3	Learn deep Turing machines,
4	Apply such deep learning mechanisms to various learning problems.
5	Know the open issues in deep learning and have a grasp of the current research directions.

Course Outcomes: By the end of the course, students will be able to

S.No	Outcome	Knowledge Level
1	Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning.	K3
2	Discuss the Neural Network training, various random models.	K3
3	Explain the Techniques of Keras, Tensor Flow, Theano and CNTK	K3
4	Classify the Concepts of CNN and RNN	K3
5	Implement Interactive Applications of Deep Learning.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Fundamentals of Deep Learning:** Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, **Fundamentals of Machine Learning:** Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting. **[Text Book 2]**
UNIT-II (10 Hrs)	**Introducing Deep Learning:** Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks. **[Text Book3]**
UNIT-III (10 Hrs)	**Neural Networks:** Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification. **[Text Book 2]**
UNIT-IV (8 Hrs)	**Convolutional Neural Networks:** Nerual Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation, **Recurrent Neural**

	Networks: Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch. **[Text Book 3]**
UNIT-V (12 Hrs)	**Interactive Applications of Deep Learning:** Machine Vision, Natural Language processing, Generative Adversial Networks, Deep Reinforcement Learning. **[Text Book 1] Deep Learning Research:** Auto encoders**,** Deep Generative Models: Boltzmann Machines Restricted Boltzmann Machines, Deep Belief Networks. **[Text Book 1]**

Text Books:	
1.	Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2.	Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433
3	Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821
4	Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412
Reference Books:	
1.	Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2.	Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3.	Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.
Web links:	
1.	Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3204	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

SOFTWARE PROJECT MANAGEMENT

(For AI&DS)

Course Objectives: Students are expected to

1	Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
2	Compare and differentiate organization structures and project structures
3	Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes: By the end of the course, students will be able to

S.No	Outcome	Knowledge Level
1	Apply the process to be followed in the software development life-cycle models	K3
2	Apply the concepts of project management & planning	K3
3	Implement the project plans through managing people, communications and change	K3
4	Conduct activities necessary to successfully complete and close the Software projects	K3
5	Implement communication, modeling, and construction & deployment practices in software development	K3

SYLLABUS

UNIT-I (10 Hrs)	**Conventional Software Management:** The waterfall model, conventional software Management performance. **Evolution of Software Economics:** Software Economics, pragmatic software cost estimation. **Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections. **The old way and the new**: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.
UNIT-II (10 Hrs)	**Life cycle phases:** Engineering and production stages, inception, Elaboration, construction, transition phases. **Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT-III (10 Hrs)	**Model based software architectures:** A Management perspective and technical perspective. **Work Flows of the process:** Software process workflows, Iteration workflows. **Checkpoints of the process: Major** mile stones, Minor Milestones, Periodic status assessments. **Iterative Process Planning:** Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.
UNIT-IV (8 Hrs)	**Project Organizations and Responsibilities:** Line-of-Business Organizations, Project Organizations, evolution of Organizations. **Process Automation:** Automation Building blocks, The Project Environment. **Project Control and Process instrumentation:** The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.
UNIT-V (12 Hrs)	Agile Methodology, ADAPTing to Scrum, Patterns for Adopting Scrum, Iterating towards Agility. **Fundamentals of DevOps**: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

Text Books:	
1.	Software Project Management, Walker Royce, PEA, 2005.
2.	Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3.	The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
Reference Books:	
1.	Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH
2.	Software Project Management, Joel Henry, PEA
3.	Software Project Management in practice, PankajJalote, PEA, 2005,
4	Effective Software Project Management, Robert K.Wysocki, Wiley,2006
5	Project Management in IT, Kathy Schwalbe, Cengage

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3205	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DISTRIBUTED SYSTEMS

(For AI&DS)

Course Objectives: Students are expected to

1.	Understand the foundations of distributed systems.
2.	Learn issues related to clock Synchronization and the need for global state in distributed systems
3	Learn distributed mutual exclusion and deadlock detection algorithms
4	Understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
5	Learn the characteristics of peer-to-peer and distributed shared memory systems

Course Outcomes: By the end of the course, the student will be able to:

S.No	Outcome	Knowledge Level
1.	Elucidate the foundations and issues of distributed systems	K2
2.	Illustrate various synchronization issues and global state for distributed systems	K3
3.	Illustrate Mutual Exclusion and Deadlock detection algorithms in distributed systems	K3
4.	Describe the agreement protocols and fault tolerance mechanisms in distributed systems	K2
5	Describe the features of peer-to-peer and distributed shared memory systems	K2

SYLLABUS

UNIT-I (12 Hrs)	**Distributed Systems:** Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges. **A model of distributed computations:** A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications. **Logical Time:** A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.
UNIT-II (12 Hrs)	**Message Ordering & Snapshots:** Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group

	communication, Causal order (CO), Total order. Globalstate and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.
UNIT-III (10 Hrs)	**Distributed Mutex & Deadlock:** Distributed mutual exclusion algorithms: Introduction, Preliminaries, Lamport's algorithm, Ricart-Agrawala algorithm, Maekawa's algorithm, Suzuki–Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Knapp's classification, Algorithms for the single resource model, the AND model and the OR model.
UNIT-IV (8 Hrs)	**Recovery & Consensus:** Check pointing and rollback recovery: Introduction, Background and definitions, Issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, Coordinated check pointing algorithm, Algorithm for asynchronous check point in gand recovery. Consensus and agreement algorithms: Problem definition, Overview of results, Agreement in a failure, free system, Agreement in synchronous systems with failures.
UNIT-V (8 Hrs)	**Peer-to-peer computing and overlay graphs:** Introduction, Data indexing and overlays, Chord–Content addressable networks, Tapestry. Distributed shared memory: Abstraction and advantages, Memory consistency models, Shared memory Mutual Exclusion.

