Regulation: R20	III / IV - B.Tech. I - Semester							
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING								
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2021-22 admitted Batch onwards)								
Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20AM3101	Design and Analysis of Algorithms	PC	3	3	0	0	30	70	100
B20AM3102	Operating Systems	PC	3	3	0	0	30	70	100
B20AM3103	Machine Learning	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
B20AM3108	Operating Systems & Compiler Design Lab	PC	1.5	0	0	3	15	35	50
B20AM3109	Machine Learning Lab	PC	1.5	0	0	3	15	35	50
B20HS3102	Soft Skills **(Skill Oriented Course)**	SOC	2	1	0	2	--	50	50
B20MC3104	Competitive Programming	MC	0	0	0	3	--	--	--
B20AM3110	Summer Internship	PR	1.5	--	--	--	--	50	50
	TOTAL		**21.5**	**19**	**0**	**8**	**180**	**520**	**700**

	Course Code	Course
#PE-I	B20AM3104	Internet of Things
	B20AM3105	Data Visualization using Tableau
	B20AM3106	Network Programming
	B20AM3107	Natural Language Processing (NPTEL)
#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
B20AM3101	PC	3	0	0	3	30	70	3 Hrs.

DESIGN AND ANALYSIS OF ALGORITHMS
(For AIML)

Course Objectives:

1.	Analyze the asymptotic performance of algorithms
2.	Write rigorous correctness proofs for algorithms.
3.	Demonstrate a familiarity with major algorithm design paradigms and data structures
4.	Synthesize efficient algorithms in common engineering design situations

Course Outcomes:

S. No	Outcome	Knowledge Level
1.	Apply mathematical analysis methods to analyse the algorithm running times using asymptotic notations	K4
2.	Compare and understand how the choice of data structures impact the performance of various greedy algorithms	K3
3.	Describe, apply and analyze the complexities of Dynamic Programming Algorithms	K3
4.	Describe, apply and analyze the complexity of Backtracking and Branch and Bound, and explain the situations which call for usage of these paradigms	K3
5.	Infer lower bounds for common problems like searching, sorting, merging, selection, Understand the concepts of P, NP classes	K2

SYLLABUS

UNIT-I (14Hrs)	**INTRODUCTION**: Getting Started: Insertion sort, analyzing algorithms, Designing algorithms, Growth of Functions: Asymptotic Notation, Standard notations and common functions, Master method for solving recurrences **DIVIDE AND CONQUER**: General method, Finding maximum and minimum, Merge sort, Quick sort, Performance Measurement, Selection Problem, A Worst-Case Optimal Algorithm, Strassen's matrix multiplication, convex hull Problem- QuickHull Algorithm
UNIT-II (10 Hrs)	Sets and Disjoint set union, Union and Find Operations **THE GREEDY METHOD:** General method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees- Prim's algorithm, Kruskal's algorithm, Optimal storage on tapes, Optimal merge patterns, Huffman coding, Single source shortest paths.

UNIT-III **(12Hrs)**	**DYNAMIC PROGRAMMING:** General method, Multistage graphs, All pairs shortest paths, Optimal binary search trees, String editing, 0/1Knapsack, The travelling salesperson problem
UNIT-IV **(12Hrs)**	**BACKTRACKING:** General method, 8-Queens problem, Sum of subsets, Graph colouring, Hamiltonian cycles **BRANCH AND BOUND:** The method, Least Cost (LC) Search, The15-puzzle problem, Control abstractions for LC Search, FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem: LC Branch and Bound, FIFO Branch-and-Bound, Travelling salesperson problem: LC Branch and Bound
UNIT-V **(8Hrs)**	**LOWER BOUND THEORY**: The method, Comparison trees, Ordered Searching, Sorting, Selection, Oracles and adversary arguments, Merging, Largest and Second largest **NP-HARD AND NP-COMPLETE PROBLEMS**: Basic concepts, Nondeterministic Algorithms, The Classes NP-hard and NP-complete, Cook's theorem. Modular Arithmetic.

Text Books:	
1.	Fundamentals of Computer Algorithms 2nd edition by Ellis Horowitz, SartajSahni, S. Rajasekharan, university press, 2008
2.	Introduction to Algorithms 3rd edition by Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, PHI, 2010
Reference Books:	
1.	Design and Analysis Algorithms – Parag Himanshu Dave, Himanshu Bhalchandra Dave Publisher: Dhanpat Rai & co, 2017
2.	Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tomassia, Johnwiley and sons, 2006
3.	Introduction to the Design and Analysis of Algorithms, Anany Levitin, PEA, 3rd Edition.
4.	Foundations of Algorithms, R. Neapolitan and K. Naimipour, Jones and Bartlett, Pearson,2011
5.	Advanced Data Structures – Peter Brass, Cambridge University Press, 2008
e-Resources:	
1.	https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2.	https://onlinecourses.swayam2.ac.in/cec20_cs03/preview
3.	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3102	**PC**	**3**	**0**	**0**	**3**	**30**	**70**	**3 Hrs.**

OPERATING SYSTEMS
(For AIML)

Course Objectives:

1.	Introduce to the internal operation of modern operating systems
2.	Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
3.	Understand File Systems in Operating System like UNIX/Linux and Windows
4.	Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
5	Analyze Security and Protection Mechanism in Operating Systems

Course Outcomes:

S. No	Outcome	Knowledge Level
1.	Describe various generations of Operating Systems and functions of Operating System, System calls	K2
2.	Describe the concept of process, threads and analyze various CPU Scheduling Algorithms and IPC	K2
3.	Illustrate memory management strategies	K3
4.	Illustrate deadlocks, files and Secondary-Storage Structure	K3
5.	Summarize Security and Protection Mechanism in Operating Systems. Understand the Operating System like UNIX/Linux and Windows	K3

SYLLABUS

UNIT-I (6 Hrs)	**Operating Systems Overview:** Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems. **System Structures:** Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.
UNIT-II (10 Hrs)	**Process Concept:** Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems. **Multithreaded Programming:** Multithreading models, Thread libraries, Threading issues. **Process Scheduling:** Basic concepts, Scheduling criteria, Scheduling algorithms,Multiple processor scheduling, Thread scheduling. **Inter-process Communication:** Race conditions, Critical Regions, Mutual exclusion with

	busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.
UNIT-III **(06 Hrs)**	**Memory-Management Strategies:** Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation. **Virtual Memory Management:** Introduction, Demand paging, Copy on-write, Page replacement, Page replacement Algorithms, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.
UNIT-IV **(10 Hrs)**	**Deadlocks:** Resources, Conditions for resource deadlocks, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention. **File Systems:** Files, Directories, File system implementation, management and optimization. **Secondary-Storage Structure:** Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.
UNIT-V **(08 Hrs)**	**System Protection:** Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. **System Security:** Introduction, Program threats, System and network threats. **Case Studies:** Linux, Microsoft Windows.

	Text Books:
1.	Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2.	Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems.)