Text Books:	
1.	Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012.
2.	Distributed computing: Principles, algorithms, and systems, Ajay Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.
Reference Books:	
1.	Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall of India, 2007.
2	Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri, McGraw-Hill, 1994.
3	Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,Pearson Education, 2007.
e-Resources:	
1.	https://nptel.ac.in/courses/106/106/106106168/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3206	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DATA WRANGLING IN DATA SCIENCE

(For AI&DS)

Course Objectives: Students are expected to

1	Gain a strong understanding of various data sources
2	Be able to do data cleaning using MYSQL and python
3	Become adept to industrial practices in data wrangling
4	Be able to use these skills in performing web scraping

Course Outcomes: By the end of the course, the students will be able to:

S.No	Outcome	Knowledge Level
1	Identify and execute the basic data format.	K2
2	Perform the computations with Excel and pdf files	K2
3	Understand the concepts of data cleanup	K3
4	Explore and analyze the Image and video data	K3
5	Understand and apply the concepts web scraping Perform the computations with Excel and pdf files	K3

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION TO DATA WRANGLING:** Data Wrangling, Importance of Data Wrangling, How is Data Wrangling performed, Tasks of Data Wrangling, Data Wrangling Tools, Introduction to Python, Python Basics, Data Meant to be Read by Machines, CSV Data, JSON Data, XML Data.
UNIT-II (10 Hrs)	**WORKING WITH EXCEL FILES AND PDFS**: Installing Python Packages, Parsing Excel Files, Parsing Excel Files, Getting Started with Parsing, PDFs and Problem Solving in Python, Programmatic Approaches to PDF Parsing, Converting PDF to Text, Parsing PDFs Using pdf miner, Acquiring and Storing DataDatabases: A Brief Introduction, Relational Databases: MySQL and PostgreSQL, Non-Relational Databases: NoSQL, When to Use a Simple File, Alternative Data Storage.
UNIT-III (10 Hrs)	**DATA CLEANUP:** Why Clean Data, Data Cleanup Basics, Identifying Values for Data Cleanup, Formatting Data, Finding Outliers and Bad Data, Finding Duplicates, Fuzzy Matching, RegEx Matching, Normalizing and Standardizing the Data, Saving the Data, Determining suitable Data Cleanup, Scripting the Cleanup Testing with New Data

UNIT-IV (8 Hrs)	**DATA EXPLORATION AND ANALYSIS:** Exploring Data, Importing Data, Exploring Table Functions, Joining Numerous Datasets, Identifying Correlations, Identifying Outliers, Creating Groupings, Analyzing Data, Separating and Focusing the Data Presenting Data, Visualizing the Data, Charts-Time-Related Data, Maps, Interactives, Words-Images, Video, and Illustrations, Presentation Tools, Publishing the Data, Open Source Platforms
UNIT-V (12 Hrs)	**WEB SCRAPING:** What to Scrape and How, Analyzing a Web Page, Network/Timeline, Interacting with JavaScript, In-Depth Analysis of a Page, Getting Pages, Reading a Web Page, Reading a Web Page with LXML, XPath-Advanced Web Scraping, Browser-Based Parsing, Screen Reading with Selenium, Screen Reading with Ghost. PySpidering the Web, Building a Spider with Scrapy, Crawling Whole Websites with Scrapy
Text Books:	
1.	Data Wrangling with Python, Jacqueline Kazil & Katharine Jarmul, O'Reilly Media, Inc,2016
2.	Data Wrangling with Python: Creating actionable data from raw sources,, Dr. Tirthajyoti Sarkar, Shubha deep Packt Publishing Ltd,2019
Reference Books:	
1.	Hands-On Data Analysis with Pandas, Stefanie Molin, Packt Publishing Ltd, 2019
2.	Practical Data Wrangling, Allan Visochek, Packt Publishing Ltd,2017
3.	Principles of Data Wrangling: Practical Techniques for Data Preparation, TyeRattenbury, Joseph M. Hellerstein, Jeffrey Heer, Sean Kandel, Connor Carreras, , O'Reilly Media, Inc,2017

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3207	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

SNOW FLAKE CLOUD ANALYTICS

(For AI&DS)

Course Objectives:

1	The main objective of the course is to master data warehousing on cloud using Snowflake

Course Outcomes: By the end of the course, students will be able to

S.No	Outcome	Knowledge Level
1	Load & transform data in Snowflake	K3
2	Scale virtual warehouses for performance and concurrency	K3
3	Share data and work with semi-structured data	K3
4	Gain a thorough knowledge of query constructs, DDL & DML operations, managing and monitoring Snowflake accounts and Snowflake's continuous data protection methods.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Snowflake Architecture** - Unlocking Business Value, Business Agility Is More Important Than Ever, All Hail the Cloud! , Snowflake Architecture, Database Storage, Micro Partitions, Benefit of Micro Partitioning, Data Clustering, Virtual Warehouses, Caching, Result Cache, Local Disk Cache **(Text Book 1)** **Getting Started with Cloud Analytics** - Key Cloud Computing Concepts (Text Book 2) **Getting Started with Snowflake** – Planning, Deciding on a Snowflake Edition, Choosing a Cloud Provider and Region, Examining Snowflake's Pricing Model, Other Pricing Considerations, Examining Types of Snowflake Tools, Creating a Snowflake Account, Connecting to Snowflake (**Text Book 2)**
UNIT-II (10 Hrs)	**Building a Virtual Warehouse** - Overview of Snowflake Virtual Warehouses, Warehouse Sizes and Features, Multicluster Virtual Warehouses, Virtual Warehouse Considerations, Building a Snowflake Virtual Warehouse **(Text Book 2)** **Getting Started with SnowSQL** - Installing SnowSQL, Configuring SnowSQL, SnowSQL Commands, Multiple Connection Names **(Text Book 2)**
UNIT-III (10 Hrs)	**Data Movement** – Stages, External Stages, External Tables and Data Lakes, Internal Stages **(Text Book 1)** **Loading Bulk Data into Snowflake** - Overview of Bulk Data Loading, Bulk Data Loading Recommendations, Bulk Loading with the Snowflake Web Interface, Data Loading with SnowSQL **(Text Book 2)** **Continuous Data Loading with Snowpipe** - Loading Data Continuously, Snowpipe

	Auto-Ingest, Building a Data Pipeline Using the Snowpipe Auto-Ingest Option **(Text Book 2)**
UNIT-IV (8 Hrs)	**Snow flake Administration**-Administering Roles and Users, Administering Resource Consumption, Administering Databases and Warehouses, Administering Account Parameters, Administering Database Objects, Administering Data Shares, Administering Clustered Tables, Snowflake Materialized Views **(Text Book 2)** **Snowflake Security Overview** – Snowflake security reference architecture, Network and site access, Account and user authentication, Object security, Data security, Security validations, Snowflake Audit and Logging **(Text Book 2).** **Business Continuity and Disaster Recovery** - Regions and Availability Zones, Data Replication, Failover, and Failback, Business Continuity Process Flow, Bringing It All Together **(Text Book 1)**
UNIT-V (12 Hrs)	**Working with Semi structured Data**- Supported File Formats, Advanced Data Types, Working with XML, Working with JSON, Working with AVRO, Working with Parquet **(Text Book 2)** **Secure Data Sharing** - Secure Data Sharing, Secure Table Sharing, Data Sharing Using a Secure View **(Text Book 2)** Time Travel (pr book 2) **(Text Book 2)** **Advanced Performance Tuning** - Designing Tables for High Performance, Designing High-Performance Queries Optimizing Queries, Optimizing Warehouse Utilization, Monitoring Resources and Account Usage Resource Monitors **(Text Book 1)**

Text Books:	
1.	Mastering Snowflake Solution Supporting Analytics and Data Sharing, Apress
2.	Jumpstart Snowflake A Step -by-Step Guide to modern cloud analytics, Apress
Reference Books:	
1.	Snowflake Essentials Getting Started with Big Data in the Cloud, Apress
2.	Snowflake Cookbook: Techniques for building modern cloud data warehousing solutions
3.	Snowflake: The Definitive Guide Architecting, Designing, and Deploying on the Snowflake Data Cloud – ORIELLY
4.	https://docs.snowflake.com/en/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3208	**PC**	**0**	**0**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

MACHINE LEARNING LAB

(For AI&DS)

Course Objectives:

1.	This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

Course Outcomes: At the end of the course, Students will be able to

S.No	Outcome	Knowledge Level
1.	Implement procedures for the machine learning algorithms	K4
2.	Design and Develop Python programs for various Learning algorithms	K4
3.	Apply appropriate data sets to the Machine Learning algorithms	K3
4.	Develop Machine Learning algorithms to solve real world problems	K4

SYLLABUS

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

Experiment 1:	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
Experiment 2:	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
Experiment 3:	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
Experiment 4:	Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier
Experiment 5:	Develop a program for Bias, Variance, Remove duplicates, Cross Validation
Experiment 6:	Write a program to implement Categorical Encoding, One-hot Encoding
Experiment 7:	Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
Experiment 8:	Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.
Experiment 9:	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
Experiment 10:	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to

	write the program. Calculate the accuracy, precision, and recall for your data set.
Experiment 11:	Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
Experiment 12:	Exploratory Data Analysis for Classification using Pandas or Matplotlib.
Experiment-13:	Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set
Experiment-14:	Write a program to Implement Support Vector Machines and Principle Component Analysis
Experiment 15:	Write a program to Implement Principle Component Analysis

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3209	**PC**	**-**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

DATA ANALYTICS USING R LAB

(For AI&DS)

Course Objectives: Students are expected to

1	learn the most important tools in R that will allow to do data science
2	Implement key concepts in Data Analytics
3	Learn different operation in R used in data analytics

Course Outcomes: By the end of the course, students will be able to

S.No	Outcome	Knowledge Level
1	Implement numerical and statistical analysis on various data sources	K4
2	Apply dada preprocessing and dimensionality reduction methods on raw data	K3
3	Implement linear regression technique on numeric data for prediction	K4
4	Execute clustering and association rule mining algorithms on different datasets	K5
5	Implement and evaluate the performance of KNN algorithm on different datasets	K4

SYLLABUS

1	To get the input from user perform numerical operations(MAX,MIN,AVG,SUM,SQRT, ROUND) using in R.
2	To perform data import/export(CSV,XLX,TXT) operations using data frames using R.
3	To get the input matrix from user and perform Matrix addition, subtraction, multiplication, Inverse transpose and division operations using vector concept in R.
4	To perform statistical operations (Mean. Median, Mode and Standard deviation) using R.
5	To perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization.
6	To perform dimensionality reduction using PCA for house data set.
7	To perform simple Linear Regression with R.
8	To perform K-Means clustering operation and visualize for iris data set.
9	Write script to diagnose any disease using KNN classification and plot results.
10	To perform market basket analysis using Association Rules(Apriori)

Text Books:	
1	Ken Black, 2013, Business Statistics, New Delhi, Wiley.
2	An Introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics. W. N. Venables, D.M. Smith and the R Development Core Team.
Reference Books:	
1	Dunlop, Dorothy D., and Ajit C. Tamhane. Statistics and data analysis: from elementary to intermediate. Prentice Hall, 2000.
2	Jared P Lander, R for everyone: advanced analytics and graphics, Pearson Education, 2013
3	G Casella and R.L. Berger, Statistical Inference, Thomson Learning 2002.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3210	**PC**	**-**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

DATA MINING USING PYTHON LAB

(For AI&DS)

Course Objectives: Students are expected to

1	Practical exposure on implementation of well-known data mining algorithms
2	Learning performance evaluation of data mining algorithms in a supervised and an unsupervised setting

Course Outcomes: By the end of the course, students will be able to

S.No	Outcome	Knowledge Level
1	Apply preprocessing techniques on real world datasets	K3
2	Apply apriori algorithm to generate frequent item sets.	K3
3	Apply Classification and clustering algorithms on different datasets.	K3

SYLLABUS

Note: Use python library scikit-learn wherever necessary

1	Demonstrate the following data preprocessing tasks using python libraries. a) Loading the dataset b) Identifying the dependent and independent variables c) Dealing with missing data
2	Demonstrate the following data preprocessing tasks using python libraries. a) Dealing with categorical data b) Scaling the features c) Splitting dataset into Training and Testing Sets
3	Demonstrate the following Similarity and Dissimilarity Measures using python a) Pearson's Correlation b) Cosine Similarity c) Jaccard Similarity d) Euclidean Distance e) Manhattan Distance
4	Build a model using linear regression algorithm on any dataset.
5	Build a classification model using Decision Tree algorithm on iris dataset
6	Apply Naïve Bayes Classification algorithm on any dataset
7	Generate frequent item sets using Apriori Algorithm in python and also generate association rules for any market basket data..
8	Apply K- Means clustering algorithm on any dataset.
9	Apply Hierarchical Clustering algorithm on any dataset.
10	Apply DBSCAN clustering algorithm on any dataset.

Web Resources:

1	https://analyticsindiamag.com/data
2	https://towardsdatascience.com/decision
3	https://towardsdatascience.com/calculate

4	https://www.springboard.com/blog/data
5	https://medium.com/analytics
6	https://www.datacamp.com/community/tutorials/naive
7	https://www.analyticsvidhya.com/blog/2019/05/beginners
8	https://towardsdatascience.com/dbscan

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3211	SOC	1	--	2	2	--	50	3 Hrs.

MEAN STACK TECHNOLOGIES MODULE -1- MONGODB, EXPRESS.JS, ANGULAR JS NODE.JS AND AJAX

(For AI&DS)

Course Objectives: On completing this course student will be able to

1	Learn the latest trends in Web Technologies.
2	Learn various NoSql systems and their features

Course Outcomes: By the end of the course, the student should have the ability to:

S.No	Outcome	Knowledge Level
1	Develop professional web pages of an application using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles.	K3
2	Utilize JavaScript for developing interactive HTML web pages and validate form data.	K3
3	Build a basic web server using Node.js and also working with Node Package Manager (NPM).	K3
4	Build a web server using Express.js	K3
5	Make use of Typescript to optimize JavaScript code by using the concept of strict type checking.	K3

SYLLABUS

1.a	**Course Name:** HTML5 - The Language
	Module Name: Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element
	Include the Metadata element in Homepage.html for providing description as "IEKart's is an online shopping website that sells goods in retail. This company deals with various categories like Electronics, Clothing, Accessories etc.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28320667711144660000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1b	**Course Name:** HTML5 - The Language
	Module Name: Sectioning Elements
	Enhance the Homepage.html of IEKart's Shopping Application by adding appropriate sectioning elements.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6372291347110857000_shared?collectionId=lex_17739732834840810000_shar

	ed&collectionType=Course
1c	**Course Name:** HTML5 - The Language
	Module Name: Paragraph Element, Division and Span Elements, List Element
	Make use of appropriate grouping elements such as list items to "About Us" page of IEKart's Shopping Application
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32785192040894940000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1d	**Course Name:** HTML5 - The Language
	Module Name: Link Element
	Link "Login", "SignUp" and "Track order" to "Login.html", "SignUp.html" and "Track.html" page respectively. Bookmark each category to its details of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15515105953273338000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1e	**Course Name:** HTML5 - The Language
	Module Name: Character Entities
	Add the © symbol in the Home page footer of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_547667376938096260_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1f	**Course Name:** HTML5 - The Language
	Module Name: HTML5 Global Attributes
	Add the global attributes such as contenteditable, spellcheck, id etc. to enhance the Signup Page functionality of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28723566050321920000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
2a	**Course Name:** HTML5 - The Language
	Module Name: Creating Table Elements, Table Elements : Colspan/Rowspan Attributes, border, cellspacing, cellpadding attributes
	Enhance the details page of IEKart's Shopping application by adding a table element to display the available mobile/any inventories.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013168035284033536113_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
2b	**Course Name:** HTML5 - The Language
	Module Name: Creating Form Elements, Color and Date Pickers, Select and Datalist Elements
	Using the form elements create Signup page for IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13975270903118459000_shared?collectionId=lex_17739732834840810000_sha