	Reference Books:
1.	Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
2.	Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
3.	Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004

	e-Resources:
1.	https://nptel.ac.in/courses/106/105/106105214/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3103	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

MACHINE LEARNING
(Common to AIML & CSD)

Course Objectives: Students are expected to

1	Explain the basic concepts and techniques of Machine Learning
2	Demonstrate regression, classification methods.
3	Illustrate the concepts of dimensionality reduction, artificial neural networks and reinforcement learning
4	Show the application of machine learning model evaluation and optimization techniques

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

S. No	Outcome	Knowledge Level
1	Explain the concepts of ingredients and preliminaries of machine learning	K2
2	Apply tree models, linear models and distance-based models	K3
3	Identify and construct features and ensemble models	K3
4	Demonstrate the concepts of dimensionality reduction techniques, model evaluation and selection techniques	K3
5	Apply the concepts of artificial neural networks, reinforcement learning	K3

SYLLABUS

UNIT-I (12 Hrs)	**The ingredients of machine learning**: Basic concepts, designing a learning system, Issues in machine learning, Types of machine learning, **Tasks**: the problems that can be solved with machine learning, **Models**: the output of machine learning, Features, the workhorses of machine learning. **Preliminaries:** The curse of dimensionality, Overfitting, Training, Test and Validation sets, The confusion matrix, **The accuracy metrics**: Accuracy, sensitivity, specificity, precision, recall, F1 measure, ROC curve, Unbalanced datasets, Naïve Bayes Classifier, **Some basic statistics:** variance, covariance, bias-variance tradeoff.
UNIT-II (10 Hrs)	**Tree Models**: Decision Trees. **Distance Based Models**: Introduction, Nearest Neighbors classification. **Linear Models**: The least-squares method: Univariate linear regression, Logistic Regression, Support Vector Machines: Linear SVM Classification, Nonlinear SVM Classification, SVM Regression (Textbook 4)
UNIT-III (10 Hrs)	**Features**: Kinds of feature, Feature transformations: Thresholding and discretization, Normalization, Incomplete Features, Feature construction and selection. **Model ensembles**: Voting Classifier, Bagging, random forests, **Boosting**: AdaBoost, Gradient Boosting. XGBoost

UNIT-IV (08 Hrs)	**Dimensionality Reduc**tion: PCA, Kernel PCA (Textbook 4), LDA **Model Evaluation and Optimization**: Cross Validation, Grid Search, Regularization
UNIT-V (10 Hrs)	**Neurons, NNs, Linear Discriminants**: The Neuron, Neural Networks, The perceptron, **Multilayer perceptron's**: Going forwards, Going backwards: Backpropagation of error, Multilayer perceptron in practice, Examples of using MLP. **Reinforcement Learning:** Overview, Example, Markov Decision Process, Uses of Reinforcement Learning

TEXTBOOKS:

1.	Introduction to Machine Learning, Alpaydin E, MIT Press (2014) 3rdEdition
2	Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge, 2012
3	Machine Learning: An algorithmic perspective, Stephen Marsland, 2nd edition, CRC press, 2014.
4	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, Aurélien Géron, 2nd Edition, O'Reilly Publications, 2019

REFERENCE BOOKS:

1.	The elements of statistical learning, Data Mining, Inference and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Second edition , Springer, 2009.
2.	Machine Learning in Action, Peter Harington, 2012, Cengage.
3.	Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, Tensorflow, Sebastian Raschka, Vahid Mirjalili, Second edition, 2020

Online MOOC Courses:

1.	"Machine Learning" course by Andrew Ng on Coursera
2.	"Introduction to Machine Learning (IITKGP)" by Prof. Sudeshna Sarkar, on Swayam
3.	"Machine Learning A-Z (Python & R in Data Science Course)" on Udemy

Useful Reference Links:

1.	"Linear Discriminant Analysis", https://sebastianraschka.com/Articles/2014_python_lda.html
2.	Python Machine Learning Cookbook-Practical Solutions from Preprocessing to Deep Learning, Chris Albon, Oreilly, 2018.
3.	"Principal Component Analysis versus Linear Discriminant Analysis", https://medium.com/analytics-vidhya/illustrative-example-of-principalcomponent-analysis-pcavs-linear-discriminant-analysis-lda-is-105c431e8907
4.	"A gentle introduction to K-fold cross-validation", https://machinelearningmastery.com/k-foldcross-validation/
5.	Grid search for model tuning", https://medium.com/analyticsvidhya/illustrative-example-ofprincipal-component-analysis-pca-vs-lineardiscriminant-analysis-lda-is-105c431e8907
6.	"Regularization in Machine Learning", https://towardsdatascience.com/regularization-inmachine-learning76441ddcf99a

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3104	**PE**	**3**	**0**	**0**	**3**	**30**	**70**	**3 Hrs.**

INTERNET OF THINGS

(Common to AIML & CSD)

Pre-requisites: Computer Networks

Course Objectives: Students are expected

1.	To understand building blocks of IoT and their characteristics
2.	To Know various architectures and protocols in IoT and security issues
3.	To use cloud services for data analytics in IoT applications
4.	To develop IoT applications using Arduino programming.

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

S. No	Outcome	Knowledge Level
1.	Discuss various Designs of IoT and IoT architectures	K2
2.	Illustrate various communication protocols in IoT	K3
3.	Use of various sensors and Actuators in IoT applications and Implement IoT applications using Arduino.	K3
4.	Analyse data in IoT applications.	K4
5.	Analyse various security issues IoT applications.	K4

SYLLABUS

UNIT-I **(10 Hrs)**	**Introduction to Internet of Things:** Definition &Characteristics of IoT, Physical design of IoT-Things in IoT, IoT protocols, Logical Design of IoT- IoT Functional Blocks, IoT Communication Models &API's, IoT levels and deployment templates. **IoT Network Architecture and Design:** Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture.
UNIT-II **(10 Hrs)**	**Communication Technologies:** wired Communication Technologies, wireless Communication Technologies. **IoT Access Technologies**: PHY/MAC Layer (IEEE 802.15.4), LoRAWAN, RPL. **Message Communication Protocols for Connected Devices** - CoAP, XMPP, MQTT.
UNIT-III **(10 Hrs)**	**IOT Physical devices and Endpoints:** Basic building blocks of an IOT device. **Sensors, Participatory sensing, RFIDs:** Sensor Technology, Participatory sensing, Industrial IOT and Automotive IOT, Actuator, Radio Frequency Identification technology. **Programming with Arduino:** Features of Arduino, Components of Arduino board, Arduino IDE, Programming Elements, Case Studies: Traffic control system, DHT Sensor with Arduino.

UNIT-IV **(8 Hrs)**	**Data Acquiring, Organising, Processing and Analytics:** Introduction, Data Acquiring and storage, Organising the Data, Transaction, Business Processes, Integration and Enterprise Systems, Analytics, Knowledge Acquiring, Managing and Storing Processes.
UNIT-V **(8 Hrs)**	**IoT Privacy, Security and Vulnerabilities Solutions:** Vulnerabilities, Security Requirements and Threat Analysis, IoT Security Tomography and Layered Attacker model, Identity management and establishment, Access control secure message communication, Security models, profiles and protocols for IoT. **Case studies illustrating IoT Design:** Home Automation, Environment, Agriculture

TEXTBOOK:

1.	Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015.
2.	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things - David Hanes, Gonzalo Salgueiro, Patrick Grossetete Robert Barton, Jerome Henry. 24750 Copyright© 2017 Cisco Systems, Inc. Published by: Cisco Press 800 East 96th Street.
3.	Internet of Things: Architecture and Design Principles by Raj Kamal, McGraw Hill Education private limited, 2017.
4.	Internet of Things, Jeeva Jose, Khanna Publishing; First edition (2018).

REFERENCE BOOKS:

1.	Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley, 2013
2.	Getting Started with the Internet of Things Cuno Pfister, Oreilly, 2011
3.	Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, Reilly (SPD), 2014.

E-Resources:

1.	Introduction to Internet of Things, https://swayam.gov.in/nd1_noc20_cs66/preview
2.	An Introduction to Programming the Internet of Things(IoT) specialization, https://www.coursera.org/specializations/iot

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3105	PE	3	--	--	3	30	70	3 Hrs.