	red&collectionType=Course
2c	**Course Name:** HTML5 - The Language
	Module Name: Input Elements - Attributes
	Enhance Signup page functionality of IEKart's Shopping application by adding attributes to input elements.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14048414537062347000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
2d	**Course Name:** HTML5 - The Language
	Module Name: Media, Iframe
	Add media content in a frame using audio, video, iframe elements to the Home page of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30738402225794945000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
3a	**Course Name:** Javascript
	Module Name: Type of Identifiers
	Write a JavaScript program to find the area of a circle using radius (var and let - reassign and observe the difference with var and let) and PI (const)
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053264414818304732_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
3b	**Course Name:** Javascript
	Module Name: Primitive and Non Primitive Data Types
	Write JavaScript code to display the movie details such as movie name, starring, language, and ratings. Initialize the variables with values of appropriate types. Use template literals wherever necessary.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21528322245232402000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
3c	**Course Name:** Javascript
	Module Name: Operators and Types of Operators
	Write JavaScript code to book movie tickets online and calculate the total price, considering the number of tickets and price per ticket as Rs. 150. Also, apply a festive season discount of 10% and calculate the discounted amount.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13808338384481720000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
3d	**Course Name:** Javascript
	Module Name: Types of Statements, Non - Conditional Statements, Types of Conditional Statements, if Statements, switch Statements
	Write a JavaScript code to book movie tickets online and calculate the total price based on

	the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If se
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_16257498471333610000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
3e	**Course Name:** Javascript
	Module Name: Types of Loops
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6238536888292970000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
4a	**Course Name:** Javascript
	Module Name: Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15455199570613326000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
4b	**Course Name:** Javascript
	Module Name: Working With Classes, Creating and Inheriting Classes
	Create an Employee class extending from a base class Person. Hints: (i) Create a class Person with name and age as attributes. (ii) Add a constructor to initialize the values (iii) Create a class Employee extending Person with additional attributes role
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012599811117760512458_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
4c	**Course Name:** Javascript
	Module Name: In-built Events and Handlers
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If se
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_4192188372573027000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
4d	**Course Name:** Javascript
	Module Name: Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser Object Model, Document Object Model

	If a user clicks on the given link, they should see an empty cone, a different heading, and a different message and a different background color. If user clicks again, they should see a re-filled cone, a different heading, a different message, and a diffe
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13197025862804100000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
5a	**Course Name:** Javascript
	Module Name: Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods
	Create an array of objects having movie details. The object should include the movie name, starring, language, and ratings. Render the details of movies on the page using the array.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053270191734784711_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
5b	**Course Name:** Javascript
	Module Name: Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API
	Simulate a periodic stock price change and display on the console. Hints: (i) Create a method which returns a random number - use Math.random, floor and other methods to return a rounded value. (ii) Invoke the method for every three seconds and stop when
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012599811633905664460_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
5c	**Course Name:** Javascript
	Module Name: Creating Modules, Consuming Modules
	Validate the user by creating a login module. Hints: (i) Create a file login.js with a User class. (ii) Create a validate method with username and password as arguments. (iii) If the username and password are equal it will return "Login Successful" else w
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013052857053585408667_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
6a	**Course Name:** Node.js
	Module Name: How to use Node.js
	Verify how to execute different functions successfully in the Node.js platform.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19002830632103186000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
6b	**Course Name:** Node.js
	Module Name: Create a web server in Node.js
	Write a program to show the workflow of JavaScript code executable by creating web server in Node.js.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28177338996267815000_shared?collectionId=lex_32407835671946760000_sha

	red&collectionType=Course
6c	**Course Name:** Node.js
	Module Name: Modular programming in Node.js
	Write a Node.js module to show the workflow of Modularization of Node application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28865394191004004000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
6d	**Course Name:** Node.js
	Module Name: Restarting Node Application
	Write a program to show the workflow of restarting a Node application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9174073856000159000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
6e	**Course Name:** Node.js
	Module Name: File Operations
	Create a text file src.txt and add the following data to it. Mongo, Express, Angular, Node.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33376440180246100000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
7a	**Course Name:** Express.js
	Module Name: Defining a route, Handling Routes, Route Parameters, Query Parameters
	Implement routing for the AdventureTrails application by embedding the necessary code in the routes/route.js file.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_29394215542149950000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
7b	**Course Name:** Express.js
	Module Name: How Middleware works, Chaining of Middlewares, Types of Middlewares
	In myNotes application: (i) we want to handle POST submissions. (ii) display customized error messages. (iii) perform logging.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13930661312009580000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
7c	**Course Name:** Express.js
	Module Name: Connecting to MongoDB with Mongoose, Validation Types and Defaults
	Write a Mongoose schema to connect with MongoDB.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035588775485440691_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
7d	**Course Name:** Express.js
	Module Name: Models

	Write a program to wrap the Schema into a Model object.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035593896869888662_shared?collectionId=lex_3240783567194676000_shared&collectionType=Course
8a	**Course Name:** Express.js
	Module Name: CRUD Operations
	Write a program to perform various CRUD (Create-Read-Update-Delete) operations using Mongoose library functions.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035684270129152696_shared?collectionId=lex_3240783567194676000_shared&collectionType=Course
8b	**Course Name:** Express.js
	Module Name: API Development
	In the myNotes application, include APIs based on the requirements provided. (i) API should fetch the details of the notes based on a notesID which is provided in the URL. Test URL - http://localhost:3000/notes/7555 (ii) API should update the details bas
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035745250975744755_shared?collectionId=lex_3240783567194676000_shared&collectionType=Course
8c	**Course Name:** Express.js
	Module Name: Why Session management, Cookies
	Write a program to explain session management using cookies.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24299316914857090000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
8d	**Course Name:** Express.js
	Module Name: Sessions
	Write a program to explain session management using sessions.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_905413034723449100_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
8e	**Course Name:** Express.js
	Module Name: Why and What Security, Helmet Middleware
	Implement security features in myNotes application
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_31677453061177940000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
9a	**Course Name:** Typescript
	Module Name: Basics of TypeScript
	On the page, display the price of the mobile-based in three different colors. Instead of using the number in our code, represent them by string values like GoldPlatinum, PinkGold, SilverTitanium.

	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28910354929502245000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
9b	**Course Name:** Typescript
	Module Name: Function
	Define an arrow function inside the event handler to filter the product array with the selected product object using the productId received by the function. Pass the selected product object to the next screen.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10783156469383723000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
9c	**Course Name:** Typescript
	Module Name: Parameter Types and Return Types
	Consider that developer needs to declare a function - getMobileByVendor which accepts string as input parameter and returns the list of mobiles.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712912427057152901_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
9d	**Course Name:** Typescript
	Module Name: Arrow Function
	Consider that developer needs to declare a manufacturer's array holding 4 objects with id and price as a parameter and needs to implement an arrow function - myfunction to populate the id parameter of manufacturers array whose price is greater than or equ
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712910875500544904_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
9e	**Course Name:** Typescript
	Module Name: Optional and Default Parameters
	Declare a function - getMobileByManufacturer with two parameters namely manufacturer and id, where manufacturer value should passed as Samsung and id parameter should be optional while invoking the function, if id is passed as 101 then this function shoul
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712914940641280906_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10a	**Course Name:** Typescript
	Module Name: Rest Parameter
	Implement business logic for adding multiple Product values into a cart variable which is type of string array.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712921860915200909_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10b	**Course Name:** Typescript

	Module Name: Creating an Interface
	Declare an interface named - Product with two properties like productId and productName with a number and string datatype and need to implement logic to populate the Product details.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712925244276736910_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10c	**Course Name:** Typescript
	Module Name: Duck Typing
	Declare an interface named - Product with two properties like productId and productName with the number and string datatype and need to implement logic to populate the Product details.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712925995458560912_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10d	**Course Name:** Typescript
	Module Name: Function Types
	Declare an interface with function type and access its value.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712948945346560918_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11a	**Course Name:** Typescript
	Module Name: Extending Interfaces
	Declare a productList interface which extends properties from two other declared interfaces like Category,Product as well as implementation to create a variable of this interface type.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712951652139008920_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11b	**Course Name:** Typescript
	Module Name: Classes
	Consider the Mobile Cart application, Create objects of the Product class and place them into the productlist array.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3705824317381604400_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11c	**Course Name:** Typescript
	Module Name: Constructor
	Declare a class named - Product with the below-mentioned declarations: (i) productId as number property (ii) Constructor to initialize this value (iii) getProductId method to return the message "Product id is <<id value>>".
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712954616782848927_shared?collectionId=lex_9436233116512678000_sh

	ared&collectionType=Course
11d	**Course Name:** Typescript
	Module Name: Access Modifiers
	Create a Product class with 4 properties namely productId, productName, productPrice, productCategory with private, public, static, and protected access modifiers and accessing them through Gadget class and its methods.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712953517170688931_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
12a	**Course Name:** Typescript
	Module Name: Properties and Methods
	Create a Product class with 4 properties namely productId and methods to setProductId() and getProductId().
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9356738095572543000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
12b	**Course Name:** Typescript
	Module Name: Creating and using Namespaces
	Create a namespace called ProductUtility and place the Product class definition in it. Import the Product class inside productlist file and use it.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_20787271128051925000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
12c	**Course Name:** Typescript
	Module Name: Creating and using Modules
	Consider the Mobile Cart application which is designed as part of the functions in a module to calculate the total price of the product using the quantity and price values and assign it to a totalPrice variable.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24788158187785620000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
12d	**Course Name:** Typescript
	Module Name: What is Generics, What are Type Parameters, Generic Functions, Generic Constraints
	Create a generic array and function to sort numbers as well as string values.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_446287045482942800_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
Software configuration and installation 1. HTML & Javascript • Simple editors such as Notepad or go for IDEs like Visual Studio Code(recommended), Eclipse etc. which makes coding easier.	

- And, to execute application, you can use any commonly used browser such as Google Chrome(recommended), Mozilla Firefox etc
- Setup details: Environmental Setup for HTML5 - Viewer Page | Infosys Springboard (onwingspan.com)
- Environment Setup: Internal - Viewer Page | Infosys Springboard (onwingspan.com)

2. Node JS
Download **Node.js** from the official site
Setup details :How to use Node.js - Viewer Page | Infosys Springboard (onwingspan.com)
3. Typescript
Installing TypeScript - Internal - Viewer Page | Infosys Springboard (onwingspan.com)

Text Books:	
1	Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2	Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3	Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
Reference Books:	
1	Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech.
2	An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning.
e-Resources:	
1	https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview (HTML5)
2	https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview (Javascript)
3	https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview (Node.js & Express.js)
4	https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview (Typescript)

Subject Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD3212	**SOC**	**1**	**--**	**2**	**2**		**50**	**3 Hrs**

MOBILE APP DEVELOPMENT

(For AIDS)

Course Objectives:

1	Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
2	Understand how to work with various mobile application development frameworks.
3	Learn the basic and important design concepts and issues of development of mobile applications.
4	Understand the capabilities and limitations of mobile devices.