DATA VISUALIZATION USING TABLEAU

(For AIML)

Course Objectives: The students able to

1	Understand basic concepts of Tableau
2	Understand concepts of Tableau Filters, groups and sets
3	Understand concepts of Tableau calculated fields and table calculations
4	Understand and draw the Tableau charts
5	Study and analyze the dashboards

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

S. No	Outcome	Knowledge Level
1	Outline the basic concepts of Tableau and connect to different databases	K2
2	Illustrate data organization in Tableau using Filters, groups and sets	K3
3	Illustrate different Tableau calculations to enhance data	K3
4	Demonstrate about different Tableau charts and apply that knowledge to draw charts for various applications.	K3
5	Apply the knowledge and create different Tableau dashboards.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Basics:** What Is Tableau, Uses Of Tableau, Tableau Versions, Tableau Architecture, Tableau New Features, How To Install Tableau, Connecting to text files, Connecting to Excel files, Connecting to Access databases, Connecting to a SQL Server, Pasting from a clipboard, Connecting to other databases, Understanding dimensions and measures, Changing data types, Applying filters, Merging multiple data sources
UNIT-II (10 Hrs)	**Simplifying and Sorting Data:** Sorting data in Tableau, Enhancing View with Filters, Sets, Groups, and Hierarchies, How tableau uses date fields
UNIT-III (12 Hrs)	**Creating Calculations to enhance data:** **What is aggregation?:** Dimension versus Attribute **What are calculated fields and Table calculations?:** How Do Calculated Fields Work, Creating Calculated Fields with the Calculation Editor, Performing Ad Hoc Calculations, How Do Table Calculations Work? A Word on Calculations and Cubes, Using the Calculation Editor to Build Calculated Fields, Ad Hoc Calculated Fields, Building Formulas Using Table Calculations, Adding Flexibility to Calculations with Parameters, Why You Should Learn Level of Detail Expressions

UNIT-IV **(12 Hrs)**	**Tableau Charts:** **Creating Univariate Charts:** Introduction, Creating tables, Creating bar graphs, Creating pie charts, Sorting the graphs, Creating histograms, Creating line charts, Using the Show Me toolbar, Creating stacked bar graphs, Creating box plots, Showing aggregate measures **Creating Bivariate Charts:** Introduction, Creating tables, Creating scatter plots, Swapping rows and columns, Adding trend lines, Selecting color palettes, Using dates **Creating Multivariate Charts:** Introduction, Creating facets, Creating area charts, Creating bullet graphs, Creating dual axes charts, Creating Gantt charts, Creating heat maps
UNIT-V **(08 Hrs)**	**Dashboards:** Dashboards in Tableau, Types of Dashboards, Building an Exploratory Dashboard, Building an Explanatory Dashboard

TEXTBOOKS:	
1.	Tableau Data Visualization Cookbook, Ashutosh Nandeshwar, Packt Publishing Ltd, First Edition, 2013 [CHAPTER 1&4]
2	Tableau Your Data!, Daniel G. Murray, John Wiley & Sons, Inc., Second edition, 2016 [CHAPTER 2&3]
3	Communicating Data with Tableau, Ben Jones, O'Reilly Media, Inc., First Edition, 2014 [CHAPTER 5]
REFERENCE BOOKS:	
1.	Ryan Sleeper, Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master 1st Edition, Kindle Edition
2.	Molly Monsey and Paul Sochan, Tableau for Dummies (For Dummies (Computer/Tech)), Publisher: For Dummies
3.	Joshua N. Milligan, Learning Tableau 10, Packt Publishing
4	Shweta Sankhe-Savale, Tableau Cookbook – Recipes for Data Visualization
Useful Reference Links:	
1.	https://www.educba.com/tableau-visualization/
2.	https://www.tableau.com/learn/articles/data-visualization
3.	https://towardsdatascience.com/tableau-visualizations-dc9e544dc9a8
4.	https://wmich.edu/sites/default/files/attachments/u1158/2019/Tableau%20WMU_2.pdf
5.	https://programmer-books.com/wp-content/uploads/2019/10/Creating-Data-Stories-with-Tableau-Public.pdf

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3106	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

NETWORK PROGRAMMING

(For AIML)

Course Objectives: Students are expected to learn

1	Understanding of core network programming by using sockets and transport layer protocols like TCP and UDP
2	Understanding of inter process communication and implementation of different forms of IPC in client-server environment
3	Get an exposure to various application layer protocols which are designed using sockets and transport layer protocols

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

S. No	Outcome	Knowledge Level
1	Explain the client-server paradigm and socket structures	K2
2	Describe the basic concepts of TCP sockets and develop TCP echo client-server programs.	K3
3	Discuss the UDP sockets and UDP echo client-server programs	K2
4	Explain Socket options and ability to understand IPC.	K2
5	Apply the applications of sockets and demonstrate skill to design simple applications like FTP, TELNET etc.	K3

SYLLABUS

UNIT-I (12 Hrs)	**Introduction to Network Programming**: OSI model-transport layer protocols: TCP, UDP and SCTP-network architecture: client-server and peer-to-peer systems, Sockets-socket Address structures: IPv4, IPv6 and Generic-value result arguments-Byte ordering functions-Byte manipulation functions-Address conversion functions
UNIT-II (10 Hrs)	**TCP:** introduction to TCP-TCP connection establishment and termination TIME_WAIT State. Elementary TCP sockets – Socket-connect-bind-listen-accept-fork-exec function-concurrent servers-Close function-read and write functions
UNIT-III (10 Hrs)	TCP echo client server program-getsockname and getpeername functions I/O multiplexing: I/O models-Select function-TCP echo server using select function-shutdown function-Poll function
UNIT-IV (08 Hrs)	**UDP:** Introduction to UDP-difference between TCP and UDP-recvfrom( ) and sendto( ) functions-UDP echo client server program-UDP echo client server using select function. Socket Options: IPv4 socket options-IPv6 socket options

UNIT-V **(10 Hrs)**	**Socket Options**: Generic socket options-TCP socket options. IPC: Introduction to IPC-forms of IPC-UNIX kernel support for pipes, FIFO, message queues, semaphores and shared memory Network programming concepts Implementation: FTP-ping-arp-SMTP-TELNET

TEXTBOOKS:	
1.	Unix Network programming, the socket networking API, W.Richard Stevens, bill fenner, Andrew m.rudoff ,PHI.
REFERENCE BOOKS:	
1.	Advanced programming in the UNIX environment, W.Richard Stevens ,pearson education

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3108	**PC**	--	--	**3**	**1.5**	**15**	**35**	**3 Hrs.**

OPERATING SYSTEMS & COMPILER DESIGN LAB
(For AIML)

Course Objectives: Students are expected

1	The main objective of this course is to implement operating systems and compiler design concepts
2	CPU scheduling and page replacement algorithms and algorithms related to deadlocks
3	How to design Automata as Acceptors, Verifiers
4	To study the various phases in the design of a compiler
5	To understand the design of top-down, bottom-up parsers
6	To introduce LEX and YACC tools

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

S. No	Outcome	Knowledge Level
1	Implement various scheduling, page replacement algorithms and algorithms related to deadlocks	K3
2	Develop programs for shared memory management and semaphores	K3
3	Determine predictive parsing table for a CFG	K4
4	Apply Lex and Yacc tools	K3
5	Build LR parser and generate SLR Parsing table	K3

SYLLABUS

Experiment 1	Simulate the following CPU scheduling algorithms: (a) Round Robin (b) SJF (c) FCFS (d) Priority
Experiment 2	Simulate the following page replacement algorithms: a) FIFO b) LRU c) LFU
Experiment 3	Write a C program that illustrates two processes communicating using shared memory
Experiment 4	Write a C program to simulate producer and consumer problem using semaphores
Experiment 5	Simulate Bankers Algorithm for Dead Lock Avoidance
Experiment 6	Write a C program to implement DFA for the given regular expression and test whether the given string is accepted or not
Experiment 7	Write a C Program to implement NFA for the given regular expression and test whether the given string is accepted or not.
Experiment 8	Write a C program to identify different types of Tokens in a given Program. a) key words b) Identifiers, constants
Experiment 9	Write a Lex Program to implement a Lexical Analyzer using Lex tool
Experiment 10	Write a parsing program to test whether the given expression is having balanced parenthesis or not

Experiment 11	Write a C program for implementation of a Shift Reduce Parser using Stack Data Structure to accept a given input string of a given grammar
Experiment 12	Write a C program to implement a Recursive Descent Parser
Experiment 13	Write C program to compute the First and Follow Sets for the given Grammar
Experiment 14	Write a C program to check the validity of input string using Predictive Parser
Experiment 15	Simulate the calculator using LEX and YACC tool.