Course Outcomes: On completing this course student will be able to

S.No	Outcome	Knowledge Level
1	Develop mobile applications using GUI and Layouts.	K6
2	Develop mobile applications using Event Listener.	K6
3	Develop mobile applications using Databases.	K6
4	Develop mobile applications using RSS Feed, Internal/External Storage, SMS, Multi-threading and GPS.	K6
5	Analyze and discover own mobile app for simple needs	K4

SYLLABUS

1	***Develop an application that uses GUI components, Font and Colours***
2	Develop an application that uses Layout Managers and event listeners.
3	***Develop a native calculator application***
4	Write an application that draws basic graphical primitives on the screen
5	Develop an application that makes use of database.
6	***Develop an application that makes use of RSS Feed.***
7	Implement an application that implements Multi threading
8	***Develop a native application that uses GPS location information.***
9	***Implement an application that writes data to the SD card.***
10	***Implement an application that creates an alert upon receiving a message***
11	***Write a mobile application that creates alarm clock.***
References	Build Your Own Security Lab, Michael Gregg, Wiley India

SOFTWARE: C / C++ / Java or equivalent compiler GnuPG, Snort, N-Stalker or Equivalent HARDWARE: Standalone desktops – 30 Nos. (or) Server supporting 30 terminals or more

Code	Category	L	T	P	C	I.M	E.M	Exam
B20MC3201	**MC**	**3**	**--**	**--**	**--**	**--**	**--**	**3 Hrs.**

EMPLOYABILITY SKILLS

(Common to AIDS, CSBS, CSE, ECE & IT)

Part-A: Verbal Ability

Course Objectives:

1.	To introduce concepts required in framing grammatically correct sentences and identifying errors While using Standard English.
2.	To familiarize the learner with high frequency words as they would be used in their professional career.
3.	To inculcate logical thinking in order to frame and use data as per the requirement
4.	To acquaint the learner of making a coherent and cohesive sentences and paragraphs for composing a written discourse.
5.	To familiarize students with soft skills and how it influences their professional grow.

Course Outcomes: The students will be able to

S.No	Outcome	Knowledge Level
1	Detect grammatical errors in the text/sentences and rectify them while answering their competitive/company specific tests and frame grammatically Correct sentences while writing.	K3
2	Answer questions on synonyms, antonyms and other vocabulary-based Exercises while attempting CAT, GRE, GATE and other related tests.	K3
3	Use their logical thinking ability and solve questions related to analogy, Syllogisms, and other reasoning-based exercises.	K3
4	Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.	K3

SYLLABUS

UNIT-I	Spotting Errors, Sentence Improvement
UNIT-II	Synonyms, Antonyms, Frequently Confused Words, Foreign Phrases, Idioms and Phrasal Verbs, Collocations.
UNIT-III	Foreign Phrases, Idioms and Phrasal Verbs, Collocations, Analogies, Odd One Out
UNIT-IV	Sentence completion, Sentence Equivalence, Close Test
UNIT-V	Reading Comprehension, Para Jumbles

Text Books:	
1.	Oxford Learners,, Grammar–Finder by John Eastwood, Oxford Publication.
2.	RS Agarwal books on objective English and verbal reasoning
3.	English Vocabulary in Use-Advanced, Cambridge University Press
4.	Collocations In Use, Cambridge University Press
5.	Soft Skills & Employability Skills by Samina Pillai and Agna Fernandez, Cambridge University Press India Pvt .Ltd.
6.	Soft Skills, by Dr.K.Alex, S. Chand & Company Ltd., New Delhi
Reference Books:	
1.	English Grammar in Use by Raymond Murphy, CUP
2.	Websites: Indiabix,800score, official CAT, GRE and GMAT sites
3.	Material from IMS, Career Launcher and Time institutes for competitive exams
4.	The Art of Public Speaking by Dale Carnegie
5.	The Leader in You by Dale Carnegie
6.	Emotional Intelligence by Daniel Golman
7.	Stay Hungry Stay Foolish by Rashmi Bansal
8.	I have a Dream by Rashmi Bansal.

Part-B: Quantitative Aptitude-I

Course Objectives:	
1.	To familiarize students with basic problems on numbers and ratios problems.
2.	To enrich the skills of solving problems on time, work, speed, distance and also Measurement of units.
3.	To enable the students to work efficiently on percentage values related to shares, profit and Loss problems.
4.	To inculcate logical thinking by exposing the students to reasoning related questions.
5.	To inculcate logical thinking by exposing the students to reasoning related questions.