REFERENCE BOOKS:	
1.	Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008.
2.	An Introduction to Formal Languages and Automata, Peter Linz, 6th Edition, Jones & Bartlett, 2016. Reference Boo
3.	Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson, Pearson Education India; 2nd edition, 2013
4.	Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning, 2nd Edition, 1 January 2011
5.	Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
6	The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH
7	Writing compilers and interpreters, R. Mak, 3rd edition, Wiley student edition
8	Operating System Concepts, Silberschatz A, Galvin P B, and Gagne G, 9th edition, Wiley, 2013.
9	Operating Systems A Concept Based Approach, Dhamdhere D M, 3rd edition, Tata McGrawHill, 2012
Useful Reference Links:	
1	https://nptel.ac.in/courses/106104123
2	https://nptel.ac.in/courses/106105214

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3109	**PC**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

MACHINE LEARNING LAB
(For AIML)

Course Objectives: Students are expected

1	To implement different mechanisms in preprocessing and model evaluation & implementation
2	To implement different dimensionality reduction techniques
3	To implement different clustering & classification techniques
4	To evaluate, save the model
5	To implement simple linear, logistic regressions and Feed-Forward Network

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

S. No	Outcome	Knowledge Level
1	Apply preprocessing techniques on custom data sets.	K3
2	Apply dimensional reduction techniques on custom datasets	K3
3	Develop, evaluate and save the different clustering & classification models	K4
4	Develop regression models, and reduce the regression model complexity using Lasso and Ridge Regularization	K3
5	Develop neural networks for structured, and unstructured data classification and regression	K3

SYLLABUS

Experiment 1	Data preprocessing: Write a program to handle missing values, bringing features to same scale, selecting meaningful features
Experiment 2	Data Preprocessing: Write a program to implement Categorical Encoding, One-hot Encoding
Experiment 3	Develop a program to implement linear and multiple regression models.
Experiment 4	Write a program to implement logistic regression for binary classification and multiclass classification
Experiment 5	Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.
Experiment 6	Write a program to implement Ensemble Learning, Data Clustering & Classification
Experiment 7	Write a program to evaluate clustering model
Experiment 8	Develop a program to do the following: Model Evaluation and optimization: K-fold cross validation, learning and validation curves, grid search
Experiment 9	Write a program to compress data via dimensionality reduction: PCA, LDA
Experiment 10	Write a program to reduce variance of a linear regression model using Lasso and Ridge Regularization
Experiment 11	Write a program to implement Perceptron for digits dataset
Experiment 1	Write a program to implement Feed-Forward Network for wheat seeds dataset.

Experiment 13	Build an Artificial Neural Network for regression by implementing the Back propagation algorithm and test the same using appropriate data sets.
Experiment 14	Write a program to save and load a trained machine learning model

REFERENCE BOOKS:

1.	Chris Albon, "Machine Learning with Python Cookbook-practical solutions from preprocessing to Deep learning", O'REILLY Publisher,2018
2.	Sebastian Raschka & Vahid Mirjalili, "Python Machine Learning", Packt Publisher, 2017
3.	Ian Good Fellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017.
4.	Francois Chollet, "Deep Learning with Python", Manning Publications, 2018.
5.	Phil Kim, "Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence", Apress , 2017.
6.	Ragav Venkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018.
7.	Navin Kumar Manaswi, "Deep Learning with Applications Using Python", Apress, 2018.
8.	Joshua F. Wiley, "R Deep Learning Essentials", Packt Publications, 2016

Useful Reference Links:	
1.	https://scikit-learn.org/stable/modules/generated/sklearn.linear_model.Perceptron.html
2.	https://towardsdatascience.com/15-data-exploration-techniques-to-go-from-data-to-insights93f66e6805df
3.	https://medium.com/ml-research-lab/chapter-4-knowledge-from-the-data-and-data-explorationanalysis-99a734792733
4.	https://machinelearningmastery.com/implement-backpropagation-algorithm-scratch-python/
5.	https://www.analyticsvidhya.com/blog/2016/01/guide-data-exploration/
6.	https://towardsdatascience.com/wtf-is-image-classification-8e78a8235acb
7.	https://medium.com/nybles/create-your-first-image-recognition-classifier-using-cnn-keras-andtensorflow-backend-6eaab98d14dd
8.	https://analyticsindiamag.com/learn-image-classification-using-cnn-in-keras-with-code/
9.	https://www.tensorflow.org/tutorials/images/transfer_learning
10.	https://www.pyimagesearch.com/2020/02/17/autoencoders-with-keras-tensorflow-and-deeplearning/
11.	https://d2l.ai/chapter_natural-language-processing-applications/sentiment-analysis-rnn.html
12.	https://towardsdatascience.com/sentiment-analysis-using-lstm-step-by-step-50d074f0994

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

SOFT SKILLS
(Common to AIDS, AIML, CSBS, CSD, 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 in still Confidence through attitude building.

Course Outcomes: At the end of the course 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
B20MC3104	MC	--	--	3	--	--	--	--

COMPETITIVE PROGRAMMING
(For AIML)

Course Objective:

1.	To learn about Stacks, Queues, Linked Lists and Templates.
2.	To learn different Searching and Sorting Algorithms.

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

S. No	Outcome	Knowledge Level
1.	Implement standard problems on Matrix.	K3
2.	Solve various classical problems on Stacks, Queues and Linked Lists.	K3
3.	Apply searching and sorting algorithms on different data structures.	K3
4.	Solve the coding tasks with the help of STL.	K3

UNIT-I	**Standard Problems on Matrix** Matrix forms and representations, Spiral filling and printing, Clockwise and anti-clock wise rotations, Zig-Zag form and Pattern coding.
UNIT-II	**Standard Problems on Linked List** Finding and removing duplicates in Linked list, Multiple links, Construct a doubly linked list from 2D Matrix, List Sorting using bubble Sort, Modular node in Linked List, Rotate doubly linked list by n nodes.
UNIT-III	**Classical Problems on Stacks and Queues** Implementing two stacks in an array, Design a stack with operations on middle element, String reversal using Stack, Queue implementation using stack, Queue reverse using queue, reversing first k elements of a stack.
UNIT-IV	**Searching and Sorting techniques:** sequential Vs. binary searching. Fibonacci Search, Exponential Search,Classical sorting techniques: Sort an array of strings using selection sort, Counting sort, Insertion sort on doubly linked list, Quick sort on single Linked List, Merge sort on Doubly linked List, 3-way Merge Sort.
UNIT-V	**Standard Library templates** Introduction to C++ language, C++ Features, Working on STLs, Algorithms-Sorting and searching, Functions, Containers, Iterators.