Course Outcomes:

S.No.	Course Outcome	Knowledge Level
1.	The students will be able to perform well in calculating on number problems and various units of ratio concepts	K3
2.	The students will be able to solve problems on time and distance and units related solutions	K3
3.	The students will become adept in solving problems related to profit and loss, in specific, quantitative ability	K3

4.	The students will present themselves well in the recruitment process using analytical and logical skills which he or she developed during the course as they are very important for any person to be placed in the industry	K3
5.	The students will earn to apply Logical thinking to the problems of Syllogisms and be able to effectively attempt competitive examinations like CAT, GRE, GATE for further studies	K3
SYLLABUS		
UNIT-I	Numbers, LCM and HCF, Chain Rule, Ratio and Proportion Importance of different types of numbers and uses of them: Divisibility tests, finding remainders in various cases, Problems related to numbers, Methods to find LCM, Methods to find HCF, applications of LCM, HCF. Importance of chain rule, Problems on chain rule, Introducing the concept of ratio in three Different methods, Problems related to Ratio and Proportion	
UNIT-II	Time and work, Time and Distance Problems on manpower and time related to work, Problems on alternate days, Problems on hours of working related to clock, Problems on pipes and cistern, Problems on combination of the some or all the above, Introduction of time and distance, Problems on average speed, Problems on Relative speed, Problems on trains, Problems on boats and streams, Problems on circular tracks, Problems on polygonal tracks, Problems on races.	
UNIT-III	Percentages, Profit Loss and Discount, Simple interest, Compound Interest, Partnerships, shares and dividends. Problems on percentages-Understanding of cost price, selling price, marked price, discount, percentage of profit, percentage of loss, percentage of discount, Problems on cost price, selling price, market price, discount. Introduction of simple interest, Introduction of compound interest, Relation between simple interest and compound interest, Introduction of partnership, Sleeping partner concept and problems, Problems on shares and dividends, and stocks.	
UNIT-IV	Introduction, number series, number analogy, classification, Letter series, ranking, directions Problems of how to find the next number in the series, Finding the missing number and related sums, Analogy, Sums related to number analogy, Ranking of alphabet, Sums related to Classification, Sums related to letter series, Relation between number series and letter series, Usage of directions north, south, east, west, Problems related to directions north, south, east, west.	
UNIT-V	Data sufficiency, Syllogisms Easy sums to understand data sufficiency, Frequent mistakes while doing data sufficiency, Syllogisms Problems.	

Text Books:	
1.	Quantitative aptitude by RS Agarwal
2.	Verbal and nonverbal reasoning by RS Agarwal
3.	Puzzles to puzzle you by shakunatala devi.
References:	
1.	Barrons by Sharon Welner Green and IraK Wolf (Galgotia Publications pvt. Ltd.)
2.	Websites: m4maths, Indiabix, 800score, official CAT, GRE and GMAT sites
3.	Material from IMS, Career Launcher and Time,, institutes for competitive exams
4.	Books for CAT by Arun sharma.
5.	Elementary and Higher algebra by HS Hall and SR Knight.
Websites:	
1.	www.m4maths.com
2.	www.Indiabix.com
3.	www.800score.com
4.	Official GRE site
5.	Official GMAT site

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS3204	**HS**	**2**	**--**	**--**	**--**	**--**	**--**	**--**

GENDER SENSITIZATION

(Common to ALL Branches)

Course Objectives:

1.	To develop students' sensibility with regard to issues of gender in contemporary India.
2.	To provide a critical perspective on the socialization of men and women.
3.	To introduce students to information about some key biological aspects of genders.
4.	To help students reflect critically on gender violence and workplace security.
5.	To expose students to more egalitarian interactions between men and women.

Course Outcomes: At the end of the course, students will be able to

S.No	Outcome	Knowledge Level
1.	Understand the important issues relating to gender in contemporary India.	K2
2.	Get sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender.	K2
3.	Attain a finer grasp of how gender discrimination works in our society and how to counter it.	K2
4.	Acquire insight into the gendered division of labour and its relation to politics and economics.	K2
5.	Develop a sense of appreciation for both men and women in all walks of life.	K3

SYLLABUS

UNIT-I	**Understanding Gender and Related Concepts - Gender in Everyday Life** Introduction: Conceptual Connotation – Sex and Gender – Basic Gender Concepts - Gendered Socialization – Gender Stereotypes –Exploring Attitudes towards Gender – Gender Roles & Relationships - Myths – Gender in Indian society – Early days – Later Vedic Period –Medieval and British Period – Independent India.
UNIT-II	**Introduction to Gender Justice- Notion and Significance** Division and Valuation of Work – Housework- The Invisible Work - "My Mother doesn't work," - Offences against Women –Fact and Fiction - Status of Women in Society – Gender and Human Rights - Gender Equality – Gender Justice – Notion and Significance
UNIT-III	**International and Constitutional Perspectives on Gender Equality** The International Bill of Rights, 1979 –Declaration on the Elimination of Violence against women 1993 –The Rights of Women –Beijing Platform for Action 1995 – Constitutional Guarantees – Fundamental Rights – Equality.

UNIT-IV	**Gender and Culture** Gender and Film - Gender and Electronic Media – Gender and Advertisement – Gender and Popular Literature – Gender Issues - Gender-Sensitive Behaviour – Gender being Together as Equals.
UNIT-V	**Gender Violence- Within and Beyond** Violence – Gender Violence – Types of Gender Violence –Gender Violence in Indian Perspective – -Women Specific Legislations for the Elimination of Violence Within and Beyond.

Reference Books:

1.	"Towards A World Of Equals: A Bilingual Textbook on Gender" by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas, and Susie Tharu, Published by Telugu Akademi (2015).
2.	Ferber, Holcomb & Wentling, Sex, Gender & Sexuality: The New Basics, Oxford Univ. Press 2008.
3.	Flavia Agnes, Sudhir Chandra, Monmayee Basu, Women and Law in India, Oxford Univ. Press 2004.
4.	Mamta Rao, Law Relating to Women and Children, Eastern Book Co, Lucknow.
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