References:	
1.	Data Structures Using C by E. BalaguruSamy, First Edition, McGraw Hill Education, 2017 .
2.	The C –Programming Language, B.W. Kernighan, Dennis M. Ritchie, Prentice Hall India Pvt.Ltd, Second Edition ,2015.
3.	Computer Science, A structured programming approach using C, B.A.Forouzan and R.F.Gilberg, 3rd Edition, Thomson, 2013.
4.	Object Oriented Programming Using C++: Alok Kumar Jagadev , Amiya Kumar Rath, Satchidananda Dehuri,PHI,2010.
E- Resources	
1.	https://www.geeksforgeeks.org/
2.	https://www.tutorialspoint.com/

Regulation: R20	III / IV - B.Tech. II - Semester							
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING								
SCHEME OF INSTRUCTION & EXAMINATION **(With effect from 2021-22 admitted Batch onwards)**								
Course Code	**Course Name**	**Category**	**Cr**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
B20AM3201	Computer Networks	PC	3	3	0	0	30	70	100
B20AM3202	Deep Learning	PC	3	3	0	0	30	70	100
B20AM3203	Software Engineering	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
B20AM3208	Data Visualization Using Tableau Lab	PC	1.5	0	0	3	15	35	50
B20AM3209	Algorithms for Efficient Coding Lab	PC	1.5	0	0	3	15	35	50
B20AM3210	Deep Learning with Tensorflow Lab	PC	1.5	0	0	3	15	35	50
B20AM3211	MEAN Stack Technologies- Module I- HTML, CSS, JavaScript, Angular JS **(Skill Oriented Course)**	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	B20AM3204	DevOps
	B20AM3205	Software Project Management
	B20AM3206	Distributed Systems
	B20AM3207	Computer Vision
#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
B20AM3201	PC	3	--	--	3	30	70	3 Hrs.

COMPUTER NETWORKS
(Common to AIML & CSD)

Course Objectives: Students are expected

1	To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
2	To study data link layer concepts, design issues, and protocols.
3	To study MAC layer Random Access Protocols, LAN.
4	To gain knowledge on Network layer and Routing Algorithms.
5	To learn Transport layer services, and protocols.
6	To acquire knowledge of Application layer protocols.

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

S. No.	Outcome	Knowledge Level
1	Illustrate the OSI reference model, TCP/IP, and Digital transmission techniques	K3
2	Demonstrate Data Link Layer protocols	K3
3	Compare and contrast MAC protocols, various types of LANs	K3
4	Summarize various network layer services and Routing algorithms	K3
5	Implement Transport layer and application layer protocols	K3

SYLLABUS

UNIT-I (10 Hrs)	Introduction: Introduction to Computer Networks, Network Models (protocols): OSI reference model, TCP/IP reference model. Network topologies, types of networks (LAN, MAN, WAN). Physical layer: Data and Signals, Digital signals, Digital transmission (Digital-to-Digital, Analog-to-Digital), multiplexing (FDM, TDM), Transmission media.
UNIT-II (8 Hrs)	Data Link Layer: Error Detection & Correction: types of errors, Error Detection (Parity, CRC, Check Sum), Error Correction (Using hamming distance), Data Link Layer services: framing, flow control, error control. Error & Flow control mechanisms: stop and wait, Go back N and selective repeat, High Level Data Link Control (HDLC).
UNIT-III (10 Hrs)	Medium access control: Random access: Aloha, Slotted Aloha, CSMA, CSMA/CD, and CSMA/CA, Local area networks: Ethernet, Types of ethernet (Token Ring, Fast Ethernet, Gigabit Ethernet), Personal Area Network: Bluetooth (Architecture), Wireless LANS: IEEE 802.11(Architecture, MAC sub layer).
UNIT-IV (8 Hrs)	Network layer: Network Layer Services, IPV4 Address, Subnetting, Super-netting, Classless addressing, Internet Protocol (IP, ARP, DHCP, ICMP), IPV6 Address format,

	Routing algorithms: Distance vector, Link state, Network Address Translation (NAT).
UNIT-V (8 Hrs)	Transport layer: UDP (User Datagram, Services, Applications), TCP (TCP Services, features, Segment, Connection establishment and termination, sliding window, flow, and congestion control), Application Layer: Application Layer services and protocols including www, DNS, SMTP, POP, FTP, Telnet, HTTP, Firewalls.

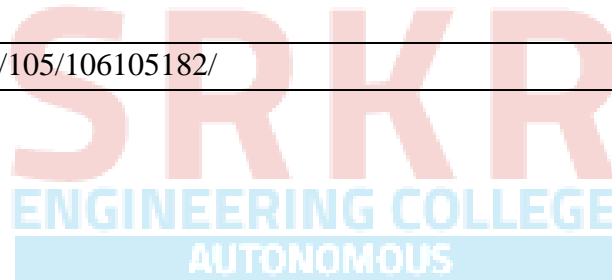| **TEXTBOOK:**	
1.	Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill, 5th Edition, 2017.
REFERENCE BOOKS:	
1.	Data and Computer Communications, William Stallings, Pearson, 10th Edition, 2013.
2.	Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, Pearson Education India; 5th edition, 2013.
3.	Computer Networks: A Systems Approach, LL Peterson, BS Davie, Morgan-Kauffman, 5th Edition, 2011.
4.	Computer Networking: A Top-Down Approach JF Kurose, KW Ross, Addison-Wesley, 5th Edition, 2009.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3202	PC	3	--	--	3	30	70	3 Hrs.

DEEP LEARNING
(For AIML)

Course Objectives: Students are expected

1	Understand and recollect basic concepts of machine learning
2	Understand concepts of deep feed forward network mechanisms
3	Understand and analyze the concepts of CNN, RNN models
4	Study the concepts of auto encoders and optimization techniques
5	Study and analyze the different DNN architectures

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

S. No	Outcome	Knowledge Level
1	Demonstrate the basic concepts of Machine learning	K3
2	Apply the concepts of deep feed forward networks.	K3
3	Apply the concepts of CNN & RNN models	K3
4	Explain and Apply optimization techniques and auto encoders.	K3
5	Explain the different DNN models and Apply that knowledge to different applications.	K3

SYLLABUS

UNIT-I (12 Hrs)	**Fundamentals Concepts of Machine Learning** **Historical Trends in Deep Learning**-Machine Learning Basics: Learning Algorithms-Supervised and Unsupervised Training, Linear Algebra for machine Learning, Testing, Cross-Validation, Dimensionality reduction, Over/Under-fitting, Hyper parameters and validation sets, Bias, Variance, Regularization
UNIT-II (10 Hrs)	**Deep Feed Forward Networks** **Deep feed forward networks**-Introduction, Various Activation Functions, error functions- Regularization for Deep learning-Early Stopping, Drop out.
UNIT-III (10 Hrs)	**Convolutional Neural Networks And Sequence Modeling** **Convolutional Networks**: Convolutional operation- Pooling- Normalization, **Sequence Modeling**: Recurrent Neural Networks, The Long Short-Term Memory.
UNIT-IV (8 Hrs)	**Auto Encoders and Optimization Algorithms** **Auto encoders** - Auto encoders: under complete, denoising, optimization for Deep Learning: gradient descent, stochastic gradient descent, mini batch gradient descent, Adagrad, RMSProp, Adam

UNIT-V (10 Hrs)	**More Deep Learning Architectures & Applications**
	Alexnet, ResNet, Transfer learning,
	Deep Generative Models: Boltzmann Machines, Restricted Boltzmann Machines
	Applications: Sentiment Analysis using LSTM, Image Segmentation

TEXTBOOK:

1.	Ian Good fellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016 (available at http://www.deeplearningbook.org)
2.	Charu C Agarwal, "Neural Networks and Deep Learning", IBM T. J. Watson Research Center, International Business Machines, Springer, 2018

REFERENCE BOOKS:

1.	Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
2.	Michael Nielsen, "Neural Networks and Deep Learning", Online book, 2016 (http://neuralnetworksanddeeplearning.com/)
3.	Li Deng, Dong Yu, "Deep Learning: Methods and Applications", Foundations and Trends in Signal Processing, 2013.
4.	Christopher and M. Bishop, "Pattern Recognition and Machine Learning", Springer Science Business Media, 2006.
5.	Jason Brownlee, "Deep Learning with Python" , ebook, 2016
6.	N. D. Lewis, "Deep Learning Step by Step with Python: A Very Gentle Introduction to Deep Neural Networks for Practical Data Science, 2016.
7.	Chris Albon, "Machine Learning with Python Cookbook-practical solutions from preprocessing to Deep learning", O'REILLY Publisher,2018

Useful Reference Links:

1.	https://medium.com/nybles/create-your-first-image-recognition-classifier-using-cnn-keras-and-tensorflow-backend-6eaab98d14dd
2.	https://www.analyticsvidhya.com/blog/2017/08/10-advanced-deep-learning-architectures-data-scientists/
3.	https://www.geeksforgeeks.org/cross-validation-machine-learning/
4.	https://www.geeksforgeeks.org/activation-functions-neural-networks/
5.	https://towardsdatascience.com/sentiment-analysis-using-lstm-step-by-step-50d074f09948
6.	https://medium.com/@lamiae.hana/a-step-by-step-guide-on-sentiment-analysis-with-rnn-and-lstm-3a293817e314
7.	https://towardsdatascience.com/common-loss-functions-in-machine-learning-46af0ffc4d23
8.	https://d2l.ai/chapter_natural-language-processing-applications/sentiment-analysis-rnn.html

Web Link:

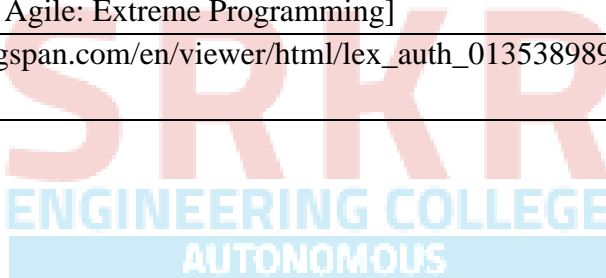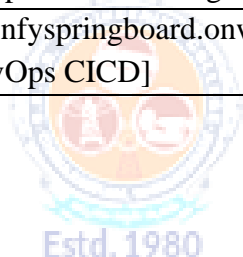| 1.	Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3203	PC	3	0	0	3	30	70	3 Hrs.

SOFTWARE ENGINEERING
(Common to AIML & CSD)

Course Objectives:

1.	Give exposure to phases of Software Development, common process models including Waterfall, the Unified Process, and elements of the Agile Process.
2.	Give exposure to a variety of Software Engineering practices such as Requirements Analysis and Specification.
3.	Give exposure to Software Design Techniques.
4.	Give exposure to various Software Quality Assurance and Testing strategies.

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

S. No	Outcome	Knowledge Level
1.	Understand different software process models and their significance.	K2
2.	Distinguish various requirements identification procedures.	K3
3.	Demonstrate different methods for requirement analysis modeling.	K3
4.	Illustrate various aspects of system design and software architectures.	K2
5.	Apply software quality assurance and testing strategies.	K3

	SYLLABUS
UNIT-I (11 Hrs)	The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models.
UNIT-II (8 Hrs)	Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements, Requirements Analysis.
UNIT-III (9 Hrs)	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 Modeling, Requirements Modeling for Web Apps.
UNIT-IV (13 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,

	Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for Web Apps, Designing Traditional Components, Component- Based Development.
UNIT-V (9Hrs)	Elements of Software Quality 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 Web Apps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views off Testing, White-Box Testing, Basis Path Testing.

Text Books:	
1.	Software Engineering: A Practitioner's approach, Roger S Pressman, 7th edition McGraw Hill Higher Education (2009)
2.	Software Engineering, Ian Sommerville, 9th edition. Pearson (2017)
Reference Books:	
1.	Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2.	Software Engineering, Ugrasen Suman, Cengage (2012)
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105182/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3204	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DevOps	
(For AIML)	

Course Objectives: Students are expected to learn

1	DevOps improves collaboration and productivity by automating infrastructure, workflows and continuously measuring applications performance.
2	To learn the DevOps Methodologies in detail
3	To Implement CI/CD tools in the application

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

S. No.	Outcome	Knowledge Level
1	Interpret the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility	K2
2	Illustrate DevOps & DevOps methodologies and their key concepts	K3
3	Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models with suitable examples	K3
4	Implement the private infrastructure using version control systems and CI/CD tools	K3
5	Demonstrate the DevOps maturity model.	K3

SYLLABUS		
UNIT-I (10 Hrs)	**Phases of Software Development Life Cycle:** SDLC, Advantages & Disadvantages of SDLC, Best SDLC Methodology, **SDLC Models:** Waterfall model, Lean SDLC Model **Values and principles of agile software development:** Four Values of Agile, Principles of Agile Manifesto.	
UNIT-II (10 Hrs)	**Fundamentals of DevOps:** How DevOps Different from Traditional IT, DevOps Workflow, DevOps vs Agile, DevOps Principles, DevOps Architecture, **DevOps Orchestration:** DevOps Applications, DevOps Pipeline, Phases of DevOps Pipeline.	
UNIT-III (10 Hrs)	**DevOps adoption in projects:** Technology aspects, Technology Challenges, CD Automation, Ops Teams Perspective, Tool stack implementation, People aspect, Processes Aspects.	
UNIT-IV (10 Hrs)	**CI/CD: Introduction to Continuous Integration**: Why do we need, CICD pipeline, Benefits of CICD, Continuous Integration tool, Agile CICD pipeline, Automation of CICD	

UNIT-V (10 Hrs)	**DevOps Maturity Model:** Key factors of DevOps maturity model, stages of DevOps maturity model, Business Benefits of DevOps Maturity, DevOps maturity Assessment

Textbooks:	
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.

References:	
1.	Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale 1st Edition, by Jennifer Davis (Author), Ryn Daniels
2.	Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation (Addison-Wesley Signature Series (Fowler)) 1st Edition by Jez Humble (Author), David Farley

Web Links:	
1.	https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013382690411003904735_shared/overview [Software Engineering and Agile software development]
2.	https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_0135015781949767681O467 [Development & Testing with Agile: Extreme Programming]
3.	https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_01353898917192499226_shared [DevOps CICD]

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3205	PE	3	--	--	3	30	70	3 Hrs.

SOFTWARE PROJECT MANAGEMENT

(For AIML)

Course Objectives: Students are expected to learn

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

Course Outcomes: At 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 (12 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.
UNIT-II (10 Hrs)	**The Old Way and The New**: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process. **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.
UNIT-IV **(8 Hrs)**	**Iterative Process Planning**: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. **Project Organizations and Responsibilities**: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
UNIT-V **(10 Hrs)**	**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. **Project Estimation and Management**: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach

TEXTBOOKS:	
1.	Software Project Management, Walker Royce, Pearson Education, 2005.
2.	Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

REFERENCE BOOKS:	
1.	Software Project Management, Joel Henry, Pearson Education.
2.	Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3.	Effective Software Project Management, Robert K. Wysocki, Wiley, 2006.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3206	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DISTRIBUTED SYSTEMS

(Common to AIML & CSD)

Course Objectives: Students are expected to learn	
1	To understand the foundations of distributed systems.
2	To learn issues related to clock Synchronization and the need for global state in distributed systems
3	To learn distributed mutual exclusion and deadlock detection algorithms
4	To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
5	To learn the characteristics of peer-to-peer and distributed shared memory systems

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

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

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 (10 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. Global state 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 pointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure – free system – Agreement in synchronous systems with failures.
UNIT-V **(10 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.

TEXTBOOKS:	
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 D 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
B20AM3207	PE	3	--	--	3	30	70	3 Hrs.

COMPUTER VISION

(For AIML)

Course Objectives: Students are expected to learn

1	Basic concepts of computer vision and image features
2	Simple and advanced architectures of CNN
3	Concepts of transfer learning
4	DNN models for object detection
5	Concept of GAN

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

S. No	Outcome	Knowledge Level
1	Understand basic concepts of computer vision	K2
2	Apply the knowledge of traditional machine learning algorithms and different advanced CNN models on image datasets for classification	K3
3	Apply transfer learning on open-source image data sets	K3
4	Explain different DNN models for object detection	K2
5	Demonstrate the knowledge of GAN model and visual embeddings on image datasets	K3

SYLLABUS

UNIT-I (10 Hrs)	**Computer vision**, applications of computer vision, Image input Converting color images to grayscale to reduce computation complexity, **Feature extraction**: What is a feature in computer vision? What makes a good (useful) feature? Extracting features (handcrafted vs. automatic extracting), **Color Feature Extraction**: Color Space—RGB color space, HSV, HSL, HSI color spaces, Y'CbCr color space **Color Feature Extraction**—Color Histogram (component, Indexed, Dominant), Color Coherence vector, Color Correlogram **Texture Feature Extraction**: Spatial Texture Feature Extraction Methods (Gray Level Co-occurrence matrices, Markov random Field) **Shape Representation**: Contour-Based Shape Methods (Centroid Distance, Curvature Signature)
UNIT-II (10 Hrs)	**Introduction to Image Classification, Image Classification with linear and nonlinear classifiers:** Classification using SVM and Decision Trees, Classifying Gray scale and color images using CNNs, Advanced CNN architectures: LeNet-5, Inception and GoogLeNet

UNIT-III **(10 Hrs)**	**Transfer Learning:** What problems does transfer learning solve, what is transfer learning, Transfer learning approaches, Choosing the appropriate level of transfer learning, Open source datasets
UNIT-IV **(10 Hrs)**	**Object Detection with R-CNN, SSD and YOLO:** General object detection framework, Region-based convolutional neural networks (R-CNNs), Single-shot detector (SSD), You only look once (YOLO)
UNIT-V **(10 Hrs)**	**Generative Adversarial networks:** GAN architecture, Evaluating GAN models, GAN applications, Visual embeddings and its applications

TEXTBOOKS:	
1.	Deep Learning for Vision Systems: Mohamed Elgendy, Manning Publishers, 2020
2	Fundamentals of Image Data Mining: Dengsheng Zhang, 2nd Edition , Springer
REFERENCE BOOKS:	
1.	Computer Vision: Models, Learning, and Inference, Somon J.D. Prince, 1st Edition, Cambridge University Press
Online MOOC Courses:	
1.	Introduction to Computer Vision and Image Processing, Introduction to Computer Vision and Image Processing	Coursera, Courseera
2.	Deep Learning for Computer Vision, Deep Learning for Computer Vision - Course (nptel.ac.in), Prof. Vineeth N. Balasubramanian

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3208	**PC**	**0**	**0**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

DATA VISUALIZATION USING TABLEAU LAB
(For AIML)

Course Objectives: The students able to

1	Understand basic concepts of Tableau
2	Understand the main concepts of visual analytics with a hands-on tutorial using Tableau
3	Understand how to create effective charts and interactive dashboards

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

S. No	Outcome	Knowledge Level
1	Apply the main concepts of data visualization	K3
2	Develop basic and advanced charts using Tableau Desktop	K4
3	Develop and build the dashboards	K4

SYLLABUS

1.	**Exercise1:** Introduction to Tableau • Course Introduction • Getting started with Tableau Desktop • Connecting to the tutorial dataset • Tableau File Types • Creating the first charts
2.	**Exercise2:** Connecting to Data sources • Text Files • Excel • Access Database
3.	**Exercise3:** Creating Basic charts and graphs • Creating a Pie Chart • Creating a Bar Chart • Creating a Line Graph • Discovering Scatter Plot
4.	**Exercise 4:** Data Management

	• Filter the data using Context filter
	• Implement Sorting
	• Grouping of data
	• Manipulating sets
	• Working with Dates(Discrete and Continuous)
5.	**Exercise 5:** Table Calculations • Creating simple calculations in Tableau • Using table calculations
6.	**Exercise 6:** Advanced Charts • Dual Axis Chart • Heat Map • Tree Map • Box Plot • Waterfall Chart • Level of Details (LOD)
7.	**Exercise 7:** Dashboards • Building an Interactive Dashboard

TEXTBOOKS:

1.	Visualization Analysis & Design by Tamara Munzner (2014) (ISBN 9781466508910)
2.	Tableau Your Data!, Daniel G. Murray, John Wiley & Sons, Inc., Second edition, 2016

REFERENCE BOOKS:

1.	Ryan Sleeper, Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master 1st Edition, Kindle Edition
2.	Molly Monsey and Paul Sochan, Tableau for Dummies (For Dummies (Computer/Tech)), Publisher: For Dummies
3.	Interactive Data Visualization for the Web by Scott Murray 2nd Edition (2017)
4	Shweta Sankhe-Savale, Tableau Cookbook – Recipes for Data Visualization

Useful Reference Links:

1.	https://www.educba.com/tableau-visualization/
2.	https://www.tableau.com/learn/articles/data-visualization
3.	https://towardsdatascience.com/tableau-visualizations-dc9e544dc9a8
4.	https://wmich.edu/sites/default/files/attachments/u1158/2019/Tableau%20WMU_2.pdf
5.	https://programmer-books.com/wp-content/uploads/2019/10/Creating-Data-Stories-with-Tableau-Public.pdf

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3209	**PC**	**0**	**0**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

ALGORITHMS FOR EFFICIENT CODING LAB
(Common to AIML & CSD)

Course Objective:

1.	To develop efficient coding for implementing advanced trees and algorithms with various inputs.

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

S. No	Outcome	Knowledge Level
1.	Develop programs to find optimal solutions for various problems using different algorithm strategies.	K3
2.	Analyze time complexity of various algorithm design techniques	K4
3.	Develop programs to implement advanced trees and pattern matching algorithms	K3

List of Experiments:

Implement and analyze the following Algorithms using Divide and Conquer

1. Binary Search
2. Merge Sort
3. Quick Sort

Implement following Algorithms using Greedy Method

4. Minimum-cost spanning tree
5. Single Source Shortest Path (Dijkstra's)

Implement following Algorithms using Dynamic programing

6. Optimal binary search trees
7. Traveling salesperson problem

Implement following Algorithms using Backtracking

8. N-Queens problem
9. Graph Coloring problem

Implement following Tree Operations

10. AVL Tree
11. Splay Tree

Implement following Pattern Matching Algorithms.

12. KMP Algorithm
13. RK Algorithm

TEXTBOOKS:

1. Fundamentals of Computer Algorithms 2nd edition by Ellis Horowitz, SartajSahni, S. Rajasekharan, university press, 2008
2. Advanced Data Structures – Peter Brass, Cambridge University Press, 2008

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3210	**PC**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

DEEP LEARNING WITH TENSORFLOW LAB
(For AIML)

Pre-requisites: Machine Learning, Machine Learning Lab

Software Packages Required:
- Keras
- Tensorflow
- PyTorch

Course Objectives: Students are expected to learn

1	To implement different deep learning models in Python
2	To work with different deep learning frameworks like Keras, Tensor flow, PyTorch etc.

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

S. No.	Outcome	Knowledge Level
1	Apply data pre-processing techniques on different types of datasets to make them suitable for developing deep learning models	K3
2	Construct neural network models for solving classification and regression tasks	K3
3	Implement Convolutional Neural Network for classification and object detection	K3
4	Use pretrained models	K3
5	Implement Recurrent Neural Network for text classification and language translation	K3

SYLLABUS

Experiment 1	Implement multilayer perceptron algorithm for MNIST Handwritten Digit Classification.
Experiment 2	Implement one hot encoding of words or characters.
Experiment 3:	Apply data augmentation techniques on images.
Experiment 4	Implement word embeddings for IMDB dataset.
Experiment 5	Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.
Experiment 6	Design a neural Network for classifying news wires (Multi class classification) using Reutersdataset.
Experiment 7	Design a neural network for predicting house prices using Boston Housing Price dataset.
Experiment 8	Build a Convolution Neural Network for MNIST Hand written Digit Classification.
Experiment 9	Build a Convolution Neural Network for simple image (dogs and Cats) Classification. Study the effect of batch normalization and dropout on the performance of CNN.

Experiment 10	Use a pre-trained convolution neural network (VGG16) for image classification
Experiment 11	Implement a Recurrent Neural Network for IMDB movie review classification problem.

Additional Programs (For Practice only)

Experiment 1	Implement a deep learning model for object detection
Experiment 2	Develop an autoencoder model for MNIST dataset
Experiment 3	Implement LSTM for language translation

REFERENCE BOOKS:

1.	Chris Albon, "Machine Learning with Python Cookbook-practical solutions from preprocessing to Deep learning", O'REILLY Publisher,2018
2.	Sebastian Raschka & Vahid Mirjalili, "Python Machine Learning", Packt Publisher, 2017
3.	Ian Good Fellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017.
4.	Francois Chollet, "Deep Learning with Python", Manning Publications, 2018.
5.	Ragav Venkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018.
6.	Navin Kumar Manaswi, "Deep Learning with Applications Using Python", Apress, 2018.

Useful Reference Links:

1.	https://scikit-learn.org/stable/modules/generated/sklearn.linear_model.Perceptron.html
2.	https://towardsdatascience.com/15-data-exploration-techniques-to-go-from-data-to-insights93f66e6805df
3.	https://medium.com/ml-research-lab/chapter-4-knowledge-from-the-data-and-data-explorationanalysis-99a734792733
4.	https://machinelearningmastery.com/implement-backpropagation-algorithm-scratch-python/
5.	https://www.analyticsvidhya.com/blog/2016/01/guide-data-exploration/
6.	https://towardsdatascience.com/wtf-is-image-classification-8e78a8235acb
7.	https://medium.com/nybles/create-your-first-image-recognition-classifier-using-cnn-keras-andtensorflow-backend-6eaab98d14dd
8.	https://analyticsindiamag.com/learn-image-classification-using-cnn-in-keras-with-code/
9.	https://www.tensorflow.org/tutorials/images/transfer_learning
10.	https://www.pyimagesearch.com/2020/02/17/autoencoders-with-keras-tensorflow-and-deeplearning/
11.	https://d2l.ai/chapter_natural-language-processing-applications/sentiment-analysis-rnn.html
12.	https://towardsdatascience.com/sentiment-analysis-using-lstm-step-by-step-50d074f0994

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM3211	SOC	1	--	2	2		50	3 Hrs.

MEAN STACK TECHNOLOGIES-MODULE I
(For AIML)

Course Objectives: Students are expected to learn

1	The core concepts of frontend and dynamic, responsive development for web applications.

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

S. No	Outcome	Knowledge Level
1	Develop static web pages using HTML & CSS elements	K3
2	Develop dynamic web pages and validate them using JavaScript	K3
3	Develop dynamic and responsive web pages using Angular JS	K3

LIST OF EXPERIMENTS

HTML 5:

Introduction to Web, Overview of Web Technologies, HTML - Introduction, HTML - Need, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements – Attributes, Paragraph Element, Division and Span Elements, List Element, Link Element, Character Entities, HTML5 Global Attributes, Creating Table Elements, Table Elements : Colspan/Rowspan Attributes, border, cellspacing and cellpadding attributes, Creating Form Elements, Input Elements - Attributes, Color and Date Pickers, Select and Data list Elements, Editing Elements, Media.

CSS:

Introduction CSS, Applying CSS to HTML, Selectors, Properties and Values, CSS Colors and Backgrounds, CSS Box Model, CSS Margins, Padding, and Borders, CSS Text and Font Properties.

JAVASCRIPT:

Why we need JavaScript, What is JavaScript, Environment Setup, Working with Identifiers, Type of Identifiers, Primitive and Non Primitive Data Types, Operators and Types of Operators, Types of Statements, Non - Conditional Statements, Types of Conditional Statements, If and Switch Statements, Types of Loops, Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions, Working With Classes, Creating and Inheriting Classes, In-built Events and Handlers, Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser and Document Object Model, Creating Arrays, Array Methods.

ANGULAR JS:

What is Angular, Features of angular, Angular Application Setup, architecture of angular, creating components, built-in pipes, Components and Modules, Elements of Template, creating a simple angular application, Executing Angular Application.

TEXTBOOKS:	
1.	Programming the World Wide Web, 8th Edition Robet W Sebesta, Pearson, 2015.
2	WebTechnologies,1st Edition 7th impression, Uttam K Roy, Oxford, 2012.
3	Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
REFERENCE BOOKS:	
1.	Getting MEAN with Mongo, Express, Angular, And Node, Simon Holmes Clive Harber, Manning
2.	An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda SKatila, Cengage Learning.
WEB LINKS:	
1	https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview (HTML 5)
2	https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview (JavaScript)
3	https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)

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

EMPLOYABILITY SKILLS

(Common to AIDS, CSBS, CSD, 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: At the end of the course Students will be able to

S.No.	Course Outcome	Knowledge Level
1.	Perform well in calculating on number problems and various units of ratio concepts	K3
2.	Solve problems on time and distance and units related solutions	K3
3.	Adept in solving problems related to profit and loss, in specific, quantitative ability	K3
4.	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.	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

Estd. 1980   AUTONOMOUS

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.
5.	K.I. Vibhute, Criminal Law, Lexis Nexis, 12th Edn.
6.	N. Prabha Unnithan (ed.), Crime & Justice in India, Sage Pub., 2013.
7.	Ritu Gupta, Sexual Harassment at Workplace, Lexis Nexis, 2013.
8.	IGNOU: Gender Sensitization: Society, Culture and Change (2019) BGSE001, New Delhi IGNOU.

Web links:	
1.	https://nptel.ac.in/courses/110105080
2.	https://www.youtube.com/watch?v=2Xfp2eiTte0
3.	https://www.youtube.com/watch?v=-FCEBe5VNcA&t=41s
4.	https://www.youtube.com/watch?v=7n9IOH0NvyY
5.	https://www.youtube.com/watch?v=dpC2jGqu4G0
6.	https://www.youtube.com/watch?v=kcW4ABcY3zI&t=99s
7.	https://www.youtube.com/watch?v=dlXw1PbnWKM
8.	https://www.youtube.com/watch?v=9bayaZ18_po
9.	https://www.youtube.com/watch?v=ZbLq23cGFV4&t=1662s
10.	https://www.youtube.com/watch?v=61aYvb0Vo68
11.	https://www.youtube.com/watch?v=728H4Khf7Gk&t=1793s
12.	https://www.youtube.com/watch?v=y2Yk-rSZ7PI
13.	https://www.youtube.com/watch?v=wSqFvcjDpos
14.	https://www.youtube.com/watch?v=AljDd7nj9wE
15.	https://www.youtube.com/watch?v=MKPM0f2fOjM